C&S COMPANIES

Sullivan County Multi-Municipal Gas Drilling Task Force

Highway Impacts Study and Report

Prepared by

C&S Companies®
Steven D Messmer, IE
Peter F Messmer

For
Member Towns

Tusten (Lead), Callicoon, Cochecton, Delaware, Fremont, Highland, Lumberland and Sullivan County Division of Planning and Environmental Management

Sullivan County, New York

This project was assisted by a grant from the Upper Delaware Council, Narrowsburg, NY 12764

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Delaware, Fremont, Highland,
Lumberland

Sullivan County, New York

August 14, 2009

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Multi-Municipal Gas Drilling Task Force
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EXECUTIVE SUMMARY

GENERAL COMMENTS
The chief purpose of the report was to produce a tool for managing the use of and recovering costs for damages to task force roads by gas developers. Therefore, the most crucial part of this report is Section III which contains the Road Use Agreement (RUA) itself. The RUA is the primary tool developed as a result of this study. Sections I and II of the report presents an overview of the field and survey data, analytical methodology, and key findings or recommendations ultimately used to develop the RUA. Section IV of the report follows up with a guideline or "road map" for implementation of the RUA. Finally, the Appendices contain backup data used or generated for/during completion of the report, and pavement management tools for ongoing use by the task force highway departments. Each section is described in more detail in the following paragraphs.

SECTION I
The first section of the report provides an overview of the project including a description of the project, an explanation of the purpose of the project, and a detailed explanation of the methodology used to complete the road survey and data collection process. The primary tool used to capture town highway network data was the pavement management system RSMS, by Cornell Local Roads. The 20 sample miles upon which the study was based for each town are indicated on the RSMS reports included in Appendices G and I. Detail information about RSMS is also provided in the Appendices.

SECTION II
Based on an evaluation of the data obtained as described in Section I, the second section provides specific conclusions about the condition of the task force highway networks and concludes with a specific list of issues that must be provided for in the Road Use Agreement due to actual road and traffic conditions within the task force towns as disclosed by the field surveys and road ratings.

SECTION III
The third section of the report provides the ***proto type*** Road Use Agreement (RUA) recommended for use by the Towns. The RUA contains eighteen Articles. Each article

provides technical requirements that comprise the complete and basic form of agreement to be executed between task force towns and developers for each gas development project. The RUA is written in a "generic" manner and is suitable for adaptation by any of the Task Force towns. It is intended that its implementation will involve customization of the required measures to the specific circumstances of each town and developer. The RUA is not intended for the layman. It is a highly technical document and a full understanding and successful implementation of the RUA will require a qualified highway engineer experienced in the practices of repair and maintenance of local roads. Required qualifications for the engineer who implements the RUA are delineated in the RUA itself.

SECTION IV

The fourth section of the report is a standard operating procedure (SOP) which describes the entire process required to successfully implement an RUA for any given gas development project. The SOP describes ten steps beginning with passing local laws to enforce use of an RUA and concluding with invoicing for remuneration of damages due to gas drilling activity. Each of the steps is defined by a title or definition, a timing specification for when the step should be executed, and finally comments and recommendations concerning specific critical path items that should be addressed during each step. Section IV is thus, intended as a planning "road map" or general guideline for Highway Supervisors, Town Supervisors, Town Boards, Town or County Planning Boards, and any other municipal official involved in the overall process of managing the impacts of gas development projects within the task force area.

APPENDICES

The appendices contain two basic categories of material. First, is all the backup data and information generated as a part of the overall study and report. This includes sample road photos, field rating work sheets, road maps and inventories, unit cost data, and various RSMS output reports.

The second and perhaps most important category of information contained in the appendices is a copy of the RSMS pavement management system software and computer data files which contain a start-up pavement management system for each of the task force towns. The software, including user manual and CD disk, may be used on a Town computer in conjunction with the data files created for this study (20 miles of road in each town) to complete and continue an ongoing pavement management system. Each town needs to simply rate all the rest of their roads and enter that into the already created data files, and thereby launch a pavement management system. This is highly recommended as it will form a data baseline for RUA implementation which will impact many roads in addition to the 20 sample roads chosen for each town.

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SECTION I – PROJECT OVERVIEW AND DATA COLLECTION

Project Description

This report was completed by C&S Companies (C&S) under contract with the Town of Tusten as authorized by the May 4th, 2009 Town of Tusten Letter of Acceptance of the C&S Addendum No. 2 Alternative A, proposal dated April 6, 2009. The report was completed in accordance with the Sullivan County Department of Planning request for proposal and addendums, which were issued on behalf of The Sullivan County Multi-Municipal Gas Drilling Task Force, in order to assist in planning for the management of potential impacts to local roads anticipated as a result of Marcellus shale gas exploration and drilling anticipated in the County.

The seven townships comprising the task force face the likelihood of heavy industrial gas drilling operations that intend to remove natural gas from the Marcellus shale strata, located about one mile below the surface of the ground. The process of mining natural gas in the Marcellus shale strata, requires construction and preparation of drilling sites and the installation and operation of drilling rigs, which in turn requires extensive quantities of materiel and heavy equipment to be transported to/from the drilling sites. Accordingly, these proposed operations require the use of town roads to access, develop, and operate the gas wells. In addition to construction traffic for hauling of supplies and equipment, the hydraulic fracturing techniques associated with the gas extraction process require injection and removal of large quantities of water for each well. Furthermore, these shafts can be turned and continued in a horizontal direction under the earth and thus remain in operation for long periods of time requiring ongoing consumption of resources and use of local roads. This can purportedly result in the use of as much as two to nine million gallons of water per well (The Natural Gas Boom in NY: Potential Water resources Impacts by Steven Winkley) which must be injected, removed, and disposed of. This equates to a potential range of about 8,000 to 75,000 tons of water hauled to and from any given site per well. Therefore, for *each well drilled* this could result in the imposition of traffic loads on any given local road within a range of about 320 to 1,500 trips of a 6,000 gallon tanker truck with a gross vehicle weight of about 80,000 lbs. This number and magnitude of loads, associated with the water hauling alone, is enough to overload local roads that were not designed for such traffic. The Towns are facing the probability of these gas drilling operations in multiple areas within each township and the potential exists to highly damage a significant number of road miles in each township.

Purpose

The purpose of this project is to inspect and evaluate the condition of the local roads within the Task Force (TF) towns and based on actual road conditions, develop a Road Use Agreement that will be enacted between the Township and a Gas Drilling Developer in order to protect the public road infrastructure. This protection must be enforced in several respects including; the maintenance of safe traffic flow patterns for the citizens, residents, and road users of the local municipalities during any gas drilling project, and provide for the remuneration of damage to municipal road infrastructures. The Gas Drilling companies will impose a level of use on the roads that far exceeds the weight and number of normal vehicles on the road. The costs of ensuing damage must be recovered and all damages must be mitigated such that the town road infrastructure is left in a condition at least as good as it was prior to the gas development project.

The Towns have specified, in various communications including the written request for proposal, various dialogues, interviews and meetings that the road use agreement accomplish the following purposes:

1. Define and enforce a Haul Route plan for any given gas drilling project.
2. Set up construction traffic control plans that safely accommodate the needs of town residents and the traveling public.
3. Identify and require any needed upgrades for roads, bridges and culverts that must be accomplished prior to use by the gas drilling companies.
4. Stipulate the conditions for pre-construction upgrades, including technical specifications and terms of payment by the developer.
5. Utilize the AASHTO Pavement Design method as the means to assess damages and specify repairs.
6. Assess the pre and post construction state of the roads.
7. Determine and assign appropriate repairs for road infrastructure damage
8. Establish procedures for road maintenance during the gas drilling project and for the final repairs after the project.
9. Stipulate the terms for final payment of damages.

One of the most important elements included in the above purposes was the insight of the Task Force to specify that the AASHTO Pavement Design Method be incorporated into the RUA methodology. This provides a quantitative method defined by the Association of State Highway Transportation officials that is applicable to local roads. The method is established, accepted, and widely used in the industry. A crucial concept of this method that will be utilized is the Structural Number (SN) concept. This concept assigns a numeric value to any given layer of a roadbed and the summation of the individual layer structural numbers yields an SN for the entire roadbed.

In order to accomplish the above purposes the project was progressed in phases from May 26th through August 14th. Phases included; interviews with the Highway Superintendents, field

inspections of sample sets of the Town Roads about their highway department operations and management, analysis and evaluation of the road infrastructure based on the field inspections and interviews, and finally the development of the Road Use Agreement (RUA). The completion of this project puts at the Town's disposal an important and timely tool, the RUA, well in advance of the commencement of the gas drilling projects. Advance communications and negotiations with the gas drilling developers is both crucial and essential in order to implement and enforce the RUA to meet the general purposes outlined above.

Method of Investigation

Selection of an investigative method: Development of an effective RUA is contingent on a full understanding of the road infrastructure, its general characteristics such as geometry (width of the traveled way, vertical and horizontal alignment, etc.) and the typical structural cross sections of the pavements and gravel roads. It is imperative for the creator of the RUA to understand the prevailing practices of the highway agencies, the materials and methods commonly used and the techniques that are possible and applicable in the region. Finally, an understanding of the current pavement and gravel roads conditions is needed. All of this background information provides for the development of a realistic and enforceable RUA. In order to gain this understanding the Cornell Local Roads Pavement Management method was chosen as the framework for the investigation of the Township road networks. This method is called the Road Surface Management System (RSMS). RSMS provides a systematic data collection and evaluation methodology that thoroughly characterizes a local road network. It provides the means to perform a uniform and systematic field inspection of each individual road. It also provides the framework for collecting and analyzing the overall road network with respect to importance and priority of the roads. It provides a tool for creating a database of the basic road inventory information such as defining each road and its characteristics such as width, length, traffic use level, importance, and pavement or gravel surface condition. Furthermore, RSMS documents the current maintenance and repair techniques used by the municipality and the costs for the treatments.

RSMS is typically used as an overall highway network budgeting and management tool. In the case of this project it served two main purposes:

1. ***For the purposes of this study a sample set of 20 miles of road for each town was rated.*** The sample set list of roads for each task force town is provided in **Appendix G (Summary of Roads Rated)**. This RSMS study allowed for the engineer to get a thorough, comprehensive, and extensive understanding of the highway networks and the highway department operations upon which the RUA is necessarily based and developed. Appendix J includes a copy of the RSMS program manual.

2. RSMS provides a baseline of important data necessary for development of the RUA, including the following:

i. Highway Materials, Labor, and Equipment Unit Costs: The unit costs of materials and equipment are a function of the cost structures of the local vendors which supply the town highway departments, as well as local union contracts negotiated for labor. Accordingly, unit rates are similar for the TF towns since in general they share the same material and equipment vendors and suppliers, and contract negotiations across the county for labor are similar. All of these data items are part of the RSMS input requirements.

ii. Repair and Maintenance Treatment Costs: Unit rates are entered into RSMS which are utilized by the software, together with data describing each treatments used by TF towns to repair roads, in order to generate the cost of typical repair treatments for any given road. The repair treatments defined in RSMS and their associated costs are useful for the establishment of bond rates in the RUA as well as providing a general understanding of the magnitude of costs for post-construction damage, which can be quite substantial when labor, materials, and equipment costs are considered.

iii. The pavement condition survey (road ratings) data completed in the field by the Engineer is entered into RSMS for the 20 miles of road segments rated in each town. This data enables RSMS to be used to categorize road segments according to their present levels of serviceability and therefore vulnerability to potential use by gas development contractors. This is ultimately captured in RSMS by identification of a pavement condition index (PCI) for each road segment.

iv. RUA Structural Number: The Pavement Condition Index (PCI), generated by RSMS from the road rating data, as discussed, is a score which rates the overall condition of a pavement on a scale from 1 to 100, with 100 being the best. The PCI is as an important part of the pre-construction inspection required by the RUA The pavement condition index will be used to help assign the SN required by the RUA for an asphalt pavement before and after use of the road by the gas development contractor. The before use SN will also be used to determine if a pre-use road upgrade is needed. Finally, the difference in the SN from before and after use will be used to determine the extent of damage caused by the gas development project, and to generate the amount of costs that the gas development contractor is liable for in order to repair the road.

It should be noted that in addition to providing a base line of data required for this study the RSMS methodology provides the additional benefit of establishing a seminal RSMS pavement management system for each town, including the following tools which are provided with this report:

- The RSMS Software disk
- The RSMS User Manual
- RSMS data files with detailed data already entered for 20 sample miles of roads as evaluated for this study.

With the above tools provided as a part of the study each TF town now has the tools required to evaluate the rest of their road networks and complete the RSMS data files for the entire town highway inventory. This will enable implementation of the RSMS pavement management system for use in planning and budgeting long term highway repair and maintenance programs.

General Comments

Field Data Collection

Data was collected for the RSMS method of investigation in two ways. First, was a series of interviews with the highway superintendent of each participating township. Second, was the field inspection of a sample set of roads from each township. This information collectively provided a full and comprehensive overview of the highway networks and scope of each highway department operation. This process of data collection, in and of itself was crucial for the consultants to understand the highway operations for the purpose of writing an effective RUA. Data from the field notes was incorporated herein as input for the RSMS method.

Highway Superintendent Interviews: The Highway Superintendents provided the selection of roads to be used in the 20 mile sample set. Each highway superintendent selected possible candidates for the sample set that actually included more than 20 miles. These roads were chosen in order to represent a broad range of the pavement types and conditions in the town. The selections also included roads that were likely candidates for haul routes to regions in the town that have already been leased for gas drilling rights. The selected roads were identified on maps and provided to the engineer for the field inspections. Since the selections included more than 20 miles in each town it was left to the judgment of the engineer to select 20 miles from the identified candidates for actual inspection. The selected roads for each town are listed in the rating summary lists of Appendix G and on the RSMS Road Repair Inventory Lists contained in Appendix I, which also depicts the limits and length of each road section.

The interviews provided the basic management information regarding maintenance operations of the highway agencies. Materials, labor, and equipment rates were gathered. Repair types and productivity rates were discussed and documented and the Highway Superintendents were asked to provide subjective ratings of traffic use levels and road importance ratings. As these interviews proceeded much of the information became repetitive because the highway departments are using the same material sources and labor and equipment rates are also very similar. Due to the repetitive nature of much of the information gained, all the field notes are not provided herein, however forms from the Town of Lumberland are provided as a sample and are included in Appendix H with the unit cost data that was developed from them. In some limited cases only one or two towns provided costs for a given item, for example bank run gravel. In this case the cost of that item was based on the one or two towns and assumed to be similar for the other towns.

Typical Road Network Treatments

Paved Road Treatments: The treatments being commonly used for paved roads by all of the municipalities include; hot mix overlays (generally 1 to 3 inches thick), cold mix asphalt

pavements of 3-4 inches thick, chip seals using #1A stone, spot paving with hot mix to repair discrete areas, cold mix and hot mix patching for potholes and broken up areas. To a limited degree there is some Slurry Seal being used, some Full Depth Reclamation (FDR), and some Cold-in-Place Recycle (CIPR) of asphalt. Cold Mix Asphalt, Hot Mix Asphalt, Slurry Seal, Full Depth Reclamation, and Cold-in-Place Recycle are all defined in the section below titled

Gravel Road treatments: Treatments for gravel roads being used primarily include annual re-grading operations, spot graveling soft spots, and limited cases of re-graveling entire road ways. Many of the towns combine spot graveling and re-grading operations each spring. Earth roads receive very limited maintenance and many are signed as seasonal roads. Spot graveling is done to a limited degree on the earth roads. There are rudimentary and shallow ditches along some of the earth roads. Table 2 below includes dust control with asphalt emulsion and Calcium Chloride as suggested treatments where needed.

Road Treatment Costs and Recommendations for Additional Treatments: The interview information was analyzed and developed into an excel spreadsheet that captures ***unit costs*** for labor, equipment, and materials *generally applicable* to all of the TF towns for typical paved and gravel road treatments. These unit costs were then used to develop treatment costs for treatments currently being used by the towns as well as additional recommended treatments made by C&S to further enhance current operations. Appendix K contains computer disks with the EXCEL program spreadsheets developed for these cost computations. Included in Table 1, is the summary of the calculated treatment costs including town labor and equipment costs.

The amount of any given treatment varied somewhat for each town. For example some towns used more hot mix than others. However, the process of hot mix paving and the costs remains similar from Town to Town regardless of how much the treatment was used. Therefore, one table of treatment costs was developed. This same slate of treatments was used in each of the RSMS data bases. RSMS provides the opportunity to choose the desired repair, whether it be hot mix or cold mix paving for example.

Table 1 – Summary of Paved Roads Treatments and Costs

Treatment Cost Summary				
Treatment	Repair Strategy	Material Cost $/Sq Yd	Town Labor & Equip $/Sq Yd	Total Cost $/Sq Yd
Crackseal	Routine Maintenance	$ 0.15	None	$ 0.15
*Surface Patch	Routine Maintenance	$ 0.32	$0.51	$ 0.83
Boxout Patch	Routine Maintenance	$ 0.32	$0.76	$ 1.09
Boxout and Crackseal	Routine	$ 0.47	$0.76	$ 1.23

	Maintenance			
Crackseal and Slurry Seal	Preventive Maint.	$ 1.49	None	$ 1.49
Microsurfacing	Preventive Maint.	$ 2.86	None	$ 2.86
*#1A Single Chip Seal	Preventive Maint.	$ 0.69	$0.21	$ 0.90
Prep and #1A Chip Seal	Preventive Maint.	$ 1.16	$0.98	$ 2.14
Box Out, #1A CS	Preventive Maint.	$ 1.02	$0.98	$ 1.99
**Slurry Seal	Preventive Maint.	$ 1.34	None	$ 1.34
Crackseal, Box out, #1A CS	Minor Rehabilitation	$ 1.16	$0.98	$ 2.14
#1ST/#1A Double Chip Seal	Minor Rehabilitation	$ 1.92	$0.42	$ 2.34
*1 ½ inch Black Top Overlay	Major Rehabilitation	$ 6.44	$2.78	$ 9.21
*3" CM #1 & #2 Stone	Major Rehabilitation	$ 6.92	$1.20	$ 8.13
3" CM (Millings & Crusher Run)	Major Rehabilitation	$ 5.62	$2.20	$ 7.82
*3" Hot Mix Overlay	Major Rehabilitation	$11.02	$2.78	$13.79
*2" Hot Mix Overlay	Major Rehabilitation	$ 7.96	$2.78	$10.74
*2 ½" Hot Mix Overlay	Major Rehabilitation	$ 9.49	$2.78	$12.27
**Cold-in-Place Recycle	Major Rehabilitation	$ 4.17	None	$ 4.17
Fabric, 12" Gravel	Reconstruction	$ 7.98	$5.35	$13.34
Fab, 12" Grvl, 6" Emul Injection	Reconstruction	$ 7.21	$5.38	$12.58
9" FDR with 4" Add Gravel	Reconstruction	$ 8.33	$2.68	$11.01
6" FDR, 4" Stab. Gravel	Reconstruction	$ 6.80	$1.31	$ 8.11
**9" FDR	Reconstruction	$ 5.63	$0.14	$ 5.77

Note: Treatments marked with an '*' are currently used. Treatments marked with '**' have been used in a few limited cases.

Table 2 – Gravel Road Treatments and Costs

Gravel Road Treatments Cost Summary			
Treatment	Material Cost	Town Labor & Equip	Total
Regrade	None	$2.59	$2.59
Spot Gravel	$2.56	$3.55	$6.11

CaCl Dust Control	**$1.60**	**None**	**$1.60**
AEP Dust Control	**$0.33**	**None**	**$0.33**
4" Gravel	**$1.08**	**$2.68**	**$3.76**
Fabric, 12" Gravel	**$4.44**	**$5.52**	**$9.96**

The unit costs indicated in the tables above can be changed using the excel spreadsheet that is part of this report. The spread sheet allows for any labor, equipment, or material unit cost to be changed in the master unit costs tables. Furthermore, any feature of an individual repair can be changed by going to the appropriate worksheet for the repair. The pieces of equipment assigned for the repair, the number of workers, the hours assigned to workers and pieces of equipment can all be adjusted. The spreadsheet provides a very versatile tool for developing and updating unit costs of repair techniques. **It is highly recommended that the spreadsheet be examined and changed accordingly where the Highway Superintendents do not agree with all of the assumptions used in setting up the repair costs before using the unit costs for planning purposes or RUA purposes.** Most importantly, as mentioned previously the spread sheet provides a tool that will be very useful for establishing the estimated costs of upgrades and final repairs during implementation of the RUA. Since the RUA does incorporate the services of a Highway Engineer, the spreadsheets can be fine tuned by the Highway Superintendent and the Highway Engineer working together as needed.

Road Condition Rating Inspections: Using the maps of candidate roads the engineer selected 20 miles of roadway with the objective of including both asphalt and aggregate surfaced roads. Additionally, the road segment selections were spaced around the town to include a representation of roads across the entire geographic region of the town. The roads were driven at a slow speed of 5 to 10 miles to conduct the condition rating. Asphalt paved roads and aggregate surfaced roads were evaluated in accordance with the techniques specified by RSMS. Ratings include an evaluation of both the severity (degree of damage) and extant (% of affected road area) of a particular kind of distress. A summary of distresses for paved and gravel roads follows.

Asphalt Paved Roads

1. **Longitudinal and transverse cracks** – These are individual, single cracks that run either in the direction of travel or perpendicular to the direction of travel. They typically indicate distress due to temperature related expansion and contraction of the asphalt pavement.
2. **Alligator cracks** – These are cracks that appear in a pattern that looks like the 'back of an alligator' or could be compared to the pattern of a spider web. These cracks indicate that the asphalt has been flexed and broken by traffic loads. They can also indicate a weak underlying aggregate base if the asphalt concrete is not very old (less than 12 to 15 years).

3. **Edge Cracks** – These are half moon shaped cracks that appear along the edge of the pavement. They indicate a weak, un-drained shoulder area that does not provide the needed strength for the pavement edge.
4. **Rutting** – The pavement is examined for the length and depth of rutting in the wheel paths. If this rutting is apparent and prevalent it indicates that the asphalt is built on top of an inadequate base. An inadequate base is either too little aggregate material, poor quality aggregate material, or both.
5. **Bleeding** – The presence of pure asphalt cement on the road surface. The asphalt cement has worked its way to the surface. This can happen if the asphalt surface treatment or asphalt concrete was constructed with the use of too much asphalt cement. It can also happen when traffic includes excessive and heavy truck loading that consolidates the asphalt concrete.
6. **Potholes and Patches** – The presence of potholes and patches are evaluated by the number, size, and depth. A minor amount of them can be expected due to normal wear and tear. Medium to high extents of them indicate either a worn out pavement at the end of its normal life or in the case of a pavement that has not lasted as long as it should they generally indicate a weak and inadequate base. High severity alligator cracks that begin to loose chunks of material often are usually the start of potholes.
7. **Drainage conditions** – Drainage conditions included a cursory evaluation of the roadside ditches. Good ditches are essential to removing water from the road bed. The drainage evaluation is not an integral part of the pavement condition evaluation. The rating method included only a simple "good, fair, poor" evaluation.
8. **Roughness** – The ride quality was evaluated. Good means the road can be driven at the posted speed. Fair means the ride is somewhat uncomfortable at the posted speed and the driver tends to slow down. Poor means that the driver must slow down significantly and drive with some measure of caution due to the roughness of the road. Poor roughness indicates a failed pavement and possibly a failed underlying base course.

Aggregate Surfaced Road Ratings

1. **Improper Cross-Section** – The crown of the road is evaluated. In general the center of the road should be higher than the edges so that the water drains off to either side. A good gravel road should be sloped at a rate of at least 3%. This would mean at least 3 ¼ inches of drop from center to edge of the gravel road for an 18 foot wide road. Also, the shoulders should be slope towards the ditch at a rate of 4-6 percent.
2. **Roadside Drainage** – The road should include ditches that are deep enough to be lower than the bottom of the road bed. Typically the bottom of the ditch should be 12 to 18 inches lower than the edge of the shoulder. This ensures that water can seep out of the road bed and that the ditches can handle the runoff from the road surface.
3. **Corrugations** – Small ridges that run perpendicular to the direction of the road can be formed in the pattern of a 'wash board' in loose gravel on the road surface. These

can be formed by traffic or even by improper grading operations. They make driving quite uncomfortable if they are severe and extensive enough. The extent and the roughness of these ridges is evaluated.

4. **Potholes** – The number and depth of potholes is evaluated. Some potholes typically appear on gravel roads. They start from small low spots that hold water and then tires splash water and gravel out of these spots to form potholes. They are remedied by regarding the road. Between regarding treatments some municipalities fill them with aggregate.
5. **Rutting** – The depth and extent of rutting is evaluated. This is the most important distress to evaluate if aggregate roads have enough thickness of quality gravel to handle to traffic on the road. Inadequate thickness of gravel or low quality gravel can result in rutting to various degrees, depending on the magnitude of deficiency.
6. **Loose Aggregate** – The depth of loose gravel and/or the presence of small gravel windrows at the center or edges of the road is evaluated. A proper road surface gravel requires a limited amount of fine material to act as a binder. A gravel that makes a good base under a pavement requires little to no fine material. If a very clean base course gravel has been used as a gravel road surface then the material may remain loose and unbound on the surface. Additionally, a good gravel road surface material should have a small top size, for example 1-inch is a good top size. Calcium Chloride (CaCl), Sodium Chloride (NaCl), or asphalt emulsion can be used to tighten and bind gravel road surfaces.
7. **Dust** – Dust and loose aggregate often go hand in hand. Again, the correct surface gravel, and CaCl, NaCl, or asphalt emulsion will prevent excessive dust problems. In rainy weather dustiness is difficult to evaluate. During the particular time that the road evaluations were done dustiness was not a significant problem. But this was also because 2009 has been a very "wet" year in general. In other seasons or years a dustiness evaluation might be quite different. In a dry year gravel surfaces can loose as much as an inch of gravel a year due to dust and erosion. It can be an issue that requires attention.
8. **Roughness** – This is the same assessment of the ride quality as described for paved roads above.

As gravel roads are constantly in a state of flux due to weather and maintenance treatments such as re-grading the corrugations, potholes, dust, and loose aggregate were less important than the evaluation of rutting, cross section, and drainage. The latter three are more indicative of the longer lasting attributes of a gravel surfaced road including the overall roadbed depth and quality of material and the cross section shape and dimensions of the traveled way and ditches. It is the last three that will be the more important considerations of the pre-use condition assessment of gravel roads in order to determine if and to what extent pre-use upgrades will be required. Even if the road can be used as-is the depth of gravel can be greatly damaged by heavy construction traffic potentially requiring complete replacement and shaping of the gravel road bed layer after the gas development project.

In addition to the road condition ratings each road section rated was photographed. The pictures provide a visual feature to accompany the condition rating and they show the variation of roadways within the municipalities. Appendix E and F include the road condition ratings and photographs respectively, for each town.

Overview of Road Network Surfaces

Road Surface Types: The Town road networks consisted of asphalt paved roads and aggregate surfaced roads (often referred to as gravel roads or dirt roads by the layman). Asphalt paved roads from town to town consisted of three types including multiple layers of oil and stone (chip seals), hot mix asphalt concrete or cold mix asphalt concrete. The proportion of each type varied from Town to Town. The various asphalt road surfaces were all rated using the same rating method described above, especially since it is difficult to differentiate between multiple chip seals, cold mix and hot mix when they have been constantly resurfaced with chip seals which are commonly used on all three types of pavements as a maintenance technique. Since the condition surveys did not include subsurface investigation the depth and type of product used in the road base layers underlying the road surfaces was not obviously visible for paved roads or aggregate roads. Anecdotally it is known that in some cases road bases include materials such as logs, and/or large field stone. Detail investigation of base materials was not a part of this study, but will be required by the RUA as part of the pre use testing requirements for the gas development contractors. The various types of road surfaces are described in more detail in the following paragraphs.

Hot Mix Asphalt (HMA): HMA is a highly refined product produced in commercial hot mix plants and trucked in to the municipality from the nearest, least cost plant. It is made from aggregate and hot liquid asphalt cement. It is placed and compacted at high temperatures before it cools to air temperature.

Cold Mix Asphalt (CMA): CMA is produced locally, in the field, by portable 'pug-mills' that are set up at the town highway barns, along the road where the paving is being done or near a gravel stockpile in the town where the mix is being made. The product is a mixture of new, specially-sized stone and liquid asphalt emulsion handled at low temperatures. Process controls are far less sophisticated than for hot mix plants. Cold mix sometimes incorporates recycled asphalt pavement millings (RAP). After mixing the cold mix material cools to air temperature and is placed and compacted at air temperature, hence the name 'cold mix'. Multiple chip seal, hot mix asphalt, and cold mix asphalt all constitute paved asphalt roads.

Multiple Chip Seal Pavements: Chip seals are generally less than 3 inches thick. When multiple chip seals are stacked to over 3 inches in thickness the pavement will perform like a cold mix pavement, as the multiple layers of chip seal are similar to a cold mix pavement constructed from scratch. Cold mix and hot mix pavements are generally thick, greater than 3 inches. If they have been repaved a number of times thickness may even be in the range of 6 to 10 inches. Over 10 inches of thickness would likely be exceptional for a Town road.

Aggregate Surfaced Roads: Roads surfaced with one or more layers of aggregate consisting of crushed or bank run gravel, as indicated by the interviews with the highway superintendents. Sometimes a course bank run is placed on a lower layer that may include large stones of 4 inches or so. Then surface gravel is placed over the bank run. Surface gravel typically has a 1 to 2 inch top size. Some aggregate roads consist only of a single layer of crushed gravel with a top size of 1to 2 inches.

Earth Roads: Earthen roads are those that may not have any gravel layer on them or may have had modest amounts of gravel placed here or there over the years to strengthen soft spots. This modest amount of gravel mixes with the native earth to yield the so-called earth road.

Roadway Dimensions and Topography

The paved roads across all the towns were most generally 17-18 feet wide. There was a smaller percentage in the 18 to 22 foot wide range. And there was a small percentage in the 12-15 foot wide range. The shoulder condition in all towns was most generally 2-3 feet of sandy gravel or earth. In most cases the shoulder area was grassy or partially grassy. However, many roads had little to no shoulders.

Gravel roads ranged in width from 15 to 22 feet, with the predominance of them in the 16-18 foot range. The shoulders of the gravel roads were hard to define. In general they were measured by assessing the demarcation between gravel placed on the traveled way versus the gravelly and grassy shoulder area. The gravel road shoulders tended to be 1- 3 feet, with many roads having little if any shoulder.

The earth roads were generally 12-15 feet wide with no shoulders and minimal to no ditches. The earth roads also tended to have delineated wheel path ruts and even vegetation between the wheel paths in some cases. Some of the earth roads were in deep cut sections with 2 to 4 foot high earth banks immediately adjacent to the narrow roadway. A number of the earth roads were impassable by smaller sedans and would require pickup trucks or SUV's to traverse them safely. Dump trucks would not easily fit on them, especially in narrow cut sections. The terrain of all the towns included significant mountainous topography with many miles of roads traversing hills and mountains with steep embankments falling away on one side of the road and rising up on the other. Also, some roads followed river and stream valleys or ran across the tops of mountains in relatively flat or gently rolling topography. The roads that progress along hill and mountain sides with steep embankments on either side will present particular challenges if the gas companies must use them. The RUA should include stipulations in an article on defining haul routes that provides for final approval on the use of any given road as a haul route, depending on safety issues such as the surrounding topography the roadway traverses.

Paved Roads Surface Conditions

The network overview is best illustrated by the Pavement Condition Index (PCI), both for each individual road section and for the entire town road network. The PCI is derived from the road condition ratings. Deduct points are assigned for each distress evaluation, by severity and extent.

The deduct points are subtracted from 100 to determine a PCI for the road section. The network PCI is a weighted average of the road PCI scores. The deduct points are set up to reflect the standards typically used in a scholastic environment and in that sense the lay person can easily relate to them. In general a score of 85 or above is considered excellent. A score of about 70 to 84 is considered good, a score of 55 to 69 is considered fair, and a score below 55 is considered poor or very poor. The deduct points are included in Appendix D. Roads scoring 'excellent' typically require only routine maintenance or no maintenance at all. Roads scoring 'good' require routine maintenance or preventive maintenance. Roads scoring fair require minor or major rehabilitation, while roads scoring poor or very poor require major rehabilitation or total reconstruction. The definitions of these treatment categories follow:

Routine Maintenance: Consists of minor pothole patching, patching of limited areas of alligator cracking, filling cracks with an asphalt sealant, or minor patching of edge cracks. The extent of such patching and crack fill is low, typically less than 5% of the overall road surface.

Preventive Maintenance: Roads that need preventive maintenance show distresses that need to be dealt with on a more extensive basis than routine maintenance. For example the road surface may not have adequate skid resistance. The road surface may be weathering and getting more open and porous which allows water to penetrate and cause damage. There may be medium to high amounts of very low severity, hairline alligator cracks. These types of problems are remedied by covering the entire road surface with a thin surface treatment. These are low cost treatments of oil and stone chips or slurry seal. Slurry seal is a mixture of sand and liquid asphalt emulsion applied about a ¼ inch thick. These types of treatments reseal the roadway and provide renewed skid resistance and water proofing, similar to a driveway sealing treatment that a homeowner will do for a paved driveway. They are designed to preserve and extend the life of the asphalt pavement.

Minor Rehabilitation: These treatments are done when an asphalt pavement still has more years left in it that will be lost if action is not taken. They include the addition of asphalt thickness to reinforce the pavement through the use of thin overlays, for example a 1½ inch hot mix overlay. They can also include a combination of an aggressive patching effort, crack filling, and then a surface treatment (oil and stone treatment or slurry seal) or thin overlay placed over the top of the patches and crack fill. Minor rehabilitations do not include thick overlays of hot mix asphalt concrete or cold mix asphalt concrete (for example 2- 4 inch thick major overlays).

Major Rehabilitation: This is done when the existing asphalt pavement has deteriorated to the point that most or all of the useful life is expended and the road is rough and uncomfortable to drive. It is only done IF the base layer underneath is adequate. If the base layer is determined to be inadequate major rehabilitation should not be done and reconstruction should be undertaken. Major rehabilitation treatments either replace or significantly reinforce the asphalt pavement with thick, new layers. Such treatments could include 2-4 inch thick overlays or a technique called cold-in-place recycling (CIPR). CIPR uses heavy machinery to grind the asphalt pavement 3-4 inches deep, mix it with some additional new stone and liquid asphalt. The machinery then

lays this mixture down in one "train-like" operation to repave the road. It is very cost effective because it uses the existing asphalt pavement and only requires modest amounts of new liquid asphalt and stone. Sometimes, 3-4 inches of the old pavement is removed by cold-milling if the roadway can't be raised. Then new hot mix asphalt is placed and the removed millings are used elsewhere for shoulders or base material on another project. Alternatively the millings can be recycled in a portable plant with liquid asphalt and some additional new aggregate to make cold-mix asphalt that can be used to place the 3-4 inch overlay. Also, overlays can be constructed of brand new cold mix.

Reconstruction: This is done when the road base has been determined to be inadequate and the existing asphalt pavement has reached the end of its useful life as evidenced by the PCI and ride quality. Base reconstruction techniques are done in many variations of a few basic techniques including the placement of brand new base aggregate in various layers and/or the incorporation of Full Depth Recycling (FDR) techniques. Reconstruction should be deferred if a pavement has useful remaining life, however the road manager must be sure not to proceed with a major rehabilitation treatment that would not achieve it's full life and thus value to the tax payer if it is placed on a poor base. When the asphalt pavement reaches failure (it becomes too uncomfortable and/or unsafe) reconstruction should be done. In general the thickness of a base must be designed for a reasonable life expectancy of 30 to 40 years with a means such as the AASHTO Pavement Design Method to meet the traffic levels of the road and the strength of the underlying natural earth. If the underlying ground is weak clay and there are heavy trucks using the road a very thick base of high strength material will be needed. If traffic is very low with cars but few trucks and the natural ground is well drained gravel the base layer could be substantially thinner and less costly to build. In general base layers should be designed and a menu of choices for the traffic levels and natural ground conditions should be developed for the town. Once a base is designed then the surface can be designed as well. Asphalt surfaces can range from only oil and stone surface treatments to cold mix or hot mix asphalt. If thicker asphalt pavements are used they also contribute to overall strength and can decrease the thickness of base. In general base materials are cheaper than asphalt products therefore roads are most economically constructed by utilizing thick base layers and thinner asphalt layers. Less expensive, thicker layers are used to support and extend the life of more costly, higher quality, smooth and comfortable asphalt layers that are seen, felt, and used by the traveling public.

The AASHTO Pavement Design method is recommended and used in the RUA as the method of pavement design for upgrades and repairs. The method can be used to design both full depth pavements in the case of reconstruction and overlay thickness requirements in the case of major rehabilitation. Surface treatments and minor rehabilitations do not require structural thickness design.

The RSMS Reports include a Road Condition Summary and Repair Category Report for each Town. The Repair Category Report indicates which repair category each road section is in, and the associated recommended repair alternatives and costs. The repair alternatives were established based on the interviews but also include additional treatments not being used to

broaden the range of choices for each category to a more technically thorough slate of treatments. The Road Condition Summary Report indicates the condition rating for each road section, and the road section PCI. Appendix G includes these reports for each town. The Appendix also includes a table for each town that shows the collective network PCI for the paved roads. This network PCI does not include the gravel roads because a gravel road PCI is a number that is in a constant state of flux and is not really that meaningful. Since the roads chosen represent a broad sample set from the town the network PCI is a meaningful number indicating the overall condition of the town asphalt paved network.

Aggregate Road Surface Conditions

Routine Maintenance: Aggregate roads routinely develop potholes, or experience other problems such as corrugations or minor rutting. These typically occurring defects are remedied by periodic re-grading and sometimes the addition of gravel here and there for soft spots. Re-grading of the entire road surface is typically done annually. Sometimes circumstances may require a second re-grading in the course of a year. Some municipalities may fill potholes on aggregate roads with gravel in-between their annual re-grading. Re-grading operations typically focus on working up the surface gravel to a depth that removes the potholes then re-shaping to build a crown into the road surface.

Preventive Maintenance: Treatments that help keep the road 'tight' and hard surfaced prevent the loss of gravel and maintain the investment in the material on the road. These treatments include the application of dust control agents such as CaCl, NaCl, or emulsion. These additives keep down dust, tighten the road surface and prevent loss of gravel that rolls off and into the ditches. They preserve material investment.

Major Rehabilitation: For an aggregate surfaced road this consists of the placement of additional gravel on the entire road. Typically 2-4 inches may be placed and compacted to replace gravel that has been lost due to dust and raveling or sinking into the subgrade.

Major Reconstruction: As with paved roads this means the placement of enough high quality gravel to support traffic loads given the type and amount of traffic and the existing natural ground. Often reconstruction incorporates the use of a geotextile to keep the new gravel from sinking into and merging with soft native soils such as clay. A larger top size bank run is often used as the structural, thick layer underneath. This can be topped with several inches of a finer graded surface material that provides a comfortable driving surface.

The Army Corp of Engineers method of aggregate surfaced road design is recommended and used in the RUA for designing upgrades and rebuilds of aggregate surfaced roads.

General Conclusions regarding the Network Conditions

Table 3, summarizes the miles of road for each town and the Paved Road network PCI based on the sample set of roads. Since the sample set of paved roads were spread strategically around the Towns it should provide a fairly representative network PCI value.

Table 3 – Summary of Network PCI for the Seven Participating Towns

	Miles of Road						Total Miles All Roads	Sample Set Miles		Paved Network PCI
	Asphalt pavement		Aggregate surface		Earth					
Township	2 lane	1 lane	2 lane	1 lane	2 lane	1 lane	Total	Paved	Unpaved	
Freemont	48.98	5.14	7.87	6.93	2.82	12.07	**83.81**	17.4	5.7	**68.8**
Delaware	41.54	17.4	1.57	0	0	0	**60.51**	18.1	1.5	**77.9**
Callicoon	59.89	3.28	7.58	6.48	0	5.38	**82.61**	17.5	3.5	**68.5**
Cochecton	35.83	2.31	11.52	4.87	0	1.28	**55.81**	19.45	2.1	**70.9**
Tusten	29.32	1.39	14.8	11.98	0	3.18	**60.67**	13.5	6.8	**82.3**
Lumberland	35.68	3.42	2	13.18	0	7.34	**61.62**	15.7	6.9	**79.7**
Highland	34.34	2.45	2.75	0.42	0	2.1	**42.06**	19.7	2.26	**71.6**

Generally speaking, New York state municipalities are largely in the 'same boat' with overall network PCI's typically in the 70's or maybe in the low 80's. It is exceptional to see network scores in the mid 80's, and rare indeed in the 90's. This is due to the overall marginal economic climate in New York and the high State and County tax rates that understandably depress the willingness of Towns to increase the tax burden. This trend is also due to the extreme weather conditions highway agencies battle in the north east that takes its toll on local roads, to a greater degree than more favorable climates without the damage caused by freeze-thaw conditions.

The Road Surface Condition ratings necessarily focus on visible surface distresses. However these distresses provide insight about whether or not the underlying base layers are adequate or deficient. Base conditions will be investigated more thoroughly on a case by case basis for the haul routes under the provisions of the RUA, using cores and test pits. However, the fact that all of the Town road network PCI's generally ranged from the high 60's to about 82, with most in the 70's, indicates that the base substructures are barely adequate, providing only 'fair' service. If they were of more substantial thickness and quality the network PCI would be higher because asphalt treatments would last longer and be in better condition.

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten (Lead), Callicoon, Cochecton
Delaware, Fremont, Highland,
Lumberland
Sullivan County, New York

SECTION II – EVALUATION OF DATA AND THE ROAD USE AGREEMENT

General Comments
The interviews with the Highway Superintendents and the RSMS road condition inspections provided an excellent and detailed overview of the Town Highway Departments and the road networks. Also the interactions with the Town Board members in the various meetings and interviews provided a well rounded overview of the situation and project purposes. Based on all of this information the following critical conclusions and Recommendations are presented as particular concerns that must addressed in the RUA.

Conclusions and Recommendations
Structural Capacity of the Roads (all types): In the Town of Freemont Graby Road, from Cr 131 to the end of the paved section (about 1.1 miles), was used extensively as a haul route for the Millenium pipeline. The PCI for this section of road is 60. It has alligator cracking over more than 30% of the total surface area and a high extent of rutting. It is an excellent example of the type of base failure and break up of the asphalt pavement that can result from the heavy trucking of a commercial gas development project. In the case of gas drilling in the Marcellus shale the damages can be expected to be every bit and more severe due to the extensive hauling of water in and out of the drilling sites that will occur. **Based on the conditions of Town roads observed during the field data collection phase it can be anticipated that road bases across all of the participating Towns will generally be highly susceptible to significant damage!** It is highly likely that substantial repairs will be required in the wake of these projects. In some cases upgrades may be needed ***prior*** to use by the gas drilling developers. Provisions for these upgrades have been included in the RUA. The RUA must and does provide the means to define the extent and cost of damages that gas developers must be responsible for.

Fair Method of Damage Assessment Needed: Since it is a certainty that structural repairs will be needed to local roads following a gas development project an RUA is absolutely essential. The main purpose of the RUA will be to provide a fair method to define the needed repairs and the reimbursable costs of those repairs that the gas developer will be responsible for. **It is recommended that this method be based on a recognizable and accepted highway engineering standard.** Accordingly the AASHTO Pavement Design concept of Structural Number is proposed and recommended for this method. The AASHTO Structural Number concept is also applicable for the specification of upgrades that may be needed even before a

will require information about the base layers of the proposed haul routes. This information will have to be gathered as part of the implementation of the RUA prior to construction. Test pits, borings, and cores are the usual methods to obtain information about the thickness and type of layers in the road bed.

The method must provide a means to fairly determine the costs of the damage actually done by the gas developer. The Structural Number concept is useful for this as it provides a single number that defines both the pre and post gas development project structural condition of the road. The difference between a pre-construction Structural Number and post-construction Structural Number can be used to define the extent of the damage that a developer is responsible for. The RSMS method of road surface condition assessment will be incorporated into the definition of the pre-construction Structural Number for asphalt pavements.

In order to minimize the potential for disagreement it is also highly recommended that the pre-construction assessment of haul routes include video logging. Finally the pre-construction assessment should include other basic data collection that is needed to help define the pre-existing conditions such as rut depth and cross slope of the road and a measure of roughness. All of these parameters would also be measured after the development project. The difference in rut depth and cross slope and the increase in roughness observed will establish the extent of damage, help define the post construction structural number, and will also indicate the types of repairs needed. Roughness can be easily measured using an index called the International Roughness Index (IRI). It is done with a small self propelled vehicle that measures the roughness of the road surface using lasers.

The Potential for Upgrades: The potential for upgrades exists greatly with the gravel and earth roads. This is true for several reasons. First, the gravel and earth roads, especially the earth roads, have minimal or no aggregate of high enough quality or thickness to handle numerous, repeated heavy loads. Rutting and potholing can definitely be expected which will compromise the roads for the traveling public, both in terms of comfort and drivability as well as safety. Secondly, many of the earth roads and some of the gravel roads that may be identified by gas developers as haul routes will not possess the geometric characteristics necessary to support both construction traffic and to continue to serve the public. Specifically of concern is the width of a number of these roads. **The RUA therefore must include a method for upgrades and it is highly recommended that the Towns enforce upgrades where needed.** Consistent with this recommendation the RUA includes procedures for defining upgrades and requires that the gas developers pay 100% of the cost of all upgrades that are needed before a project commences. The logic for this recommendation is that all such upgrades are ***imposed*** upon the municipality and would not ordinarily be required for the existing needs of the public. Of course both these concerns (inadequate base and narrow width of traveled way) could also apply to paved roads, as very narrow paved roads exist in the towns as well. Even paved roads could require extensive upgrades prior to use.

Geometry of the Roads: The most significant geometric problem associated with the potential haul routes is width of the traveled way. This could apply to paved and unpaved roads. In particular there are gravel and earth roads that lead directly to already existent areas where gas drilling rights have been established. In some cases these gravel or earth roads are very narrow. Heavy construction along these 'corridors' will create traffic conflicts between construction traffic and the public. In short, right-of-way will have to be acquired in order to upgrade narrow roads (paved or unpaved) to a usable acceptable width. **It is recommended that the RUA establish a protocol for the upgrade of roads that require right-of-way and widening.** Accordingly the RUA includes articles to govern this activity. The RUA states that the Town will have the right to establish road cross section design for upgrades including the lane width of the roads. It is also recommended that road width and the need of an upgrade also be evaluated in light of a traffic flow management plan, another recommendation discussed below. In some cases right-of-way acquisition and widening may be avoidable through the establishment of haul routes that utilize 'one-way' patterns. The RUA further states that the gas developers will be fully responsible for the identification of the limits of all right-of-way acquisitions and the purchase of all such right-of-way. Furthermore, the RUA will stipulate that the right-of-way is deeded over to the town, at no cost to the town, such that the reconstructed roadway and the right-of-way upon which it is aligned becomes town right-of-way. In addition to width of the driven way another significant concern is the geometry of intersections. There may be the need for improved turning radii and sight distance at intersections for haul routes. The RUA must and does address this need as well. The RUA requires that the Town Engineer establishes necessary plans and specifications for these kinds of upgrades as well, to be done and paid for fully by the gas developer.

Traffic Flow and Control: The construction traffic will be significant both in terms of the number of loads and trips and in terms of the size of the equipment. There will be thousands of truck loads of equipment and supplies associated with any given project. Definition of haul routes alone is not enough to manage the magnitude of the traffic that will hit any given town for one of these projects. **It is highly recommended that a full traffic flow and control plan be developed and implemented for these projects.** Accordingly the RUA includes an article that requires the development and adherence to this plan. The plan must include definition of all haul routes, the definition of one-way or two-way traffic and the direction of one-way traffic for each and every haul route. The plan must also address such sensitive issues as how school bus and emergency vehicle access will be maintained and how residents will be able to safely navigate their own local roads on their way to and from their homes. The plan must also include where, if any, traffic control personnel will be stationed and what traffic flow patterns they will direct. It should also include a detailed description of the traffic control devices that will be used (cones, barrels, signs, barricades etc.) and where they will be located. The safety of the traveling public depends upon such a traffic flow and control plan and it is highly recommended that it is implemented in accordance with the RUA.

Culverts and Bridges: There is always the potential that various bridges and culverts will not be able to handle the projected magnitude and number of heavy loads that will be imposed by the

gas development projects. **It is recommended that the municipalities engage the services of a structural engineer to assess the status and potential impact to all culverts and bridges on the identified haul routes.** Accordingly the RUA includes an article that stipulates this will be done. The structural engineer must also begin early in the planning process in order to have adequate time to assess bridge and culvert conditions. In some cases, upgrades may be required to bridges and culverts in order for them to be used. Again, the RUA will require that these upgrades are done in accordance with the plans and specifications of the Town Structural Engineer and that they are fully paid for by the gas developer.

Timing and Execution of a Road Use Agreement: An RUA is not going to be effective if it is not implemented systematically, comprehensively, and in a timely manner. Therefore it is highly recommended that the Town governing boards decide upon and implement a policy and procedure for engaging the gas developers early on and implementing the RUA with enough time to complete the pre-construction planning required by the RUA. **It is recommended that municipalities draft and implement a local regulation or law requiring the implementation of an RUA with each and every gas developer.** In general the RUA will require at least 12 months prior to the commencement of construction in order for implementation. This time is needed to define the haul routes, assess the traffic on each haul route, conduct a pre-construction assessment of the haul routes, determine if any upgrades are needed, complete the upgrades, and develop a traffic control and management plan.

RUA Cost Reimbursement: The RUA requires the services of a highway engineer and a structural engineer. It is recommended that the municipalities engage and hire these needed engineering services to protect Town interests. The costs for these services are being imposed upon the Towns by the gas development activities and therefore it is reasonable to expect that the costs are borne by the developers. Accordingly the RUA requires that all costs of engineering services to implement the RUA are paid for by the developer, yet the engineers will work for the municipalities, not the gas developers. The engineers must have specific qualifications and experience working with local highway agencies. They must be intimately familiar with the AASHTO design method and all local highway materials and methods of construction. This familiarity must include the design, management, and inspection of local road projects using hot mix, cold mix, asphalt emulsion surface treatments, gravel road maintenance, selection and use of proper gravel materials for gravel roads and paved road bases, local roads recycling mix design and construction etc.

Summary of Recommendations for the Road Use Agreement

Following is a list of the most important recommendations for the RUA based upon the analysis discussed above.

1. Base the RUA methodology on a recognizable and accepted highway engineering standard, namely the AASHTO Pavement Design Method and the Structural Number concept.

2. Define pre and post construction pavement conditions and apply the AASHTO Structural Number concept to define the extent of damage and the required repair.
3. Use a pre-construction assessment method that includes coring, test pits and/or borings to determine the actual roadbed structure in order to assign the Structural Number. Use rut depth, cross slope, and roughness measures also as part of the pre-construction assessment.
4. Repeat the pre-construction assessment after the project to define the extent of damages.
5. Utilize the RSMS Road Condition Surface Rating method as part of the process to define the pre and post construction Structural Number for Asphalt Pavements.
6. Determine a fair and equitable definition of the costs of damage.
7. Require that all right-of-way acquisition for widening or intersection radii improvements be done and paid for by the gas developer.
8. A full traffic management and control plan must be developed and implemented for these projects by the developer and approved by the Town.
9. The municipalities must engage the services of a structural engineer to assess the status and potential impact to all culverts and bridges on the identified haul routes.
10. Research, develop and implement a local regulation or law requiring the implementation of an RUA with each an every gas developer.
11. Adopt the RUA as a matter of policy as soon as possible, before Marcellus Shale gas development projects are approved by the NYS DEC.
12. The municipalities must hire the consultant highway and structural engineers who must work for the municipalities and represent the interests of the municipalities. The costs of these services should be paid for by the gas developers.

The actual RUA, included in Section III included the above recommendations. It also has many other salient inclusions, such as language regarding guarantees and bonding. The actual RUA explains in detail how to actually implement it. The RUA is a highly technical document that is not intended to be implemented by a layman. It is necessarily technical in nature in order to provide the necessary protocol for use by the highway and structural engineer that will be hired by the Towns.

Where to go from Here?

As discussed the next part of this report, (Section III) contains the Road Use Agreement, which provides the detailed technical methodology for tracking and recovering costs affiliated with damage to roads as a result of gas exploration and drilling activity. However, it is important to understand that successful implementation of the RUA requires a careful planning and execution process. In order to facilitate this process and implement the RUA, Section IV of this report provides a summary outline or "road map" of actions that should be taken by each TF Town in order to prepare for and execute the RUA.

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten (Lead), Callicoon, Cochecton
Delaware, Fremont, Highland,
Lumberland
Sullivan County, New York

SECTION III – ROAD USE AGREEMENT (RUA)

Road Use Agreement
Technical Articles

Purpose

The purpose of this road use agreement is to protect the publicly owned and maintained asset of the Town of _____ roads and bridges paid for by the tax dollars o0 the residents of the Town of _____. This agreement insures that the Town of _____ is compensated for any damage to the Town highway and bridge infrastructure, beyond normal depreciation, caused by large commercial development projects that impose extensive and sustained traffic loads beyond the normal load carrying capacity that the Town highway system is designed and built to handle. By requiring compensation for damages, this agreement insures that Town residents do not suffer undue damage to the public highway asset and loss of the benefits of that public investment. It further protects the Town residents from suffering undue financial burden to repair the damage done by large private developers for their own profitable enterprises.

Article I
HIGHWAY ENGINEER

The Municipality will engage the services of a Highway Engineer and a Bridge Engineer to implement the road use agreement on behalf of the Municipality. The Highway Engineer must meet the following requirements:

1. **The Highway Engineer** - must have 15 years experience in all of the following disciplines:

    a. **Pavement Management** – The Highway Engineer must have specific experience in the discipline of managing local road networks. This experience must include in depth knowledge of determining and selecting the appropriate repair strategies for local roads. The Highway Engineer must have a working knowledge of when

asphalt recycling, and full depth reclamation. The Engineer must have experience in road condition rating systems that evaluate the extent and severity of the various distress modes of gravel and bituminous surfaced roadways. The Engineer must have specific experience in selecting the proper maintenance and repair strategies given the visible deterioration. The Engineer must be able to recognize and differentiate the difference between distress modes of asphalt concrete versus underlying base failure.

b. **Highway Materials** – The Highway Engineer must have a thorough knowledge of soils, gravel, and asphalt testing and materials. The Highway Engineer must have knowledge and experience in reading and interpreting laboratory test results for soils, aggregates, and asphalt materials to include; sieve analysis, Atterberg limits, the sand equivalent test, cold-in-place mix design procedures, Marshall Mix design, CBR testing, USCS soils classification, a-coefficient determination etc. The Highway Engineer must have specific experience in the forensic investigation of local roads pavement failures and the determination of modes of failure and the recommendation of appropriate repair methods.

c. **Highway Structural Design** – The Highway Engineer must have specific knowledge and experience in designing gravel roads and full depth asphalt pavements using the AASHTO pavement design method and the United States Corp of Engineers design method for gravel roads and airfields as well as general pavement design experience.

d. **Local Roads Construction Methods and Materials** – The Highway Engineer must have specific knowledge and experience specifying and inspecting local roads construction methods and materials. This experience must include surface treatments (chip seals, slurry seal, microsurfacing etc.) cold mix asphalt concrete, hot mix asphalt concrete, and full depth reclamation using additives such as asphalt emulsion, foamed asphalt, Portland cement, lime and fly ash.

2. **The Structural Engineer** - Must have a minimum of 15 years experience in the field of structural engineering as applied to the design of bridges for NYS DOT or local highway agencies at the county, town, city and village levels. The Bridge Engineer must possess a Professional Engineer's License valid in New York State.

Article II
Definitions and Approach

1. **Definitions -** The following definitions will be used throughout the agreement.
   a. **Paved Road Repair Strategies-** The following repairs are for the pavement layers only. The reconstruction repairs do not include vertical or horizontal realignment or widening of the roadway. They are limited to improvements of the existing roadway structure.

      i. **Routine Maintenance** – spot repairs, patching and crack sealing.
      ii. **Minor Rehabilitation** – Surface treatments or thin asphalt overlays of 1 to 2 inches.
      iii. **Major Rehabilitation** – A thick asphalt treatment such as cold-in-place recycling of existing asphalt concrete or a 2-inch or thicker Hot Mix Asphalt Concrete overlay.
      iv. **Rebuild** – Replacement or Full Depth Reclamation of the pavement base. Replacement of the pavement surface with a new surface treatment, cold mix asphalt, or hot mix asphalt. May also include ditch cleaning and culvert replacements

   b. **Gravel Road Repair Strategies**
      i. **Routine Maintenance** – spot repairs, pothole patching.
      ii. **Minor Rehabilitation** – Re-grading and re-compaction of surface to remove potholes, improve crown and restore a smooth ride.
      iii. **Major Rehabilitation** – Addition of up to four inches of surface gravel.
      iv. **Rebuild** – Replacement or addition of more than 4-inches of gravel possibly including geo-textile. May also include ditch cleaning and culvert replacements.

   c. **Pavement Types -** The pavement surface of the Designated Haul Route will either be aggregate or one of various types of bituminous pavements described below:
      i. **Aggregate** – Bank run, creek run, crusher run, or screened gravel products.
      ii. **Surface Treatment** – Single or multiple layers of asphalt binder and stone chip treatments, slurry seal, other types of surface treatments, or a thin layer of hot mix asphalt. The total thickness of bituminous materials is not in excess of 1-inch.
      iii. **Multiple Surface Treatment** - Multiple layers of asphalt binder and stone chip treatments, slurry seal, other types of surface treatments, or a thin

layer of hot mix asphalt. The total thickness of bituminous materials is between 1 to 2 inches.

iv. **Cold Mix Asphalt Concrete** – A 2-inch or thicker asphalt concrete produced by mixing an asphalt emulsion binder and aggregate mixture. 60% or more of the total core thickness is cold mix asphalt concrete. The mix is produced by either a central plant pug-mill, a mix-paver, or a cold-in-place recycle process.

v. **Hot Mix Asphalt Concrete** – Asphalt hot mix concrete 2-inches or thicker, produced at a central hot mix asphalt plant. 60% or more of the total core thickness is hot mix asphalt concrete.

vi. **Composite** – A pavement composed of various layers of cold mix asphalt, or hot mix asphalt, 2 inches thick or thicker. The proportion of the hot mix and cold mix are both between 40% - 60% of the core thickness. (A pavement consisting of only cold mix or only hot mix that is coated with surface treatments would be considered either cold mix or hot mix.)

d. **Pavement Condition Index -** The pavement condition of the Designated Haul Route is assessed prior to the Development project and just after the development project using the Road Surface Management System (RSMS). The RSMS evaluation will also include an evaluation of rutting, cross slope, and roughness before and after the Development Project (reference Article VI and Article XI). The rutting and cross slope measurements are used to determine the RSMS rutting score. The roughness measurement is used to determine the RSMS roughness score. The RSMS system results in a final Pavement Condition Index (PCI) which is a numeric score of the pavement ranging from 0 to 100. Appendix A of the RUA shall include RSMS rating forms and the deduct points to calculate the PCI. The Highway Engineer will conduct the RSMS pavement condition evaluation before and after the Development Project and determine the PCI for each case. The following table relates the PCI score to the pavement condition:

PCI Score	Pavement Condition
85 – 100	Excellent
70 – 84	Good
55 – 69	Fair
0 – 54	Poor

2. **Approach -** The road use agreement is based on the American Association of State Highway and Transportation Officials (AASHTO) Structural Number (SN) concept. The SN represents the 'structural capacity' of the road bed layered system of the Designated Haul Route. The basic approach is to determine the SN (i.e. structural capacity) of the existing roadbed prior to the Development project. Then the projected Development Project traffic is considered and the needed SN for the Project is

determined. Based on the project traffic it is determined whether or not the existing road structure can handle the projected project traffic such that the Designated Haul Route is anticipated to be safe for the traveling public during the project. If not an upgrade prior to the project may be required. After the project the final SN of the pavement is again determined and the 'before' and 'final' Structural Numbers are compared to determine the needed repairs.

a. **Structural Number Definitions** - Article XI below specifies how the Developer's share of the repair costs is determined.
   i. S_{NB} – Structural Number of the Road bed before the project
   ii. SN_P – Minimum Structural Number needed to accommodate the traffic for the Development project.
   iii. SN_F – Structural Number of the Road bed after use by the Development project.
   iv. SN_R – Structural Number of the completed roadbed repair after the Development Project.

b. **If SN_B is greater than SN_P** - The Designated Haul Route is adequate for the project traffic. After the project is complete there is a determination of SN_F which will be less than SN_B due to the wear and tear on the road from the project. A repair is determined that will leave the road with an SN_R that meets or exceeds SN_B. If the SN_R meets the SN_B Developer will pay for 100 % of the repair costs. If the SN_R exceeds the SN_B – for example the Municipality requires an upgrade – the developer pays the proportion meeting the SN_B, and the Municipality pays for any upgrade of the SN_R greater than the SN_B.

c. **If SN_B is less than SN_P** - The road ***may*** need to be upgraded even before the Developer uses it, in order to safely accommodate the traveling public and the project traffic. After the project is complete there is a determination of SN_F. In this case the SN_F may or may not exceed SN_B. If SN_F still exceeds SN_B then a determination is made whether or not any routine or minor rehabilitation is needed to restore the pavement ride quality. If the road structure has been sufficiently damaged by the project such that its SN_F falls below SN_B then an additional major repair (SN_R) will be needed that meets or exceeds the original SN_B.

d. **Roads Used 'As-Is'** - The road is evaluated before and after the development project to determine the SN_R and SN_F and the needed repair is determined to recover costs for any damage, i.e. $SN_B - SN_F$. The repair costs are proportioned between the municipality and the developer relative to SN_B. The percent of the cost associated with returning the structural capacity of the road to SN_B is borne by the Developer. If the required repair exceeds SN_B, this increase in capacity is paid for by the municipality, as previously discussed. In this fashion then, the

developer only pays for the proportion of the cost of the repair that is due to his use of the road. The cost of the additional increase in capacity (over and above SN_B) is borne by the municipality because that portion of the repair restores the road to a new and improved condition that did not exist prior to the project. The cost of this improved capacity is borne by the municipality and its taxpayers who will benefit from this increase in service life that will exist for years after the Developer is done with using the road.

e. **Roads Up-graded Before Use -** The municipality must undertake a project that it had not planned nor budgeted for. Therefore the Developer is responsible for all costs of the needed upgrade. The scope of the upgrade is determined in accordance with Article VII. The municipality is responsible to limit the scope of the specified repair to meet the ***minimum*** needs of the Development Project. At the conclusion of the Development project the road is evaluated. If SN_F still exceeds SN_B then any repairs needed will be limited to routine maintenance. The Developer shall be responsible for 100 percent of the costs of this routine maintenance. If the SN_F is lower than the SN_B then a minor rehabilitation, major rehabilitation, or rebuild will be needed. In this case the responsibility for the repair costs are proportioned as described in the Roads Used 'As-Is" section above. If the Municipality wants to undertake a repair that exceeds the need of the developer then the municipality shall pay for the portion of the improvement that exceeds that needed by the developer.

Article III
DESIGNATION OF HAUL ROUTES

1. **Designation of Haul Routes** - The Developer shall determine routes (hereto referred to as Designated Haul Routes) for hauling equipment and materials to and from the project site/s. A list and map of the Designated Haul Routes shall be identified and included as an Appendix B to this RUA. Appendix B shall be submitted by the Developer, to the municipality for review and approval prior to final signing of the Road Use Agreement. The Haul Routes may not be used by the Developer until written approval is provided by the Municipality. The information submitted in Appendix B by the Developer shall specify the requested start and completion dates for use of the Haul Route and shall meet all other requirements specified herein.

2. **Construction Traffic Estimation** – The Municipality shall engage the services of a NYS licensed Civil Engineering firm, to estimate all of the construction traffic that will use each Designated Haul Route. The costs of the engineering services shall be paid for by the Developer. The type, weight, number of axles, and load on each axle, of each construction vehicle shall be defined and the number of trips for each shall be estimated. This shall be done for overweight vehicles hauling in construction components as well as all non-overweight loads carrying aggregate, concrete and any other building supplies and materials over the designated haul roads from any and all suppliers, vendors, contractors etc. involved in the project. The estimated construction traffic shall be converted to a total number of Equivalent 18-Kip Single Axle Loads (ESAL's). This shall be done for each Designated Haul Route. A report of this analysis for each road will be given to the Municipality at least three months before the project begins. The Road Use Agreement will be executed only after this data is submitted and the SN_P determined and compared to the SN_B for each Haul Route in Accordance with Article VI.

3. **Time Requirement for Designation of Haul Routes** - The Haul Routes shall be designated **no later than three months prior** to the commencement of construction activities and prior to the final signing and execution of the Road Use Agreement. The Pre-Construction Survey (see Article V) will begin after the signing of the Road Use Agreement.

ARTICLE IV
USE OF DESIGNATED HAUL ROUTES

1. **Use of Designated Roads:** In connection with the development, construction, operation and maintenance of the Development Project, the Developer hereby acknowledges and agrees that _____, its contractors and subcontractors and each of their respective agents, employees, representatives, and permitted assigns (collectively, the "Developer") shall use the roads and highways located in the Municipality identified in Appendix B hereto (the "Designated Haul Routes"). The Designated Haul Routes may be used by Developer only in connection with the development, construction, operation, and maintenance of the Project, including the transportation of heavy equipment and materials to and from the Project. Appendix B of this RUA, identifies the Designated Haul Routes (as discussed) that will be used for: (1) transportation and delivery of Development Project equipment and components and other materials and equipment to be used in connection with the Project; (2) truck transportation leaving the Project site following delivery of equipment and materials; (3) transportation and delivery of local sources of materials, including concrete and gravel.

2. **Limitations of Road Use:** The acknowledgement of use by Developer of the Designated Haul Routes are subject to the following conditions:

   a. **Restrictions.** All other Municipal roads not selected as Designated Haul Routes are strictly forbidden for use by the Developer throughout the duration of the Project. In the event that the Developer would like to amend and add any road to the list of Designated Haul Routes during the project the Municipality shall be informed and Appendix B shall be amended. All Articles of this agreement shall then be immediately applicable and satisfied prior to the added road being used.

   b. **'One Time Use' of a road that is not a Designated Haul Route** - In the event the Developer determines it is necessary for the Project to use a Municipal road not identified on Appendix B as a Designated Haul Road, then the Developer shall notify the appropriate Municipal Designee, describing in detail such use and the reasons therefore. If the use is to be 'one time' – in the event of emergency, extreme weather, or other extenuating circumstances - the Municipal Designee shall make a determination to allow or disallow the requested temporary road use without the road being added to Appendix B of this RUA as a Designated Haul Route. If the Developer determines that the road may be used multiple times it shall be added to Appendix B as described in this Article as a Designated Haul Route, and must be approved by the Municipality prior to such use.

   c. **Extreme Weather Conditions** - Once construction begins on the Project the Municipal Designee shall be entitled, at any time, to notify the Developer that use

of a/the Designated Haul Road/s may result in excessive damage to a/the Designated Haul Road/s due to weather conditions that may pose a serious safety risk to the traveling public. The Developer shall work with such Municipal Designee to develop a plan to mitigate or prevent the safety liabilities of such weather conditions. If the Parties are able to develop a plan to mitigate or prevent such safety liabilities, then the Developer may continue to use such roads provided such mitigation is implemented. If the Parties are unable to develop such a plan, the Developer may propose an alternate route to the Project site for approval by the Municipality (such approval not to be unreasonably withheld).

Article V
Traffic Control and Management Plan

Included with the submission of the Haul Routes to the Municipality, the Developer shall include a detailed proposed Traffic Control and Management Plan for the review and approval of the Town board. The plan shall be in accordance with the New York State Manual of Uniform Traffic Control Devices (NYS MUTCD). This plan shall include the following elements:

1. Designation of one-way or two-way direction of construction traffic.
2. The hours of operations for traffic construction.
3. A description of whether or not any traffic flaggers will be needed. If they are needed the plan shall specify where they will be located and what directions they shall be responsible to signal to the traveling public.
4. Specific plans to accommodate School Buses.
5. Specific plans to accommodate emergency vehicles
6. A map indicating the location of all needed traffic control devices including signs, cones, barrels etc. All signs and devices used shall meet the requirements of the NYS MUTCD.

The Municipality will review and give final approval of this Traffic Control and Management Plan. The Municipality retains the right to approve or deny the use of any proposed Haul Route permission not to be unreasonably withheld. The Municipality retains the right to require changes to any aspect of the Traffic Control and Management Plan permission not to be unreasonably withheld.

Article VI
Preconstruction Survey and
Structural Classification of Haul Routes

1. **Time Requirement for Analysis** - As soon as practicable after the execution of this Agreement, but in any event prior to the commencement of construction the Municipal Highway Engineer shall conduct the Pre-Construction Survey and calculate the SN_B and SN_P of each haul route as explained below. **The Pre-Construction Survey and the SN_B and SN_P analysis shall be done after the signing of the Road Use Agreement, during the three month period before construction begins. Roads will be posted to heavy traffic if the road use agreement is not executed on time, no exceptions.** The Developer is responsible to pay for the engineering services.

2. **SN_B for Bituminous Pavements** - Bituminous pavements include the following pavement types: **Surface Treatment, Multiple Surface Treatment, Cold Mix Asphalt Concrete, Hot Mix Asphalt, and Composite pavements.** Surface treatments (1- inch or less thickness) do not contribute any significant strength to the pavement system. They provide a water proofing and smooth riding surface that protects the underlying base aggregate. The surface treatment layer is not included as a layer in the SN_B calculation. Determination of **SN_B** for paved roads consists of two parts; the Structural Number of the bituminous pavement and the Structural Number of the underlying base layers. To determine the Structural Number of the pavement the RSMS rating, pavement cores, the rutting assessment, cross slope assessment, and a roughness assessment are needed. Determination of the structural number of the underlying base layer/s requires test pits to determine the base material/s and thickness. Data collection requirements are explained below:

   a. **Video Recording** – The video is not actually used in the calculation of SN_B and SN_P. However it provides a visual record of the road conditions prior to the project for qualitative comparison to the visual conditions after the project. The road surface is marked with paint every $1/10^{th}$ of a mile with a large visible line and station prior to the video.

   b. **Pavement Coring** – 4 or 5 inch cores are extracted from the pavement. 8 cores per mile are extracted at 660 foot intervals. The Core Pattern is shown in Appendix C. If current core data is on record it may be used.
   c. **Test Pits or Borings** – 4 test pits will be excavated per mile nominally ¼ mile apart with two in each lane. If current and adequate data regarding the base layer/s is on record it may be used. The pits will be selected to include two 'bad' areas

and two 'good' areas in order to sample potential variables in the road structure. The test pits shall be dug from edge of pavement and include approximately 2/3rd of the lane width. Pits shall go through all roadbed layers and penetrate a foot into the natural sub-grade. Samples will be taken from each discernable aggregate layer and the sub-grade. A cross section diagram of the test pit will be drawn indicating the position, width and thickness of each base layer. Alternatively, the municipality may elect to use split spoon boring to a depth of 4 feet. If this technique is used a boring shall be taken in the inner wheel path and outer wheel path of each test site. A diagram of each boring shall then be provided. The municipality will engage the services of a qualified highway materials engineer to test the samples. Each material of each layer of the test pits/borings shall be classified in accordance with the Unified Soils Classification System (USCS). If the multiple specimens of a given layer, for a uniformly constructed road section, are obviously the same material based on visual inspection of the qualified engineer then three representative samples may be chosen from the test pits of that road section and tested instead of testing all of the specimens.

d. **Rutting assessment** – The pavement ruts are measured in each wheel path at 1/10th mile intervals. The data is tabulated and the average rut depth is calculated for each wheel path.

e. **Cross Slope assessment** – The cross slope of the pavement is measured at 1/10th mile intervals. The results are tabulated for each wheel path of both lanes (four measurements at each 1/10th mile location are taken). If the slope is uniform across the lane it is reported as the same number for each wheel path. If the slope is different (for example greater in the outer wheel path) then each wheel path is measured and recorded individually. The average cross slope is calculated for each wheel path.

f. **Roughness measurement** – International Roughness Index (IRI) for the segment of road.

g. **RSMS Rating** – The pavement is rated in accordance with the RSMS system. The rutting, cross slope, and roughness information described below are used to make the decision for the roughness and rutting scores in the RSMS condition evaluation. The RSMS condition then yields a PCI score as described above.

h. **SN_B Calculation -** $SN_B = SN_P + SN_U$

   i. **SN_P = Structural Number of the pavement -** Use '0' for Surface Treatment roads. Determine the predominant pavement type and the 80th percentile pavement thickness (thickness that 80 percent of the cores are equal to or greater than). Determine the PCI of the pavement using the RSMS condition rating. Determine the ASHTO SN using the 80th

percentile thickness and the a-coefficient that best represents the bituminous material type and PCI.

j. **SN_U = Structural Number of the underlying base layer/s** -Determine the AAHSTO SN for the base layers of the inner wheel path and outer wheel path of each test pit. Select the SN that represents the weakest 35th percentile of all of the calculated Structural Numbers for each wheel path of each test pit. This is the SN that 35 percent of the structural numbers are equal to or less than. The 35th percentile is used because failure of this percent or more typically triggers major repair work for the entire pavement rather than spot repairs.

3. **SN_B for Aggregate Surfaced Roads** - The **SN_B** is composed of the structural number of each aggregate layer. The aggregate layers must be determined by test pits or boring.

a. **Video Recording** – The video is not used in the calculation of SN_B and SN_P. It provides a visual record of the road conditions prior to the project. The road surface is marked with paint every 1/10th of a mile with a large visible line and station prior to the video. The video is taken before the initial re-grading and re-shaping by the municipality.

b. **RSMS Condition Rating** – The rating is conducted on the existing condition before the initial re-grading and re-shaping by the municipality.

c. **Reshaping and Re-grading** - The municipality agrees to re-grade, shape, and compact gravel roads imminently prior to use by the Developer, if needed. This establishes a good road for the Developer at the outset of the project.

d. **Test Holes or Borings** – Small test holes are excavated for gravel roads. The holes can be dug by hand or with a backhoe. If current and adequate data regarding the base layer/s is on record it may be used. They shall be dug through the aggregate road bed layer/s until the natural sub-grade is encountered. Alternatively, split-spoon borings can be done. The borings shall penetrate at least 3 to 4 feet to be sure all road bed layers are sampled and the boring reaches into the natural sub-grade. A representative sample of each layer shall be taken for testing. Each layer thickness shall be measured. Six (6) test hole or boring locations will be selected per mile nominally 880 ft. apart with three in each lane. If boring in lieu of test holes then a boring shall be taken in each wheel path of the six locations for a total of 12 borings per mile. A diagram of each boring shall then be provided. The municipality will engage the services of a qualified highway materials engineer to test the samples. Each material of each layer of the test pits/borings shall be classified in accordance with the Unified Soils Classification System (USCS). If the multiple specimens of a given layer are

obviously the same material based on the visual inspection of the qualified materials engineer then three representative samples may be tested for the layer instead of testing all of the specimens.

e. $SN_B = SN_{layer\ 1} + SN_{layer\ 2} + SN_{layer\ i} \cdots$

SN_B is determined by the thickness and a-coefficient of each gravel layer. The thickness of each layer is determined by analysis of the test holes/borings. The 80th percentile thickness (The thickness which 80% of the layer thickness measurements are equal to or greater than) is used for each layer. The USCS classification determines the a-coefficient assessment for each layer.

Article VII
Determination of SN_P

1. **Explanation of SN_P – SN_P** - This is the minimum Structural Number needed to accommodate the traffic for the Development project. In some cases it is possible that the road structure is so minimal that it will not be able to support the proposed Development traffic. This could be the case for bituminous surfaced roads with little to no aggregate base or very poor quality aggregate base over weak natural soils like clay. It could also be the case for aggregate roads with only several inches of imported gravel over weak natural soils such as clay. Therefore, the SN_B must be compared to the SN_P in order to determine if an upgrade is needed even before the Development project can begin. SN_P is determined differently for gravel roads and bituminous surfaced roads. However even if SN_P is greater than SN_B doesn't mean an upgrade is needed. Other factors will be considered. If the road has very low traffic or there are few if any residences on the road the municipality may allow the project to advance without an upgrade. The municipality reserves the right to make the decision about requiring an upgrade or not. Further details concerning this issue are discussed in Article V.

2. **SN_P for Gravel Roads** - The Army Corp of Engineers method of the Design of Aggregate Surfaced Roads and Airfields will be used to determine the minimum amount of gravel required to support the projected traffic for the Development project (Reference the Department of the Army Technical Manual TM 5-822-12). The in-put variables for this method are traffic, sub-grade strength, strength of the gravel to be used, and design life. It yields the needed thickness of gravel. This thickness and the appropriate a-coefficient of the gravel to be used (the gravel must meet the specifications of the Corp of Engineers method) will give the needed SN_P for the Development Project Traffic. If the SN_P is greater than the existing SN_B an upgrade may be needed.

3. **SN_P for Surface Treated Roads** - If the existing road is a surface treatment over gravel then the main structural support is provided by the underlying gravel. The surface treatment can be ignored. The question is how much gravel base is required for the Development Project. Therefore the Army Corp of Engineers method is used for Surface Treated Roads to determine the gravel base requirement and calculate the SN_P. No surface treatment is included in the SN_P calculation. If the SN_P is greater than the existing SN_B an upgrade may be needed. The upgrade will include a surface treatment.

4. **SN_P for Bituminous Paved Roads** - The AASHTO flexible pavement design equation is used to determine the minimum Structural Number required to support the projected Development Traffic. In most cases the SN_B of an existing paved road should far exceed the minimum SN_P calculated for the Project. However, there may be cases where the bituminous pavement is very thin or in poor condition and it is over a very poor base. In these extreme cases the SN_B may in fact be less than the minimum SN_P needed for the project and an upgrade may be needed.

5. **Minimum SN_P** - The AASHTO design equation does not yield a Structural Number lower than 1.0. If the projected traffic is so low that it falls out of range of the equation then SN_P will be set at 1.0. If SN_B is less than 1.0 it may need to be upgraded to meet or exceed a Structural Number of 1.0 before the project.

Article VIII
Designation of Upgrades Prior to Use by Developer

1. **Roads that do not require upgrades before use** – These roads can be used by the Developer without any repairs or improvements to the road bed structure prior to construction. However, geometric improvements (turning radii etc) and bridge or culvert improvements may still be required as needed. The Municipality reserves the right to require needed improvements to the appurtenances of the roadway. The Developer shall be responsible for all costs of the work. Articles XIV, XV, XVI further stipulate the conditions for upgrades and improvements that are required prior to using the haul roads.

2. **Roads that require upgrades before use** – If the road structure has been determined to be insufficient to support the anticipated traffic of the developer, in accordance with Article V, the Developer may be required to upgrade the road before using it. The municipality may also determine that improvements shall include shoulders, ditches, culverts and other drainage related facilities. The Municipality

reserves the right to make the final decision whether or not an upgrade is required. If the Municipality wants to undertake a repair that exceeds the need of the developer (SN_P) then the municipality shall pay for the portion of the improvement that exceeds that needed by the developer. The proportioning of costs is explained in Article XI.

3. **Gravel Road Upgrades** - The Developer shall re-grade and re-shape the roadway and place a geo-textile. The Developer shall place, shape, and compact the material on the roadway. The Highway Engineer will inspect and enforce the following specifications:

a. Cross Section

Feature	Specification
Crown	3%
Width of Gravel	20 Feet
Geo-textile	Required
Thickness of Gravel	As per design of Highway Engineer (reference Article V) Minimum Requirement of 4 inches
Compaction	95% Proctor Density

b. Material Specification

Component	Allowable Percent
Gravel – Pass 1" sieve and retained on #10	50% -75%
Sand – Pass #10 sieve and retained on #200	25% - 40%
Silt & Clay – Pass #200	8% - 15%

4. **Paved Roads -** The Municipal Highway Engineer shall determine the full cross section design and material specifications for this upgrade, based on the determination of SN_P in accordance with Article VI. The Municipal Highway Engineer will inspect and enforce the specifications. The municipality agrees to keep the upgrade to the minimum needed to serve the needs of the developer. The Developer shall hire a qualified contractor of its choice to construct the upgrade according to the full specifications provided by the municipality. The Developer shall be responsible for all costs of the work. Geometric improvements (turning radii etc) and bridge or culvert improvements required shall be included in the project at the expense of the developer.

Article IX
Monitoring and Maintenance of Gravel Roads

1. **Monitoring Conditions –** Due to the constantly changing conditions of gravel roads the condition of gravel Haul Routes will be inspected during use by the Highway Engineer. The full costs of these inspection services will be paid for by the Developer. The Highway Engineer will perform a Road Surface Condition Rating (RSCR) and document the condition of the road surface with photographs prior to each and every re-grading maintenance treatment, or a minimum of six times (bi-monthly) during each year the road is used for the Development project, whichever is greater. RSMS Ratings and photographs will become part of the record for analysis by the Highway Engineer in the determination of the SN_F as described in Article X below.

2. **Maintenance:** As conditions warrant the Developer will be responsible for all costs of re-grading, reshaping and re-compacting of gravel Haul Routes to maintain them in a safe, drivable condition. The Developer shall also be required to provide and pay for Calcium Chloride dust control treatments at least two times between the months of May and September. At the discretion of the Municipality, depending on road conditions, more Calcium Chloride treatments may be required. The Municipality will determine when re-grading and dust control treatments are required and shall direct the Developer when to do them.

Article X
PROJECT COMPLETION DATE

Completion Date - (Date) shall mark the beginning of a 6 month period for closure of the Road Use Agreement to include the following tasks:

1. **Post Use Pavement Survey** – This survey shall be completed within the first month after (Date) (Reference Article X).

2. **Final Determination of Repairs** – The Town shall determine the needed repairs by the end of the first three (3) months following (Date). (Reference Article XI)

3. **Reimbursement for Repairs** – The Developer shall make initial reimbursement (reference Article XI) no later than 180 days after (Date).

Article XI
POST USE PAVEMENT SURVEY AND SN_F DETERMINATION

1. **Post Use Pavement Survey** - The Municipality shall hire a NYS licensed Civil Engineering firm to do the post use survey. The tasks listed below shall be completed within a one (1) month window following the Project Completion Date (reference Article IX). The Developer shall pay for all costs of the Post Use Pavement Survey and the SN_F Determination for each Designated Haul Route.

   a. **Gravel Roads:**
      i. **Video Survey of Roads** – Repeat as described in Article III above.
      ii. **Final Condition Distress Survey** – Do an RSMS Gravel Road Condition Survey.
      iii. **SN_F determination** – As described below.

   b. **Paved Roads:**
      i. **Video Survey of Roads** – Repeat as described in Article V above.
      ii. **Final Condition Distress Survey** – Repeat as described in Article V above.
      iii. **Rut Depth and Cross Slope measurements** – Perform as described in Article V above.

iv. **Road Roughness** – Repeat as described in Article V above.
v. **SN_F determination** – As described below.

2. **Determination of SN_F For Gravel Roads** – The Municipal Highway Engineer shall analyze the Post Use Pavement Survey information and determine the SN_F for each Designated Haul Route in accordance with the following procedures:

a. **Dominant Distress Mode** - The Highway Engineer will examine the photographs and RSMS Condition Ratings taken while the road was used as a Designated Haul Route. Examine the Post Use Distress Survey and the final Road Surface Condition Rating. Based on the assessment of this information determine the Dominant Distress Mode that best characterizes the condition of the Haul Route. The Dominant Distress mode is either Surface Distress or Structural Distress as follows:

i. **Surface Distress** – The Road Surface Condition Ratings done during use and the final Road Surface Condition Rating indicate that distresses were primarily surface problems such as poor crown and drainage, potholes, loose gravel and corrugations, raveling and loss of gravel, etc. Rutting was limited to low extent (less than 20% of the road length) and low severity (rut depth does not exceed 25% of the total thickness of the gravel layers) and gravel was not merged or intermingled with native sub-grade.
ii. **Structural Distress** - The Road Surface Condition Ratings done during use and the final RSCR indicate moderate (20% -50% of the road length) or high (greater than 50%) extent of rutting that was of moderate (24%-50% of the total thickness of the gravel layers) to high (greater than 50% of the total thickness of the gravel layers) severity. There may be pumping of sub-grade into the base material and intermingling of base material with sub-grade from the mixing and churning of traffic that has rutted the road. In addition the surface may also have exhibited surface problems such as poor crown, poor drainage and potholes.

b. **Determine SN_F** – The **SN_F** determination depends on the Dominant Distress Mode which can be either Surface Distress of Structural Distress.
i. **SN_F When Dominant Distress is Surface Distress** - If the dominant Distress Mode is Surface Distress the main reduction in the SN_F will be attributable to routine gravel loss. Studies have shown that typical gravel loss is up to 1-inch per year. If the Road Condition Ratings during and after the project indicate that gravel loss was less than 1-inch the Highway Engineer will assume that the final SN_F is still comparable to the SN_B. The only repair required of the Developer is to re-grade, re-shape, and re-compact the road surface.
ii. **SN_F When Dominant Distress is Structural Distress** – In this case it is the Highway Engineer's determination, based on the Road Surface

Condition Rating reports that significant damage has occurred to the gravel layer as a result of gravel loss, rutting, pumping of native sub-grade and/or even intermingling of the gravel and the underlying native sub-grade. There are two possible structural damage modes. Determination of the required repair for these damage modes are discussed in Article XI below.

1. **SN_F When there is Substantial loss of Gravel** - In the judgment of the Highway Engineer there appears to be substantial gravel loss (in excess of 1-inch). The road is re-graded and compacted and then six (6) test pits or borings per mile will be taken in accordance with the procedures used for the pre-construction survey. The gravel thickness of these test pits/borings is determined and compared to the pre-project gravel thickness. The SN for the thickness of gravel that was lost is determined (using the pre-construction a-coefficient). This SN is subtracted from the SN_B to determine SN_F.
2. **SN_F When there is Significant Rutting and Contamination of Base Gravel** - The road shall be re-graded, re-shaped and re-compacted. Six (6) test pits or borings per mile will be taken, according to the procedure for the pre-use survey. The remaining gravel thickness is determined and compared to the pre-project gravel thickness. Additionally, the specimens will be tested in the laboratory to determine their gradation, plasticity and USCS classification. Based on the thickness and this post-project USCS classification the gravel a-coefficient will be determined for each test pit/boring location. The 35th percentile SN will be selected as the SN_F.

3. Determination of SN_F For Paved Roads - The Highway Engineer will examine the pre-construction survey data and the post construction survey data. Determine if there is any measurable change in distress. If there is then determine the Dominant Distress Mode that best characterizes the condition of the Haul Route.

a. **Dominant Distress Mode** - Is either Pavement Deterioration or Pavement and Base Deterioration. Determination of the required repair for these damage modes are discussed in Article XI below.
   i. **No Pavement Deterioration** – Upon examination of the pre-construction and post-construction survey the Highway Engineer determines that there is no significant increase in distresses as measured by the surveys. Though the traffic has induced stress on the pavement system the reduction in structural capacity is estimated to be within the range of normal depreciation. In this case SN_F shall be considered to be insignificantly less than SN_B. No repair is required.

ii. **Pavement Deterioration** – The post-construction surveys in comparison to the pre-construction surveys indicate an increase in visible distress such as cracking or very minor rutting of the asphalt concrete. However, based on the evaluation of the data by the Highway Engineer there is no evidence of base failure such as deep, wide ruts that indicate consolidation and displacement of the base, severe and extensive alligator cracking, or potholes.

b. **SN_F When Dominant Distress Mode is No Pavement Deterioration**
   i. **$SN_F = SN_P + SN_U$**
      1. **SN_P = Structural Number of the bituminous pavement layers.** The predominant pavement type and the 80th percentile pavement is the same as determined for the SN_B calculation. However, the PCI of the pavement must be re-evaluated using the post-construction RSMS condition rating. Determine the SN_P using the pre-construction 80th percentile thickness and the a-coefficient that best represents the post-construction pavement condition.
      2. **SN_U = Structural Number of the underlying base layers.** Assume no significant change in the SN_U. Use the same SN_U that was used for SN_B.

c. **SN_F When Dominant Distress Mode is Pavement and Base Deterioration** - The post-construction surveys in comparison to the pre-construction surveys indicate an increase in visible distress such as cracking. Based on the evaluation of the data by the Highway Engineer ***there is*** also evidence of significant base failure such as deep, wide ruts that indicate consolidation and displacement of the base, severe alligator cracking, and/or potholes.
   i. **$SN_F = SN_P + SN_U$**
      1. **SN_P = Structural Number of the bituminous pavement layers** The predominant pavement type and the 80th percentile pavement is the same as determined for the SN_B calculation. However, the PCI of the pavement must be re-evaluated using the post-construction RSMS condition rating. Determine the SN_P using the pre-construction 80th percentile thickness and the a-coefficient that best represents the post-construction pavement condition.

      2. **SN_U = Structural Number of the underlying base layers** The Highway Engineer evaluates the post-construction surveys and determines if the base still has existing structural capacity. If so the Highway Engineer determines the thickness and a-coefficient of the base layer/s based on engineering judgment and the post-construction surveys. Alternatively, if in the judgment of the Highway Engineer the base layer/s has/have been damaged to the

point that there is little to no structural value left then SN_U can be set equal to zero.

Article XII
DETERMINATION OF FINAL REPAIRS AND COST SHARES

1. **General Procedure -** The Municipality shall examine the post-construction survey and compare it to the pre-construction survey. Based on the data and field inspection the Municipal Highway Engineer shall determine the needed repairs. The Municipal Highway Engineer shall prepare a report of the needed repairs that includes the treatment for each road segment and the total estimated cost of the repair. The costs shall include all labor, equipment, and materials. The report shall be submitted to the Developer within the first three month period after the Project Completion Date (assuming the Post-Construction Pavement survey is completed within the first month as per Article VI). All material, labor, and equipment costs for the repair shall be reimbursed to the Municipality by the Developer no later than 180 days after (Date).

2. **Gravel Roads**
   a. **Gravel Roads that were Upgraded Prior to Use** – The Highway Engineer determines if the additional gravel that was added for the upgrade still has a minimum thickness of 4 inches. If the gravel has been raveled off such that the underlying geo-textile no longer has a minimum of 4 inches of cover the Developer shall place additional gravel such that the minimum cover is 4 inches. If no additional gravel is needed the Developer is still required to re-grade, re-shape, and re-compact the road surface.

   b. **Gravel Roads that were not Upgraded Prior to Use** – The repair will be determined by the Highway Engineer according to the following:
      i. **Substantial loss of gravel** – The Developer is responsible to replace the thickness of gravel lost as determined in Article VI above. The Developer is responsible for 100% of the cost of the repair.
      ii. **Significant Rutting and Contamination of Base Gravel -** The U.S. Army Corp of Engineers method for the design of gravel roads and airfields shall be applied to determine the amount of gravel to be placed on the road and what the SN_R will be after the repair is done. The repair must be a minimum of 4 inches of gravel. The repair must include geo-textile. SN_R must meet or exceed the SN_B.

   c. **If $SN_R = SN_B$ -** The Developer pays for 100% of the Cost of the Repair.

d. **If $SN_R > SN_B$** - The Developer pays for the proportion of cost associated with improving the road from SN_F to SN_B. The Municipality pays for the proportion of cost associated with the improvement that increases the road structural capacity from SN_B to SN_R. Costs shall include all labor, equipment, and materials. Cost Share Equations are as follows:

$$\% \text{ Developer Share} = \frac{SN_B - SN_F}{SN_R - SN_F} \times 100 \qquad \% \text{ Municipal Share} = \frac{SN_R - SN_B}{SN_R - SN_F} \times 100$$

3. **Paved Roads** -Paved Roads include Hot Mix, Cold Mix, and Surface Treatments. Determination of repairs is done for those roads that have either **Pavement Deterioration** or **Pavement and Base Deterioration**. Based on the post-construction survey and engineering judgment the Highway Engineer will determine the Repair Strategy needed for the road (routine maintenance, minor rehabilitation, major rehabilitation, rebuild).

   a. **Routine Maintenance** – There is no road base damage. Distresses include minor amounts of cracking, isolated potholes or alligator cracked spots that are less than 10% of the surface area of the road. Treatments include patching, crack filling, and/or surface treatments. According to the professional judgment of the Highway Engineer these repairs restore the existing pavement to a good condition and return SN_F to SN_B therefore no actual calculation of SN_R is required. The Developer is responsible for 100% of the cost of the repairs.

   b. **Minor Rehabilitation** – The road base has not been damaged. The pavement needs a thin overlay to cover and seal cracking and/or fill minor rutting that has occurred in the existing asphalt layers. The overlay will therefore restore ride quality and seal the road surface but not add significant strength. Minor Rehabilitation will be applicable especially for pavements whose pre-construction condition was in excellent or good shape and which are still in good shape after the development project.

      i. **Overlay Thickness and Material Type** - The Highway Engineer will use the AASHTO flexible pavement overlay design method to determine and specify the type of asphalt and the thickness of overlay needed to meet the following criteria. Generally the overlay should be in the range of 1 to 2 ½ inches thick to fulfill these criteria. The Highway Engineer will determine the SN_R of the overlay not to exceed SN_B (if this is not possible then a Major Rehabilitation must be done).
      ii. **The Post Development condition:** Still in good condition
      iii. **Structural Number:** $SN_F + SN_R = SN_B$

iv. **Reflective Cracking:** The potential for serious reflective cracking must be minimal

v. **Overlay Life:** The overlay can be reasonably expected to last 10-15 years

vi. **Material Type:** The overlay can be hot mix or cold mix asphalt concrete

vii. **Hot Mix Asphalt Concrete** – The Highway Engineer shall specify hot mix in accordance with NYS DOT standard material specifications.

viii. **Cold Mix Asphalt concrete** – The Highway Engineer shall determine and specify the mix design including; aggregate type and proportions, amount and type of asphalt binder. The method of production and placement such as a central plant operation or mix paver.

ix. **Reimbursement Cost Share** - Since this repair is limited to restoring SN_F to SN_B the Developer is responsible for 100% of the costs of the repair.

c. **Major Rehabilitation** – The extent of cracking is moderate to high and severity is moderate to high. The service life of the existing asphalt has been mostly expended due to the combination of the pre-construction condition and the Development traffic. The road base has not been damaged ***and*** is adequate to support a substantial asphalt overlay or asphalt recycle treatment. In this case the Highway Engineer will determine and specify an asphalt overlay or asphalt recycling treatment that will meet the following criteria:

i. The SN_R of the repair, including the existing base and rehabilitated asphalt layer/s, must be designed for a 15-year life using the AASHTO Flexible Pavement Overlay design method.

ii. $SN_F + SN_R > SN_B$

iii. The repair is limited to an asphalt overlay or asphalt recycling treatment and does not include upgrading the underlying base.

iv. A Marshall mix-design must be done for all Cold-in-place recycle treatments based on asphalt concrete specimens taken from the existing pavement.

v. Hot-in-place recycling treatments will be done in accordance with applicable NYS DOT specifications for this treatment.

vi. At least 2-3 inches of existing asphalt concrete must remain below the recycled treatments. Recycled mats ***must*** be topped with a surface treatment or hot mix overlay.

vii. **Reimbursement Cost Share** - The Developer pays for the proportion of cost associated with improving the road from SN_F to SN_B. The Municipality pays for the proportion of cost associated with the improvement that increases the road structural capacity from SN_B to SN_R. Costs shall include all labor, equipment, and materials. The equations for Cost Shares are expressed below:

$$\% \text{ Developer Share} = \frac{SN_B - SN_F}{SN_R - SN_F} \times 100 \qquad \% \text{ Municipal Share} = \frac{SN_R - SN_B}{SN_R - SN_F} \times 100$$

d. **Rebuild** - The extent of cracking is moderate to high and severity is moderate to high. The service life of the existing asphalt has been completely depleted. The road base has been significantly damaged and/or is ***not adequate*** to support a substantial asphalt overlay or asphalt recycle treatment. In this case the Highway Engineer will determine and specify a full depth pavement structure rebuild. The treatment must include a new or reclaimed base and a new pavement that meets or exceeds the pavement type that existed prior to the Development project.

i. **Rebuild General Criteria:**
   1. **Design Method** – The treatment must be designed using the AASHTO design method for new flexible pavements.
   2. **Design Life – 25 years**
   3. **Surface Type** – Must be equal to or better than the surface type that existed prior to the Development project. Pavement types in ascending order of quality are as follows: surface treatment, cold mix, hot mix.
   4. **Minimum Acceptable Base Material Strength Coefficient** – The base material (virgin base or reclaimed base) shall meet or exceed an AASHTO a-coefficient of 0.12.

ii. **Base Rebuild** – The Highway Engineer will determine and specify the most cost effective base rebuilding method depending on the existing materials in the roadbed. The following criteria will apply.
   1. New Base shall meet the following criteria:
      a. **Base Gravel Specification**

Component	Allowable Percent
Gravel –Pass 2-in sieve and retained on #10	50%-70%
Sand – Pass #10 Sieve and Retained on #200	25%-40%
Silt and Clay – Pass #200 Sieve	0% - 10%

b. **Base Gravel Placement** – The base gravel shall be placed uniformly to meet the design thickness. It shall be placed from ditch to ditch such that it is 'day-lighted' to the ditch for proper drainage. It shall be compacted to the industry standard of 95% Proctor Density.

c. **Reclaimed Base** – The Highway Engineer will determine and specify the following:

i. **The target gradation** - For the aggregate blend to be stabilized. The gradation of any base material to be stabilized shall meet the following criteria:

Component	Allowable Percent
Gravel – Pass 2" sieve and retained on #10	50% -75%
Sand – Pass #10 sieve and retained on #200	25% - 40%
Silt & Clay – Pass #200	0% - 10%

ii. **The stabilizing agent** – The Highway Engineer will specify the most cost effective stabilizer. Depending on the gradation (especially the % fines) of the material to be stabilized any of the following additives can be used: additional clean crushed stone, high quality base aggregate, liquid asphalt emulsion, foamed asphalt cement, calcium chloride, Portland cement, lime, fly ash.

iii. **The amount of stabilizer/s** – The optimum stabilizer content is selected for the material being stabilized and the stabilization additive.

iv. **The method of stabilization** - Can include in-place full depth reclamation or central plant and paver operations.

v. **The Estimated a-coefficient** – The a-coefficient of the stabilized material must meet or exceed 0.12. This shall be determined by necessary laboratory tests on stabilized material specimens such as CBR.

vi. **Base Layer Stabilization Operation** – The Highway Engineer will determine the width of the process and whether or not it will include the shoulders. It shall be compacted to the industry standard of 95% Proctor Density.

iii. **Bituminous Pavement** – The Highway Engineer will determine and specify a new bituminous pavement in accordance with the following criteria:

1. **Pavement Type** - Must be equal to or better than the surface type that existed prior to the Development project. Pavement types in ascending order of quality are as follows: surface treatment, cold mix, hot mix.
2. **Material Specifications** – The materials must meet all applicable NYS DOT standard specifications.
3. **Pavement width** – Must equal the width that existed prior to the Development project.

4. **Construction** – Must be constructed in accordance with all applicable Municipal specifications.

iv. **Rebuild Reimbursement Cost Share** - The Developer pays for the proportion of cost associated with improving the road from SN_F to SN_B. The Municipality pays for the proportion of cost associated with the improvement that increases the road structural capacity from SN_B to SN_R. Costs shall include all labor, equipment, and materials. The equations for Cost Shares are expressed below:

$$\% \text{ Developer Share} = \frac{SN_B - SN_F}{SN_R - SN_F} \times 100 \qquad \% \text{ Municipal Share} = \frac{SN_R - SN_B}{SN_R - SN_F} \ 100$$

ARTICLE XIII
Repair of 'One-Time Use' Roads

In accordance with Article II roads may be used on a one time basis if requested in writing. The Developer will repair any damage caused by the project to the One-time use roads, and return such roads to the condition such roads were in prior to such damage (as near as is reasonably practicable having due regard for normal wear and tear). Prior to commencement of such repair, the Municipality and Developer shall meet to review the damage in relation to the Initial Survey or most recent subsequent survey, as applicable. The Developer shall repair (or cause to be repaired) such damage and restore the road to the standard agreed upon, unless the Developer can demonstrate to the reasonable satisfaction of the Municipal Designees that the damage was not caused by the Developer. Any repair and restoration shall be promptly performed at such times as the Developer and the Municipality determine, having due regard for safety, the presence of emergency conditions and the costs of such repairs. In the event that the Developer fails to repair such roads within the agreed period, then, unless the Parties mutually agree otherwise, the Municipality may make such repairs and shall invoice the Developer for the costs incurred by the Municipality in connection with the repair. The Developer shall pay such invoiced amounts within ten (10) days following receipt of the invoice.

ARTICLE XIV
Culverts and Bridges

1. **General** - Improvements/Upgrades to bridges and culverts may be required prior to commencement of the project. These improvements are discussed in Article XIV below. Damage as a result of the Development Project to a culvert or bridge structure

that was not improved or upgraded must be repaired following the project, or sooner if deemed necessary by the Municipality. All modifications or repairs to culverts or bridges shall be designed by a Professional Engineer licensed to practice in New York State in accordance with accepted AASHTO and NYSDOT standards and approved by the Municipality. All damage by the contractor shall be mitigated, either through repair or replacement, by the contractor at his expense to the satisfaction of the Municipality.

2. **Inspection of Culverts and Bridges.** Within one month after the execution of this agreement, and prior to the commencement of construction, the Municipality shall select a qualified engineering company to inspect the culverts and bridges on the Designated Haul Routes. The inspection shall be done within that same month following execution of the agreement. Culverts and bridges on any other roads anticipated to serve on a 'one- time' basis or roads which could be added as Designated Haul Routes shall also be included. The engineer shall take photographs of the culvert and bridges. The full costs of the inspections will be borne by the Developer. Based on the inspections the selected engineering firm shall provide a report discussing the status of culverts and bridges that shall require improvements/upgrades prior to their use in the Development Project. This report shall also present the recommended improvements/upgrades to the structures and shall be submitted to the Municipality for review. The Municipality will prepare a final list of improvement/upgrade projects that must be done prior to commencement of the Development Project. The Municipality reserves the right to require an evaluation of any bridge that will be crossed by an overweight special hauling vehicle. The evaluation shall be done by a qualified NYS licensed engineering firm.

ARTICLE XV
IMPROVEMENT AND MODIFICATIONS TO DESIGNATED HAUL ROUTES

1. **Improvements and Modifications to Designated Haul Routes.** The Parties acknowledge and agree that certain modifications and improvements to the Designated Haul Routes and related appurtenant structures are necessary to accommodate the use of Designated Haul Routes by the Developer contemplated hereby, including the widening of certain roads and modifications and improvements necessary to accommodate the heavy equipment and materials to be transported on the Designated Haul Routes. The modifications and improvements that shall be made by the Developer are described in detail on Appendix D hereto. The Municipality and the Developer agree that such improvements and modifications shall be made in accordance with the specifications set forth on Appendix D. Notwithstanding anything herein to the contrary, upon the reasonable request of the Developer the

Municipality is authorized from the time to time to grant consent to deviations from the specifications set forth in Appendix D. Appendix D shall be submitted to the Municipality by the Developer prior to final signature of the Road Use Agreement.

2. **List of Materials and Construction Techniques.** Ten (10) days prior to the commencement of any modification or improvement pursuant to this Article XIV, the Developer shall deliver to the Municipality a list of all materials to be used and construction techniques to be employed in connection therewith, subject to the approval of the Municipality (not to be unreasonably withheld).

3. **Subsequent Modifications or Improvements.** If modifications or improvements are necessary to the Designated Haul Routes and related appurtenant structures that were not contemplated when this Agreement was executed, the parties agree to negotiate in good faith and mutually agree to such modification or improvement, together with the materials to be used, the construction techniques to be employed, and the specifications applicable to such work.

4. **Compliance with Law.** The Developer agrees that all modifications and improvements shall comply with all applicable laws, subject to the obligation of the Municipality set forth in Article XVI.

5. **Permits**. The Developer shall obtain all necessary governmental permits and approvals that are necessary to permit the Developer to make the modifications and improvements to the Designated Roads contemplated herein, including obtaining all necessary private land rights that may be required in connection with Section 9.6. The Town shall not be responsible for obtaining any such private land use rights. The Developer shall be responsible for obtaining all required permits and approvals as follows:

    a. Town Highway Work Permits – For any and all work in the Town right-of-way, including utilities.
    b. Town Highway Driveway Access Permits
    c. NYS DOT Overweight and Special Hauling Permits for Town Roads
    d. NYS DEC permits for water crossings, wetlands, etc.
    e. Army Corps of Engineer permits for water crossings etc.

Article XVI
Emergency Repairs

The Developer will be expected to perform any emergency repairs to the haul roads, including the pavement, drainage structures, or any other highway related appurtenance that is damaged by the Developer and which the Municipality determines must be repaired. The Municipality will inform the Developer of required emergency repairs and the repair shall be accomplished within a minimum of three days time. If more time is required the Developer shall inform the Municipality of the status of the repair on a daily basis. Close communication will be required between the Municipal Highway Engineer and the project manager of the Development project. All costs of the repair shall be paid for by the Developer.

ARTICLE XVII
WARRANTIES BY DEVELOPER

1. **Workmanship and Material Warranties** - The following warranty and workmanship requirements apply to all repairs, modifications, and improvements that the Developer (its contractors or subcontractors) shall make prior to or during the course of the Construction project in order to accomplish the Development Project. As used herein, "Applicable Warranty Period" means, with respect to any repair, modification, or improvement by the Developer hereunder, the time period that begins on the date repairs, modifications or improvements to Designated Roads are complete and ending on the date that is twelve (12) months after such completion date.

   a. Developer's engineering responsibility, including the selection of material and equipment suitable for the repair of, and modifications and improvements to, the Designated Haul Routes and One Time Use Roads shall be carried out in accordance with generally accepted engineering practices, and Developer's construction responsibility shall be carried out in accordance with sound construction practices. The Developer shall require from its construction contractors and subcontractors the same standards for engineering and construction practice. The Developer warrants that it shall perform and complete all repairs, modifications and improvements hereunder in a good and workmanlike manner.

b. The Developer warrants that all repairs, modifications and improvements hereunder shall be free from defects in material and workmanship. The Developer shall remedy any defects in the repairs, modifications and improvements performed hereunder including repairs, modifications and improvements, workmanship, materials and equipment provided by subcontractors during the "Applicable Warranty Period". A "defect" means any and all design, engineering, construction, manufacturing, installation, materials, equipment, repairs, modifications or improvements which (1) does not conform to the terms of this Agreement (2) is of improper or inferior workmanship, or (3) is not suitable for use under the applicable climatic and range of operating conditions.

2. **Remedies.** During the Applicable Warranty Period, the Municipality shall notify the Developer in writing of any defects in the repairs, modifications or improvements. At no additional cost to the Municipality, the Developer shall proceed promptly to take such action relating to its performance hereunder as is necessary to cause the repairs, modifications and improvements to comply with the warranties specified in this Agreement. The Developer shall be available either at the project or by telephone for the performance of warranty repairs on a seven (7) day a week, twenty-four (24) hours per day basis.

3. **Final Waiver of Liens.** The Developer warrants that all repairs, modifications, improvements and materials furnished in connection with the performance by Developer Parties under this Agreement shall be free and clear of all liens.

Article XVIII
Bonding

A bond or other financial security as deemed appropriate by the municipality will be required for each designated haul road in an amount to be determined subsequent to the designation of haul routes but prior to signing of the final agreement. The bonded amounts shall be based on the engineers estimate for upgrades and preliminary estimate of potential damages as determined in accordance with the specifications herein.

Appendix A – RSMS Field Rating Data Sheets

(Note: This appendix intentionally blank. Content to be completed as explained in RUA upon implementation of the RUA)

Appendix B – Designated Haul Routes

(Note: This appendix intentionally blank. Content to be completed as explained in RUA upon implementation of the RUA)

Appendix C – Pre/Post Survey Core/Test Pit Location Plans

(Note: This appendix intentionally blank. Content to be completed as explained in RUA upon implementation of the RUA)

Appendix D – Proposed Modifications and Upgrades to Haul Routes

(Note: This appendix intentionally blank. Content to be completed as explained in RUA upon implementation of the RUA)

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten (Lead), Callicoon, Cochecton
Delaware, Fremont, Highland,
Lumberland
Sullivan County, New York

SECTION IV– ROAD USE AGREEMENT IMPLEMENTATION PROCEDURE

General Comments

Implementation of the RUA is time sensitive and requires coordination with all parties involved. In order to help facilitate this process a standardized operating procedure (SOP) for implementation of the RUA is outlined here. It should be understood that this SOP is intended as a guideline only. It is a general framework which sets forth the major steps and issues that should be considered in general chronological order and with some recommendations for the time required for the various steps. This SOP should be carefully examined by each Town and modified as necessary in accordance with the policies and procedures of all involved municipal organizations and the needs of residents in the areas being impacted and the public in general.

STANDARD OPERATING PROCEDURE STEPS

STEP 1: Develop local Law/s requiring use of the RUA

Timing: To be completed as soon as possible before development activity.

Recommendations:

1. New Local Law: Development of local law should specifically require gas drilling contractors to be permitted based upon the detailed requirements of the RUA presented here. The local law should be clear in its requirement for: 1) procedure to apply for and obtain an RUA permit; 2) technical conformance to the RUA, 3) paying for all engineering services required for implementation of the RUA; 4) financial reimbursement to the municipality for all upgrades and repair of damages to local roads as determined by the technical process specified in the RUA; 4) posting bonds or other financial instruments in order to be approved for and obtain an RUA permit; 5) any other requirements as set forth by municipal legal counsel.

2. Modification of Existing Local Laws: In addition to the development of new local law specifically requiring permitting of gas drilling road use activity per the RUA, another useful concept discussed as part of this study was the possibility of modifying

driveway permits may be expanded to include residential, commercial, and industrial activity, and furthermore subdivided into temporary permits for construction, as well as permanent permits for permanent site developments. Provisions could be made within driveway permitting procedures to account for industrial activities typical of drilling contractors and others. These provisions may require an RUA as part of the permitting process. Furthermore, such requirements would serve as a "trigger" alerting municipalities of intended gas drilling activity at an early stage.

STEP 2: Procure services of Highway and Structural Engineer to implement RUA

Timing: This step should be taken when it is known that developers are actually planning activity within the municipality. Such knowledge may be triggered by application for driveway access permits, as previously discussed. It may also be triggered by application of the developer for other permits, such as environmental. Municipalities should be in close communication with all local, state, and federal agencies that may require permitting or approvals for gas drilling activity. Such communication can serve as verification of intent on the part of a developer to initiate action within the municipality.

Recommendations:

1. Qualifications: It is important that the engineering consultant is thoroughly familiar with local roads and meets the qualifications delineated within the RUA. General highway experience or experience at state or federal levels is of limited value – the most important qualification is extensive experience working with towns and local roads.

2. Location: The qualified consultant even if not available locally may contain costs by subcontracting field testing activities to local testing firms if available.

STEP 3: Initiate Contact with Developer

Timing: Ideally this should occur 9 to 12 months prior to commencement of gas drilling activity. Proactive measures should be taken to identify the companies likely to be active in the area, (prime contractor and all subcontractors) and to determine when they plan to commence drilling activities.

Recommendations: Initial contacts may be of an informal nature via phone calls and letters to developers from local permitting officials, based on evidence of potential activity, as previously discussed. Formal legal/permitting contacts will follow if/when developers seek to meet the requirements of local law as previously discussed. Finally, in the worst case, if developers refuse to enter negotiations and/or do not comply with the requirements of local law, contact will occur as a result of prohibiting road by posting the roads until such time as the developer "comes to the table" and complies with all municipal requirements in order to obtain an RUA permit.

STEP 4: Define Preliminary Haul Route in Accordance with RUA Requirements

Timing: The process of defining and obtaining approval for haul routes should begin at least 6 months in advance of intended activity in order to facilitate a thorough review and approval process.

Recommendations: The review and approval process must meet all requirements specified in the RUA. The following general considerations apply:

1. Risk Assessment: The haul route should be reviewed not only by the town board and highway supervisors, but also by local fire and medical emergency responders and local law enforcement. This review should consider the presence of schools, hospitals, industrial and/or commercial centers, and levels of residential traffic.

2. Traffic Control and Safety: In accordance with the RUA the developer must submit to the highway supervisor a traffic and safety control plan which meets the requirements of the national MUTCD and any local addendums thereto.

3. Start/Completions Dates: Developer haul route proposals must include specific intended start and completion dates. Any changes or extensions to the intended period of use must be formally requested and permitted by the municipality.

4. Preliminary Approval: After complete review of the proposed, preliminary haul route the municipality should adopt a resolution accepting the route as is, or with modifications. Once passed the resolution with all supporting data should be forwarded to the engineer for final approval.

Note: The preliminary haul route identification, review and approval are for the purposes of public safety and timing. Final approval is contingent upon technical review by the engineer as stipulated in detail in the RUA, and generally discussed in STEP 5, which follows.

STEP 5: Haul Route Final Approval

Timing: This step should be completed within 3 to 2 months of planned activity, allowing one final month for completion of STEP 6, described herein.
Recommendations:

Recommendations: Final approval of the haul route is contingent upon technical review and approval by the engineer. The technical review must include a determination of whether or not the road requires a structural or geometric upgrade. If an upgrade is

required an engineer estimate of cost should be prepared and final approval should be contingent upon agreement by the developer to fund the upgrade.

STEP 6: Pre-use Road Survey

Timing: The pre-use survey should be completed within the last month prior to commencement of activity.

Recommendations: The pre-use survey must be in accordance with the RUA. The purpose of the survey is to document before use conditions for comparison purposes with after use conditions. The difference in condition determines the level of repair costs as described in the RUA. The pre-use survey will include test cores and/or test pits, road rutting measurements, road smoothness assessment (International Roughness Index), Video Logging, and detailed road condition rating in accordance with the RSMS pavement management system, or equivalent, specifications.

STEP 7: Posting Bonds/Other Financial Instruments to Guarantee Repair Funds

Timing: To be completed immediately before, if not sooner, commencement of construction activity.

Recommendations: The amount of the bond or other financial instrument should be high enough to compensate for road repairs in the event the Developer fails to comply with the financial reimbursement requirements of the RUA.

STEP 8: Commencement and Monitoring of Development Activity

Timing: The development activity should not commence before or persist after the permitted start and completion dates without written approval from the municipality.

Recommendations:

1. Municipal Officials and Public Agency Notifications: Notifications of activity should be sent to local law enforcement, emergency management personnel, schools, hospitals, and/or any other agencies that may be affected by the planned traffic.
2. Residential Notifications: Letters of notification should be sent to individual residences along haul routes.
3. Public Notices: General notices may be made in local newspapers and publications if necessary.
4. Monitoring and Enforcement: The construction traffic should be monitored by the Highway Supervisor and local law enforcement. Deviations from the Haul Route, and/or permitted start/end dates, should be controlled by local law enforcement, and if necessary legal action taken to prevent violations, as may be advised by municipal legal counsel.

STEP 9: Post-use Road Survey

Timing: The post use road survey should be contacted within one month after the permitted end date of the Haul Route specified under the RUA.

Recommendations: The post-use survey will consist of the same testing requirements performed for the pre-use survey as specified in the RUA.

STEP 10: Engineering Evaluation and Invoicing for Repair Costs

Timing: The engineering evaluation and repair cost determination and invoicing of the developer should be complete within three months of the end of activity date permitted by the RUA.

Recommendations: The engineer will evaluate the pre/post use survey data, and complete a detailed engineer's estimate of all costs associated road repairs and/or upgrades in accordance with the detailed specifications set forth in the RUA. The engineer cost estimate shall be provided in writing to the municipality, along with pertinent backup information as may be required. Upon receipt and approval of the engineer's estimate by the municipality, the municipality will invoice the developer for the amount determined in the engineer cost estimate. The municipality should be required to pay within 30 days. If payment is not received within 180 days the municipality should commence collection proceedings, including acquisition of funds from bond or other financial instrument guarantees.

Appendix A

Letters of Authorization

Office of the Supervisor
Bernard R. Johnson
Supervisor
Town of Tusten
210 Bridge Street
Narrowsburg, NY 12764
(845)252-3668
bjohnson@tusten.org

June 23, 2009

Mr. Steven D. Messmer, EI
Project Manager
C & S Companies
499 Col. Eileen Collins Blvd.
Syracuse, N.Y. 13212

RE: Request of Amendment to Contract for the Multi-Municipal Gas Drilling Task Force – Roadway Assessment Study: Addition of Town of Fremont to Study

Dear Mr. Messmer:

This letter is to advise you that, at its May 11, 2009 meeting, the Town Board of the Town of Fremont passed a resolution to join the Multi-Municipal Gas Drilling Task Force, comprised of Tusten and the other five Sullivan County Towns of Highland, Delaware, Cochecton, Lumberland and Callicoon, and to participate in the Roadway Assessment Study (RAS) for which the Task Force has contracted with C&S Companies as consulting engineer.

As noted in our in our Letter of Acceptance dated May 4, 2009, the Town of Tusten is the lead agent for the Task Force, and also, as stated therein, the contract references C&S' proposal for services outlined in Addendum No. 2, Alternative A, dated April 6, 2009, which was accepted and approved by the Task Force Project Committee. Per the terms outlined within Addendum No. 2, we request that you amend the Contract to include the addition of Fremont to the RAS.

With the selection of Alternative A, and consistent with our conference call of April 15, 2009 regarding the possible inclusion of additional municipalities and their respective cost share, we understand that the Town of Fremont can be included in the RAS for an additional cost of $4,400, bringing the total contract cost to $30,800.

So long as these terms are acceptable to you, please prepare an amendment to the Contract reflecting the addition of the Town of Fremont to the RAS.

If you have any questions, please contact me at 845-252-3668.

Sincerely,

Ben Johnson, Town of Tusten, Supervisor

Cc: Dr. William Pammer, Commissioner of Planning
Mr. Ethan Cohen, Chief Planner/Project Manager
Mr. James Grier, Town of Fremont, Supervisor

C&S Companies
499 Col. Eileen Collins Blvd.
Syracuse, NY 13212
p: (315) 455-2000
f: (315) 455-9667
www.cscos.com

June 26, 2009

Office of the Supervisor
Bernard R. Johnson
Supervisor
Town of Tusten
210 Bridge Street
Narrowsburg, New York 12764

RE: Addendum No. 1 to Agreement between C&S Engineers Inc. and Town of Tusten for Local Roads Consulting Services, Multi-Municipal Gas Drilling Task Force, Sullivan County, New York

C&S Job No.: I47.001.001

Dear Mr. Johnson,

Pursuant to your letter of June 23, 2009 requesting the addition of the Town of Fremont to the above referenced project, C&S Engineers Inc. is pleased to present this addendum. We hereby agree to include the Town of Fremont in the project and to complete the same scope of services for the Town as delineated in our original agreement dated May 18, 2009. This addendum will amend the amount of the contract by an additional $4,400.00, bringing the total contract cost to $30,800.00. However, due to the addition of Fremont several weeks later than the other towns, a time extension will be required for delivery of the Town of Fremont final report, which will be provided on or before September 9, 2009. Additionally, a fourth and final invoice for services rendered for the Town of Fremont, will be issued on or about September 9, 2009 as well.

If this addendum is acceptable to you, kindly acknowledge the same by signing this document and returning it to the undersigned. This proposal will constitute an amendment of our original agreement upon your acceptance as acknowledged below.

Very truly yours,
C&S ENGINEERS, INC.

Paul W. Wilke, P.E.
Manager, Transportation Service Group

Accepted this 21st day of July, 2009

By: Bernard R. Johnson
Bernard R. Johnson
Supervisor
Town of Tusten

Enc.

cc: Dr. William Pammer, Commissioner of Planning
Mr. Ethan Cohen, Chief Planner/Project Manager
Mr. James Grier, Town of Fremont, Supervisor
Mr. Peter Messmer, Steuben County DPW

Office of the Supervisor
Town of Tusten
P.O. Box 195
Narrowsburg, NY 12764
(845)252-3668
bjohnson@tusten.org

May 4, 2009

Mr. Steven D. Messmer, EI
Project Manager
C&S Companies
499 Co. Eileen Collins Blvd.
Syracuse, NY 13212

RE: Acceptance Letter for the Multi-Municipal Gas Drilling Task Force

Dear Mr. Messmer:
This letter is to advise you that your proposal for the Multi-Municipal Gas Drilling Task Force, Addendum No. 2, Alternative A, dated April 6, 2009 has been accepted by the Task Force Committee. As the lead agent of the Multi-Municipal Gas Drilling Task Force, we expect to be able to provide you with a notice to proceed pending a resolution by the Town of Tusten Town Board to be voted on May 11, 2009. Congratulations, and we look forward to working with you.
With the acceptance of your proposal by the Task Force Committee, please allow to me outline the following points to offer clarity on the execution of the contract award, who you will be contracting with, and who you will be submitting deliverables to:

1. As noted above, the Town of Tusten is the lead agent of the Multi-Municipal Gas Drilling Task Force. Therefore, you will be contracting with the Town of Tusten. As such, the Town of Tusten Town Board will be passing a resolution to enter into a contract with your firm on 11 May 2009 not to exceed your Alternative A scope of work of $26,400 if a sixth town joins, or not to exceed the original $22,000 project cost with the current 5 towns.

2. The Town of Tusten will execute an inter-municipal agreement (IMA) among members of the Multi-Municipal Gas Drilling Task Force outlining financial contributions and insurance matters. You will receive the IMA once it is executed by the member towns.

3. The Sullivan County Division of Planning and Environmental Management is the project manager or "owners representative" reporting to the Town of Tusten. All

deliverables are to be submitted to the Sullivan County Division of Planning and Environmental Management. Your main contact persons with the Division of Planning are Dr. William J. Pammer, Planning Commissioner, and Mr. Ethan Cohen, Chief Planner. I am aware that we you have been in correspondence with Mr. Cohen already and that contact makes the communication protocol somewhat formalized, but please cc Dr. Pammer on all correspondence henceforth. Dr. Pammer's e-mail address is william.pammer@co.sullivan.ny.us and Mr. Cohen's e-mail is ethan.cohen@co.sullivan.ny.us.

4. With the selection of Alternative A, and consistent with our conference call of April 5, 2009 regarding the possible addition of one or two more municipalities and their respective cost share, 5 towns will be part of the study whereby the cost share of an additional municipality is $4,400. As noted in point #1, a sixth town may be joining the collaboration potentially bringing the total contract cost to $26,400 from the original $22,000 project cost with 5 towns.

5. Your contract time frame is approximately three months. Therefore, you will submit invoices to the Town of Tusten Town Supervisor via regular mail on 29 May, 30 June, and 31 July. The Town's mailing address is: 210 Bridge Street, P.O. box 195, Narrowsburg, N.Y. 12764.

6. The Sullivan County Division of Planning has our authorization to review your work and serve as the project point of contact through the representatives noted in item #3. Dr. Pammer and Mr. Cohen will also work with you in resolving questions and issues during the completion of the work and approving the final work product.

7. Prior to commencement of work, the following documents must be filed with this office:
   1. Executed Contract Agreement (attached)
   2. Certificate of Insurance, in limits as set forth in the proposal
   3. 100% Performance and Payment Bonds, if applicable.

In closing, we are very excited about this project and look forward to working with you. If you have any questions, please contact me at 845-252-3668.

Sincerely,

Ben Johnson, Supervisor

Cc:
Dr. William Pammer, Commissioner of Planning
Mr. Ethan Cohen, Chief Planner

Appendix B

The Natural Gas Boom in NY: Potential Water Resource Impacts

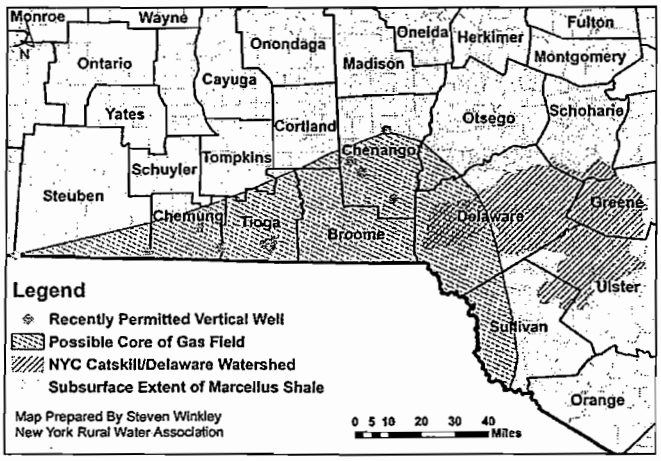
The Natural Gas Boom in NY: Potential Water Resource Impacts

by Steven Winkley,
Water Resources Planning Specialist

Do you know that the most promising natural gas field in America is found beneath parts of New York's Southern Tier and Catskills? In parts of Broome, Chemung, Chenango, Delaware, Otsego, Sullivan, and Tioga Counties, local landowners are being approached by gas companies for the leasing of their land's natural gas exploration and development rights. An internet search conducted in mid-August 2008 revealed leasing rates in New York are as high as $3,000 per acre per year plus 15 to 18 percent royalties on the value of the natural gas once it is extracted. Not surprisingly, landowner groups have formed in many areas of New York to bargain collectively with gas companies to get the best deals.

The economic impact to local landowners could prove considerable, not to mention the impacts on local economies in general. However, some communities have expressed concerns on the impacts on local infrastructure such as roads. Many individuals, groups, and agencies have also expressed alarm about potential water resource impacts. In this article, I will discuss these potential water quantity and water quality issues.

Figure 1
Marcellus Shale Gas Field (August 2008)



The Source Rock

The source of the natural gas in New York is a geological rock formation known as the Marcellus Shale. This formation is named after rock outcrops found in the Marcellus area near Syracuse. The Marcellus Shale is a black shale that contains a high amount of organic material (shale is a sedimentary rock composed of clay that has been compacted together). The Marcellus Shale occurs across much of New York (see Figure 1) and actually extends southward to West Virginia. The deeper and thicker the Marcellus Shale is, the more potential it has for natural gas production. In New York, the deepest and thickest portion of the Marcellus Shale is found in a region known as the "core area" (see Figure 1). In this area, the Marcellus Shale is reportedly found 5,000 to 8,000 feet below the land surface.

Natural gas occurs within the Marcellus Shale within the pore spaces of the rock, within vertical fractures, and on individual mineral grains. However, it is very difficult to remove the gas because the pore spaces in the shale rock are very small and not well connected. Up until now it has not been economically viable to try to extract natural gas from most shale formations.

Gas Extraction

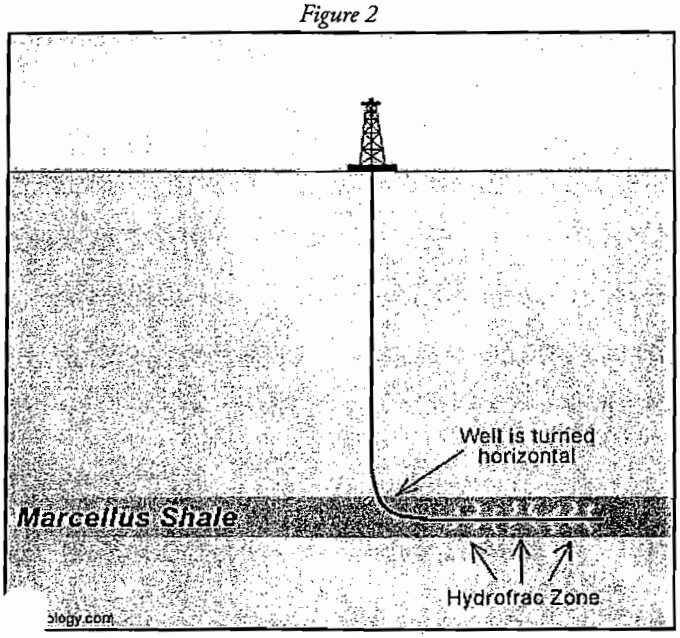
Today, higher natural gas prices and relatively new technologies make shale gas wells economically viable. The key to a successful gas recovery well in the Marcellus is to intersect a network of vertical fractures that allow the gas to flow to the well. As you would expect, a conventional, vertical well penetrates very few of these vertical fractures. In contrast, a horizontal well drilled maximizes the number of fractures that are intersected. As Figure 2 shows, recent technology allows a vertical well to turn horizontal once the Marcellus Shale is encountered. A second new technology allows more effective removal of natural gas from the relatively tight shale. This process, known as hydrofracing, involves increasing the number of fractures intersecting the well using high-pressure water or a gel. Large amounts of sand and/or other additives are then pumped into the well to prevent the opened fractures from closing. The cost to drill and complete a horizontal well is not cheap. Published estimates range from $3 million to $4 million for each well!

Water Quantity Issues

Water resources can be potentially impacted by Marcellus natural gas development in different ways. First, the hydrofracing technique uses large amounts of water. Reportedly, it takes between 2 and 9 million gallons of water per well. This freshwater, withdrawn from wells or surface water, or purchased from public water systems or bulk water suppliers, is considered a consumptive use because the water is usually not returned. Many fear aquifer depletion, stream flow reduction, drinking water supply

disruption, and impacts to fish and wildlife and plant life. In June, 2008, the Susquehanna River Basin Commission sent letters to 23 gas well companies stating that water used for developing natural gas wells needs Commission approval. The Delaware River Basin Commission has taken similar actions. All of the core area is situated within the jurisdiction of either the Susquehanna River Basin Commission or the Delaware River Basin Commission.

Figure 2



Water Quality Issues

Second, there are possible water quality impacts. Chemicals are introduced into the well during the drilling and hydrofracing process. Once the well is completed, much of the water that is introduced during drilling and hydrofracing returns to the surface (though some estimate that 20%-50% of these fluids remain underground). Returned water, known as "flow back", not only contains the drilling muds and fracturing fluid, but also naturally-occurring water from the formation. Water from the Marcellus Formation is typically that of a brine, with metals, hydrocarbons, dissolved gases, and normally occurring radioactive materials (NORMS) present. The Marcellus Shale is known to be radioactive, producing elevated levels of radon gas in some regions of New York State for example. Flow back water is stored on-site and eventually removed for off-site treatment and disposal.

New York City Watershed

As indicated on Figure 1, some of the core Marcellus Shale Gas Field is situated within the Catskill/Delaware Watershed for New York City's Water Supply System. All of the Catskill/Delaware Watershed is underlain by the Marcellus Shale. The Commissioner of the New York City Department of Environmental Protection (NYCDEP) has expressed concerns about the regulation of natural gas drilling and development within the New York City watershed. In a letter to the New York State Department of Environmental Conservation (NYSDEC), the agency with jurisdiction of permitting gas drilling and development, NYCDEP has proposed a 1-mile drilling exclusion zone around City reservoirs, tunnels, shafts, etc. NYCDEP has asked to be consulted when NYSDEC reviews drilling permit applications in the City's watershed. It also requests that applicants for drilling permits disclose all chemicals used in drilling activities, and that natural gas drilling and development not be exempted from the City's Watershed Rules and Regulations.

Regulatory Timetable

As of July 2008, the NYSDEC had received four applications for horizontal drilling in the Marcellus Shale. Up until now, drilling permits have been covered under a Generic Environmental Impact Statement (GEIS) published in 1992. Since this GEIS does not address the issues of horizontal drilling, any drilling company wishing to proceed now must undertake an individual, site-specific environmental impact study. The NYSDEC has begun the process of developing a Supplemental GEIS to address horizontal drilling impacts. The first step is to outline (scope) the factors that must be included in the Supplemental GEIS. NYSDEC has already indicated that these factors could include potential adverse impacts to groundwater, surface water, wetlands, air quality, aesthetics, noise, traffic and community character, as well as cumulative impacts, and effects on local governments. To assist in the development of the scoping document, NYSDEC plans on holding public hearings across the Southern Tier and the Catskills this fall on a draft scoping document. After these meetings, the NYSDEC will prepare a Supplemental GEIS for eventual public review. Their target is to release this Supplemental GEIS by early spring, 2009.

Get Involved

Water system operators/managers and community officials in the Southern Tier and Catskills should plan to attend the upcoming meetings regarding the potential impacts of horizontal gas drilling in the Marcellus Formation. This is your opportunity to listen, learn, and let your voice be heard on this important matter. Natural gas drilling and development has the potential to benefit local economies but it is critical that water resources and the environment are adequately protected.

Appendix C

Town Highway Maps
Town Road Inventories
Road Traffic and Importance Ratings

AS SHOWN ON THE C IAL TOWN HIGHWAY MAP
TOWN L LICOON
CORRECTEL ..S TO 10/28/08

Town of Callicoon
Highway Inventory

THNO	NAME	MAPLOC	TOTLENGTH	BIT2LANE	BIT1LANE	GRAV2LANE	GRAV1LANE	EARTH2LANE	EARTH1LANE	Importance	Traffic
1	ANAWANDA LAKE ROAD	6C	1.69	1.69	0.00	0.00	0.00	0.00	0.00	3	M
3	BAYER ROAD	7C	2.12	2.12	0.00	0.00	0.00	0.00	0.00	3	M
4	PLEASANT VALLEY ROAD	9A	1.28	1.28	0.00	0.00	0.00	0.00	0.00	2	ML
5	DIENER HILL RD	9B	0.53	0.00	0.18	0.00	0.35	0.00	0.00	1	L
6	BUCK BROOK ROAD	7B	1.37	1.37	0.00	0.00	0.00	0.00	0.00	2	ML
7	BETHLEHEM ROAD	5C	3.22	2.61	0.61	0.00	0.00	0.00	0.00	2	ML
9	SEIBERT ROAD	6E	0.64	0.00	0.00	0.64	0.00	0.00	0.00	2	ML
10	HUBER ROAD	2E	2.42	2.42	0.00	0.00	0.00	0.00	0.00	2	MH
11	BOBAND ROAD	8G	1.46	0.27	0.00	0.00	1.19	0.00	0.00	2	M
12	CATTAIL ROAD	5G	2.28	2.28	0.00	0.00	0.00	0.00	0.00	3	MH
13	DYKER ROAD	8C	1.47	1.47	0.00	0.00	0.00	0.00	0.00	3	M
14	DUTCH HILL ROAD	2D	1.55	1.55	0.00	0.00	0.00	0.00	0.00	2	ML
16	OLD DANZER ROAD	6F	1.60	1.60	0.00	0.00	0.00	0.00	0.00	3	M
17	DEWITT FLATS ROAD	8G	0.49	0.49	0.00	0.00	0.00	0.00	0.00	4	MH
18	MALL ROAD	9D	1.12	0.28	0.00	0.88	0.00	0.00	0.00	1	L
19	EAGIN ROAD	7F	0.78	0.78	0.00	0.00	0.00	0.00	0.00	1	ML
20	EAST HILL ROAD	8G	1.74	1.74	0.00	0.00	0.00	0.00	0.00	3	M
22	HARDENBURGH ROAD	5F	0.87	0.87	0.00	0.00	0.00	0.00	0.00	3	M
23	FAUBEL ROAD	8E	1.62	1.62	0.00	0.00	0.00	0.00	0.00	3	M
24	GORR ROAD	9C	1.24	0.01	0.00	0.00	0.00	0.00	1.23	1	L
25	GREBEL ROAD	8D	1.24	0.41	0.00	0.83	0.00	0.00	0.00	2	ML
26	HAHN ROAD	5D	1.52	1.52	0.00	0.00	0.00	0.00	0.00	3	M
27	WEISSMAN ROAD	5D	2.34	2.34	0.00	0.00	0.00	0.00	0.00	2	ML
30	HEMMER ROAD	8F	2.08	2.08	0.00	0.00	0.00	0.00	0.00	4	MH
31	HESSINGER & LARE ROAD	6E	3.79	3.79	0.00	0.00	0.00	0.00	0.00	5	H
33	HUBERT ROAD	9G	1.15	1.15	0.00	0.00	0.00	0.00	0.00	2	ML
34	HUST ROAD	7D	2.32	1.99	0.33	0.00	0.00	0.00	0.00	4	MH
35	KRATZ ROAD	9C	0.90	0.00	0.00	0.00	0.90	0.00	0.00	1	L
36	KELLER ROAD	5D	1.09	1.09	0.00	0.00	0.00	0.00	0.00	1	L
37	KLINGER ROAD	3E	2.44	0.47	0.00	1.97	0.00	0.00	0.00	2	ML
38	LEINS ROAD	6C	0.66	0.00	0.00	0.66	0.00	0.00	0.00	1	L
39	LIKEL ROAD	8E	0.94	0.94	0.00	0.00	0.00	0.00	0.00	2	ML
40	MEYER ROAD	4F	1.38	0.00	0.00	0.00	1.38	0.00	0.00	2	ML
41A	MAUER ROAD	6C	1.02	0.00	0.00	0.00	0.00	0.00	1.02	1	L
41B	KINNEY ROAD	6B	0.31	0.00	0.31	0.00	0.00	0.00	0.00	1	L
42	SCHAFER ROAD	9D	0.63	0.63	0.00	0.00	0.00	0.00	0.00	4	MH
42A	TONJES RD	D9	0.60	0.60	0.00	0.00	0.00	0.00	0.00	4	MH
43	MENGES ROAD	5G	2.41	2.41	0.00	0.00	0.00	0.00	0.00	3	M
44	ESSELMANN ROAD	8D	1.32	1.32	0.00	0.00	0.00	0.00	0.00	3	M

AS SHOWN ON THE [illegible]IAL TOWN HIGHWAY MAP
TOWN [illegible]ALLICOON
CORRECTED AS TO 10/28/08

46	POLEY ROAD	9C	1.23	1.23	0.00	0.00	0.00	0.00	0.00	3	M
47	WALDEMERE ROAD	2F	0.98	0.17	0.00	0.00	0.00	0.00	0.81	2	ML
47A	OLD WALDEMERE ROAD	2F	0.47	0.47	0.00	0.00	0.00	0.00	0.00	1	L
48	STEWART ROAD	8B	1.02	1.02	0.00	0.00	0.00	0.00	0.00	2	ML
50	STUMP POND ROAD	5E	3.68	3.68	0.00	0.00	0.00	0.00	0.00	4	MH
51	DIETZ ROAD	6D	2.36	0.00	0.00	0.00	0.00	0.00	2.36	2	ML
52	SANDER ROAD	7E	1.43	0.46	0.00	0.97	0.00	0.00	0.00	2	ML
55	CARL SPIELMAN ROAD	7G	0.66	0.66	0.00	0.00	0.00	0.00	0.00	3	MH
56	J. SPIELMAN ROAD	9G	0.46	0.00	0.00	0.00	0.46	0.00	0.00	1	L
57	TEMPLE ROAD	2F	0.59	0.59	0.00	0.00	0.00	0.00	0.00	3	M
57A	BACK SHANDLEE ROAD	2F	0.36	0.36	0.00	0.00	0.00	0.00	0.00	3	M
58	DURR ROAD	9F	0.38	0.10	0.28	0.00	0.00	0.00	0.00	2	ML
60	JACK MENGES ROAD	7G	0.35	0.35	0.00	0.00	0.00	0.00	0.00	3	M
61	J. YOUNG ROAD	4D	2.70	0.00	0.00	1.63	1.07	0.00	0.00	3	M
62	FRED HESSINGER	6D	0.09	0.00	0.09	0.00	0.00	0.00	0.00	2	M
62A	SCHMIDT LANE	6D	0.09	0.00	0.09	0.00	0.00	0.00	0.00	2	M
62B	FIREHOUSE ROAD	6D	0.09	0.00	0.09	0.00	0.00	0.00	0.00	2	M
64	WHITENDALE RD	5E	0.91	0.00	0.00	0.00	0.91	0.00	0.00	1	L
65	OLD CR #128	9E	0.39	0.39	0.00	0.00	0.00	0.00	0.00	1	L
66	WAHL ROAD	7E	1.99	1.99	0.00	0.00	0.00	0.00	0.00	3	MH
72	YAUN ROAD	6F	1.17	1.17	0.00	0.00	0.00	0.00	0.00	2	ML
74	SHANDELEE LAKE ROAD	3F	0.34	0.34	0.00	0.00	0.00	0.00	0.00	2	M
75	ERLEMANN ROAD	6E	0.38	0.00	0.38	0.00	0.00	0.00	0.00	1	L
76	BANUAT ROAD	7C	0.12	0.12	0.00	0.00	0.00	0.00	0.00	1	L
77	KIMBALL ROAD	7B	0.52	0.52	0.00	0.00	0.00	0.00	0.00	1	L
78	SOMMERS ROAD	8C	0.50	0.00	0.50	0.00	0.00	0.00	0.00	1	L
79	OLD CR #95	8B	0.22	0.22	0.00	0.00	0.00	0.00	0.00	1	L
80	ANAWANDA LAKE VIEW RD	5C	0.20	0.00	0.20	0.00	0.00	0.00	0.00	3	M
81	WEGMAN ROAD	3D	0.22	0.00	0.22	0.00	0.00	0.00	0.00	1	L
82	HAUSMAN ROAD	8E	0.08	0.08	0.00	0.00	0.00	0.00	0.00	1	L
83	EARL MYERS ROAD	8E	0.78	0.78	0.00	0.00	0.00	0.00	0.00	2	ML
85	OLD ROUTE 52	F9	0.22	0.00	0.00	0.00	0.22	0.00	0.00	1	L
	TOTALS		82.61	59.89	3.28	7.58	6.48	0.00	5.42		

OFFICIAL HIGHWAY MAP

TOWN OF CALLICOON

COUNTY OF SULLIVAN

STATE OF NEW YORK

Supervisor LINDA BABICZ

Superintendent DAVID ERLWEIN

Officially Adopted DATE

Certified by TOWN CLERK

EARTH — COLD MIX ASPHALT — (NONE)

GRAVEL — HOT MIX ASPHALT — TYPICAL

LEGEND

STATE HIGHWAY		TOWN HIGHWAY		COUNTY BOUNDARY	
STATE HIGHWAY		TOWN HIGHWAY		TOWN BOUNDARY	
COUNTY ROAD		TOWN HIGHWAY		INC. VILLAGE BOUNDARY	
TOWN HIGHWAY		STATE BOUNDARY		STREAMS	

Scale 1 inch = 2000 Feet

MAP PREPARED BY

SULLIVAN COUNTY DEPT. OF PUBLIC WORKS

ROBERT A. MEYER, P.E.
COMMISSIONER

C & S
~~DPEM~~ COPY

INTERVIEWS - 5/12/09 E. COHEN W/ D. ERLWEIN

5/28/09 S. MESSMER W/ D. ERLWEIN & OTHER HWY DEPT PERSONNEL

CORRECTED 10/29/08

AS SHOWN ON THE O L TOWN HIGHWAY MAP
TOWN O IECTON
CORRECTED AS OF 11/6/08

THNO	NAME	MAPLOC	TOTLENGTH	BIT2LANE	BIT1LANE	GRAV2LANE	GRAV1LANE	EARTH2LANE	EARTH1LANE	Importance	Traffic
1	BROOK RD.	5C	1.94	0.66		1.28		0.00		3	M
2	PINE WOOD RD.	6F	0.84	0.47		0.37				2	M
3	LOUNSBURY RD.	4G	0.40	0.30		0.10	0.00			2	M
4	BRIGHAM RD.	4B	0.37				0.37			1	L
7	COCHECTON RD.	4B	0.70	0.70						5	H
8	DAILEY RD.	7F	0.77	0.28		0.49				2	M
9	DEVILS RD.	5E	0.67	0.67						3	M
10	DEPOT RD.	4B	0.13		0.13					4	H
12	LUX RD.	4G	0.21		0.16		0.05			2	M
13	FISHER RD.	5G	0.23		0.07		0.16			1	L
14	LONG RD.	5C	0.50		0.06		0.44			2	M
15	SKIPPERENE RD.	7D	3.51	3.51	0.00	0.00	0.00			4	H
16	BUFF RD.	6E	1.72	0.60		1.12				3	M
17	SWAMP POND RD.	9F	0.54				0.54			2	M
18	OLSEN RD.	6E	0.48			0.48				2	M
19	NOBODY RD.	7B	0.34	0.34			0.00			2	M
20	MOHN RD.	7E	1.48	0.76		0.72				3	M
21	MUELLER RD.	4F	1.13	1.13						5	H
22	BERNAS RD.	5F	2.75	2.75		0.00				4	H
23	FRED WHITE RD.	8F	1.18	1.18						3	M
24	SMALES RD.	5D	0.43	0.43						4	H
25	MITCHELL POND WEST	4D	1.69	1.15		0.54				3	M
27	NEW TURNPIKE "A"	4C	2.38	0.19	1.08	1.11				3	M
28	NEW TURNPIKE "B"	3E	1.47	1.47						3	M
30	ERHLEY RD.	9F	1.02				1.02			2	L
31	NEARING RD.	5E	0.97	0.97		0.00				4	H
33	HAASE RD.	6D	0.94			0.94				1	L
34	RAUCH RD.	6D	0.48	0.48						2	M
35	PARSONAGE RD.	4B	0.25		0.25					2	M
36	CROSS RD.	3D	0.55	0.55						3	M
37	MITCHELL POND EAST	5D	2.52	2.52		0.00				5	H
38	STONY RD.	6D	1.42	0.84		0.58				3	M
39	KELLY RD.	7E	0.86	0.86						2	M
40	NELSON RD.	6E	0.17		0.17					2	M
41	SCHALCK RD.	8F	1.52	1.20		0 32				3	M
42	DAUB RD.	8E	1.03	0.98	0.00		0.05			3	M
43	SHORT CUT RD.	6E	1.68	1.68						5	H
44	SKINNER'S FALLS RD	6B	1.05	1.05						4	H
44A	SKINNER FALLS WEST RD.	6B	0.21	0.21						4	H
45	TYLER RD.	8E	3.39	2.09	0.30	0.40	0.60			4	H
46	WESTERVELT RD.	5G	0.69			0.69				2	M
47	CRESTWOOD RD.	5E	0.21	0.21						2	M
49	NEWMAN RD.	4A	0.09		0.09					2	M
50	JOHNS RD.	5D	0.73			0.73				0	M
51	MILL RD.	4C	1.87			1.01	0.86		1.28	2	M
52	TOMEL RD.	6F	0.28			0.28				2	M

53	HARTMANN RD.	3D	0.13				0.13			1	L
54	QUALLS RD.	5G	0.31			0.31				1	M
55	MY PLACE RD.	4B	0.08				0.08			1	L
56	C. MEYER RD.	5B	0.05			0.05				1	L
57	FORMAN RD.	5F	0.53	0.53						3	M
58	OLD CR	7E	1.20	1.20						3	M
59	ZYLSTRA RD.	5E	0.19	0.19						2	M
60	CUSHETUNK DRIVE	6C	2.79	2.79						3	M
61	CLINTONIA WAY	6D	0.23	0.23						1	L
62	MEADOWSWEET LANE	6C	0.12	0.12						1	L
63	TRILLIUM TRAIL	6C	0.12	0.12						1	L
64	LENNI LENAPE ROAD	7C	0.90	0.90						3	M
65	HOFFMAN RD.	9E	0.57				0.57			2	M
			55.01	36.31	2.31	11.52	4.87		1.28		

p.3
845-932-8737
Jul 16 08 08:51a Brian DuBois

OFFICIAL HIGHWAY MAP

TOWN OF COCHECTON

SULLIVAN COUNTY

STATE OF NEW YORK

LEGEND

EARTH

GRAVEL

PAVED COLD MIX ASPHALT - N/A

PAVED HOT MIX ASPHALT - TYP

CES 2004

INTERVIEW DATES

1) JAN. 2009 - William Cohen w/ Brian DuBois & Gary Maas

2) May 29, 2009 - Steve Messner w/ Brian DuBois (#2)

Supervisor SALVATORE INDELICATO

Superintendent BRIAN DUBOIS

Officially Adopted [illegible]

Certified by [illegible]

MAP PREPARED BY

SULLIVAN COUNTY DEPT OF PUBLIC WORKS

ROBERT A. MEISTER

COMMISSIONER

AS SHOWN OF THE O AL TOWN HIGHWAY MAP
TOWN C LWARE
CORRECTED AS TO 10/28/08

THNO	NAME	MAPLOC	TOTLENGTH	BIT2LANE	BIT1LANE	GRAV2LANE	GRAV1LANE	EARTH2LANE	EARTH1LANE	Importance	Traffic
1	WINKELSTERN LANE	7E	0.21		0.21	0.00	0.00			1	E
2	SWISS HILL NORTH	8E	3.66	3.66						5	B
2A	SWISS HILL N. SPUR	9D	0.02		0.02					1	E
3	NEW TURNPIKE RD	5G	1.03	1.03						1	E
4	BUDDENHAGEN	5C	0.75	0.75						2	E
5	BEECHWOODS	5D	3.14	2.61	0.53					5	B
6	CROSS	2C	0.49	0.49	0.00					1	E
7	WAGNER LANE	3D	0.38		0.38					1	E
8	BAUERNFEIND	6D	0.73	0.20	0.53					2	E
9	OLD HANKINS	3C	1.36	0.46	0.00	0.90				1	E
10	VILLA ROMA	7E	1.96	1.96						5	A
11	EGGLER	8D	1.37	1.37	0.00					2	D
12	FULTON HILL	7F	1.86	1.86						4	C 3
13	VIADUCT	4E	1.70	1.70	0.00					5	B
14	OLD TAYLOR	8F	1.18	1.18						5	A
15	POLSTER	7D	0.72	0.72						5	A
16	HUBBARD	6F	0.37	0.37						1	E
17	DUENER HILL	5C	0.13		0.13					1	E
18	HORTONVILLE MAIN ST.	4D	0.72	0.72						5	A
19	SEMINARY RD.	3D	1.83	1.83						3	E
20	KRATZ	6C	0.84	0.84						3	D
21	KNACK HILL	4C	0.73		0.73					1	E
22	KAUTZ	3C	2.26	2.26						2	E
23	GABEL	5E	2.63	1.90	0.73					5	A
24	LONG	6E	0.84	0.84						3	E
25	TONJES	7C	0.92	0.92						5	B
26	MESMER HILL	6G	0.39		0.39					4	C
27	MILLER	7D	1.40		1.40					5	A
28	TOWER	2C	1.42		1.42					3	C
28A	BAER	2C	0.36		0.36					1	E
29	STARCKS LANE	3E	0.13	0.13						5	A
31	HOSPITAL	4D	1.88	1.08	0.80					5	B
32	DIEHL	7E	0.82	0.82						4	D
33	BOETTGER	5E	0.30	0.30						1	E
34	LUX	5F	1.22		1.22					2	E
35	REUM	6E	0.79	0.79						5	A
36	ROBISCH HILL	5C	1.83		1.83					1	E
37	RIVER	1C	4.34	0.80	3.54					5	A
38	SICKMILLER	8D	0.94	0.94	0.00					2	E
39	MUELLER	7G	0.62	0.62						5	A
40A	SWISS HILL "A"	8F	0.23	0.23						5	C
40B	JAKETOWN RD.	8G	0.30	0.30						5	B
41	SCHWARTZ	5C	1.20	0.80	0.40					2	E
43	WELSH	7F	0.64	0.64						1	E

TOWN HIGH[illegible] INVENTORY
AS SHOWN OF THE OI[illegible]L TOWN HIGHWAY MAP
TOWN C[illegible]LWARE
CORRECTED AS TO 10/28/08

44	HESS	5C	0.12	0.12						1	E
45	FUHRER	9E	0.05		0.05					1	E
46A	BACK	8D	0.12		0.12					1	E
46B	TAYLOR	8D	0.14	0.14	0.00					1	E
47	CALLICOON STREETS	3D									
47A	RAILROAD AVENUE	3D	0.17		0.17					2	E
47B	MITCHELL AVENUE	3D	0.04		0.04					2	E
47C	HIGHVIEW AVENUE	3D	0.06	0.06						2	E
47D	HIGH STREET	3D	0.07		0.07					2	E
47E	GREGORY STREET	3D	0.12		0.12					2	E
47F	A. DORRER DRIVE	3D	0.15	0.15						5	A
48	HORTONVILLE STREETS	4E									
48A	HORTON AVENUE	4E	0.21		0.21					2	E
48B	ROCK AVENUE	4E	0.22		0.22					2	E
48C	48B SPUR (ROCK AVE.)	4E	0.04		0.04					2	E
49	KEEGAN	6E	0.18		0.18					2	E
50	NORTH HORTON AVENUE	4E	0.24		0.24					2	E
51	CREAMERY	3E	0.33	0.05	0.28					2	E
52	STONE ARCH	7E	0.16	0.16						1	E
54	SCHOOL HOUSE HILL	8D	0.37	0.37						5	A
55	DEL VUE	3D	0.43	0.43						2	E
55A	DEL VUE EXTENSION	3D	0.11	0.11						1	E
56	EGGLER SPUR	8D	0.10		0.10					1	E
57	RADIO TOWER	6C	0.79	0.24	0.55					2	E
58	TERRACE AVENUE	8D	0.05		0.05					3	C
59	DUENER HILL	5C	0.05	0.05						1	E
60	FRED SCHWARTZ	8F	0.17		0.17					1	E
61	SHAMFIELD HEIGHTS	7D	0.13	0.13						2	E
62	LARE	8D	0.10	0.10						2	E
63	HILLTOP	3D	0.14	0.14						2	E
64	HORSESHOE	3D	0.17	0.00	0.17					1	E
65	TOP OF THE WORLD EST	4F									
65A	COUNTRY LANE	4F	1.24	1.24						5	B
65B	HILLSIDE LANE	4F	0.16	0.16						1	E
65C	MOUNTAINTOP LANE	4F	0.12	0.12						1	E
65D	SERENITY DRIVE	4F	0.61	0.61						3	D
65E	DEER RUN	4F	1.24	1.24						1	E
65F	WHITE TAIL DR.	4F	0.35	0.35						1	E
65G	FAWN PLACE	4F	0.23	0.23						1	E
66	LAHM	3C	0.89	0.22		0.67				1	E1
			60.51	**41.54**	**17.40**	**1.57**	**0.00**				

OFFICIAL HIGHWAY MAP

TOWN OF DELAWARE

COUNTY OF SULLIVAN

STATE OF NEW YORK

C & S Copy

Inspection Dates:

① Jan 2009 (?) Ethan Cohen w/ Bill Eschenberg

② May 29, 2009 Steve Messmer w/ Bill Eschenberg (2)

Supervisor _____

Superintendent WM. ESCHENBERG

Officially Adopted May 6, 2010

Certified by _____

THNO	NAME	MAPLOC	TOTLENGTH	BIT2LANE	BIT1LANE	GRAV2LANE	GRAV1LANE	EARTH2LANE	EARTH1LANE	Importance	Traffic
1	AIRPORT	6C	3.49	3.49						1	H
2	BOWER	5F	0.60				0.20		0.40	4	L
3	HARDER	8C	0.41		0.41					4	L
4	BECK'S HILL	9C	0.13		0.13					4	L
5	BARKER	7F	1.18	1.18						1	H
7	YORK LAKE	9B	0.59	0.59						1	M
8	DRY BROOK	9B	0.87	0.87						1	M
9	COLLINS	6F	0.92	0.92						1	M
10	CRAWFORD	7D	2.27	2.27						1	H
11	MAIL RD. EXTENSION	9D	0.06	0.06						3	L
12	CORKSCREW	8C	1.73	1.51			0.22			2	L
12A	CORKSCREW SPUR	8C	0.06	0.06						4	L
13	OLD BROOK	8D	0.61	0.61						4	L
14	ELDRED STREET	6E	0.06	0.06						4	L
15	HILLSIDE	9D	1.13	1.13						1	H
16	HARTUNG	5F	1.18	1.18						1	H
17	LAKE VIEW DRIVE	5F	2.29	2.29						1	H
18	HUGHES	7A	1.26			1.26				4	L
19	IRISHTOWN	6B	1.19	1.19						2	M
20	DEVLIN	6F	1.05	1.05						1	H
21	KOINONIA LK & MUD PD	5G	1.44	0.92		0.52				3	L
22	MAIL	8D	2.88	2.88						1	H
24	OLD MINISINK FORD A	9A	1.28		1.28					3	L
25	OLD MINISINK FORD B	9A	0.15						0.15	5	L
26	QUICK	9D	0.15		0.15					4	L
27	CLARK	5D	3.41	1.21		0.65			1.55	4 2	L
28	WOODS	7B	3.13	3.13						2 4	H
29	SCHUMACHER POND	7B	0.92	0.92						2 4	M
31	SEITZ	8D	0.45	0.45						3 3	L
32	MARCEL FOUR	5D	0.11	0.00		0.11				4 2	L
33	STEGES	5E	1.53	1.53						1 5	H
35	SCHOOL HOUSE	9D	0.06		0.06					3 3	L
36	AUSTIN	9D	0.05		0.05					3 3	L
37	TOW PATH	9D	0.06		0.06					4	L
39	PARK	7B	0.67	0.67						1	M
40	WASHINGTON BEACH	6C	0.21	0.21						2	L
41	WASHINGTON LAKE	6C	0.46	0.46						2	M
42	PARK LANE	7B	0.47	0.47						1	M
43	KERN	8C	0.53	0.53						1	H
44	BODINE LAKE	6C	0.55	0.55						1	H
45	ELDRED HEIGHTS	6E	0.06	0.06						3	L
46	MOHICAN LAKE	6G	0.47	0.47						1	H
47	KIEFERLE	2E	0.20	0.20						4	L
48	FRAZIER	6E	0.37	0.37						2	L
49	HICKORY LANE	9D	0.20	0.20						3	L

All are backwards

p.2
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Town Of Highland
Jul 23 09 06:45a

50	JAMES LEAVENWORTH	6D	0.18			0.18				3	L
51	NEW SAMYN	7C	0.29	0.26		0.03				3	L
52	WALTER'S FARM	6C	0.32	0.32						3	L
52A	WALTER'S FARM SPUR	6C	0.07	0.07						3	L
53	CEMETERY DRIVE	5E	0.13		0.13					4	L
54	MONTOZA DRIVE	9D	0.16		0.16					4	L
55	WATER St.	6e	0.02		0.02					4	L
	TOTALS		42.06	34.34	2.45	2.75	0.42		2.10		

p.3
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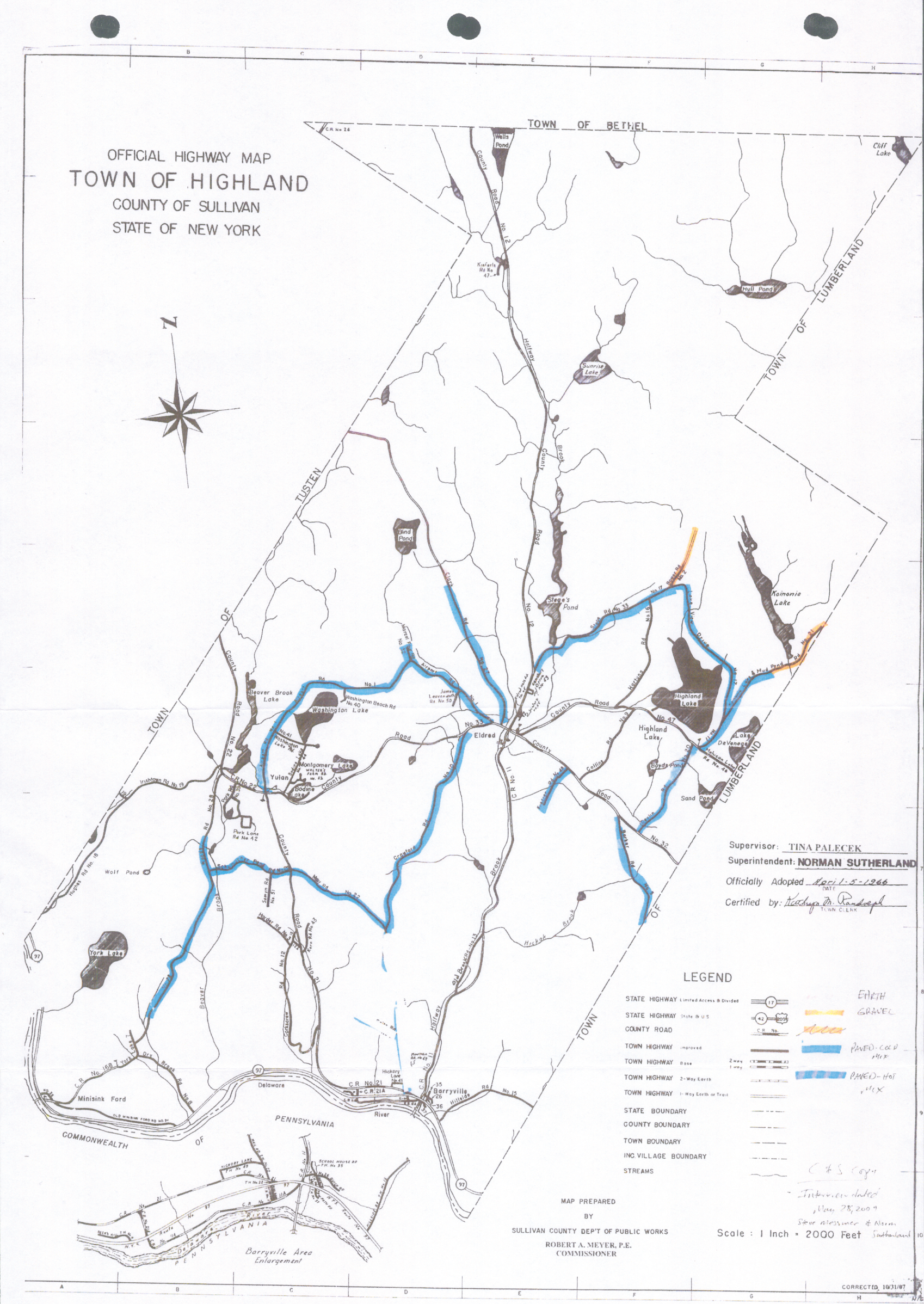
Jul 23 09 06:45a Town Of Highland

OFFICIAL HIGHWAY MAP
TOWN OF HIGHLAND
COUNTY OF SULLIVAN
STATE OF NEW YORK



Supervisor: TINA PALECEK

Superintendent: NORMAN SUTHERLAND

Officially Adopted April 5 1966
DATE

Certified by: Kathryn M. Randolph
TOWN CLERK

LEGEND

- STATE HIGHWAY Limited Access & Divided
- STATE HIGHWAY State & U.S.
- COUNTY ROAD C.R. No.
- TOWN HIGHWAY Improved
- TOWN HIGHWAY Base
- TOWN HIGHWAY 2-Way Earth
- TOWN HIGHWAY 1-Way Earth or Trail
- STATE BOUNDARY
- COUNTY BOUNDARY
- TOWN BOUNDARY
- INC. VILLAGE BOUNDARY
- STREAMS

EARTH
GRAVEL
PAVED - COLD MIX
PAVED - HOT MIX

C & S Copy
- Interview dated May 28, 2009
Steve Messmer & Norm Sutherland

MAP PREPARED
BY
SULLIVAN COUNTY DEPT OF PUBLIC WORKS
ROBERT A. MEYER, P.E.
COMMISSIONER

Scale : 1 Inch = 2000 Feet

CORRECTED 10/31/07

TOWN HI Y INVENTORY
AS SHOWN ON THE C. . AL TOWN HIGHWAY MAP
TOWN OF LUMBERLAND
CORRECTED AS TO 11/14/08

THNO	NAME	MAPLOC	TOTLENGTH	BIT2LANE	BIT1LANE	GRAV2LANE	GRAV1LANE	EARTH2LANE	EARTH1LANE	Importance	Traffic
1	BLOOM	8C	1.01	1.01						2	E
2	ROWLEY	6C	0.90	0.90						4	D
3	BERM & CHURCH	8D	1.09	0.83					0.26	2	E
4	BARNES	8F	0.57				0.57			1	E
5	SWEENEY	7E	0.20				0.20			1	E
6	DECKER	8F	3.05	0.62		0.22			2.21	3	D
7	TARAS SCHEVCHENKO	7E	1.15	1.15						4	D
8	FISH CABIN	8F	0.59						0.59	1	E
9	MOHAPH	6D	0.65		0.33		0.32			1	E
10	HALLENBACH	7F	0.52				0.52			1	E
11	KNIGHT	7F	0.96	0.96						3	D
12	HALLOCK	8B	1.03		0.07				0.96	1	E
13	HARING	7B	3.32	3.32						5	C
14	HOLLOW	7D	3.35	3.35						5	C
15	HOMEYER	9F	0.39		0.39		0.00			1	E
16	AKESON	7F	0.44		0.44					1	E
17	KALIN-WEBER	6E	2.55	2.55						3	C
18	LEBANON	3E	3.34		0.16		3.18			1	E
19	MAPES	7C	2.45				2.45			1	E
20	McDONALD	5E	0.50				0.50			1	E
21	LEERS	5D	1.67	1.67						5	B
22	MOHICAN LAKE	5D	2.97	2.97						5	B
23	MAXWELL	9D	0.10		0.10					1	E
24	RIO DAM	7F	2.00	2.00						3	D
25	CHAPIN	3E	1.16		0.09				1.07	1	E
26	SCHWAB	7B	0.18	0.18						3	E
27	SWANERBURY	8D	0.27		0.27					1	E
28	BIRDSALL	9G	0.24	0.05	0.19					1	E
29	OGDEN	6E	0.91	0.91						2	D
30	METAUQUE	5E	0.32				0.32			1	E
31	SHORTELL	9F	0.79						0.79	1	E
32	TUTHILL	8B	1.62				0.87		0.75	1	E
33	VAN TUYL	8B	2.69	2.69						3	C
33A	VAN TUYL SPUR	8C	0.03	0.03						3	D
34	ALFRED ROAD	8C	0.28	0.28						4	E
35	WHITE	8E	2.68	2.68						4	C
37	CASKEY	8F	0.69						0.69	1	E
38	SMITH	5E	0.61	0.61						3	C
39	MOHICAN LAKE TRAILS	5D									
39A	MOHICAN TRAIL	5D	0.89	0.89						3	D
39B	MINISINK TRAIL	5D	0.72	0.72						3	D

TOWN HIGH INVENTORY
AS SHOWN ON THE OF . TOWN HIGHWAY MAP
TOWN OF LUMBERLAND
CORRECTED AS TO 11/14/08

39C	DELAWARE TRAIL	5D	0.57	0.57						5	0
39D	ONEIDA TRAIL	5D	0.18	0.18						5	0
39E	ELK TRAIL	5D	0.23	0.23			0.00			5	0
39F	CAHOONZIE TRAIL	5D	0.04		0.04					5	0
39G	BEAVER TRAIL	5D	0.08		0.08					5	0
39H	HURON TRAIL	5D	0.03		0.03					5	0
39I	OTTER TRAIL	5D	0.16	0.16						5	0
39J	DEER TRAIL	5D	0.11		0.05		0.06			5	0
39K	DEER TRAIL SPUR	5D	0.01				0.01			5	0
39L	MINK TRAIL	5D	0.22		0.15		0.07			5	0
39M	WEST MOHICAN TRAIL	5D	0.21	0.21			0.00			5	0
40	STEFANYK	6E	0.54	0.54						5	0
41	SUNFLOWER DRIVE	6E	0.46				0.46			5	0
42	HUNCZAK BLVD.	7E	0.17				0.17			4	E
43	KINDRACHUK	7D	0.28		0.28		0.00			5	E
43A	BOHDAN LEPKY RD.	7E	0.22		0.22		0.00			5	E
44	PITIO	7E	0.21		0.21		0.00			5	E
45	SALAK DEVELOPMENT	8D									
45A	IVAN FRANKO	8D	0.37	0.37		0.00				5	E
45B	BIRCH	8D	0.12			0.12				5	E
45C	OAK	8D	0.26			0.26				5	E
45D	MAGNOLIA DRIVE	8D	0.44			0.44				5	E
45E	WILLOW LANE	8D	0.14	0.14		0.00				5	E
45F	PINE	8D	0.25			0.25				5	E
46	ANNA DRIVE	8E	0.29	0.29		0.00				5	E
47	BARAN DRIVE	8E	0.30	0.30		0.00				5	E
48	ANDREW PAYE	8E	0.16		0.16		0.00			4	E
49	EDGAR LEWIS	7B	0.22				0.22			4	E
50	HOYT	7E	0.26				0.24		0.02	4	E
51	LOCH ADA	6C	0.77				0.77			3	E
52	PARKSIDE DRIVE	5D	0.20	0.20						4	E
53	BROOKSIDE DRIVE	5E	0.12	0.12						4	E
54	HOLLOWATY-KOZAK	3E	0.13	0.13						5	E
55	TOW PATH	9B	0.69				0.69			3	E
56	GEBA DRIVE	7E	0.62	0.62						5	E
57	BROOKWOOD ROAD	6C	1.04				1.04			5	E
58	BASS ROAD	6C	0.14				0.12			2	E
59	OZERAINY ROAD	7C	0.71			0.71				5	E
60	VALLEY VIEW DRIVE	7G	0.19	0.19						3	E
61	WOODLAND DRIVE	7C	0.30	0.30						5	E
62	CEMETERY ROAD	7D	0.20		0.16		0.40			1	E
63	CRANE'S SPRING RD.	8F	0.14	0.14						1	E

TOWN HIG' INVENTORY
AS SHOWN ON THE OF. . - TOWN HIGHWAY MAP
TOWN OF LUMBERLAND
CORRECTED AS TO 11/14/08

64	AUSTRALIA RD.	6F	0.48	0.48						5	
65	OUTBACK RD.	6F	0.14	0.14						5	
	TOTALS		**61.28**	**35.68**	**3.42**	**2.00**	**13.18**		**7.34**		

OFFICIAL HIGHWAY MAP

TOWN OF LUMBERLAND

COUNTY OF SULLIVAN

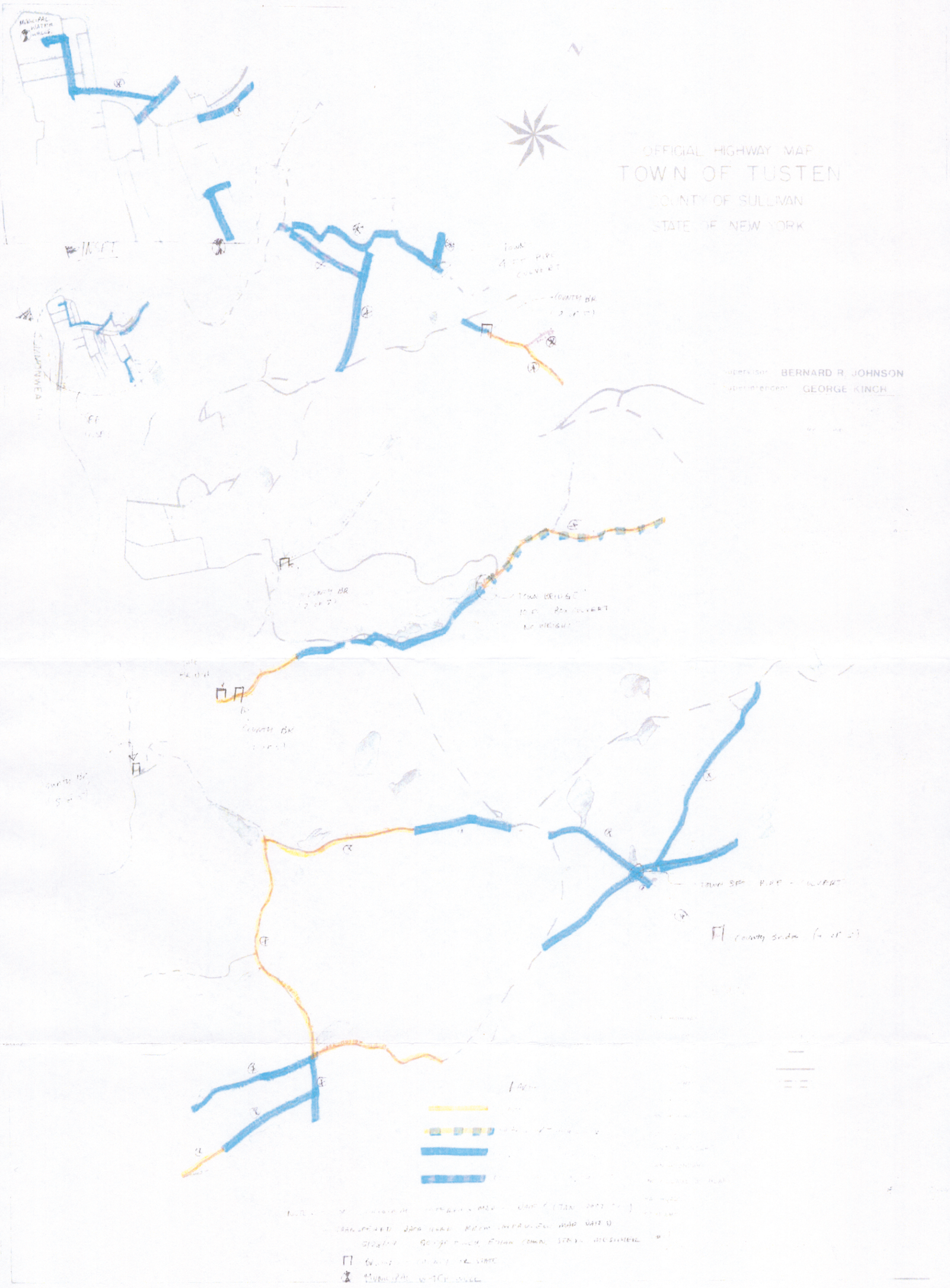
STATE OF NEW YORK

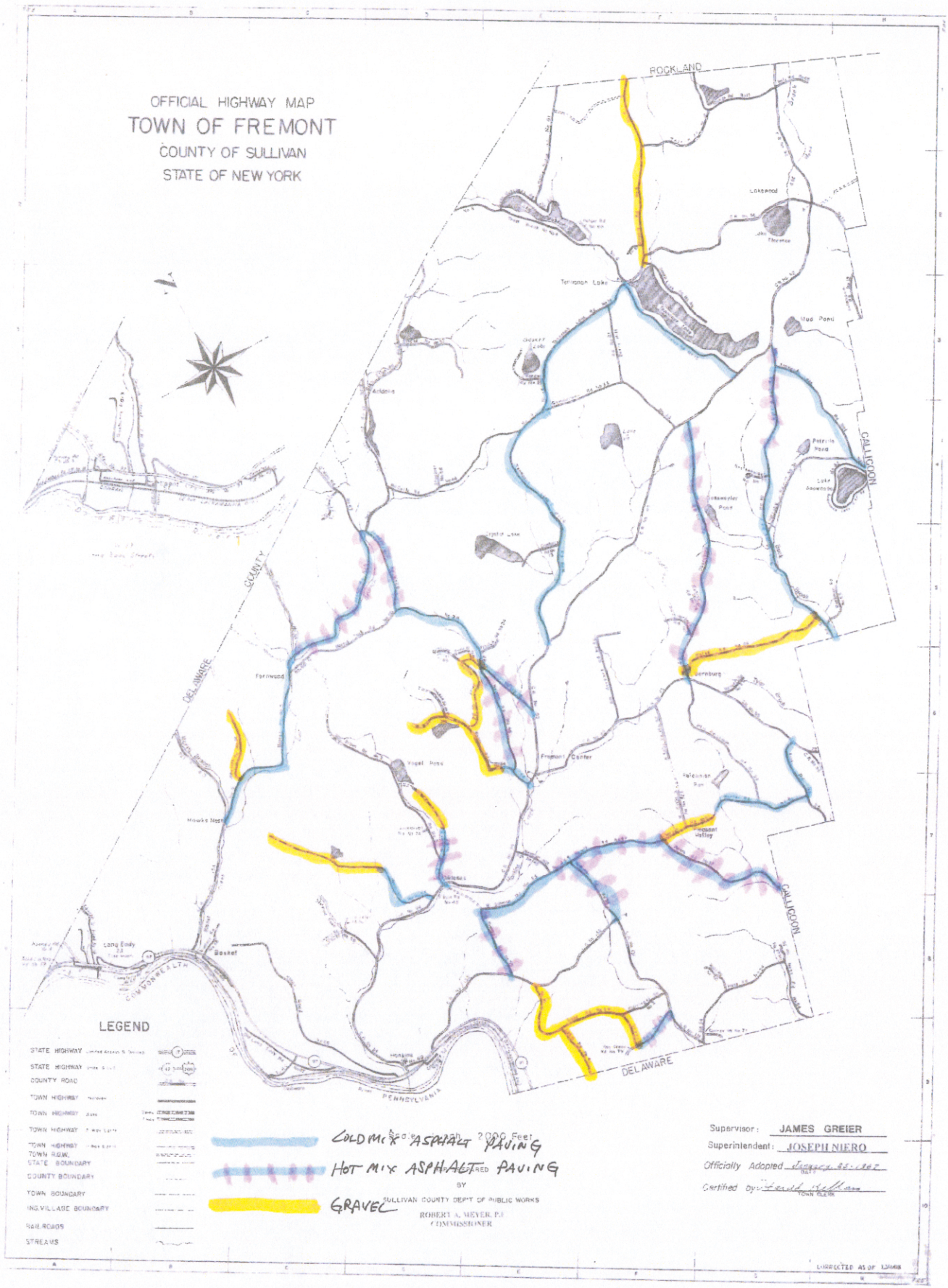
TOWN HIG ✓ INVENTORY
AS SHOWN ON THE OF _ TOWN HIGHWAY MAP
TOWN OF TUSTEN
CORRECTED AS TO 10/28/08

THNO	NAME	MAPLOC	TOTLENGTH	BIT2LANE	BIT1LANE	GRAV2LANE	GRAV1LANE	EARTH2LANE	EARTH1LANE	Importance	Traffic
1	SECOND AVENUE	3A	0.34	0.34						5	E 1
2	THIRD AVENUE	3A	0.23	0.23						5	E 1
3	FOURTH AVENUE	3A	0.30	0.30						5	E 1
5	ERIE AVENUE	3A	0.21	0.21						5	C 3
6	BUDDENHAGEN	3C	0.25			0.25				5	E 1
7	CRAWFORD	6B	0.31	0.31						5	E 1
8	CACKLETOWN	4B	0.35		0.35					5	E 1
9	OLD COCHECTON	3D	0.24		0.24					5	E 1
10	DEXHEIMER	8E	1.10	1.10						5	D 2
11	DELAWARE DRIVE	3A	1.04	0.56		0.48				5	E 1
13	GABLES	3C	1.84	1.73		0.11				5	C 3
14	HANKINS	7A	1.90	0.72			0.35		0.83	5	E 1
15	SMITH HUGHES	0B	0.18				0.18			1	E 1
16	DEEP HOLLOW	9C	2.24				2.24			2	E 1
17	SCHALCK	4E	0.71			0.71				3	E 1
18	DEEP HOLLOW HILL	4B	0.59	0.39	0.20					3	E 1
19	OAK STREET	3A	0.60	0.60						5	D 2
20	IRISHTOWN	9B	1.46	0.38		0.62			0.46	5	E 1
21	LACKAWAXEN	9B	1.30	1.30						5	D 2
22	HALF MOON LAKE	6G	0.23			0.23				3	E 1
23	LUXTON LAKE	5C	0.80	0.38			0.42			3	E 1
24	NOBER-STRUNK	3D	0.33	0.33						3	E 1
25	MILE HILL	5D	0.10	0.06	0.04					1	E 1
26	NEWEIDEN	5D	0.23	0.18					0.05	3	E 1
27	MAHL'S POND	7C	2.65	2.40	0.25					3	D 2
28A	TROUT POND RD. A	7G	0.41	0.41					0.00	3	E 1
28B	TROUT POND RD. B	F6	0.89						0.89	3	E 1
29	BLIND POND	7E	2.16	1.20	0.01	0.00			0.95	5	E 1
30	TEN MILE RIVER "A"	6B	0.71				0.71			1	E 1
31	RYER	6F	2.26	2.26						3	D 2
32	BROOK	6C	1.33	0.54			0.79			1	E 1
33	KIRKS	3B	0.44	0.44						5	A 5
34	HUMPHREY	3B	2.10				2.10			2	E 1
35	ACKERMAN	2C	0.91		0.04		0.87			2	E 1
37	SWAMP POND	5E	3.37	1.42		1.95				2	E 1
39	GRASSY SWAMP	8B	1.67		0.17	0.44	1.06			2	E 1
40	HOFFMAN	3E	1.25	0.00		1.25				2	E 1
41	SCHOOL STREET	3A	0.42	0.42						5	E 1
42	GROVE STREET	3A	0.13	0.13						5	E 1
43	LAKE STREET	3A	0.17	0.17						5	E 1
44	MAIN STREET	3A	0.21	0.21						5	A 5

TOWN H. ··Y INVENTORY
AS SHOWN ON THE C.. .L TOWN HIGHWAY MAP
TOWN OF TUSTEN
CORRECTED AS TO 10/28/08

45	FIFTH STREET	3A	0.32	0.32						5	C 3
46	FOURTH STREET	3A	0.22	0.22						5	d 2
47	THIRD STREET	3A	0.17	0.17						5	d 2
48	TUSTEN	6B	1.10				1.10			5	E 1
49	COCHECTON TURNPIK	8C	4.51	0.65		2.51	1.35			3	E 1
50	HOMESTEAD	5C	0.44				0.44			3	E 1
51	DAUB	3E	0.30				0.30			3	E 1
53	ENGELMANN LAKE	3A	0.08	0.08						5	E 1
54	WELCH STREET	3A	0.03		0.03					5	E 1
55	CAMP UTOPIA	7G	0.32	0.32						3	E 1
57	WEBER	7E	0.18	0.18						3	E 1
58	HICKORY LANE	3A	0.41	0.41						5	E 1
59	SECOND STREET	3A	0.07	0.07			0.07			5	E 1
60	CULLEN	3A	0.11	0.11						5	E 1
61	CATHOLIC CEMETERY	3B	0.06		0.06					1	E 1
62	PARKER	3C	0.51	0.51						5	E 1
63	HILL TOP LANE	3B	0.20			0.20				5	E 1
64	EVERGREEN LANE	5C	2.18	1.33		0.85				5	E 1
65	MAPLE LANE	5C	1.06			1.06				5	E 1
66	FRANCIS DRIVE	9B	0.67			0.67				5	E 1
67	PERRY POND	2C	2.24	1.64		0.60				5	E 1
68	BEAR RUN	2D	0.28			0.28				5	E 1
69	BROOK DRIVE	2D	0.36			0.36				5	E 1
70	FOREST POND	2D	0.39			0.39				5	E 1
71	LAKE RIDGE	5C	1.33	0.39		0.94				5	E 1
72	ARENA COURT	B4	0.26			0.26				3	E 1
73	WOODOAK DRIVE	B4	1.41	1.41		0.00				5	E 1
74	LAUREL LANE	B4	0.11			0.11				2	E 1
75	HEMLOCK LANE	B5	0.38			0.38				5	E 1
76	ASPEN WAY	B4	0.15			0.15				5	E 1
77	DE MAURO LANE	A3	0.43	0.43						5	E 1
78	HINKLEY RD.	B3	0.02	0.02						5	E 1
79	MATHIS WEIDEN DR.	5D	2.34	2.34						5	E 1
	TOTALS		60.60	26.98	1.39	14.80	11.98		3.18		


OFFICIAL HIGHWAY MAP
TOWN OF TUSTEN
COUNTY OF SULLIVAN
STATE OF NEW YORK
Supervisor BERNARD R. JOHNSON
Superintendent GEORGE KINCH
INSET
COUNTY BR
TOWN BRIDGE
NO WEIGHT
TOWN SET PIPE - CULVERT
County Bridge

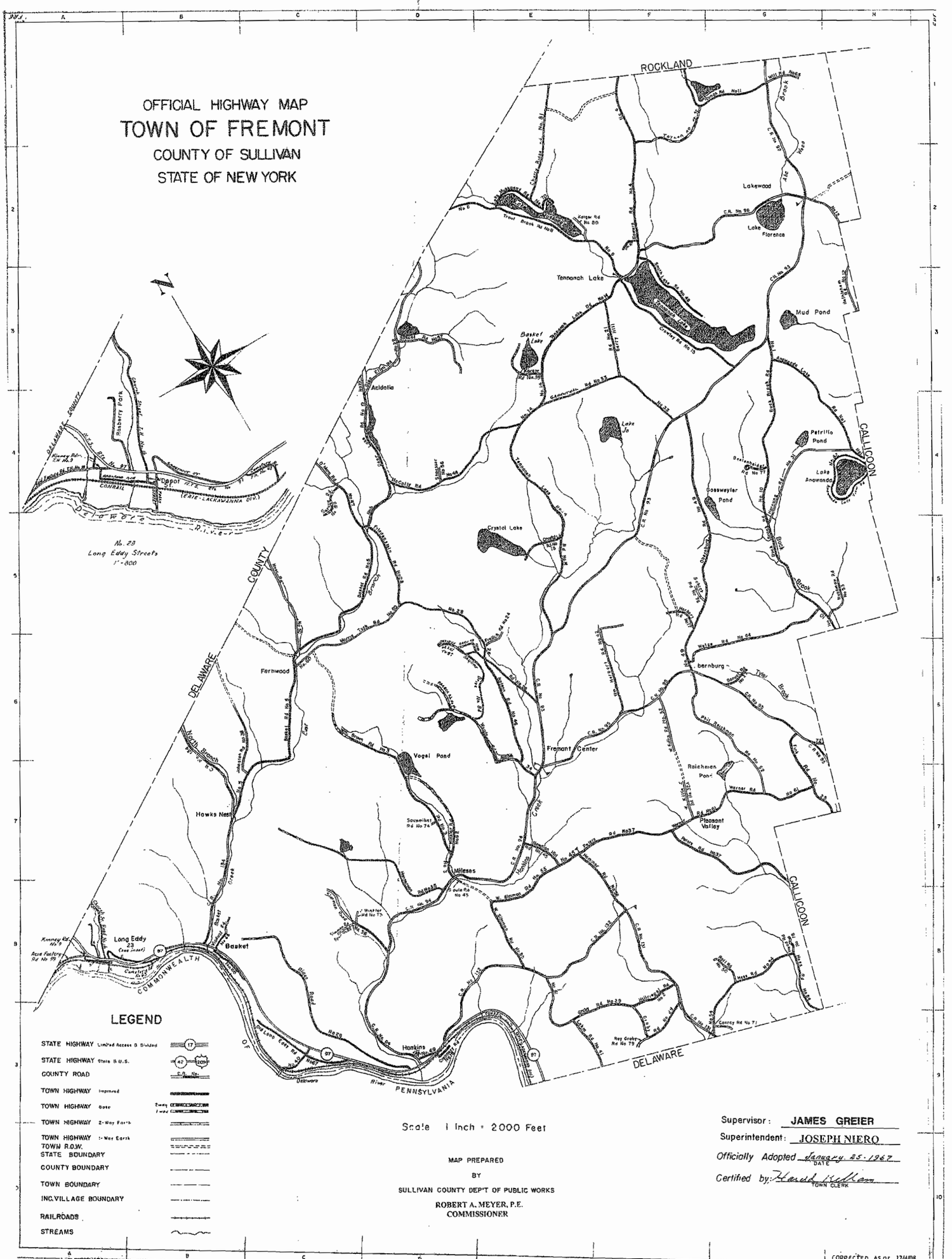

OFFICIAL HIGHWAY MAP
TOWN OF FREMONT
COUNTY OF SULLIVAN
STATE OF NEW YORK
ROCKLAND
CALLICOON
DELAWARE
COUNTY
DELAWARE
PENNSYLVANIA
COMMONWEALTH
Lakewood
Tennanah Lake
Mud Pond
Aldana
Fernwood
Vogel Pond
Fremont Center
Hawks Nest
Long Eddy
Basket
Pleasant Valley
LEGEND
STATE HIGHWAY
STATE HIGHWAY
COUNTY ROAD
TOWN HIGHWAY
TOWN HIGHWAY
TOWN HIGHWAY
TOWN HIGHWAY
TOWN R.O.W.
STATE BOUNDARY
COUNTY BOUNDARY
TOWN BOUNDARY
ING. VILLAGE BOUNDARY
RAILROADS
STREAMS
COLD MIX ASPHALT PAVING
HOT MIX ASPHALT PAVING
GRAVEL
Scale 1 inch = 2000 Feet
PREPARED
BY
SULLIVAN COUNTY DEPT OF PUBLIC WORKS
ROBERT A. MEYER, P.E.
COMMISSIONER
Supervisor: JAMES GREIER
Superintendent: JOSEPH NIERO
Officially Adopted January 25, 1962
DATE
Certified by: Harold Kellam
TOWN CLERK
CORRECTED AS OF 1/24/68

TOWN HIGHWAY INVENTORY
AS SHOWN ON THE OFFICIAL TOWN HIGHWAY MAP
TOWN OF FREMONT
CORRECTED AS TO 12/04/08

THNO	NAME	MAPLOC	TOTLENGTH	BIT2LANE	BIT1LANE	GRAV2LANE	GRAV1LANE	EARTH2LANE	EARTH1LANE
1	ANAWANDA LAKE	3G	1.60	1.60					
2	HILLRIEGEL	8F	0.52	0.52					
3	WILLIAM BROWN	6C	2.04	0.64		1.18	0.22		
4	BOWERS	2F	1.67	1.67					
5	BASKET	5C	4.19	4.19					
8	TROUT BROOK	2E	1.93	1.93					
9	KINNEY	8A	0.12	0.12					
10	BUCK BROOK	4G	2.90	2.90					
11	YOUNGS	1F	1.11	1.11					0.00
12	BETHLEHEM	3H	0.98						0.98
13	CRYSTAL LAKE	5E	0.46				0.46		
14	TENNANAH LAKE	4E	4.18	4.18					
15	CROWLEY	3F	1.46	0.75	0.71				
16	CHURCH STREET	8A	0.51	0.36	0.00	0.15			
17	HERBERT	5F	0.33				0.33		
18	CREAMERY	9D	0.18		0.18				
19	DEER LAKE	4D	1.15	1.01		0.14			
21	BERRY HILL	3F	0.71	0.48		0.23			
22	GLEN ELLYN	3D	1.50					1.17	0.33
23	LONG EDDY STREETS	8A							
23A	RASBERRY PARK	8A	0.36	0.36					
23B	DEPOT STREET	8A	0.14	0.14					
23C	CHESTNUT STREET	8A	0.40	0.40					
23D	RAILROAD AVE.	8A	0.23		0.23				
23E	FERRY STREET	8A	0.10		0.07	0.00	0.03		
24	FRELICH	6E	0.27	0.00					0.27
25	FINK	6G	0.98	0.98					
26	RIDGE	8C	2.55	1.81		0.74			
27	BANUAT	6G	0.20	0.20					
28	FRIEDENSTEIN	5D	2.72	2.72					
29	GRABY	9F	1.52		0.45		1.07		
30	NEER	5C	1.04						1.04
31	HORNUNG	4G	1.28						1.28
32	W. KILLIE	7F	0.54						0.54
32A	W. KILLIE "A"	7F	0.38						0.38
33	GREENTHAL	4E	1.51	1.10		0.41			0.00
34	WOODS	6D	1.52	0.67		0.82		0.03	
35	HENDERSON	7C	1.75	0.79			0.96		
36	HAMMER	7E	0.73	0.73					
37	PETERS	7F	2.47	2.47					
38	JOHNSTON	6B	0.73						0.73
3E	KAROW	3E	0.50				0.50		
40	KELLAMS BRIDGE	9C	0.39	0.39					
41	LAHM	9E	1.30				1.30		
42	WM. HERBERT	6F	1.14	0.40		0.12			0.62
43	SIPPLE	8D	0.08						0.08
44	McCOLLY	4D	1.53	1.53					
45	NEWMAN HILL	7E	0.64	0.64					
46	NELSON	6E	1.10	1.10					
47	O'MARA	4C	0.77		0.53				0.24
48	SMITH LAKE	3F	0.95	0.95					
49	OBERNBURG	5F	2.56	2.56					
50	ROLL	8G	0.31				0.31		
52	PHIL REICHMAN	6F	1.58		0.10		0.12		1.36
53	RUEBMAN	5H	0.49						0.49
54	HESS	8G	2.01	2.01					
55	W. SIMMON	8E	1.62	1.62					
56	STAESSER	4D	0.10						0.10
57	SPECHT	3D	0.90					0.45	0.45
58	SIMMON	8D	0.93		0.48				0.45
59	ACID FACTORY	8A	0.22						0.22
60	MORRIS TURK	6C	1.27					1.17	0.10
61	WARNER	7F	1.62	1.12			0.50		
62	WINKLER	7D	0.76	0.27	0.49				

TOWN HIGHWAY INVENTORY
AS SHOWN ON THE OFFICIAL TOWN HIGHWAY MAP
TOWN OF FREMONT
CORRECTED AS TO 12/04/08

63	CEMETERY	8B	0.20	0.20					
64	WEISS	5F	1.53		0.14	1.39			
65	WILL	1G	0.30						0.30
67	OLD LONG EDDY	9C	1.26		1.26				
68	VIADUCT	8B	0.69		0.50		0.19		
69	HANKINS	9D	0.17	0.17					
70	LAKE MUSKODAY	2E	0.84	0.84					
71	CONROY	9G	0.19				0.19		
72	OLD C.R. NO. 95	6G	0.14	0.14					
73	JOE WINKLER	8C	0.12						0.12
74	SAUSMIKAT	7D	0.04						0.04
76	SCHICK	5F	0.17						0.17
77	BESTENHEIDER	4G	0.22				0.22		
78	HEAD	8G	0.17				0.17		
79	RAY GRABY	9F	0.17						0.17
80	KUTGER	2E	0.43						0.43
81	CHERRY RIDGE	2E	1.00						1.00
82	ANAWANDA LAKE VIEW	4H	1.00	1.00					
83	GARCIA	4C	0.36				0.36		
84	SKYLINE DRIVE	6D	1.04			1.04			
85	SIMMON SPUR	8D	0.18						0.18
86	FARBER	6E	0.24			0.24			
87	SKYLINE DRIVE EXT.	6D	0.33			0.33			
88	ODEN	6D	0.24			0.24			
89	MAKELA	9D	0.05			0.05			
90	TAYLOR	2F	0.79			0.79			
91	LAKESIDE WOODS	2F	0.21	0.21					
	Totals		**83.81**	**48.98**	**5.14**	**7.87**	**6.93**	**2.82**	**12.07**


OFFICIAL HIGHWAY MAP
TOWN OF FREMONT
COUNTY OF SULLIVAN
STATE OF NEW YORK
ROCKLAND
CALLICOON
DELAWARE
COUNTY
DELAWARE
COMMONWEALTH OF PENNSYLVANIA
Lakewood
Lake Florence
Tennanah Lake
Mud Pond
Basket Lake
Acidalia
Lake Jo
Petrillo Pond
Lake Anawanda
Gossweyler Pond
Crystal Lake
Fernwood
Vogel Pond
Fremont Center
Reichman Pond
Pleasant Valley
Hawks Nest
Milesas
Long Eddy
Basket
Hankins
Rosberry Park
Depot
No. 23
Long Eddy Streets
1" = 800
LEGEND
STATE HIGHWAY Limited Access & Divided
STATE HIGHWAY State & U.S.
COUNTY ROAD
TOWN HIGHWAY Improved
TOWN HIGHWAY Gate
TOWN HIGHWAY 2-Way Earth
TOWN HIGHWAY 1-Way Earth
TOWN R.O.W.
STATE BOUNDARY
COUNTY BOUNDARY
TOWN BOUNDARY
INC. VILLAGE BOUNDARY
RAILROADS
STREAMS
Scale 1 Inch = 2000 Feet
MAP PREPARED
BY
SULLIVAN COUNTY DEP'T OF PUBLIC WORKS
ROBERT A. MEYER, P.E.
COMMISSIONER
Supervisor: JAMES GREIER
Superintendent: JOSEPH NIERO
Officially Adopted January 25 1967
DATE
Certified by: Harold Kellam
TOWN CLERK
CORRECTED AS OF 12/4/08

Appendix D

RSMS Deduct Point Standards

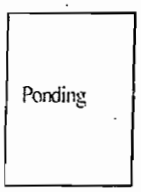
(Applied during RSMS Field Rating of Sample Roads)

RSMS 2003 Unpaved Condition Survey

Street:		Distance	
Section #:		Start :	
Start:		End :	
End:		Length:	
Name:			
Date:			
Weather:			
Temp (F°/C°):			

IMPROPER X-SECTION

Excellent 0



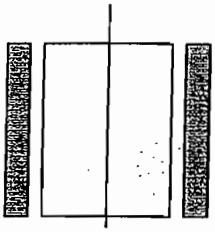
CONDITION

SEVERITY

1	Good	5
4	Fair	15
7	Poor	20

ROADSIDE DRAINAGE

Excellent 0



CONDITION

SEVERITY

1	Good	5
4	Fair	15
7	Poor	20

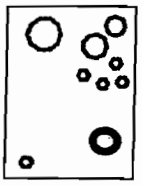
CORRUGATIONS

EXTENT

SEVERITY

	NO Defects	Low	Med	High
Low	1	2	3	10
Med	4	5	6	12
High	7	8	9	14

POTHOLES

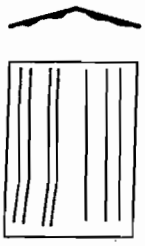


EXTENT

SEVERITY

	NO Defects	Low	Med	High
Low	1	2	3	10
Med	4	5	6	15
High	7	8	9	18

RUTTING



EXTENT

SEVERITY

	NO Defects	Low	Med	High
Low	1	2	3	25
Med	4	5	6	45
High	7	8	9	50

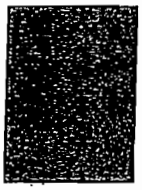
LOOSE AGGREGATE

EXTENT

SEVERITY

	NO Defects	Low	Med	High
Low	1	2	3	10
Med	4	8	6	15
High	7	8	9	20

DUST



CONDITION

SEVERITY

1	Good	0
4	Fair	5
7	Poor	8

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY

1	Good	9
4	Fair	15
7	Poor	30

RSMS 2003 Flexible Pavement Condition Survey

Street: _____	Distance: _____	Name: _____
Section #: _____	Start : _____	Date: _____
Start: _____	End : _____	Weather: _____
End: _____	Length: _____	Temp (F°/C°): _____

LONGITUDINAL/ TRANSVERSE CRACKING

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

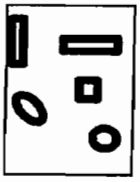
ALLIGATOR CRACKING

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

EDGE CRACKING

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

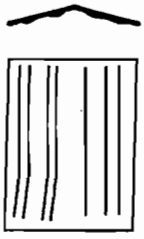
PATCHING / POTHOLES



NO Defects	EXTENT
	1 Low
	2 Medium
	3 High

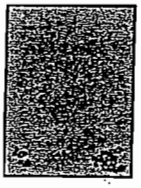
Do not include good patches

RUTTING



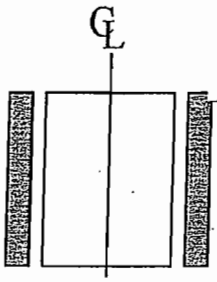
SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

BLEEDING



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

16

Appendix E

RSMS Field Rating Worksheets

(For 20 Miles of Sample Roads Rated in Each Town)

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Road Rating Field Data Sheets

Town of Callicoon

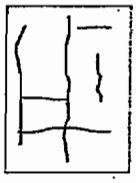
Calicoon

100

W = 18' SH = 2'-3' crushed stone

RSMS:	Flexible Pavement Condition Survey	
Street: Bethlehem Rd	Distance:	Name: PFM
Section#: 7-1	Start: 0.0	Date: 6/13
Start: Cr 123	End: 1.2	Weather: sunny
End: 1.2 mi. pt.	Length: 1.2	Temp(F°/C°):

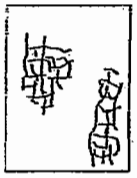
LONGITUDINAL/ TRANSVERSE CRACKING



~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING



~~NO Defects~~

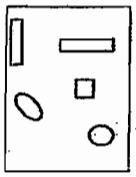
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

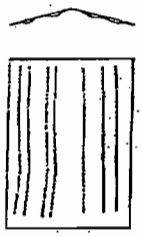


~~NO Defects~~

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

RUTTING



~~NO Defects~~

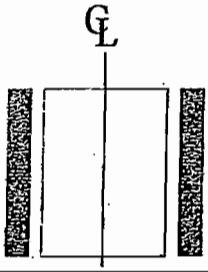
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

none

SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE



SEVERITY	CONDITION	
1	~~Good~~	
4	Fair	
7	Poor	

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	~~Good~~	
4	Fair	
7	Poor	

new HM

Calicoon (93)

W=18' SH= 0'-3' Sandy Gravel

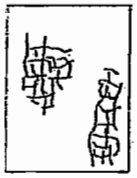
RSMS:	Flexible Pavement Condition Survey	
Street: Bethlehem Rd	Distance:	Name: PFM
Section#: 7-2	Start: 1.2	Date: 6/13
Start: 1.2 mi pt.	End: 2.7	Weather: Sunny
End: End of pavement	Length: 1.5	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING — 0

NO Defects

SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — 0



NO Defects

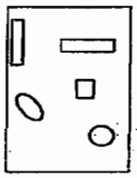
SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING — 0

NO Defects

SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES — 0



NO Defects

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

RUTTING — 0

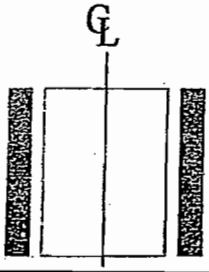
NO Defects

SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING — Non-0

SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE — 0



SEVERITY	CONDITION	
1	Good	X
4	Fair	
7	Poor	

ROUGHNESS — 7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	Good	
4	Fair	X
7	Poor	

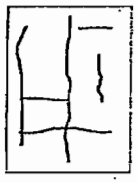
#1A CS over Hm or Cm

calicoon (90)

W=18' SH=0'-3' Sandy Gravel

RSMS:	Flexible Pavement Condition Survey	
Street: Buck Brook Rd	Distance:	Name: PFM
Section#: 6-1	Start: 0.0	Date: 6/13
Start: Bayer Rd	End: 1.4	Weather: Sunny
End: town line	Length: 1.4	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING -6



NO Defects

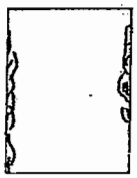
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	X 4	5	6
High	7	8	9

ALLIGATOR CRACKING -2

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	X 1	2	3
Med	4	5	6
High	7	8	9

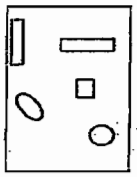
EDGE CRACKING -2



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	X 1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES 0



NO Defects

EXTENT	
1	Low
2	Medium
3	High

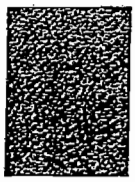
Do not include good patches

RUTTING 0

NO Defects

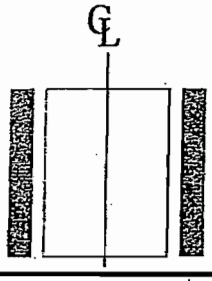
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING 0 None



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE 0



SEVERITY	CONDITION	
X 1	Good	
4	Fair	
7	Poor	

ROUGHNESS 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
X 1	Good	
4	Fair	
7	Poor	

HM Road

Do nothing

callicoon

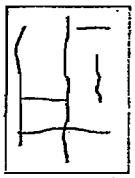
75

W=17' SH = 0'-2' Sandy Gravel

RSMS	Flexible Pavement Condition Survey	
Street: earl Myers Rd	Distance:	Name: PFM
Section#: 40-1	Start: 0.0	Date: 6/13
Start: Cr 127	End: 0.8	Weather: sunny
End: Faubel Rd	Length: 0.8	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

0



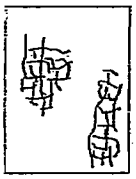
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-9



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	~~6~~
High	7	8	9

EDGE CRACKING

-6

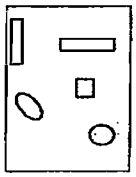
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	~~3~~
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

-5



NO Defects

EXTENT

Do not include good patches

1	Low
~~2~~	~~Medium~~
3	High

RUTTING

0

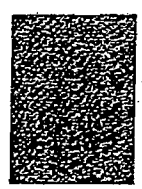
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

None 0

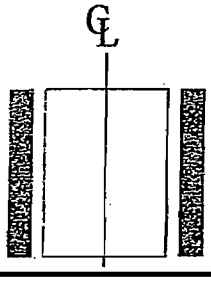


CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE

-5



CONDITION

SEVERITY	
1	Good
~~4~~	~~Fair~~
7	Poor

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
~~1~~	~~Good~~
4	Fair
7	Poor

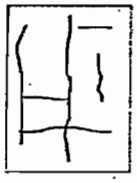
cm road ravelly open cm surface
recycle or thick overlay

Callicoon (69)

W=17' SH= 0'-4' Sandy Gravel

RSMS	Flexible Pavement Condition Survey	
Street: Esselman Rd	Distance:	Name: PFM
Section#: 44-1	Start: 0.0	Date: 6/13
Start: Faubel Rd	End: 1.3	Weather: Sunny
End: CR 128	Length: 1.3	Temp(F°/C°):

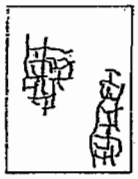
LONGITUDINAL/ TRANSVERSE CRACKING — 0



NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -9



NO Defects ☐

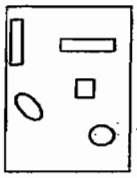
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6 ☒
High	7	8	9

EDGE CRACKING — -6

NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2	3 ☒
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES — -5



NO Defects ☐

Do not include good patches

EXTENT	
1	Low
2 ☒	Medium
3	High

RUTTING — 0

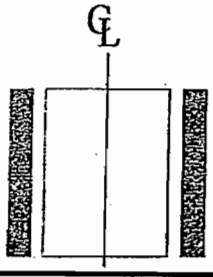
NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING — None 0

SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE — -5



SEVERITY	CONDITION	
1	Good	
4 ☒	Fair	
7	Poor	

ROUGHNESS — -7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	Good	
4 ☒	Fair	
7	Poor	

Ravelly open cm

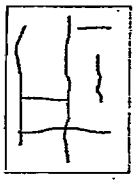
Recycle

callicoon (59)

W=19' SH=2'-3' Sandy Gravel

RSMS	Flexible Pavement Condition Survey	
Street: Huber Rd	Distance:	Name: PFM
Section#: 10-1	Start: 0.0	Date: 6/13
Start: Cr 149	End: 2.4	Weather: Cloudy
End: town line	Length: 2.4	Temp(F°/C°):

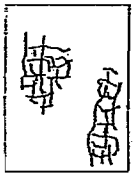
LONGITUDINAL/ TRANSVERSE CRACKING — 0



~~NO Defects~~

SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -9



NO Defects

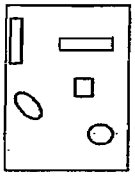
SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	~~6~~
High	7	8	9

EDGE CRACKING — -6

NO Defects

SEVERITY	EXTENT: Low	Med	High
Low	1	2	~~3~~
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES — -9



NO Defects

Do not include good patches

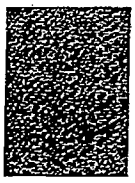
EXTENT	
1	Low
2	Medium
3 ~~X~~	High

RUTTING — -6

NO Defects

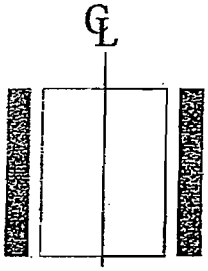
SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

BLEEDING — None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE — -0



SEVERITY	CONDITION
1 ~~X~~	Good
4 ~~X~~	Fair
7	Poor

ROUGHNESS — -11

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7 ~~X~~	Poor

recycle/Rebuild

Callicoon

(42)

RSMS 2003 W=15' SH=0'-2' Sandy Gravel

Unpaved Condition Survey

Street: J. Young Rd Distance

Section #: 61-1 Start: 0.0

Start: Stump Pond Rd End: 2.6

End: Weissman Rd Length: 2.6

Name: PFM

Date: 6/13

Weather: Cloudy

Temp (F°/C°):

IMPROPER X-SECTION

-20

CONDITION

SEVERITY

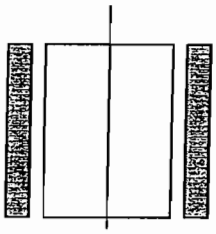
1 Good

4 Fair

7 X Poor

ROADSIDE DRAINAGE

-15



CONDITION

SEVERITY

1 Good

4 X Fair

7 Poor

CORRUGATIONS

0

NO Defects

EXTENT

Low Med High

SEVERITY

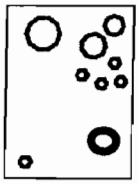
Low 1 2 3

Med 4 5 6

High 7 8 9

POTHOLES

-6



NO Defects

EXTENT

Low Med High

SEVERITY

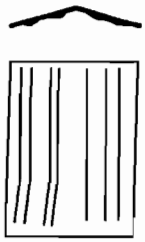
Low 1 2 3

Med X 5 6

High 7 8 9

RUTTING

0



NO Defects

EXTENT

Low Med High

SEVERITY

Low 1 2 3

Med 4 5 6

High 7 8 9

LOOSE AGGREGATE

-2

NO Defects

EXTENT

Low Med High

SEVERITY

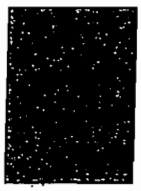
Low X 2 3

Med 4 5 6

High 7 8 9

DUST

0



CONDITION

SEVERITY

1 X Good

4 Fair

7 Poor

ROUGHNESS

-15

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY

1 Good

4 X Fair

7 Poor

needs crown and gravel

callicoon

85

SH = 0'-2' Gravel

RSMS 2003 W=15' Unpaved Condition Survey

Street:	Kratz	Distance		Name:	PFM
Section #:	35-1	Start:	0.0	Date:	6/13
Start:	Poley Rd	End:	0.9	Weather:	Sunny
End:	Delaware line	Length:	0.9	Temp (F°/C°):	

IMPROPER X-SECTION

-5

Ponding

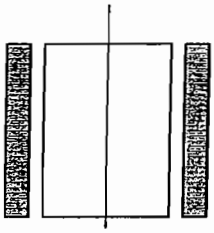
CONDITION

SEVERITY

1 X	Good
4	Fair
7	Poor

ROADSIDE DRAINAGE

-5



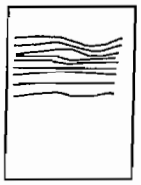
CONDITION

SEVERITY

1 X	Good
4	Fair
7	Poor

CORRUGATIONS

0



NO Defects

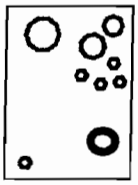
EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

0



NO Defects

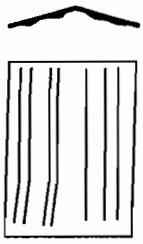
EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

RUTTING

0



NO Defects

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

-5

NO Defects

EXTENT

SEVERITY

	Low	Med	High
Low	1	X 2	3
Med	4	5	6
High	7	8	9

DUST

0

CONDITION

SEVERITY

1 X	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY

1 X	Good
4	Fair
7	Poor

Do nothing

Calli coon (79)

W=18' SH=0'-3' Sandy Gravel

RSMS	Flexible Pavement Condition Survey	
Street: Pulley Rd	Distance:	Name: PFM
Section#: 46-1	Start: 0.0	Date: 6/13
Start: Schafer	End: 1.2	Weather: sunny
End:	Length: 1.2	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING — 0

NO Defects [X]

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -6

NO Defects [ ]

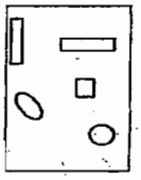
SEVERITY	EXTENT Low	Med	High
Low	1	2	3 [X]
Med	4	5	6
High	7	8	9

EDGE CRACKING — -6

NO Defects [ ]

SEVERITY	EXTENT Low	Med	High
Low	1	2	3 [X]
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES — -3



NO Defects [ ]

Do not include good patches

EXTENT	
1 [X]	Low
2	Medium
3	High

RUTTING — -2

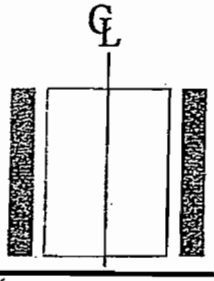
NO Defects [ ]

SEVERITY	EXTENT Low	Med	High
Low	1 [X]	2	3
Med	4	5	6
High	7	8	9

BLEEDING — 0 None

SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE — -5



SEVERITY	CONDITION	
1	Good	
4 [X]	Fair	
7	Poor	

ROUGHNESS — 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1 [X]	Good	
4	Fair	
7	Poor	

#1 ACS over CM Maybe HM patch and surface treat

Callicoon

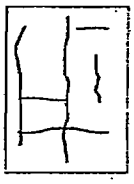
39

W=17' SH=0'-3' Sandy Gravel

RSMS: Schaefer Rd	Flexible Pavement Condition Survey	
Street: ~~Schaefer Rd~~	Distance:	Name: PF-M
Section#: 42-1	Start: 0.00	Date: 6/13
Start: CR 128	End: 0.6	Weather: Sunny
End: Doley Rd	Length: 0.6	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

0

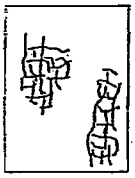


~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-15



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	X

EDGE CRACKING

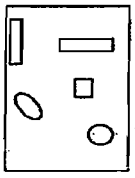
-6

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	X
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES

-9



NO Defects

Do not include good patches

EXTENT	
1	Low
2	Medium
X	High

RUTTING

-7

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	X	6
High	7	8	9

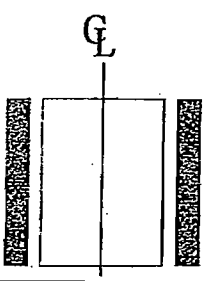
BLEEDING

-5

SEVERITY	CONDITION	
1	Good	
X	Fair	
7	Poor	

DRAINAGE

-9



SEVERITY	CONDITION	
1	Good	
4	Fair	
X	Poor	

ROUGHNESS

-11

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	Good	
4	Fair	
7	X Poor	

looks like HM
complete rebuild

callicoon

56

W=18'

SH=2'-3' Sandy Gravel

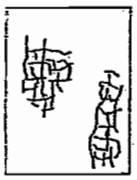
RSMS	Flexible Pavement Condition Survey	
Street: ~~Kra~~ Stewart Rd	Distance:	Name: PFM
Section#: 48-1	Start: 0.0	Date: 6/13
Start: Cr 121	End: 1.0	Weather: Sunny
End: Town line	Length: 1.0	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING 0

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

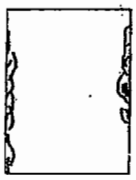
ALLIGATOR CRACKING -9



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	~~6~~
High	7	8	9

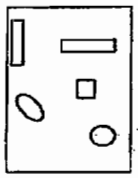
EDGE CRACKING -6



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	~~3~~
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES -9



NO Defects

Do not include good patches

EXTENT

1	Low
2	Medium
~~3~~	High

RUTTING 0

~~NO Defects~~

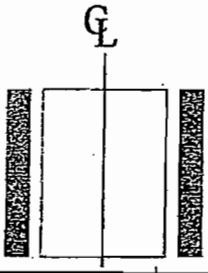
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING None 0

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE -9



CONDITION

SEVERITY	
1	Good
4	Fair
7	~~Poor~~

ROUGHNESS -11

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
~~7~~	Poor

ravelly open cm (If Hm as per map Key then it is a course type III binder)

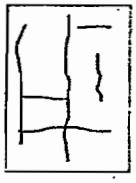
Callicoon

54

W=19' SH=3'-4' Sandy Gravel

RSMS	Flexible Pavement Condition Survey	
Street: Stump pond Rd	Distance:	Name: PFM
Section#: 50-1	Start: 0.0	Date: 6/13
Start: CR 149	End: 3.7	Weather: Sunny
End: CR 149	Length: 3.7	Temp(F°/C°):

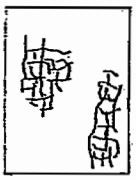
LONGITUDINAL/ TRANSVERSE CRACKING — 0



~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -15



NO Defects

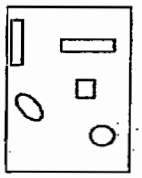
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	~~6~~
High	7	8	~~9~~

EDGE CRACKING — -6

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	~~3~~
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES — -9

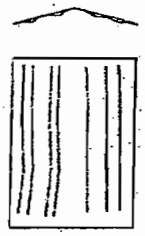


NO Defects

Do not include good patches

EXTENT	
1	Low
2	Medium
3 ~~X~~	High

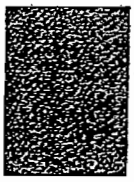
RUTTING — 0



~~NO Defects~~

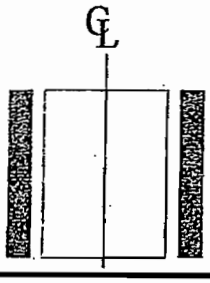
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING — 0 none



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE — -5



SEVERITY	CONDITION	
1	Good	
4 ~~X~~	~~Fair~~	
7	Poor	

ROUGHNESS — -11

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	Good	
4	Fair	
7 ~~X~~	~~Poor~~	

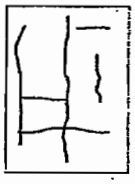
Recycle/Rebuild

Callicoon (46)

W=18' SH= 0'-3' Gravel

RSMS	Flexible Pavement Condition Survey	
Street: Longes Rd	Distance:	Name: PFM
Section#: 42A-1	Start: 0.0	Date: 6/13
Start: Schaefer	End: 0.5	Weather: sunny
End: Delaware line	Length: 0.5	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING — 0



NO Defects: ~~X~~

SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -15

NO Defects:

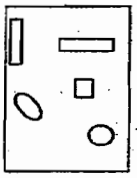
SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	~~9~~

EDGE CRACKING — -6

NO Defects:

SEVERITY	EXTENT: Low	Med	High
Low	1	2	~~3~~
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES — -9



NO Defects:

Do not include good patches

EXTENT	
1	Low
2	Medium
3	~~High~~

RUTTING — -4

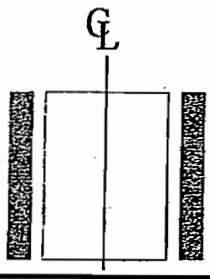
NO Defects:

SEVERITY	EXTENT: Low	Med	High
Low	1	~~2~~	3
Med	4	5	6
High	7	8	9

BLEEDING — 0 None

SEVERITY	CONDITION
~~1~~	~~Good~~
4	Fair
7	Poor

DRAINAGE — -9



SEVERITY	CONDITION
1	Good
4	Fair
7	~~Poor~~

ROUGHNESS — -11

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	~~Poor~~

Rebuild

looks like old HM

calicoon

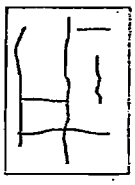
83

W=19' SH=2'-3' Sandy Gravel

RSMS	Flexible Pavement Condition Survey	
Street: Weissman	Distance:	Name: PFM
Section#: 27-1	Start: 0.0	Date: 6/13
Start: Cr 123	End: 0.7	Weather: Sunny
End: 0.7 Mi. pt.	Length: 0.7	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

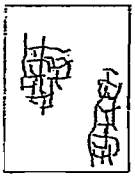
-10



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High	X	8	8	9

ALLIGATOR CRACKING

-5



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med	X	4	5	6
High		7	8	9

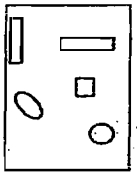
EDGE CRACKING

-2

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low	X	1	2	3
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES

0



~~NO Defects~~

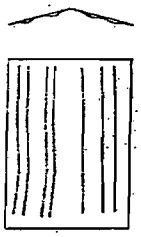
EXTENT

Do not include good patches

1	Low
2	Medium
3	High

RUTTING

0



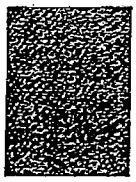
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

0 none

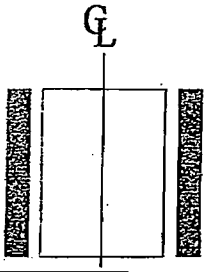


CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE

-0



CONDITION

SEVERITY	
X 1	Good
4	Fair
7	Poor

ROUGHNESS

-0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
X 1	Good
4	Fair
7	Poor

#1A CS over HM patch and crack fill

calicoon

59

W=19'

SH=2'-3' Sandy Gravel

RSMS	Flexible Pavement Condition Survey	
Street: Weissman	Distance:	Name: RFM
Section#: 27-2	Start: 0.7	Date: 6/13
Start: 0.7 Mi. ph.	End: 1.9	Weather: sunny
End: Stump Pond Rd	Length: 1.2	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING — 0

NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -15

NO Defects ☐

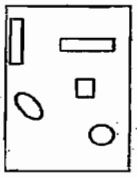
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9 ☒

EDGE CRACKING — -6

NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2	3 ☒
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES — 0



NO Defects ☒

EXTENT	
1	Low
2	Medium
3	High

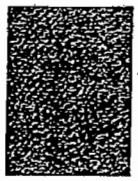
Do not include good patches

RUTTING — -4

NO Defects ☐

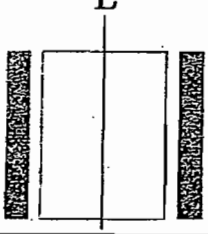
SEVERITY	EXTENT Low	Med	High
Low	1 ☒	2	3
Med	4	5	6
High	7	8	9

BLEEDING — None 0



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE — -5



SEVERITY	CONDITION	
1	Good	
4	Fair	☒
7	Poor	

ROUGHNESS — -11

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	☒

#1 CS over CM

recycle/rebuild

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Road Rating Field Data Sheets

Town of Cochecton

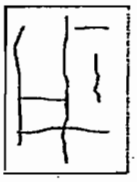
Cochecton

54

Sh=1-3 gross W=18'

RSMS:	Flexible Pavement Condition Survey	
Street: Bemus Rd	Distance:	Name: PFM
Section#: 22-1	Start: 0.0	Date: 6/13
Start: Short Cut Rd	End: 2.8	Weather: sunny
End: 17b	Length: 2.8	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		~~X~~	8	9

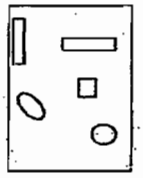
ALLIGATOR CRACKING

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	8	~~9~~

EDGE CRACKING

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	~~2~~	3
Med		4	5	6
High		7	8	9

PATCHING / POTHOLES



NO Defects	EXTENT
	1 ~~Low~~
	2 Medium
	3 High

Do not include good patches

RUTTING

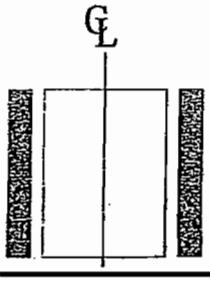
SEVERITY	NO Defects	EXTENT Low	Med	High
Low		~~1~~	2	3
Med		4	5	6
High		7	8	9

BLEEDING

None

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



SEVERITY	CONDITION
1	Good
4	~~Fair~~
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	~~Fair~~
7	Poor

Collection

68

RSMS 2003 sh: 0-2 Ft gravel W: 12' Unpaved Condition Survey

Street: Brook Rd	Distance	Name: PFM	
Section #: 1-2	Start: 0.0	Date: 6/14	
Start: Mitchell Pond	w. End: 0.4	Weather: Cloudy	
End: 0.4 mi. Dr.	Length: 0.4	Temp (F°/C°):	

IMPROPER X-SECTION

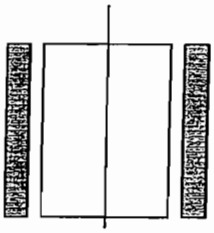
-15

CONDITION

SEVERITY	
1	Good
4 X	Fair
7	Poor

ROADSIDE DRAINAGE

-15

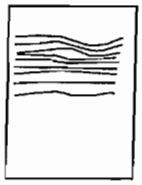


CONDITION

SEVERITY	
1	Good
4 X	Fair
7	Poor

CORRUGATIONS

0



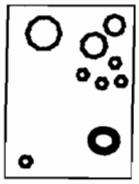
NO Defects X

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

0



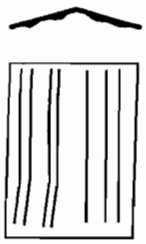
NO Defects X

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

RUTTING

0



NO Defects X

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

-2

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

DUST

0

CONDITION

SEVERITY	
1 X	Good
4	Fair
7	Poor

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1 X	Good
4	Fair
7	Poor

Blue stone crusher run gravel surface

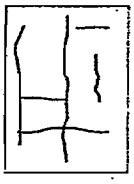
Cochecton 93

sh: 0-1 Ft earth W=12'

RSMS:	Flexible Pavement Condition Survey	
Street: Brook Rd	Distance:	Name: PFM
Section#: 1-2	Start: 0.4	Date: 6/14
Start: 0.4 mi. ph.	End: 0.55	Weather: Cloudy
End: Johns Rd	Length: 0.15	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

0

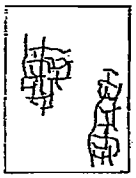


~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-5

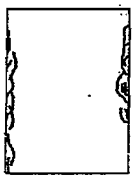


NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

EDGE CRACKING

-2

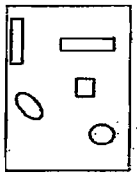


NO Defects

SEVERITY	EXTENT Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES

0



~~NO Defects~~

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

RUTTING

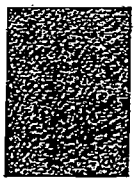
0

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

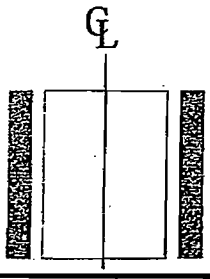
0 none



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE

-Ø



SEVERITY	CONDITION	
~~1~~	Good	
4	Fair	
7	Poor	

ROUGHNESS

-Ø

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
~~1~~	Good	
4	Fair	
7	Poor	

Fairly new HM patch a couple spots

Cochecton (68)

RSMS 2003 Sh = 1-3 Ft gravel W = 12'

Unpaved Condition Survey

Street:	Brook Rd	Distance		Name:	PFM
Section #:	1-3	Start :	0.55	Date:	6/14
Start:	0.55 Mi. pt	End :	1.55	Weather:	Cloudy
End:		Length:	1.0	Temp (F°/C°):	

IMPROPER X-SECTION

-15

Ponding

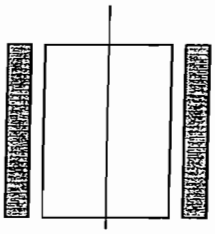
CONDITION

SEVERITY

1	Good
~~4~~	Fair
7	Poor

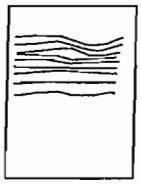
ROADSIDE DRAINAGE

-15



CONDITION

SEVERITY



1	Good
~~4~~	Fair
7	Poor

CORRUGATIONS

0

~~NO Defects~~

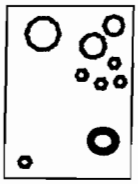
EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

0



~~NO Defects~~

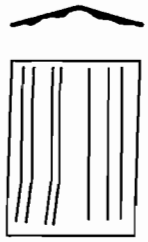
EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

RUTTING

0



~~NO Defects~~

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

-2

NO Defects

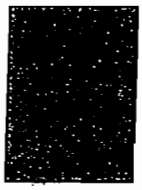
EXTENT

SEVERITY

	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

DUST

0



CONDITION

SEVERITY

~~1~~	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY

1	~~Good~~
4	Fair
7	Poor

Crusher run blue stone surface

Colchester

(64)

Sh = 0-1 Ft Sandy gravel W = 18'

RSMS	Flexible Pavement Condition Survey	
Street: Brook Rd	Distance:	Name: RFM
Section#: 1-4	Start: 1.55	Date: 6/14
Start: Mi. pt. 1.55	End: 1.95	Weather: Cloudy
End: CR 116	Length: 0.4	Temp(F°/C°):

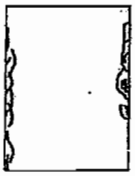
LONGITUDINAL/ TRANSVERSE CRACKING -10

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		X	8	9

ALLIGATOR CRACKING -9

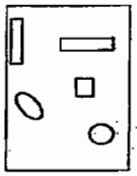
SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	8	9

EDGE CRACKING -2



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES -3



NO Defects

EXTENT

1 X Low
2 Medium
3 High

Do not include good patches

RUTTING 0

NO Defects

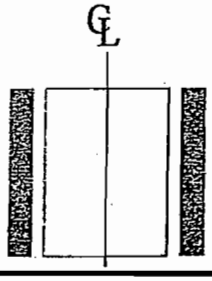
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING 0 none

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE -5



CONDITION

SEVERITY	
1	Good
4 X	Fair
7	Poor

ROUGHNESS -7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4 X	Fair
7	Poor

Hot mix pavement
Recycle or patch and overlay

Cochecton

(79)

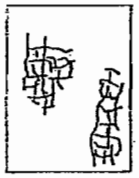
W=17' Th=2.3 grass

RSMS	Flexible Pavement Condition Survey	
Street: Fred White Rd	Distance:	Name: PFM
Section#: 23-1	Start: 0.0	Date: 6/14
Start: Tyler Rd	End: 1.0	Weather: sunny
End: 52/Cr 165	Length: 1.0	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING -6

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med	X	4	5	6
High		7	8	9

ALLIGATOR CRACKING -5

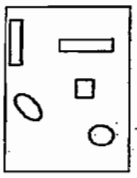


SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med	X	4	5	6
High		7	8	9

EDGE CRACKING -2

SEVERITY	NO Defects	EXTENT Low	Med	High
Low	X	1	2	3
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES -3



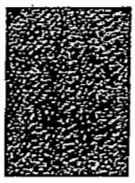
NO Defects	EXTENT
	1 Low
	2 Medium
	3 High

Do not include good patches

RUTTING 0

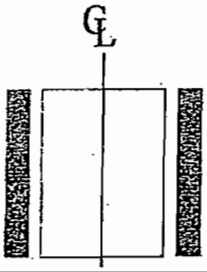
SEVERITY	NO Defects	EXTENT Low	Med	High
Low	X	1	2	3
Med		4	5	6
High		7	8	9

BLEEDING 0 none



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE -5



SEVERITY	CONDITION
1	Good
4 X	Fair
7	Poor

ROUGHNESS -Ø

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

Fairly new HM patch

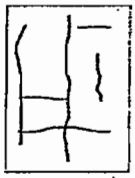
Cochecton

(78)

sh=1-2 Ft sandy spots W=18'

RSMS	Flexible Pavement Condition Survey	
Street: Johns Rd	Distance:	Name: PFM
Section#: 50-1	Start: 0.0	Date: 6/13
Start: Mitchell Pond	End: 0.7	Weather: Rainy
End:	Length: 0.7	Temp(F°/C°):

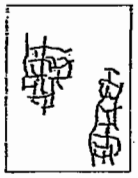
LONGITUDINAL/ TRANSVERSE CRACKING -10



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	X	8	9

ALLIGATOR CRACKING -7



NO Defects

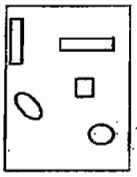
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	X	6
High	7	8	9

EDGE CRACKING -2

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES -3



NO Defects

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

RUTTING 0

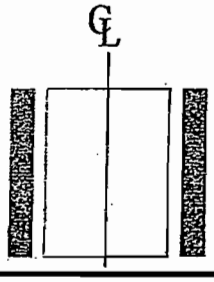
NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING 0 None

SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE -0



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

ROUGHNESS -0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

spot paving

Cochecton (78)

RSMS 2003 Sh = W = 15' Unpaved Condition Survey

Street: Mill Rd	Distance	Name: PFM	
Section #: 52-1	Start: 0.0	Date: 6/13	
Start: Mitchell Pond rd	End: 0.7	Weather: Rainy	
End: Dead end Sign	Length: 0.7	Temp (F°/C°):	

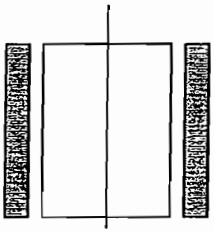
IMPROPER X-SECTION -15

CONDITION

SEVERITY

1	Good
4 X	Fair
7	Poor

ROADSIDE DRAINAGE -5



CONDITION

SEVERITY

1 X	Good
4	Fair
7	Poor

CORRUGATIONS Ø

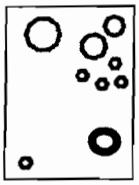
NO Defects X

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES Ø



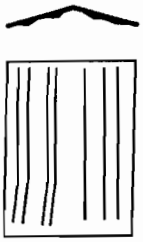
NO Defects X

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

RUTTING Ø



NO Defects X

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE -2

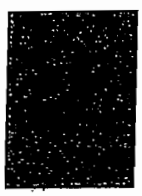
NO Defects

EXTENT

SEVERITY

	Low	Med	High
Low	1 X	2	3
Med	4	5	6
High	7	8	9

DUST Ø



CONDITION

SEVERITY

1 X	Good
4	Fair
7	Poor

ROUGHNESS Ø

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY

1 X	Good
4	Fair
7	Poor

Do nothing Gravel road Blue stone crusher run

Cochecton

RSMS 2003 — Unpaved Condition Survey

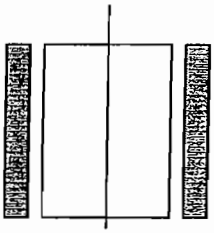
Street: Mill Rd	Distance	Name: PFM	
Section #: 51-2	Start:	Date: 6/13	
Start: Dead end sign	End:	Weather: Rainy	
End:	Length:	Temp (F°/C°):	

IMPROPER X-SECTION

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

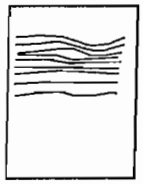
ROADSIDE DRAINAGE



CONDITION

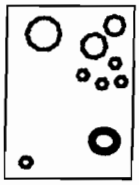
SEVERITY	
1	Good
4	Fair
7	Poor

CORRUGATIONS



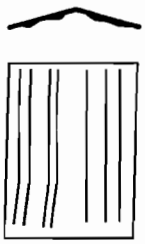
SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

POTHOLES



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

RUTTING



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

LOOSE AGGREGATE

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

DUST

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

Earth road very narrow w/ Dirt wheel paths grass between too rough to go down

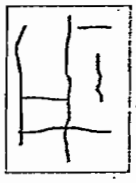
Cochecton

(82)

Sh=1-3 sandy gravel W=18'

RSMS Mitchell pond east	Flexible Pavement Condition Survey	
Street:	Distance:	Name: PFM
Section#: 37-1	Start: 0.0	Date: 6/13
Start: Cr 114	End: 2.6	Weather: Cloudy
End: Cr 116	Length: 2.6	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING -6



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

ALLIGATOR CRACKING -7

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	~~5~~	6
High	7	8	9

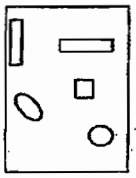
EDGE CRACKING -2

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES -3



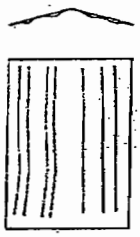
NO Defects

Do not include good patches

EXTENT

~~1~~	Low
2	Medium
3	High

RUTTING Ø

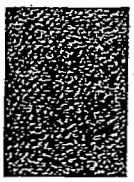


~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

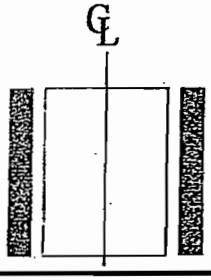
BLEEDING Ø None



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE Ø



CONDITION

SEVERITY	
~~1~~	Good
4	Fair
7	Poor

ROUGHNESS Ø

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
~~1~~	Good
4	Fair
7	Poor

Hot Mix pavement

Thick overlay or box out patch and chipseal

Cochecton

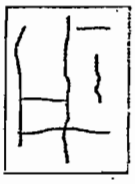
(63)

W=18' Sh=1-2Ft earth

RSMS	Flexible Pavement Condition Survey	
Street: Mitchell pond	Distance:	Name: PFM
Section#: 25-1	Start: 0.0	Date: 6/13
Start: CR14	End: 0.7	Weather: Cloudy
End: 0.7 Mi. pt.	Length: 0.7	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

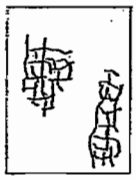
-10



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High	X	8	9	

ALLIGATOR CRACKING

-9



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	X
High		7	8	9

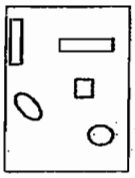
EDGE CRACKING

-8

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High	X	8	9	

PATCHING/ POTHOLES

-3



NO Defects	EXTENT
	1 ~~Low~~
	2 Medium
	3 High

Do not include good patches

RUTTING

Ø

SEVERITY	~~NO Defects~~	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	8	9

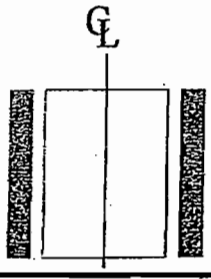
BLEEDING

None Ø

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE

Ø



SEVERITY	CONDITION
1	~~Good~~
4	Fair
7	Poor

ROUGHNESS

-7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	~~Fair~~
7	Poor

Hm Road

Recycle or patch and overlay

Cochecton

100

W=18' Sh=0-2ft gravel

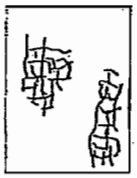
RSMS	Flexible Pavement Condition Survey	
Street: Mitchell Pond W.	Distance:	Name: PFM
Section#: 25-2	Start: 0.7	Date: 6/13
Start: 0.7Mi pt.	End: 1.1	Weather: Cloudy
End: Mill Rd	Length: 0.4	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

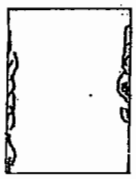
ALLIGATOR CRACKING



NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

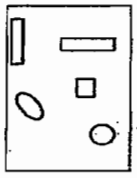
EDGE CRACKING



NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES



NO Defects ☒

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

RUTTING

NO Defects ☒

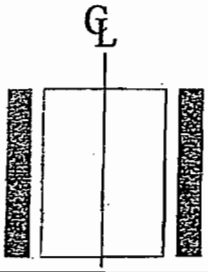
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

None

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



SEVERITY	CONDITION
1 ☒	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1 ☒	Good
4	Fair
7	Poor

Brand new hot mix

W-20 [illegible]

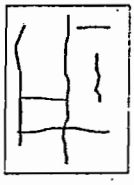
Cochecton

82

RSMS	Flexible Pavement Condition Survey	
Street: Mueller Rd	Distance:	Name: PFM
Section#: 21-1	Start: 0.0	Date: 6/14
Start: 17B	End: 1.1	Weather: Sunny
End: Lounsbury Rd	Length: 1.1	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

-6



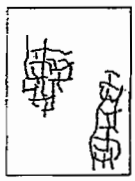
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

ALLIGATOR CRACKING

-5



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

EDGE CRACKING

-2

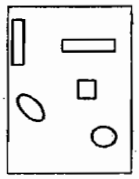
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

0



~~NO Defects~~

EXTENT

Do not include good patches

1	Low
2	Medium
3	High

RUTTING

0

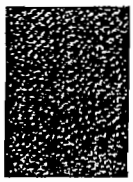
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

0 None

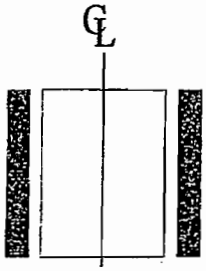


CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE

-5



CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

Fairly new HM road
patch a couple places

Cochecton

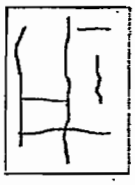
(56)

sh = 1-2 [illegible] gravel/grass W = 17.5'

RSMS	Flexible Pavement Condition Survey	
Street: Schalk Rd	Distance:	Name: PFM
Section#: 41-1	Start: 0.0	Date: 6/14
Start: Tyler Rd	End: 1.2	Weather: Sunny
End: Ehrley Rd	Length: 1.2	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

Ø



~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-15

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	~~9~~

EDGE CRACKING

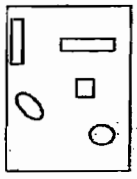
-6

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	~~3~~
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES

-5



NO Defects

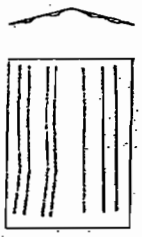
Do not include good patches

EXTENT

1	Low
~~2~~	Medium
3	High

RUTTING

-6

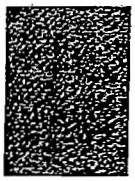


NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

BLEEDING

none 0

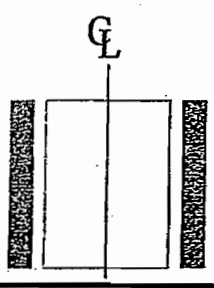


CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE

-5



CONDITION

SEVERITY	
1	Good
~~4~~	Fair
7	Poor

ROUGHNESS

-7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
~~4~~	Fair
7	Poor

HM road Recycle/Rebuild

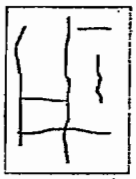
Collection

82

Sh: 1:3 grass W: 19'

RSMS	Flexible Pavement Condition Survey	
Street: Shortcut Rd	Distance:	Name: PFM
Section#: 43-1	Start: 0.0	Date: 6/13
Start: CR 113	End: 1.7	Weather: Cloudy
End: CR 112	Length: 1.7	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING -6

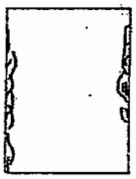


SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		X	5	6
High		7	8	9

ALLIGATOR CRACKING -7

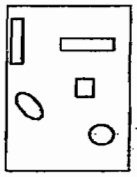
SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	X	6
High		7	8	9

EDGE CRACKING -2



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES -3



NO Defects	EXTENT
	1 X Low
	2 Medium
	3 High

Do not include good patches

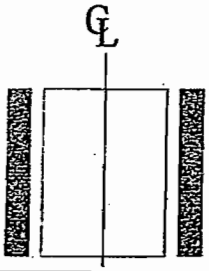
RUTTING 0

SEVERITY	NO Defects	EXTENT Low	Med	High
Low	X	1	2	3
Med		4	5	6
High		7	8	9

BLEEDING 0 none

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE 0



SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

ROUGHNESS 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

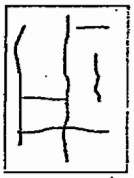
HM pavement
spot pave
patch, surface treat

Collection (75)

Sh = 1-3 areas W = 17.5'

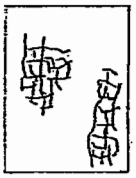
RSMS #	Flexible Pavement Condition Survey	
Street: Skipperene	Distance:	Name: PFM
Section#: 15-1	Start: 0.0	Date: 6/14
Start: 97	End: 3.5	Weather: Cloudy
End: Old County Rd	Length: 3.5	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING - 6



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med	X	5	6	
High		7	8	9

ALLIGATOR CRACKING - 7

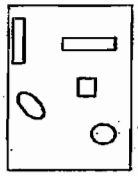


SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	X	6
High		7	8	9

EDGE CRACKING - 2

SEVERITY	NO Defects	EXTENT Low	Med	High
Low	X	2	3	
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES - 3



NO Defects

Do not include good patches

EXTENT

1 X Low
2 Medium
3 High

RUTTING - 2

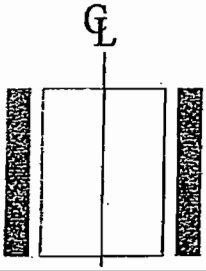
SEVERITY	NO Defects	EXTENT Low	Med	High
Low	X	2	3	
Med		4	5	6
High		7	8	9

BLEEDING none O

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE - 5



CONDITION

SEVERITY	
1	Good
4 X	Fair
7	Poor

ROUGHNESS Good on spot paved Areas, Fair on rest of Road

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

O

CONDITION

SEVERITY	
1 X	Good
4	Fair
7	Poor

Hm Road w/ cs surface at beginning of 97 end Intermittant spot paving Hm ~~o~~ alng entire Rd Road should have spot paving on all Areas between the more recent spot paved sections

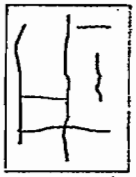
Collector

66

Sh = 0-3 grass W=18'

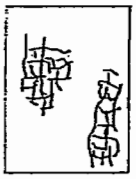
RSMS	Flexible Pavement Condition Survey	
Street: Smales Rd	Distance:	Name: PFM
Section#: 24-1	Start: 0.0	Date: 6/13
Start:	End: 0.4	Weather: Cloudy
End:	Length: 0.4	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING - 10



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		X	8	9

ALLIGATOR CRACKING - 7

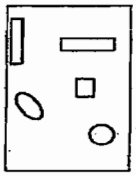


SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	X	6
High		7	8	9

EDGE CRACKING - 2

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		X	2	3
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES - 3



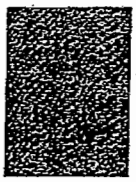
NO Defects	EXTENT
	1 X Low
	2 Medium
	3 High

Do not include good patches

RUTTING 0

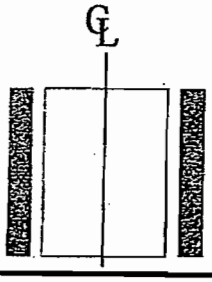
SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low	X	1	2	3
Med		4	5	6
High		7	8	9

BLEEDING None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE - 5



SEVERITY	CONDITION
1	Good
4 X	Fair
7	Poor

ROUGHNESS - 7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

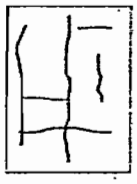
SEVERITY	CONDITION
1	Good
4 X	Fair
7	Poor

Correction 57

sh=2-3 Sandy gravel cross W=17'

RSMS	Flexible Pavement Condition Survey	
Street: Tyler Rd	Distance:	Name: PFM
Section#: 45-1	Start: 0.0	Date: 6/13
Start: 52/cr 115	End: 2.8	Weather: Sunny
End: Erhley Rd	Length: 2.8	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING -6



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		X	5	6
High		7	8	9

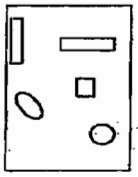
ALLIGATOR CRACKING -12

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	X	9

EDGE CRACKING -2

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES -5



NO Defects	EXTENT
	1 Low
	2 X Medium
	3 High

Do not include good patches

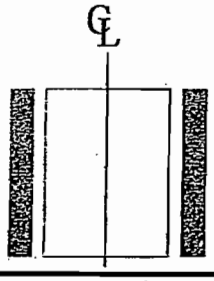
RUTTING -6

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		X	5	6
High		7	8	9

BLEEDING none 0

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE -5



SEVERITY	CONDITION
1	Good
4 X	Fair
7	Poor

ROUGHNESS -7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4 X	Fair
7	Poor

HM Road with Alternating sections of spot paving and hot mix with extensive cracking Recommend recycle or HM OL on bad sections

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Road Rating Field Data Sheets

Town of Delaware

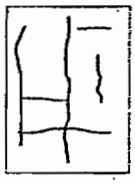
92

W=21' SH=0'

RSMS	Flexible Pavement Condition Survey	
Street: Beechwood Sd	Distance:	Name: PFM
Section#: 5-1	Start: 0.0	Date: 6/13
Start: Main St	End: 3.1	Weather: sunny
End: Kratz Rd	Length: 3.1	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

-2



SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

NO Defects

ALLIGATOR CRACKING

-2

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

NO Defects

EDGE CRACKING

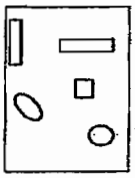
-2

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

NO Defects

PATCHING/ POTHOLES

0



NO Defects

EXTENT	
1	Low
2	Medium
3	High

Do not include good patches

RUTTING

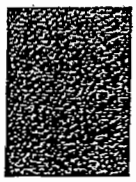
0

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

NO Defects

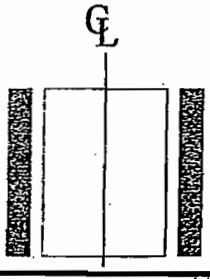
BLEEDING

-2



SEVERITY	CONDITION	
1	X	Good
4		Fair
7		Poor

DRAINAGE



0

SEVERITY	CONDITION	
1	X	Good
4		Fair
7		Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

SEVERITY	CONDITION	
1	X	Good
4		Fair
7		Poor

CM or HM pavement w/ CS surface

1 CS candidate or defer CS

2 Crack Fill and patch

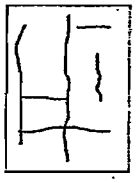
Delaware

80

W=15.5' SH=2'-3' Sandy Gravel

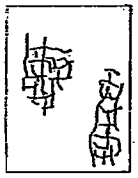
RSMS:	Flexible Pavement Condition Survey	
Street: Fulton Hill Rd	Distance:	Name: PFM
Section#: 12-1	Start: 0.0	Date: 6/13
Start: Mesmer Rd	End: 0.7	Weather: Sunny
End: 0.7 mi. Pt.	Length: 0.7	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING -10



SEVERITY	EXTENT: Low	Med	High
NO Defects			
Low	1	2	3
Med	4	5	6
High	X	8	9

ALLIGATOR CRACKING -5

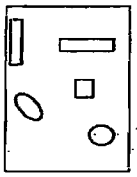


SEVERITY	EXTENT: Low	Med	High
NO Defects			
Low	1	2	3
Med	X	5	6
High	7	8	9

EDGE CRACKING -2

SEVERITY	EXTENT: Low	Med	High
NO Defects			
Low	X	2	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES -3



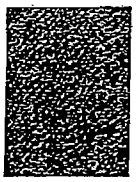
NO Defects	EXTENT
	X Low
	2 Medium
	3 High

Do not include good patches

RUTTING 0

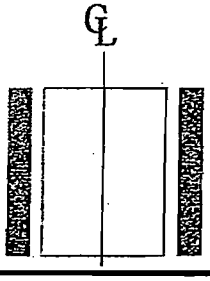
SEVERITY	EXTENT: Low	Med	High
NO Defects	X		
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE -0



SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

ROUGHNESS -0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

CM road patch and rock fill

Delaware

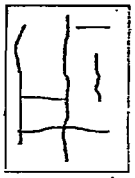
58

W=15.5' SH=1'-3' Sandy Gravel

RSMS	Flexible Pavement Condition Survey	
Street: Fulton Hill Rd	Distance:	Name: PFM
Section#: 12-2	Start: 0.70	Date: 6/13
Start: 0.7 mi pt.	End: 1.80	Weather: Sunny
End: NY 52	Length: 1.10	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

-6



SEVERITY	EXTENT Low	Med	High
NO Defects			
Low	1	2	3
Med	X	5	6
High	7	8	9

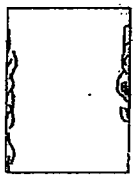
ALLIGATOR CRACKING

-9

SEVERITY	EXTENT Low	Med	High
NO Defects			
Low	1	2	3
Med	4	5	X
High	7	8	9

EDGE CRACKING

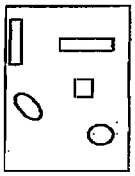
-4



SEVERITY	EXTENT Low	Med	High
NO Defects			
Low	1	X	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES

-9



NO Defects

EXTENT

Do not include good patches

1	Low
2	Medium
X 3	High

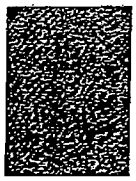
RUTTING

-7

SEVERITY	EXTENT Low	Med	High
NO Defects			
Low	1	2	3
Med	4	X	6
High	7	8	9

BLEEDING

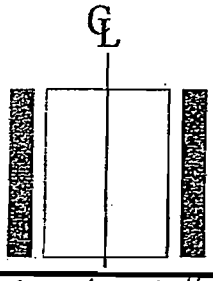
None 0



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



0

CONDITION

SEVERITY	
1 X	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

-7

CONDITION

SEVERITY	
1	Good
4 X	Fair
7	Poor

looks like surface treatment or maybe CM recycle

Delaware

78

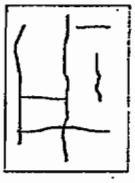
W=18'

SH = 1'-3' Earth

RSMS	Flexible Pavement Condition Survey	
Street: Gabel Rd	Distance:	Name: PFM
Section#: 23-1	Start: 0.0	Date: 6/13
Start: CR 164	End: 1.8	Weather: sunny
End: Reum Rd	Length: 1.8	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

-10



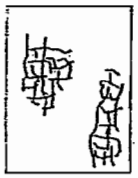
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	X	8	9

ALLIGATOR CRACKING

-5



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

EDGE CRACKING

-4

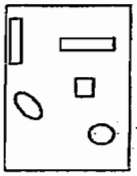
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	X	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES

-3



NO Defects

EXTENT

1 X Low	
2 Medium	
3 High	

Do not include good patches

RUTTING

0

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

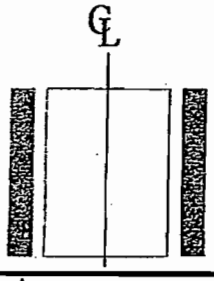
BLEEDING

none 0

CONDITION

SEVERITY	
1 Good	
4 Fair	
7 Poor	

DRAINAGE



0

CONDITION

SEVERITY	
1 X Good	
4 Fair	
7 Poor	

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1 X Good	
4 Fair	
7 Poor	

#1 A surface over HM or CM patch and crack fill

Delaware (8)

W = 15'

SH = 2'-3' Gravel Earth

RSMS 2003 Unpaved Condition Survey

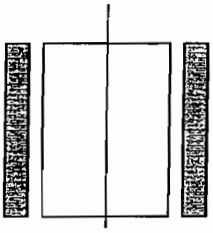
Street: Hankins Rd - Distance		Name: PFM	
Section #: 9-1	Start: 0.00	Date: 6/13/09	
Start: cross Rd	End: 0.90	Weather: sunny	
End: 0.90 mi pt	Length: 0.90	Temp (F°/C°):	

IMPROPER X-SECTION — -20

CONDITION

SEVERITY	
1	Good
4	Fair
7	~~Poor~~

ROADSIDE DRAINAGE — -15



CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

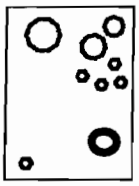
CORRUGATIONS — 0

~~NO Defects~~

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES — -2

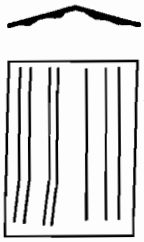


NO Defects

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

RUTTING — 0



~~NO Defects~~

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE — -20

NO Defects

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	~~9~~

DUST — -5

CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

ROUGHNESS — -30

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	~~Poor~~

Delaware

95

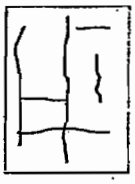
W=15'

SH= 0'-1' Sandy Gravel

RSMS	Flexible Pavement Condition Survey	
Street: Hankins Rd	Distance:	Name: PFM
Section#: 9-2	Start: 0.9	Date: 6/13
Start: 0.9 mi. ph.	End: 1.3	Weather: Sunny
End: NY 97	Length: 0.4	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

0



~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

0

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING

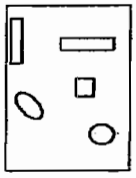
-5

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

PATCHING/ POTHOLES

0



~~NO Defects~~

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

RUTTING

0

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

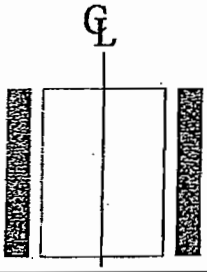
BLEEDING

None 0

SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE

0



SEVERITY	CONDITION	
1	~~Good~~	
4	Fair	
7	Poor	

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	~~Good~~	
4	Fair	
7	Poor	

CM or HM pavement with CS surface excellent condition - Do nothing or patch a couple edge spots

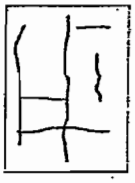
Delaware

69

W=16' SH=2'-3' Sandy Grave

RSMS	Flexible Pavement Condition Survey	
Street: Hospital Rd	Distance:	Name: PFM
Section#: 31-1	Start: 0.00	Date: 6/13
Start: NYS 97	End: 1.7	Weather: sunny
End: Seminary Rd	Length: 1.7	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING 0

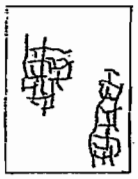


NO Defects (X)

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING -9



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6 (X)
High	7	8	9

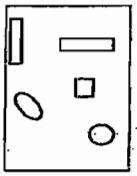
EDGE CRACKING -4

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2 (X)	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES -5



NO Defects

EXTENT

Do not include good patches

1	Low
2 (X)	Medium
3	High

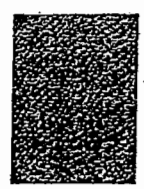
RUTTING -4

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2 (X)	3
Med	4	5	6
High	7	8	9

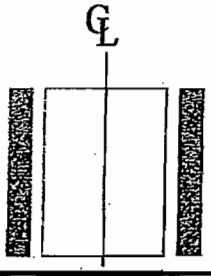
BLEEDING -2



CONDITION

SEVERITY	
1 (X)	Good
4	Fair
7	Poor

DRAINAGE 0



CONDITION

SEVERITY	
1 (X)	Good
4	Fair
7	Poor

ROUGHNESS -7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4 (X)	Fair
7	Poor

First mile coming up the hill from NYS 97 has some spot repairs that are badly needed in some High/high Allig areas most of road is high extent, mod sev. Aligators Rehab candidate. CS will not last well over existing cracking although CS would be used as a "delaying" treatment

Delaware

64

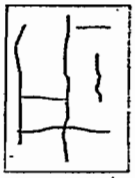
W=16'

SH = 2'-3' Sandy Grave

RSMS	Flexible Pavement Condition Survey	
Street: Kautz Rd	Distance: -1	Name: PFM
Section#: 22-1	Start: 0.0	Date: 6/13
Start: Seminary Rd	End: 1.5	Weather: Sunny
End: 1.5 mi. pt.	Length: 1.5	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

0



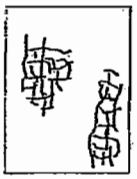
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-9



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	~~6~~
High	7	8	9

EDGE CRACKING

-6

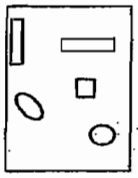
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	~~3~~
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

-5



NO Defects

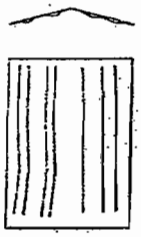
EXTENT

Do not include good patches

1	Low
~~2~~	Medium
3	High

RUTTING

-4



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	~~2~~	3
Med	4	5	6
High	7	8	9

BLEEDING

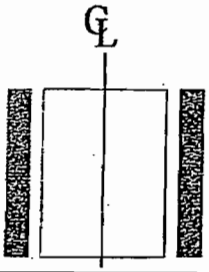
None 0

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE

-5



CONDITION

SEVERITY	
1	Good
~~4~~	Fair
7	Poor

ROUGHNESS

-7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

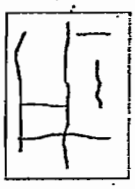
SEVERITY	
1	Good
~~4~~	Fair
7	Poor

Delaware (86)

W=16' SH=2'-3' Sandy Gravel

RSMS	Flexible Pavement Condition Survey	
Street: Kautz Rd - L	Distance:	Name: PFM
Section#: 22-2	Start: 1.50	Date: 6/13
Start: 1.5 mi, pt.	End: 2.30	Weather: sunny
End: CL 131	Length: 0.80	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING -2



NO Defects

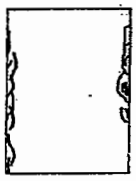
SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING -5

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

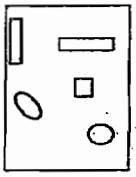
EDGE CRACKING -2



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES -3

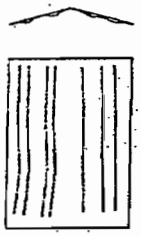


NO Defects

Do not include good patches

EXTENT	
1 X	Low
2	Medium
3	High

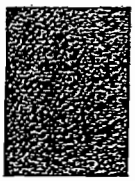
RUTTING -2



NO Defects

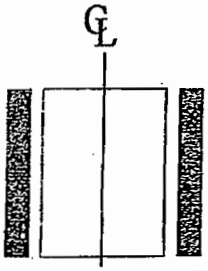
SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

BLEEDING None 0



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE 0



SEVERITY	CONDITION	
1 X	Good	
4	Fair	
7	Poor	

ROUGHNESS 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1 X	Good	
4	Fair	
7	Poor	

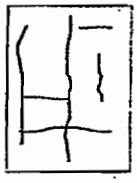
Minor patching

Delaware (45)

W = 18'-19' SH = 2'-3' Sandy Gra

RSMS	Flexible Pavement Condition Survey	
Street: Lahm Rd	Distance:	Name: PFM
Section#: 66-1	Start: 0.0	Date: 6/13
Start: Cross Rd	End: 0.2	Weather: sunny
End: 0.2 mi. pt.	Length: 0.2	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING 0



~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING -15

NO Defects

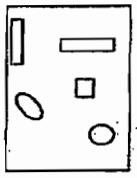
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	~~9~~

EDGE CRACKING -11

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	~~9~~

PATCHING/ POTHOLES -9



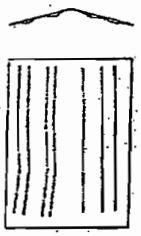
NO Defects

Do not include good patches

EXTENT

1	Low
2	Medium
~~3~~	~~High~~

RUTTING 0



~~NO Defects~~

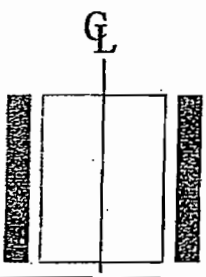
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING none 0

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE -9



CONDITION

SEVERITY	
1	Good
4	Fair
~~7~~	~~Poor~~

ROUGHNESS -11

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
~~7~~	~~Poor~~

Disintigrated, Broken up CS. Road should be reverted back to gravel very Rough although no wheel path ruts. Likely would preform well as gravel Rd.

Delaware (19)

grassy shoulders

SH = 2'-3' Sandy Gravel

RSMS 2003 W = 18'-19' Unpaved Condition Survey

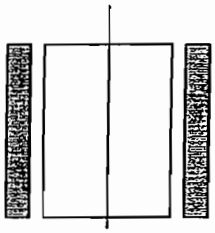
Street: Lahm Rd - 2	Distance	Name: PFM	
Section #: 66-2	Start: 0.2	Date: 6/13	
Start: 0.2 Mi. Pt.	End: 0.8	Weather: sunny	
End: T of Fremont	Length: 0.6	Temp (F°/C°):	

IMPROPER X-SECTION -15

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

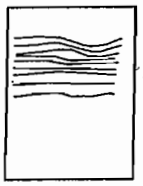
ROADSIDE DRAINAGE -20



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

CORRUGATIONS 0

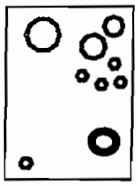


EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

NO Defects

POTHOLES -6



EXTENT

SEVERITY	Low	Med	High
Low	1	X	3
Med	4	5	6
High	7	8	9

NO Defects

RUTTING some ruts from drainage along Rd No real up ruts

-8

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

NO Defects

LOOSE AGGREGATE -2

EXTENT

SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

NO Defects

DUST 0

CONDITION

SEVERITY	
X	Good
4	Fair
7	Poor

ROUGHNESS -30

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

Cross section is very poor. Many places w/ inverted crown. exposed rock in Road bed

Delaware

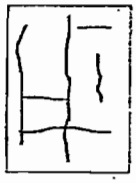
(81)

W = 18'

SH = 0'-3' Sandy Grave

RSMS	Flexible Pavement Condition Survey	
Street: Miller Rd	Distance:	Name: PFM
Section#: 27-1	Start: 0.0	Date: 6/13
Start: Cr 164	End: 1.4	Weather: Sunny
End: 52	Length: 1.4	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING -10



SEVERITY	EXTENT Low	Med	High
NO Defects			
Low	1	2	3
Med	4	5	6
High	X	8	9

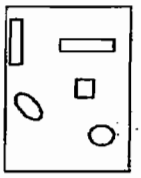
ALLIGATOR CRACKING -5

SEVERITY	EXTENT Low	Med	High
NO Defects			
Low	1	2	3
Med	X4	5	6
High	7	8	9

EDGE CRACKING -2

SEVERITY	EXTENT Low	Med	High
NO Defects			
Low	X1	2	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES 0



NO Defects

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

RUTTING 0

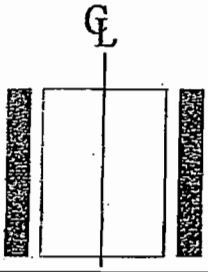
NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING -2

SEVERITY	CONDITION	
1	X	Good
4		Fair
7		Poor

DRAINAGE 0



SEVERITY	CONDITION	
1	X	Good
4		Fair
7		Poor

ROUGHNESS 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	X	Good
4		Fair
7		Poor

HM or cm road patch and crack fill

Delaware

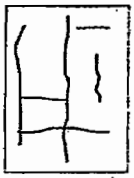
(80)

W=21' SH = 3'+4' Sandy Gravel Earth

RSMS	Flexible Pavement Condition Survey	
Street: Reum Rd	Distance:	Name: PFM
Section#: 35-1	Start: 0.0	Date: 6/13
Start: CR 164	End: 0.9	Weather: Sunny
End: Gabel Rd	Length: 0.9	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

0

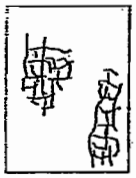


NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-7



NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	☒	6
High	7	8	9

EDGE CRACKING

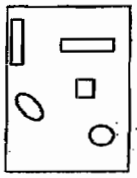
-6

NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2	☒
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES

-3



NO Defects ☐

Do not include good pasches

1 ☒	Low
2	Medium
3	High

RUTTING

-4

NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	☒	3
Med	4	5	6
High	7	8	9

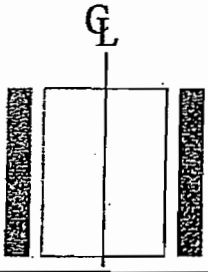
BLEEDING

None 0

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



0

CONDITION

SEVERITY	
1 ☒	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY	
1 ☒	Good
4	Fair
7	Poor

HM or CM road, with C stripe
needs a reinforcement overlay or box out patch and surface treat, probably the later would be good

Delaware

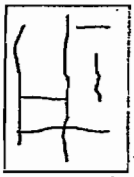
88

W=21'

SH = 3'-4' sandy, Grav

RSMS	Flexible Pavement Condition Survey	
Street: Reum Rd	Distance: 2	Name: PFM
Section#: 35-2	Start: 0.90	Date: 6/13
Start: Gabet	End: 1.70	Weather: sunny
End: 52A	Length: 0.80	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING 0

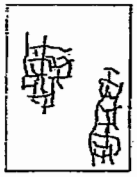


NO Defects ☒

EXTENT (Low Med High)

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING -5

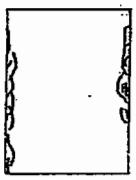


NO Defects ☐

EXTENT (Low Med High)

SEVERITY	Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

EDGE CRACKING -2

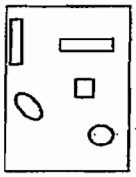


NO Defects ☐

EXTENT (Low Med High)

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES -3



NO Defects ☐

EXTENT

1 ~~Low~~	
2 Medium	
3 High	

Do not include good patches

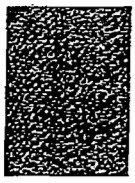
RUTTING -2

NO Defects ☐

EXTENT (Low Med High)

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

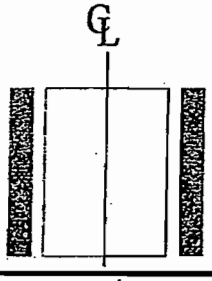
BLEEDING 0 None



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE 0



CONDITION

SEVERITY	
1 ~~Good~~	
4 Fair	
7 Poor	

ROUGHNESS 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1 ~~Good~~	
4 Fair	
7 Poor	

Freshly surface treated Hm or cm (about a year old s.t.) patching

Delaware

(91)

W=18'

SH=0'-3' Sandy. Grave Earth

RSMS	Flexible Pavement Condition Survey	
Street: Swiss Hill Rd	Distance:	Name: PFM
Section#: 2-1	Start: 0.0	Date: 6/13
Start: 52	End: 1.6	Weather: Sunny
End: 1.6 mi. pt.	Length: 1.6	Temp(F°/C°):

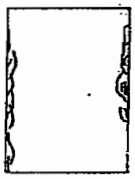
LONGITUDINAL/ TRANSVERSE CRACKING -2

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

ALLIGATOR CRACKING -2

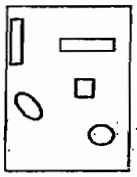
SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

EDGE CRACKING -2



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES -3



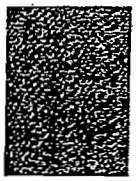
NO Defects	EXTENT
	1 X Low
	2 Medium
	3 High

Do not include good patches

RUTTING 0

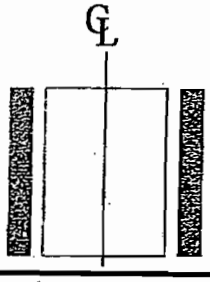
SEVERITY	NO Defects	EXTENT Low	Med	High
Low	X	1	2	3
Med		4	5	6
High		7	8	9

BLEEDING None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE 0



SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

ROUGHNESS 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

HM or CM Road probably CS surface
Do nothing Maybe patch

Delaware

55

W=18'

SH=2'-3' Sandy Grave.

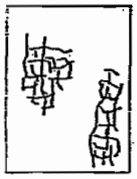
RSMS	Flexible Pavement Condition Survey	
Street: Swiss Hill Rd	Distance:	Name: PFM
Section#: 2-2	Start: 1.6	Date: 6/13
Start: 1.6 mi. pt.	End: 2.7	Weather: sunny
End: Eggler	Length: 1.1	Temp(F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING -6

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

ALLIGATOR CRACKING -9



NO Defects

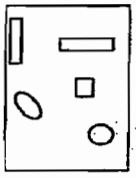
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	X
High	7	8	9

EDGE CRACKING -4

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	X	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES -9



NO Defects

Do not include good patches

EXTENT	
1	Low
2	Medium
3 X	High

RUTTING -6

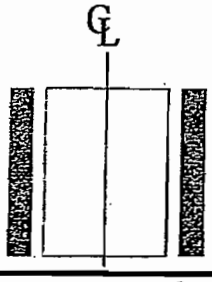
NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

BLEEDING 0 None

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE 0



SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

ROUGHNESS -11

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7 X	Poor

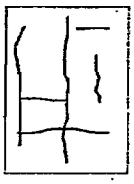
CM or Multiple CS recycle

Delaware (73)

W = 21' SH = 2' Paved F

RSMS	Flexible Pavement Condition Survey	
Street: Villa Roma	Distance:	Name: PFM
Section#: 10-1	Start: 0.0	Date: 6/13
Start: Er 164	End: 1.0	Weather: Sunny
End: Dolster Rd	Length: 1.0	Temp(F°/C°):

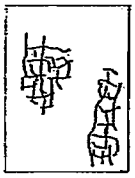
LONGITUDINAL/ TRANSVERSE CRACKING -10



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	X	8	9

ALLIGATOR CRACKING -10



NO Defects

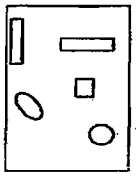
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	X	8	9

EDGE CRACKING -2

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES -3



NO Defects

Do not include good patches

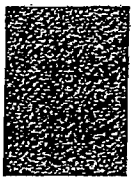
EXTENT	
1 X Low	
2 Medium	
3 High	

RUTTING -2

NO Defects

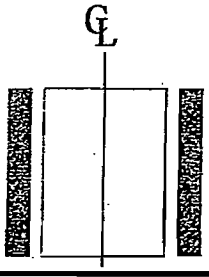
SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

BLEEDING None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE 0



SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

ROUGHNESS 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

Striped Road, Full width Hot mix (Like county Rd) needs minor Rehab. Box out patches, crack sed, S.T. or patch and Thin O.L.

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Road Rating Field Data Sheets

Town of Freemont

~~[redacted]~~ FREEMONT

W = 17'

SH = 2' Sandy Gravel

21.6
20.0

RSMS 2003

Flexible Pavement Condition Survey

Street: Anawanda Lake Rd	Distance:	Name: PFM	
Section #: 92-1	Start: 0.00	Date: 7/4/09	
Start: Town line	End: 1.6	Weather:	
End: CR 93	Length: 1.6	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING

NO Defects

EXTENT: Low Med High

SEVERITY: Low / Med / High

1	2	3
X 4	5	6
7	8	9

ALLIGATOR CRACKING

NO Defects

EXTENT: Low Med High

SEVERITY: Low / Med / High

1	2	3
X 4	5	6
7	8	9

EDGE CRACKING

NO Defects

EXTENT: Low Med High

SEVERITY: Low / Med / High

X 1	2	3
4	5	6
7	8	9

PATCHING / POTHOLES

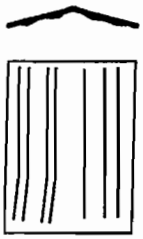
~~NO Defects~~

EXTENT

1	Low
2	Medium
3	High

Do not include good patches

RUTTING



~~NO Defects~~

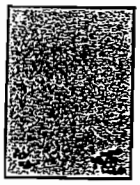
EXTENT: Low Med High

SEVERITY: Low / Med / High

1	2	3
4	5	6
7	8	9

BLEEDING

None

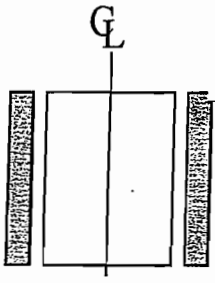


CONDITION

SEVERITY

1	Good
4	Fair
7	Poor

DRAINAGE



CONDITION

SEVERITY

1 X	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY

1 X	Good
4	Fair
7	Poor

Routine Patching / Spot Pave a couple areas

FREEMONT

W = 16.5

SH = 2' – 3' Sandy Gravel

4
35.5
33.9
1.6

Basket Rd

RSMS 2003 Flexible Pavement Condition Survey

Street: BASKET Rd *	Distance:	Name:	PFM
Section #: 5-1	Start: 0.00	Date:	7/3/09
Start: ~~Basket~~ / Neer	End: 1.6	Weather:	
End: O'Mara Rd	Length: 1.6	Temp (F°/C°):	

* Note: Signage Unclear Called Segment Basket – may be Long Eddy or Sket

LONGITUDINAL/ TRANSVERSE CRACKING

NO Defects

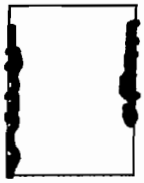
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

ALLIGATOR CRACKING

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

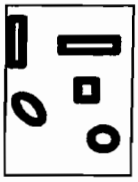
EDGE CRACKING



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES



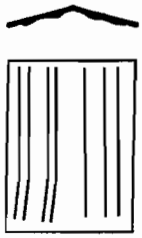
NO Defects

Do not include good patches

EXTENT

1	~~Low~~
2	Medium
3	High

RUTTING

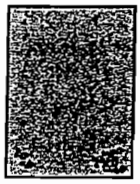


~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

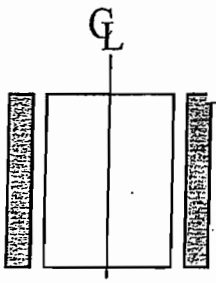
None



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

Box out Patch a few spots. Appears to be a 3-Syrold Hot Mix pavement, in very good condition, overall

W = 17'

FREEMONT

Sh = 1'-2'

33.9
31.9
32.6 HM,
32.8 HM End
33.6 HM,
33.7 HM, End
33.8

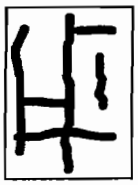
RSMS 2003

Flexible Pavement Condition Survey

Street: Basket Rd
Section #: F-2
Start: CR 134
End: ~~Skeet~~/Neel Rd
Distance:
Start: 0.00
End: 2.00
Length: 2.00

Name: PFM
Date: 7/3/09
Weather:
Temp (F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING



~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

NO Defects

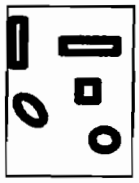
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	X
High	7	8	9

EDGE CRACKING

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	X
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

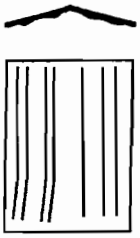


NO Defects

Do not include good patches

EXTENT	
1	Low
~~2~~	~~Medium~~
3	High

RUTTING

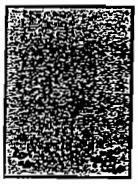


NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	X	3
Med	4	5	6
High	7	8	9

BLEEDING

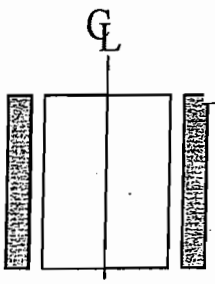
None



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



CONDITION

SEVERITY	
1	Good
4	X Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

Appears to be a failing double Chip seal, Bottom Layer of #2 stone appearing. Much breakup. Scarify, Improve Base Re-Surface 0.3 miles of Hot Mix Spot paving]

FREEMONT

W = 14'-16'

SH = 1'-2' Sandy Gravel

26.2
24.4

RSMS 2003 — Unpaved Condition Survey

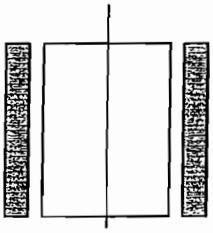
Street: Bowers Rd	Distance	Name: PFM	
Section #: 4-1	Start: 0.00	Date: 7/4/09	
Start: CR 96	End: 1.8	Weather:	
End: Town line	Length: 1.8	Temp (F°/C°):	

IMPROPER X-SECTION

CONDITION

SEVERITY	
1	Good
4	X Fair
7	Poor

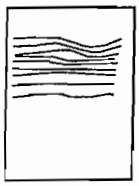
ROADSIDE DRAINAGE



CONDITION

SEVERITY	
1	Good
4	X Fair
7	Poor

CORRUGATIONS

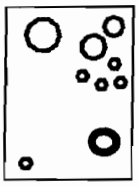


NO Defects: X

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES



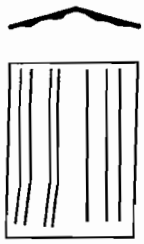
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

26.9

RUTTING



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

DUST

CONDITION

SEVERITY	
1	X Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	X Good
4	Fair
7	Poor

Red Sandy Earth Road, Some blue Stone Crusher run in Some places.

FREEMONT

W = 16'

SH = 2'-3' Sandy Gravel

74.6
74.0

RSMS 2003

Flexible Pavement Condition Survey

Street: Fink Rd	Distance:	Name: PFM	
Section #: 25-1	Start: 0.00	Date: 7/3/09	
Start: Warner Rd	End: .6	Weather:	
End: CR 95	Length: .6	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING

NO Defects (X)

EXTENT: Low Med High

SEVERITY: Low 1 2 3; Med 4 5 6; High 7 8 9

ALLIGATOR CRACKING

NO Defects

EXTENT: Low Med High

SEVERITY: Low 1 2 3; Med 4 5 6; High 7 8 (9)

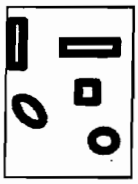
EDGE CRACKING

NO Defects

EXTENT: Low Med High

SEVERITY: Low 1 2 (3); Med 4 5 6; High 7 8 9

PATCHING / POTHOLES



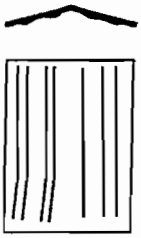
NO Defects

EXTENT

Do not include good patches

1 Low
2 Medium (X)
3 High

RUTTING



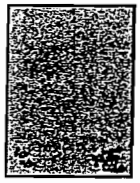
NO Defects

EXTENT: Low Med High

SEVERITY: Low (X) 2 3; Med 4 5 6; High 7 8 9

BLEEDING

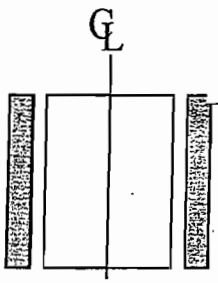
None



CONDITION

SEVERITY: 1 Good; 4 Fair; 7 Poor

DRAINAGE



CONDITION

SEVERITY: 1 Good (X); 4 Fair; 7 Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY: 1 Good; 4 Fair (X); 7 Poor

Maj Rehab (Maybe Rebuild depending on Base)

21.2 miles

W = 15'

SH = 2'-3' Earth

FREEMONT

59.1
58.0

RSMS 2003

Flexible Pavement Condition Survey

Street: Graby Rd	Distance:	Name: PFM	
Section #: 29-1	Start: 0.00	Date: 7/3/09	
Start: CR 131	End: 1.1	Weather:	
End: End of Pavement	Length: 1.1	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

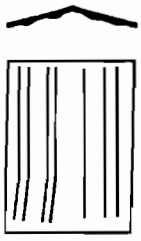
NO Defects

Do not include good patches

EXTENT

1 Low
2 Medium
3 High

RUTTING

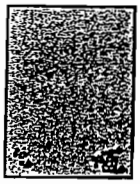


NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

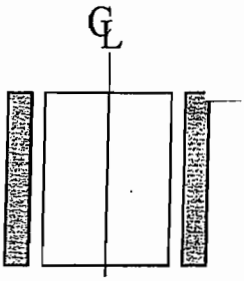
None



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

★ Totally Failed AC Pavement, with Low Sev, High Ext Ruts. Road was used as access for Millenium Pipeline. Excellent Example of Trucking damage!

FREEMONT

W = 16' Sh - 1'-2' Gr

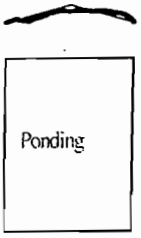
58.0
57.6

RSMS 2003 — Unpaved Condition Survey

Street:	Grabv Rd	Distance	
Section #:	29-2	Start:	1.1
Start:	End of Pavement	End:	1.5
End:	Lahm Rd	Length:	.4

Name: PFM
Date: 7/3/09
Weather:
Temp (F°/C°):

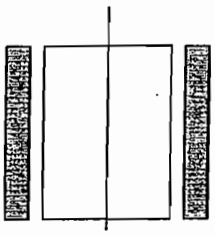
IMPROPER X-SECTION



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

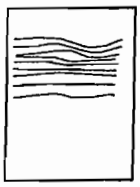
ROADSIDE DRAINAGE



CONDITION

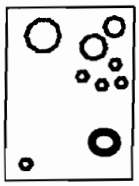
SEVERITY	
1	Good
4	Fair
7	Poor

CORRUGATIONS



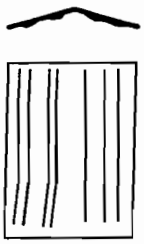
SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

POTHOLES



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

RUTTING



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

LOOSE AGGREGATE

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		X	2	3
Med		4	5	6
High		7	8	9

DUST

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

Crushed Blue Stone.

W = 20.5' SH = 0'-2' Earth

FREEMONT

61.1
60.3

RSMS 2003

Flexible Pavement Condition Survey

Street: Hammer Rd	Distance:	Name: PFM	
Section #: 36-1	Start: 0.00	Date: 7/31/09	
Start: CR 131/132	End: .8	Weather:	
End: Peter's Rd	Length: .8	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING

NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING

NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

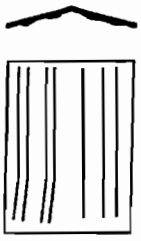
PATCHING / POTHOLES

NO Defects ☒

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

RUTTING

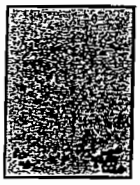


NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

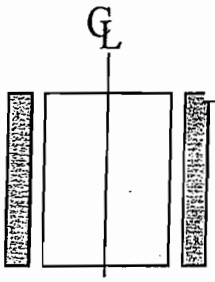
BLEEDING

None



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE



CONDITION

SEVERITY	CONDITION	
1	Good	☒
4	Fair	
7	Poor	

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	CONDITION	
1	Good	☒
4	Fair	
7	Poor	

New Hot Mix Surface - 1 yr old
Excellent - Do Nothing

FREEMONT

w = 13' sh = 0

30.8
30.0

RSMS 2003

Unpaved Condition Survey

Street: Johnston Rd	Distance	Name: PFM
Section #: 38-1	Start: 0.00	Date: 7/3/09
Start: Basket Rd	End: 0.80	Weather:
End: Dead End	Length: 0.80	Temp (F°/C°):

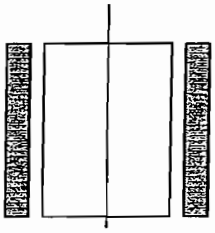
IMPROPER X-SECTION

CONDITION

SEVERITY

1	Good
4	Fair
7	Poor

ROADSIDE DRAINAGE



CONDITION

SEVERITY

1	Good
4	Fair
7	Poor

CORRUGATIONS

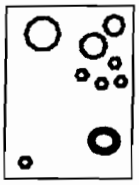
NO Defects

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES



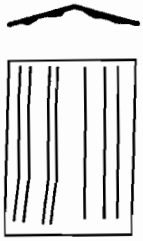
NO Defects

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

RUTTING



NO Defects

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

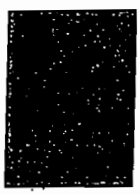
NO Defects

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

DUST



CONDITION

SEVERITY

1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY

1	Good
4	Fair
7	Poor

Steep Drop off on East side and steep hill on Left. Road Climbs a mountain 13' section ends at .8 mi and road becomes unimproved, Narrow earth Lane to dead Wheel Ruts

FREEMONT

W = 17.5' SH = 0'-2' Gravel

62.6
62.0
61.3

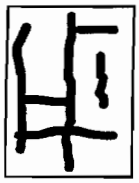
RSMS 2003

Flexible Pavement Condition Survey

Street: Peters Rd Distance: ____
Section #: 37-1 Start: 0.00
Start: Newman Hill Rd End: 1.30
End: Varner Rd Length: 1.30

Name: PFM
Date: 7/13/09
Weather: ____
Temp (F°/C°): ____

LONGITUDINAL/ TRANSVERSE CRACKING



~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
~~Med~~	~~4~~	5	6
High	7	8	9

EDGE CRACKING

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

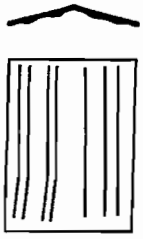
PATCHING / POTHOLES

NO Defects

Do not include good patches

	EXTENT
1	~~Low~~
2	Medium
3	High

RUTTING

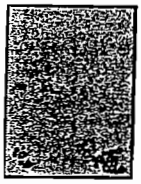


~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

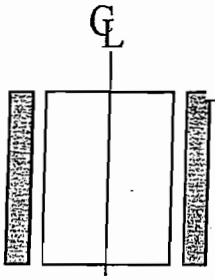
BLEEDING

None



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



CONDITION ____

SEVERITY	CONDITION
1	Good
4	~~Fair~~
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION ____

SEVERITY	CONDITION
1	~~Good~~
4	Fair
7	Poor

Needs Patching and Spot Pave in a few Places. Generally Good Condition

FREEMONT

W = 17' SH = 2' Sandy Earth

67.10
65.7

RSMS 2003 — Flexible Pavement Condition Survey

Street: Peters Rd Distance: ____
Section #: 37-2 Start: 1.3
Start: Warner Rd End: 2.6
End: Town line Length: 1.3

Name: PFM
Date: 7/3/09
Weather: ____
Temp (F°/C°): ____

LONGITUDINAL/ TRANSVERSE CRACKING

NO Defects ☒

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

EXTENT: Low Med High

ALLIGATOR CRACKING

NO Defects ☐

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9 ☒

EXTENT: Low Med High

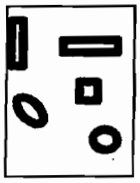
EDGE CRACKING

NO Defects ☐

SEVERITY	Low	Med	High
Low	1	2	3 ☒
Med	4	5	6
High	7	8	9

EXTENT: Low Med High

PATCHING / POTHOLES



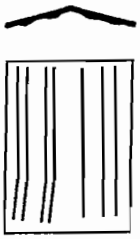
NO Defects ☐

Do not include good patches

EXTENT

1	Low
2	Medium
3 ☒	High

RUTTING



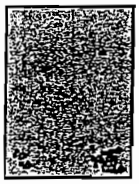
NO Defects ☐

SEVERITY	Low	Med	High
Low	1	2 ☒	3
Med	4	5	6
High	7	8	9

EXTENT: Low Med High

BLEEDING

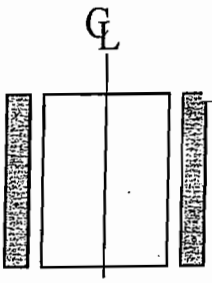
None



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



CONDITION

SEVERITY	
1	Good
4 ☒	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7 ☒	Poor

Rebuild / Maj Rehab

FREEMONT

W = 12'

SH = 0'

41.2
40.2

RSMS 2003

Unpaved Condition Survey

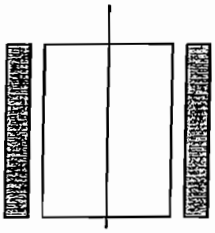
Street:	Skyline DR	Distance		Name:	PFM
Section #:	84-1	Start :	0.00	Date:	7/3/09
Start:	Nelson Rd	End :	1.0	Weather:	
End:	Wood Rd	Length:	1.0	Temp (F°/C°):	

IMPROPER X-SECTION

CONDITION

SEVERITY	
1	Good
4	Fair
7 X	Poor

ROADSIDE DRAINAGE



CONDITION

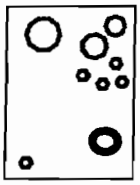
SEVERITY	
1	Good
4	Fair
7 X	Poor

CORRUGATIONS

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	8	9

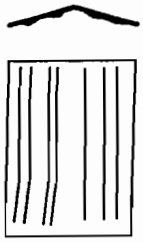
(NO Defects: X)

POTHOLES



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

RUTTING

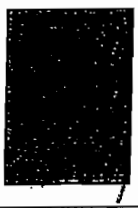


SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

LOOSE AGGREGATE

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

DUST



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

(Good: X)

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

(Fair: X)

Sandy Red Earth road. Narrow 12-14'. No crown. Wally driving down road in many places. Needs grad and cross section. Little to no ditches.

W = 20'

FREEMONT

SH = 0'-2' Sandy Gravel

35.5

33.9

RSMS 2003

Flexible Pavement Condition Survey

Street: Tennanah Lake Rd Distance: ____

Section #: 14-1 Start: 0.00

Start: CR 93 End: 1.6

End: 1.6 mi point Length: 1.6

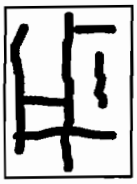
Name: PFM

Date: 7/4/09

Weather: ____

Temp (F°/C°): ____

LONGITUDINAL/ TRANSVERSE CRACKING



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		X 4	5	6
High		7	8	9

ALLIGATOR CRACKING

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		X 4	5	6
High		7	8	9

EDGE CRACKING

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		X 1	2	3
Med		4	5	6
High		7	8	9

PATCHING / POTHOLES

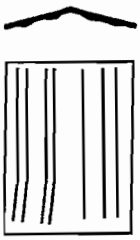
NO Defects

Do not include good patches

EXTENT

1	Low
2	Medium
3	High

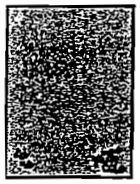
RUTTING



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low	X	1	2	3
Med		4	5	6
High		7	8	9

BLEEDING

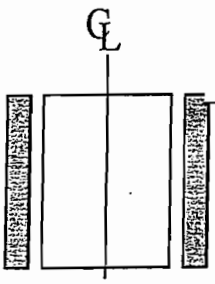
None



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	X Good
4	Fair
7	Poor

Do Nothing or Spray patch

W = 17'

Fremont

SH = 0" - 2' Sandy Gravel

~~36.5~~ 35.5

RSMS 2003

Flexible Pavement Condition Survey

Street: Tennanah Lake Rd Distance: ____

Section #: 14-2 Start: 1.6

Start: 1.6 mi point End: 3.7

End: 3.7 mi point Length: 2.1

Name: PFM

Date: 7/4/09

Weather: ____

Temp (F°/C°): ____

LONGITUDINAL/ TRANSVERSE CRACKING

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	~~9~~

EDGE CRACKING

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	~~3~~
Med	4	5	6
High	7	8	9

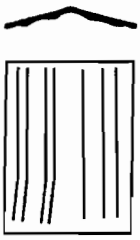
PATCHING / POTHOLES

NO Defects

Do not include good patches

	EXTENT
1	Low
2	Medium
3	~~High~~

RUTTING

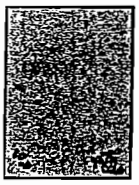


NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	~~2~~	3
Med	4	5	6
High	7	8	9

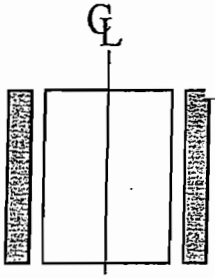
BLEEDING

None



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



SEVERITY	CONDITION
1	Good
4	Fair
7	~~Poor~~

Rebuild

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	~~Poor~~

W = 17'

Freemont
SH = 0'-2' Sandy Gravel

38.1
32.6

RSMS 2003 — Flexible Pavement Condition Survey

Street: Tennanah	Distance:	Name: PFM	
Section #: 14-3	Start: 3.7	Date: 7/4/09	
Start: 3.7 mi point	End: 4.2	Weather:	
End: CR 96	Length: .5	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X 1	2	3
Med		4	5	6
High		7	8	9

ALLIGATOR CRACKING

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		X 4	5	6
High		7	8	9

EDGE CRACKING

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X 1	2	3
Med		4	5	6
High		7	8	9

PATCHING / POTHOLES

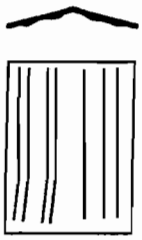
NO Defects

Do not include good patches

EXTENT

1 X Low
2 Medium
3 High

RUTTING



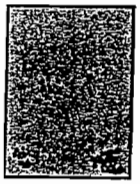
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

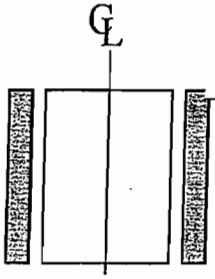
None



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



CONDITION

SEVERITY	
1 X	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1 X	Good
4	Fair
7	Poor

Patch a few places

Freemont

W = 16'

SH = 1'-2' Sandy Gravel

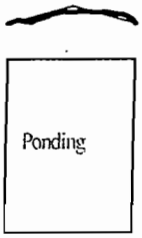
64.3
68.5
grav
Ends

RSMS 2003

Unpaved Condition Survey

Street: Warner Rd	Distance	Name: PFM	
Section #: 61-1	Start: 0.00	Date: 7/3/09	
Start: Peters Rd	End: 0.80	Weather:	
End: Start of Pavement	Length: 0.80	Temp (F°/C°):	

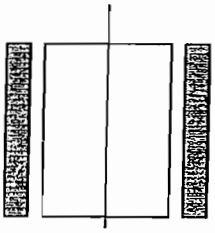
IMPROPER X-SECTION



CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

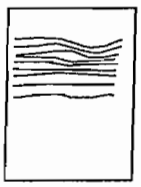
ROADSIDE DRAINAGE



CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

CORRUGATIONS

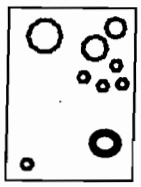


~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

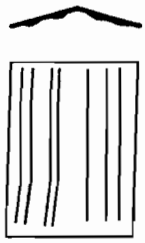


~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

RUTTING



~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

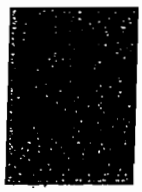
LOOSE AGGREGATE

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

DUST



CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

Red Sandy Earth Road.

W = 16

Freemont
SH = 2'-3' Sandy Gravel

70.2
69.3

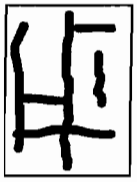
RSMS 2003

Flexible Pavement Condition Survey

Street: Warner Rd Distance: _____
Section #: 61-2 Start: 0.80
Start: End of Gravel End: 1.7
End: Fink Rd Length: .9

Name: PFM
Date: 7/3/09
Weather: _____
Temp (F°/C°): _____

LONGITUDINAL/ TRANSVERSE CRACKING



NO Defects ☒

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

NO Defects ☐

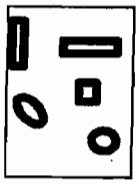
SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9 ☒

EDGE CRACKING

NO Defects ☐

SEVERITY	Low	Med	High
Low	1	2	3 ☒
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

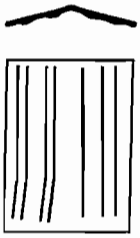


NO Defects ☐

Do not include good patches

1	Low
2	Medium
3	High ☒

RUTTING

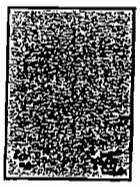


NO Defects ☐

SEVERITY	Low	Med	High
Low	1	2 ☒	3
Med	4	5	6
High	7	8	9

BLEEDING

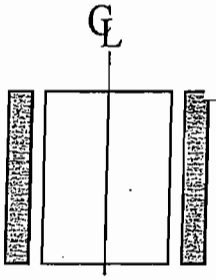
None



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



CONDITION

SEVERITY	
1	Good
4 ✓	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7 ☒	Poor

Rebuild/Maj Rehab

20.6 miles

W = 17' Freemont
SH = 2' Sandy Gravel

55.0
53.4

RSMS 2003 — Flexible Pavement Condition Survey

Street: W. Simmon Rd	Distance:	Name:	PFM
Section #: 55-1	Start: 0.00	Date:	7/3/09
Start: Newman Rd.	End: 1.6	Weather:	
End: County Rd 132	Length: 1.6	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

ALLIGATOR CRACKING

NO Defects

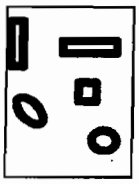
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	X
High	7	8	9

EDGE CRACKING

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

PATCHING / POTHOLES

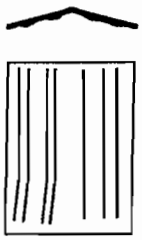


NO Defects

Do not include good patches

EXTENT	
1	Low
2	X Medium
3	High

RUTTING

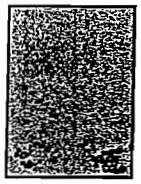


NO Defects

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

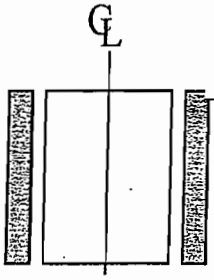
BLEEDING

None



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



SEVERITY	CONDITION
1	Good
4	X Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	X Fair
7	Poor

Maj Rehab. Lack of Rutting indicates Base is adequate. Bituminous pavement is worn out.

W = 15'

Freemont

SH = None

43.5
43.1

RSMS 2003

Flexible Pavement Condition Survey

Street: Wood Rd Distance:
Section #: 24-1 Start: 0.00
Start: County Rd 9 & 94 End: .4
End: Gravel section Length: .4

Name: PLM
Date: 7/31/09
Weather:
Temp (F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

NO Defects: X

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

NO Defects:

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	X

EDGE CRACKING

NO Defects:

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

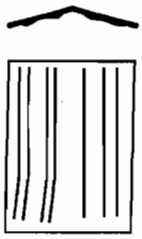
PATCHING / POTHOLES

NO Defects:

Do not include good patches

EXTENT	
1	X Low
2	Medium
3	High

RUTTING

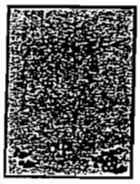


NO Defects:

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

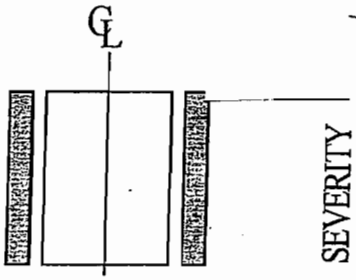
BLEEDING

None



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



SEVERITY	CONDITION
1	Good
4	X Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	X Fair
7	Poor

Maj Rehab of Pavement for Sure
Possibly Base Rebuild. FDR with New Surface
would likely be a reasonable option

W = 16' Freemont SH = 0'-2'

2
42.1
42.2
.9

RSMS 2003 — Unpaved Condition Survey

Street:	Wood Rd	Distance	
Section #:	34-2	Start:	.4
Start:	End of Pavement	End:	1.3
End:	Dead End	Length:	0.90

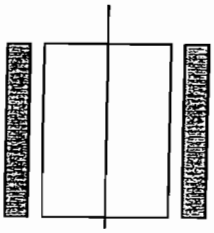
Name: PFM
Date: 7/3/09
Weather:
Temp (F°/C°):

IMPROPER X-SECTION

CONDITION

SEVERITY	
1	Good
4	X Fair
7	Poor

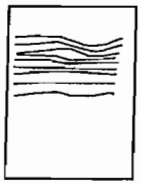
ROADSIDE DRAINAGE



CONDITION

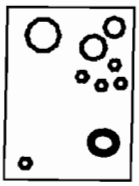
SEVERITY	
1	Good
4	X Fair
7	Poor

CORRUGATIONS



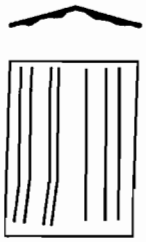
SEVERITY	NO Defects	EXTENT Low	Med	High
	X			
Low		1	2	3
Med		4	5	6
High		7	8	9

POTHOLES



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

RUTTING



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

LOOSE AGGREGATE

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

DUST

CONDITION

SEVERITY	
1	X Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	X Good
4	Fair
7	Poor

Sandy Red Earth

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Road Rating Field Data Sheets

Town of Highland

T. of Highland

209.1
207.9
1.2

207.9
209.1

Sh = 3'-4'

W = 19'

RSMS 2003

Flexible Pavement Condition Survey

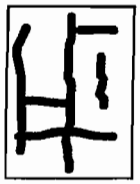
Street: Airport Rd	Distance:	Name: PFM	
Section #: 1-1	Start: 0.00	Date: 6/20/09	
Start: CR 33	End: 3.40	Weather: Rainy	
End: CR 33/21/22	Length: 3.40	Temp (F°/C°):	

21.1
209.7
2.3

82

LONGITUDINAL/ TRANSVERSE CRACKING

0



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-7

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING

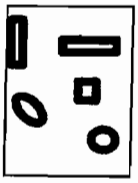
-6

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

-3



NO Defects

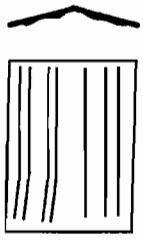
Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

9

RUTTING

-2

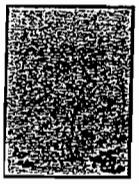


NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

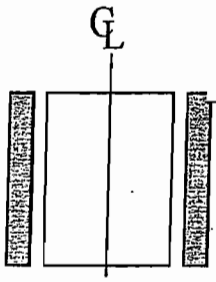
None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE

0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

Moderate Amout of Patching Needed Then Surface Treat.

First ≈0.1 mi Then ≈10' wide for Seasonal section

W = 14'-15' Sh = N/A

-35

RSMS 2003 — Unpaved Condition Survey

Street: Bower Rd Distance
Section #: 2-1 Start: ____
Start: Siege Rd End: ____
End: Dead End Length: ____

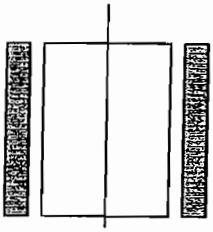
Name: PW
Date: 6/20/09
Weather: Rainy
Temp (F°/C°): ____

IMPROPER X-SECTION — -20

CONDITION

SEVERITY	
1	Good
4	Fair
7	~~Poor~~

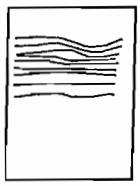
ROADSIDE DRAINAGE — -20



CONDITION

SEVERITY	
1	Good
4	Fair
7	~~Poor~~

CORRUGATIONS — 0

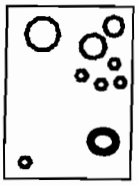


~~NO Defects~~

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES — -15

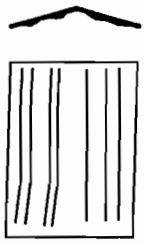


NO Defects

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	~~6~~
High	7	8	9

RUTTING — -50



NO Defects

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	~~9~~

LOOSE AGGREGATE — 0

~~NO Defects~~

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

17

DUST — 0

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

ROUGHNESS — -30

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	~~Poor~~

Road was not passable for Mini Van
At point where it became a 'Seasonal Road'

 Needs complete construction

58

216.00
214.80

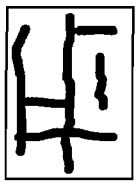
W=20' Sh = 2'-4' Gr Mostly ≈ 3' Sh

RSMS 2003

Flexible Pavement Condition Survey

Street: Clark Rd	Distance:	Name: PFM	
Section #: 27-1	Start: 0.00	Date: 6/20	
Start: CR 32	End: 1.20	Weather: Rainy	
End: Pavement End	Length: 1.20	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING — 0



NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -15

NO Defects ☐

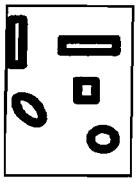
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9 ☒

EDGE CRACKING — -6

NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2	3 ☒
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES — -3

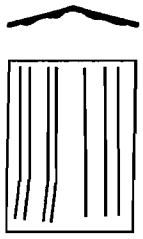


NO Defects ☐

Do not include good patches

EXTENT	
1	Low ☒
2	Medium
3	High

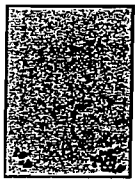
RUTTING — -4



NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2 ☒	3
Med	4	5	6
High	7	8	9

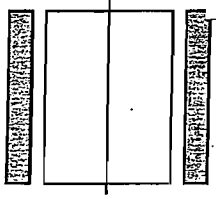
BLEEDING — -2



SEVERITY	CONDITION	
1	Good	☒
4	Fair	
7	Poor	

12

DRAINAGE — -5



SEVERITY	CONDITION	
1	Good	
4	Fair	☒
7	Poor	

ROUGHNESS — -7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	Good	
4	Fair	☒
7	Poor	

Recycle/Rebuild - Needs Base Reinforcement. Pavement is Shot.

90

W = 17'-18' Sh = 3'-4' 216.0

RSMS 2003 — Unpaved Condition Survey

Street: Clark Rd	Distance	Name: PFM	
Section #: 27-2	Start: 1.20	Date: 6/20	
Start: Pavement End	End: 1.40	Weather: Rainy	
End: Dead End Sign	Length: 0.20	Temp (F°/C°):	

IMPROPER X-SECTION

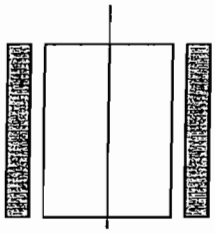
-5

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROADSIDE DRAINAGE

-5



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

CORRUGATIONS

0

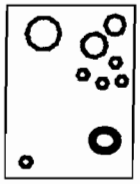
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

0



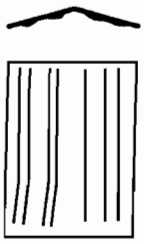
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

RUTTING

0



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

0

13

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

DUST

-0

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROUGHNESS

-0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

Very Good Gravel Rd.
Crushed Blue Stone

w = 11-12' Sh = 1'-2'

RSMS 2003 Unpaved Condition Survey

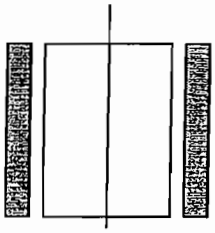
Street: Clark Rd	Distance	Name: DRM	217.2
Section #: 27-3	Start: 1.40	Date:	216.2
Start: 1.40 Dead End Sign	End: 2.40	Weather:	
End: Road closed	Length: 1.00	Temp (F°/C°):	-8

IMPROPER X-SECTION — -20

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor X

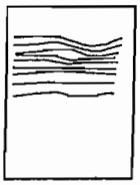
ROADSIDE DRAINAGE — -20



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor X

CORRUGATIONS — 0

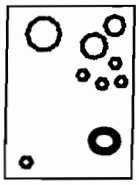


NO Defects X

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES — -6

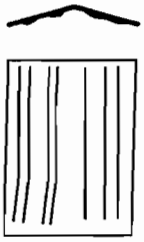


NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	X	3
Med	4	5	6
High	7	8	9

RUTTING — -30



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2'	3
Med	4	X	6
High	7	8	9

LOOSE AGGREGATE — -2

14

NO Defects X

EXTENT

SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

DUST — 0

CONDITION

SEVERITY	
1	Good X
4	Fair
7	Poor

ROUGHNESS — -30

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair X
7	Poor X

Red Earth Gravel to crushed Stone in places Needs Gravel and Construction of Crown + Ditches

217.2

W = 10'-12'

RSMS 2003

Unpaved Condition Survey

Street: Clark Rd
Section #: 27-4
Start: Road Closed Sign
End: Could Not Proceed

Distance
Start: 2.40
End: 2.50
Length: ?

Name: PFM
Date: 9/6/2009
Weather: Rainy
Temp (F°/C°):

-20

IMPROPER X-SECTION

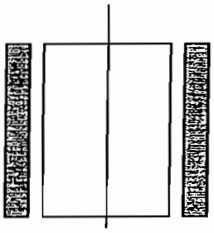
-20

CONDITION

SEVERITY	
1	Good
4	Fair
7	~~Poor~~

ROADSIDE DRAINAGE

-20



CONDITION

SEVERITY	
1	Good
4	Fair
7	~~Poor~~

CORRUGATIONS

0

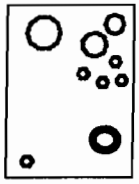
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

0



~~NO Defects~~

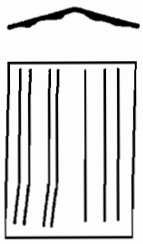
EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

15

RUTTING

-50



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	~~9~~

LOOSE AGGREGATE

0

~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

DUST

0

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

ROUGHNESS

-30

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	~~Poor~~

Road had deep Ruts, that appeared soft. Could not proceed. Road Impassable

206.3
205.2

1.1

Sh = 4' Gr

RSMS 2003 W = 19'

Flexible Pavement Condition Survey

Street: Crawford Rd	Distance:	Name:	
Section #: 10:1	Start: 0.0	Date:	
Start: Mail Rd	End: 1.1	Weather:	
End: House #84	Length: 1.1	Temp (F°/C°):	

100

LONGITUDINAL/ TRANSVERSE CRACKING

0

NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

0

NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING

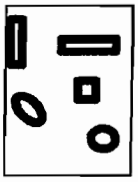
0

NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

0



NO Defects ☒

Do not include good patches

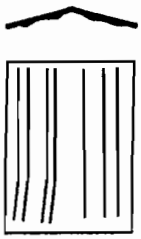
EXTENT

1	Low
2	Medium
3	High

7

RUTTING

0

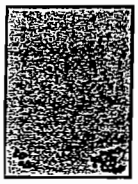


NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

None 0

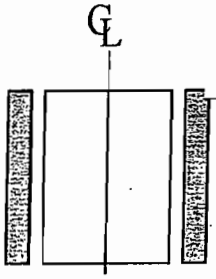


CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE

0



CONDITION

SEVERITY	
1	Good
4	Fair ☒
7	Poor

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good ☒
4	Fair
7	Poor

66

207.6
206.3
1.3

w = 19' Sh = 3'-4' Gr

RSMS 2003

Flexible Pavement Condition Survey

Street: Crawford	Distance:	Name: PFM	
Section #: 10-2	Start: 1.10	Date: 6/20	
Start: House #84	End: 2.40	Weather: Rainy	
End: CR 33	Length: 1.30	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING — 0

NO Defects: ~~X~~

SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -7

NO Defects:

SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	X	6
High	7	8	9

EDGE CRACKING — -4

NO Defects:

SEVERITY	EXTENT: Low	Med	High
Low	1	X	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES — -5

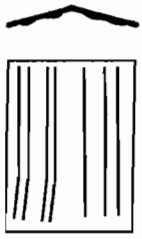
NO Defects:

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

8

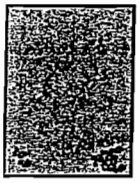
RUTTING — -6



NO Defects:

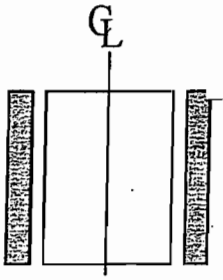
SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

BLEEDING — None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE — -5



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

ROUGHNESS — -7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

Needs more spot paving. Should have been recycled. Spot paving life is not good. Done too thin for the underlying AC.

w=22' sh= 3'-4'

83

RSMS 2003 — Flexible Pavement Condition Survey

Street: Devlin Rd	Distance:	Name: DAM	231.5
Section #: 20-1	Start: 0.00	Date:	230.5
Start: CR 47	End: 1.00	Weather:	
End: CR 32	Length: 1.0	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING — 0

NO Defects: X

SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -7

NO Defects:

SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	X	6
High	7	8	9

EDGE CRACKING — -2

NO Defects:

SEVERITY	EXTENT: Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES — -3

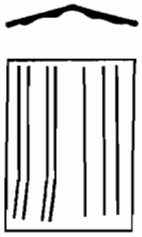
NO Defects:

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

21

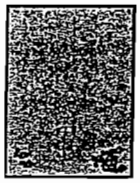
RUTTING — 0



NO Defects:

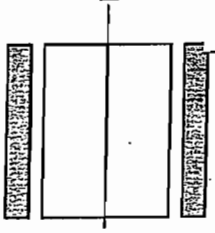
SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING — None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE — -5



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

ROUGHNESS — 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

C.5 Surface over AC

Patch and Surf Treat

(48)

W = 17-18' Sh = 3'6"

RSMS 2003 Koinonia Lake — Flexible Pavement Condition Survey

Street: Mud Pond Rd	Distance:	Name: PFM	227.7
Section #: 21-1	Start: 0.00	Date: 6/2009	227.1
Start: Lake View Dr	End: 0.60	Weather: Rainy	
End: End of Pavement Koinonia Camp Entrance	Length: 0.60	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING — 0

NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -15

NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9 ☒

EDGE CRACKING — -6

NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2	3 ☒
Med	4	5	6
High	7	8	9

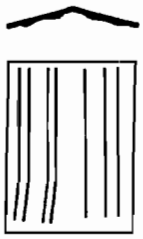
PATCHING / POTHOLES — -9

NO Defects ☐

Do not include good patches

EXTENT	
1	Low
2	Medium
3 ☒	High

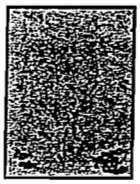
RUTTING — -6



NO Defects ☐

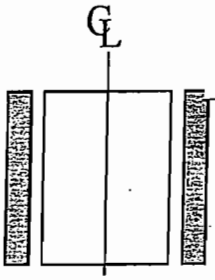
SEVERITY	EXTENT Low	Med	High
Low	1	2	3 ☒
Med	4	5	6
High	7	8	9

BLEEDING — None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE — -5



SEVERITY	CONDITION
1	Good
4 ☒	Fair
7	Poor

ROUGHNESS — -11

Check road for presence of the following:
- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7 ☒	Poor

19

Rebuild

Road Continues, as a Narrow 10-12' earth Road with Ruts and Grass between

228.5
227.7
225.8

RSMS 2003 Koinonia Lake W=15'-16' Unpaved Condition Survey

Street: + Mud Pond Rd	Distance	Name:	PFM
Section #: 21-2	Start: 0.60	Date:	6/20
Start: Koinania Camp	End: 1.40	Weather:	
End: Road Narrows	Length: 0.8	Temp (F°/C°):	

46

IMPROPER X-SECTION

-15

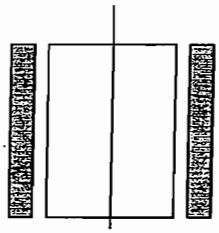
Ponding

CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

ROADSIDE DRAINAGE

-15

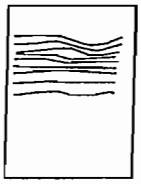


CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

CORRUGATIONS

0



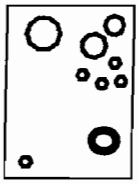
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

-2



NO Defects

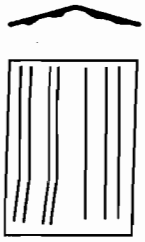
EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

20

RUTTING

-20



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	~~2~~	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

-2

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

DUST

0

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

Needs added Gravel to build a good crown. Needs Ditching improvement

AGG sh = 3'

w = 19' Sh = 1'-3' Gr

RSMS 2003

Flexible Pavement Condition Survey

Street: Lake View Dr Distance: ____

Section #: 17-1 Start: 0.00

Start: Bower Rd End: 2.10

End: CR 47 Length: 2.10

Name: PFM

Date: 6/20/09

Weather: Rainy

Temp (F°/C°): ____

226.7
224.6
2.1
84

LONGITUDINAL/ TRANSVERSE CRACKING

-2

NO Defects

EXTENT: Low Med High

SEVERITY: Low [1] 2 3; Med 4 5 6; High 7 8 9

ALLIGATOR CRACKING

-5

NO Defects

EXTENT: Low Med High

SEVERITY: Low 1 2 3; Med [4] 5 6; High 7 8 9

EDGE CRACKING

-2

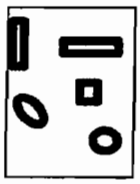
NO Defects

EXTENT: Low Med High

SEVERITY: Low [1] 2 3; Med 4 5 6; High 7 8 9

PATCHING / POTHOLES

0



NO Defects

EXTENT

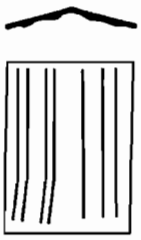
Do not include good patches

1 Low
2 Medium
3 High

18

RUTTING

0



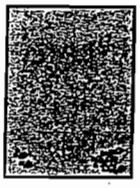
NO Defects

EXTENT: Low Med High

SEVERITY: Low 1 2 3; Med 4 5 6; High 7 8 9

BLEEDING

-2

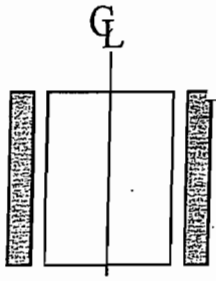


CONDITION

SEVERITY: 1 Good; 4 Fair; 7 Poor

DRAINAGE

-5



CONDITION

SEVERITY: 1 Good; 4 Fair; 7 Poor

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY: 1 Good; 4 Fair; 7 Poor

Patch a few Places. Spot Pave near Bower Road

T. of Highland (55)

198.5
197.3
1.2

w=18' Avg 2'-3'
Sh 0-4'

RSMS 2003 Flexible Pavement Condition Survey

Street: Mail Rd	Distance:	Name: PRM	
Section #: 22-1	Start: 0.00	Date: 6/20/09	
Start: CR 21	End: 1.20	Weather: Rainy	
End: Crawford RD	Length: 1.20	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING — 6

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

ALLIGATOR CRACKING — 7

NO Defects

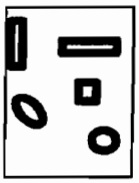
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	X	6
High	7	8	9

EDGE CRACKING — 11

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	X

PATCHING / POTHOLES — 3



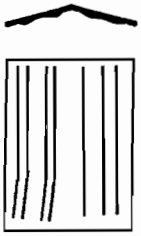
NO Defects

Do not include good patches

EXTENT	
1	Low X
2	Medium
3	High

4

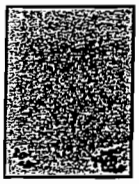
RUTTING — 6



NO Defects

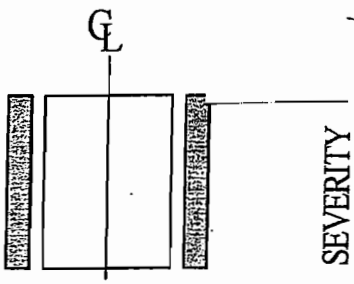
SEVERITY	EXTENT Low	Med	High
Low	1	2	X
Med	4	5	6
High	7	8	9

BLEEDING — None 0



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE — 5



SEVERITY	CONDITION	
1	Good	
4	Fair	X
7	Poor	

ROUGHNESS — 7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	Good	
4	Fair	X
7	Poor	

Cold Recycle. Maybe FDR if inadequate Base as indicated by curb drop off/Rutting

61

201.2
200.1
1-1

198.5

201.8
201.2

Sh Add 2'-3'

RSMS 2003 W=19' Sh=0-4' Flexible Pavement Condition Survey

Mail

Street: ~~Crawford Rd~~	Distance:	Name: PFM	
Section #: 22-3-2	Start: 0.00	Date: 6/20/09	
Start: Mail Rd	End: 0.60	Weather: Rainy	
End: ~~House #10~~	Length: 0.60	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING — 0

NO Defects: X

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -7

NO Defects:

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	X	6
High	7	8	9

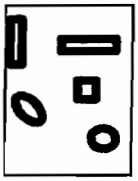
EDGE CRACKING — -11

NO Defects:

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	X

PATCHING / POTHOLES — -3



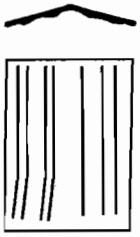
NO Defects:

EXTENT

Do not include good patches

1	Low X
2	Medium
3	High

RUTTING — -6

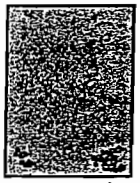


NO Defects:

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

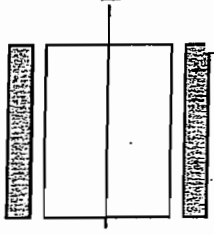
BLEEDING — None 0 — 5



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE — -5



CONDITION

SEVERITY	
1	Good
4	Fair X
7	Poor

ROUGHNESS — -7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair X
7	Poor

Recycle FDR or CIR. Base looks marginal quality. Has a Thin HMA OL on pre-existing pavement. Looks Like Extensive Edge Cracking

(60)

W = 20' AVG Sh: 2-3' Gr
Range 0-4'

RSMS 2003 Flexible Pavement Condition Survey

Mail Street: ~~Crawford~~ Rd	Distance:	Name: PFM
Section #: 22-3	Start: 0.6	Date: 6/20/09
Start: House #101	End: 1.7	Weather:
End: CR 23/NY597	Length: 1.1	Temp (F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING

0

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-7

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	~~5~~	6
High	7	8	9

EDGE CRACKING

-7

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	~~6~~
High	7	8	9

PATCHING / POTHOLES

-3

NO Defects

Do not include good patches

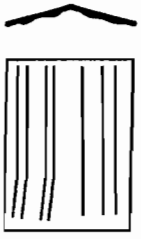
EXTENT

1	~~Low~~
2	Medium
3	High

6

RUTTING

OWP Drop off -6

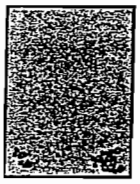


NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

BLEEDING

-5

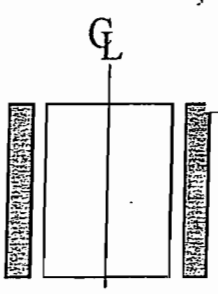


CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

DRAINAGE

-5



CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

ROUGHNESS

-7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

Looks like a cold mix with partially stripped C.S. Needs base reinforcement!

Probably FDR candidate.. OWP drop off

(58) 209.2 209.6

RSMS 2003 w=12' Sh=1-2' Gr Flexible Pavement Condition Survey

Street: Mascal Four Rd	Distance:	Name: PRW	
Section #: 32-1	Start :	Date:	
Start: 0.00	End :	Weather:	
End: 0.10	Length:	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING — 0

NO Defects: X

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -15

NO Defects:

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9X

EDGE CRACKING — 0

NO Defects: X

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

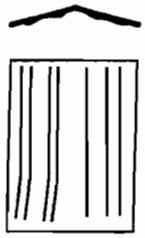
PATCHING / POTHOLES — -3

NO Defects:

Do not include good patches

EXTENT	
1	Low X
2	Medium
3	High

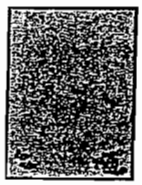
RUTTING — -4



NO Defects:

SEVERITY	Low	Med	High
Low	1	X 2	3
Med	4	5	6
High	7	8	9

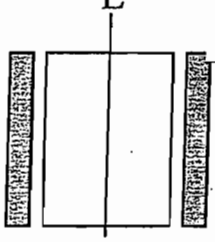
BLEEDING — none 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

10

DRAINAGE — -0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor X

ROUGHNESS — -11

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor X

Needs to be recycled or reverted to gravel

(34)

w = 12' Sh = 1'-2'

RSMS 2003 — Unpaved Condition Survey

Street: Marcel Four Rd	Distance	Name: PFM	
Section #: 32-2	Start: 0.10	Date:	
Start: ≈0.10 End of Pavement	End: 0.40	Weather:	
End: ≈0.40 Last House Log Cabin	Length: 0.3	Temp (F°/C°):	

IMPROPER X-SECTION

-20

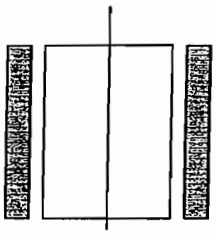
Ponding

CONDITION

SEVERITY	
1	Good
4	Fair
7	~~Poor~~

ROADSIDE DRAINAGE

-20



CONDITION

SEVERITY	
1	Good
4	Fair
7	~~Poor~~

CORRUGATIONS

0

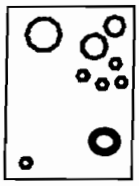
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

-6



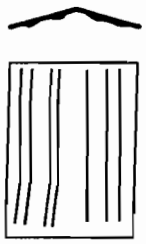
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

RUTTING

-5



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

0

~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

11

DUST

0

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

-15

CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

Needs Gravel Layer and Shape a Cross Section with Crown.

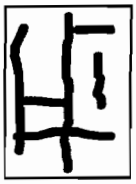
100

197.0
196.4

RSMS 2003 W=18' Sh=0-3' Gr Flexible Pavement Condition Survey

Street: Schumacher Rd	Distance:	Name:
Section #: 29-1	Start: 0.00	Date:
Start: Woods Rd	End: 0.60	Weather:
End: NYSEG Pole 124T	Length: 0.60	Temp (F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING 0



NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING 0

NO Defects ☒

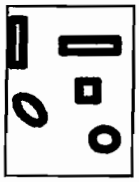
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING 0

NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES 0



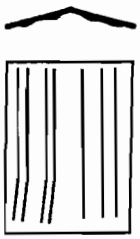
NO Defects ☒

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

2

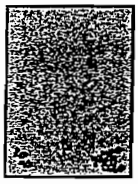
RUTTING 0



NO Defects ☒

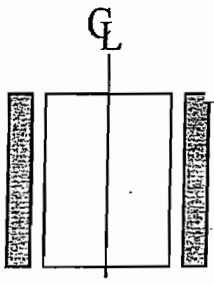
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING None 0



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE, 0



SEVERITY	CONDITION	
1	Good	☒
4	Fair	
7	Poor	

ROUGHNESS 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	Good	☒
4	Fair	
7	Poor	

Excellent condition Cold Mix. Do Nothing

]

T. of Highland 60

197.3
197.0

RSMS 2003 W=18' Sh=0'-3' Flexible Pavement Condition Survey

Street: Schumacher Rd Distance:	Name: RFW
Section #: 29-2 Start: 0.60	Date:
Start: NYSEG Pole 1247 End: 0.90	Weather:
End: CR 21 Length: 0.30	Temp (F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING — 4

NO Defects

SEVERITY	EXTENT: Low	Med	High
Low	1	X 2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — 9

NO Defects

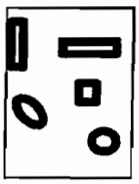
SEVERITY	EXTENT: Low	Med	High
Low	1	2	3
Med	4	5	X 6
High	7	8	9

EDGE CRACKING — 2

NO Defects

SEVERITY	EXTENT: Low	Med	High
Low	X 1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES — 3

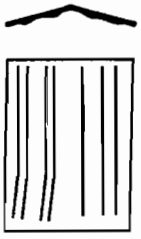


NO Defects

Do not include good patches

EXTENT	
1	X Low
2	Medium
3	High

RUTTING — 2

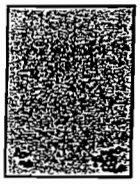


NO Defects

SEVERITY	EXTENT: Low	Med	High
Low	X 1	2	3
Med	4	5	6
High	7	8	9

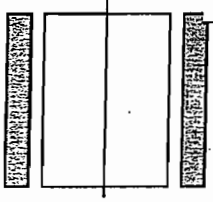
BLEEDING — None 0

3



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE, — 5



CONDITION

SEVERITY		
1	Good	
4	Fair	X
7	Poor	

ROUGHNESS — 7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY		
1	Good	
4	Fair	X
7	Poor	

Patch and Surface Treat
or Patch and ~~thermo~~ Overlay (2"-3" Cold Mix)

(73) 223.3 / 1.1

w=20.5 Sh=2'-3' Cor 221.0

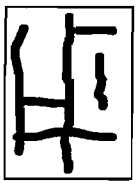
220.5

RSMS 2003 Flexible Pavement Condition Survey

Street: Stege Rd	Distance:	Name: PFM	
Section #: 33-1	Start: 0.00	Date: 6/20/09	
Start: CR 12	End: 1.70	Weather: Rainy	
End: Bower Rd	Length: 1.70	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING

-6



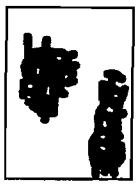
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

ALLIGATOR CRACKING

-7



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	~~5~~	6
High	7	8	9

223.3 / 220.5

2.8 / 1.1 / 1.7

EDGE CRACKING

-4

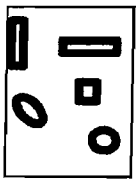
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	~~2~~	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

-3



NO Defects

EXTENT

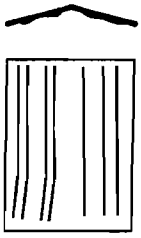
Do not include good patches

1	~~Low~~
2	Medium
3	High

16

RUTTING

-2



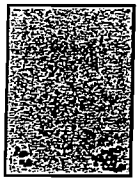
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

BLEEDING

None 0

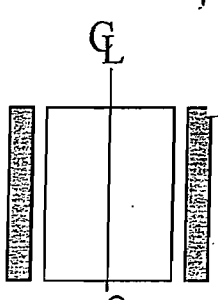


CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE

-5



CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	~~Poor~~

ROUGHNESS

-0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

Patch and Surface Treat.

T. of Highland

61

195.2
192.1
3.1

RSMS 2003 W = 19'6" S = 2'-4' Gr Flexible Pavement Condition Survey

Street: Woods Rd	Distance:	Name: PFM	
Section #: 28-1	Start: 0.00	Date: 6/20/09	
Start: Jork Lake Rd	End: 3.10	Weather: rain	
End: CR 22	Length: 3.1	Temp (F°/C°):	

PM.1

LONGITUDINAL/ TRANSVERSE CRACKING — 0

NO Defects: X

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -9

NO Defects:

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	X
High	7	8	9

EDGE CRACKING — -6

NO Defects:

SEVERITY	Low	Med	High
Low	1	2	X
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES — -9

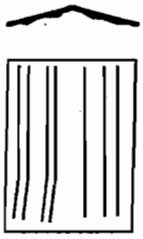
NO Defects:

Do not include good patches

EXTENT	
1	Low
2	Medium
3	X High

1

RUTTING — -4



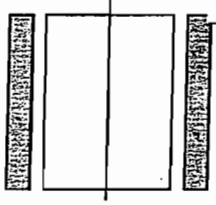
NO Defects:

SEVERITY	Low	Med	High
Low	1	X	3
Med	4	5	6
High	7	8	9

BLEEDING — None 0

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE — 0



SEVERITY	
1 X	Good
4	Fair
7	Poor

ROUGHNESS — -11

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	
1	Good
4	Fair
7 X	Poor

Cold Recycle in Place

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Road Rating Field Data Sheets

Town of Lumberland

LUMBERLAND

(63)

276.3
275.1
1.2

RSMS 2003 W=15' Sh=2'-3' Gr

Unpaved Condition Survey

Street: Chapin Rd
Section #: 25-1
Start: CR 43
End: Lebanon Rd

Distance
Start: 0.00
End: 1.20
Length: 1.20

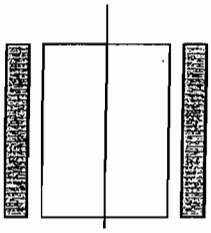
Name: PFM
Date: 6/20/09
Weather: Rainy
Temp (F°/C°):

IMPROPER X-SECTION -15

CONDITION / SEVERITY

1 Good	
4 Fair	X
7 Poor	

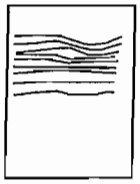
ROADSIDE DRAINAGE -15



CONDITION / SEVERITY

1 Good	
4 Fair	X
7 Poor	

CORRUGATIONS 0

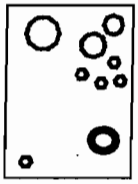


NO Defects: X

EXTENT / SEVERITY

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES -2



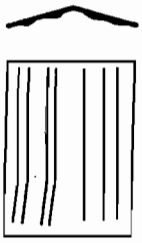
NO Defects:

EXTENT / SEVERITY

SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

1

RUTTING -5



NO Defects:

EXTENT / SEVERITY

SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE 0

NO Defects: X

EXTENT / SEVERITY

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

DUST -0

CONDITION / SEVERITY

1 Good	X
4 Fair	
7 Poor	

ROUGHNESS 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION / SEVERITY

1 Good	X
4 Fair	
7 Poor	

Sandy Red Brown Gravel Road. Some Spot Gravels & Crushed Blue Stone

Needs enough additional gravel to build a better crown. Needs some pothole patching.

LUMBERLAND (69) 300.4

W=21' Sh=2'-3' Gravel

RSMS 2003 — Flexible Pavement Condition Survey

Street: Hollow Rd Distance:
Section #: 14-1 Start: 0.00
Start: CR 32 End: 2.40
End: Bridge Length: 2.40

Name:
Date:
Weather:
Temp (F°/C°):

299.1
296.0

LONGITUDINAL/ TRANSVERSE CRACKING — 0

NO Defects: X

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -15

NO Defects:

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	X

3.4

300.4
299.4

EDGE CRACKING — -6

NO Defects:

SEVERITY	Low	Med	High
Low	1	2	X
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES — -3

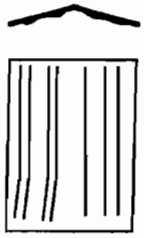
NO Defects:

Do not include good patches

1	Low
2	Medium
3	High

10

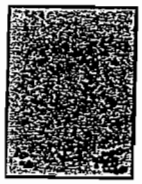
RUTTING — -2



NO Defects:

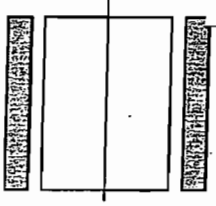
SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

BLEEDING — None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE, ℄ — -5



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

ROUGHNESS — 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

How old is surface?

Recycle Asphalt Pavement (CIPR) assuming Good base

No rutting - seems base is OK for traffic.

How long did the 1" HMA Last?

LUMBERLAND

(84)

RSMS 2003 — Flexible Pavement Condition Survey

Street: Hollow Rd | Distance:
Section #: 14-2 | Start: 2.4
Start: Bridge | End: 3.4
End: N45 97 | Length: 1.0

Name: PFM
Date: 6/2/09
Weather: Overcast
Temp (F°/C°):

LONGITUDINAL/ TRANSVERSE CRACKING -6

NO Defects

SEVERITY	Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

ALLIGATOR CRACKING -4

NO Defects

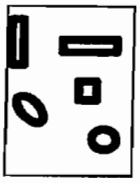
SEVERITY	Low	Med	High
Low	1	X	3
Med	4	5	6
High	7	8	9

EDGE CRACKING -6

NO Defects

SEVERITY	Low	Med	High
Low	1	2	X
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES 0

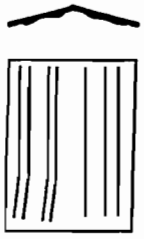


NO Defects

Do not include good patches

1	Low
2	Medium
3	High

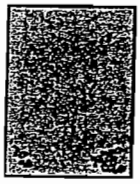
RUTTING 0



NO Defects

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

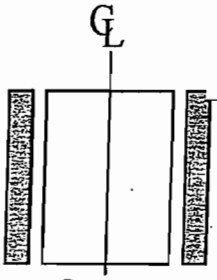
BLEEDING None 0



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE 0



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROUGHNESS 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

Patch, Crack Seal, Surface Treat (H/A or Slurry)

LUMBERLAND (52) 16.8

W=20' Sb = 2'-3' Sandy Gravel

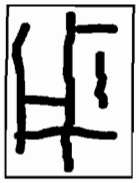
RSMS 2003 Flexible Pavement Condition Survey

290.6
288.0

Street: Kelly Weber Rd Distance: ____
Section #: 12-1 Start: 0.00
Start: Smith Rd End: 2.60
End: CR 31 Length: 2.60

Name: PFM
Date: 6/21/09
Weather: Sunny
Temp (F°/C°): ____

LONGITUDINAL/ TRANSVERSE CRACKING — 0



NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING — -15

NO Defects ☐

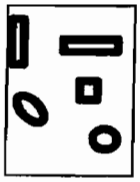
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9 ☒

EDGE CRACKING — -6

NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2	3 ☒
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES — -3



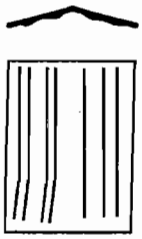
NO Defects ☐

Do not include good patches

EXTENT	
1	Low ☒
2	Medium
3	High

6

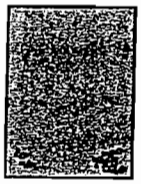
RUTTING — -13



NO Defects ☐

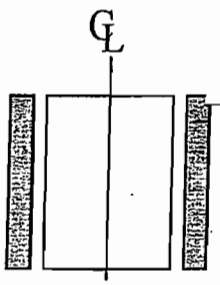
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9 ☒

BLEEDING — None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE — 0



SEVERITY	CONDITION
1	Good ☒
4	Fair
7	Poor

ROUGHNESS — -11

Check road for presence of the following:
- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor ☒

Maybe a Hot mix surface or maybe #A.C.S.
Good Example of Damage extensive trucking could do to these AC paved Town Roads!
This road needs significant Base improvement!

LUMBERLAND (2)
Seasonal Limited Use
W = 10' Sh = 1'-3' Earth AVG = 1'

RSMS 2003 — Unpaved Condition Survey

279.5
276.3
3.2

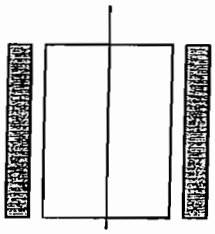
Street: Lebanon Rd. Distance	Name: PFM
Section #: 18-1 Start: 0.00	Date: 6/21/09
Start: Chapin Rd End: 3.20	Weather: Overcast
End: Leers Rd Length: 3.20	Temp (F°/C°):

IMPROPER X-SECTION — -20

CONDITION

SEVERITY	
1	Good
4	Fair
7	X Poor

ROADSIDE DRAINAGE — -15



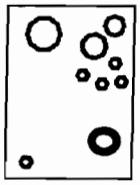
CONDITION

SEVERITY	
1	Good
4	X Fair
7	Poor

CORRUGATIONS — -10

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	X
Med		4	5	6
High		7	8	9

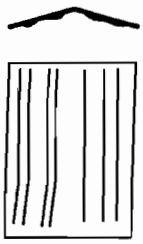
POTHOLES — -6



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		X	5	6
High		7	8	9

2

RUTTING — -30



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	X	6
High		7	8	9

LOOSE AGGREGATE — -2

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		X	2	3
Med		4	5	6
High		7	8	9

DUST — -0

CONDITION

SEVERITY	
1	X Good
4	Fair
7	Poor

ROUGHNESS — -15

Check road for presence of the following:
- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	X Fair
7	Poor

Needs More Gravel and Crown.
A number of bad drainage spots, deep rutt spots need attention

87

W=19' Sh = 2'-4' Gr/Sand

RSMS 2003 — Flexible Pavement Condition Survey

Street: Leers Rd	Distance:	Name: PFW	
Section #: 21-1	Start: 0.00	Date: 6/21/09	
Start: Lebanon Rd	End: 1.40	Weather: Part Sun	
End: Mohican Lake Rd	Length: 1.40	Temp (F°/C°):	

~~279.5~~ 281.3 279.9 1.4

LONGITUDINAL/ TRANSVERSE CRACKING

0

~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-6

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	~~3~~
Med	4	5	6
High	7	8	9

EDGE CRACKING

-4

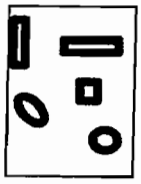
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	~~2~~	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

-3



NO Defects

EXTENT

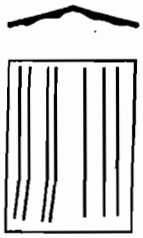
Do not include good patches

1	~~Low~~
2	Medium
3	High

3

RUTTING

0



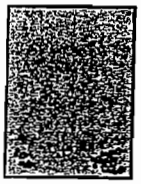
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

None 0

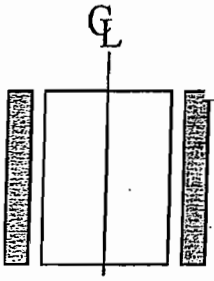


CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE

0



CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

Excellent Chip Seal Candidate. Same minor Patch Prep needed prior to C.S.

LUMBERLAND

46

W = 12'-13' Shr = 1' Gr

RSMS 2003

Unpaved Condition Survey

Street: Mapes Rd	Distance	Name: PFM	
Section #: ~~[illegible]~~ 19.1	Start: 0.00	Date: 6/2/09	
Start: Van Tuyl Rd	End: 2.50	Weather: Overcast	311.0
End: Haring Rd	Length: 2.50	Temp (F°/C°):	308.5
			2.5

IMPROPER X-SECTION

-15

Ponding

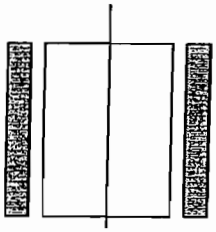
CONDITION

SEVERITY

1	Good
4	~~Fair~~
7	Poor

ROADSIDE DRAINAGE

-15



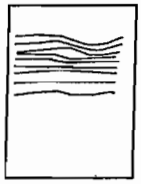
CONDITION

SEVERITY

1	Good
4	~~Fair~~
7	Poor

CORRUGATIONS

0



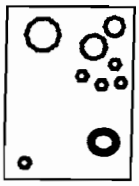
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

-2



NO Defects

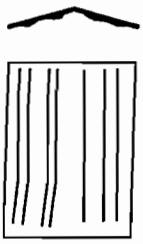
EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

13

RUTTING

-5



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

-2

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

DUST

0

CONDITION

SEVERITY

1	~~Good~~
4	Fair
7	Poor

ROUGHNESS

-15

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY

1	Good
4	~~Fair~~
7	Poor

Sandy Red Earth w some Crushed Blue Stone spot Gravel. Needs Crown + Better Ditches.

LUMBERLAND

Fully Striped Hot Mix pavement

W = 19'8" Sh = 3'-4' Gr

87

RSMS 2003 — Flexible Pavement Condition Survey

Street: Mohican Lake Rd	Distance:	Name: DFM	
Section #: 22-1	Start: 0.00	Date: 6/21/09	
Start: Town Line	End: 2.90	Weather: Overcast	
End:	Length: 2.90	Temp (F°/C°):	

5

298.11

283.2

2.9

LONGITUDINAL/ TRANSVERSE CRACKING

-6

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	X	5	6
High	7	8	9

ALLIGATOR CRACKING

-7

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	X	6
High	7	8	9

EDGE CRACKING

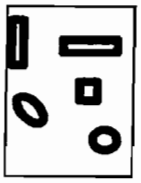
0

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

0



NO Defects

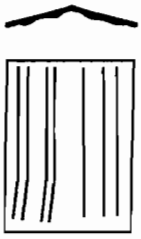
Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

4

RUTTING

0

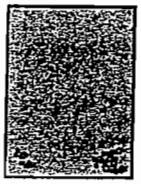


NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

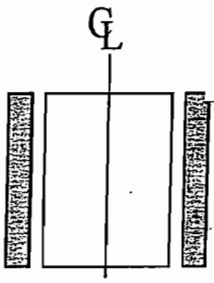
BLEEDING

None 0



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE



0

CONDITION

SEVERITY	CONDITION	
1	~~Good~~	
4	Fair	
7	Poor	

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY	CONDITION	
1	~~Good~~	
4	Fair	
7	Poor	

Patch and Type III Slurry Seal.

LUMBERLAND

94

W=18' Sh = 3' Sandy Gravel

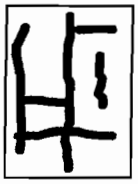
RSMS 2003

Flexible Pavement Condition Survey

Street: Smith Rd	Distance:	Name: PFM	288.0
Section #: 38-1	Start: 0.00	Date: 6/21/09	287.4
Start: CR 42	End: 0.60	Weather: Overcast	
End: Ogden Rd	Length: 0.60	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING

-2



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-4

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	~~2~~	3
Med	4	5	6
High	7	8	9

EDGE CRACKING

0

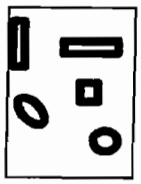
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

0



~~NO Defects~~

EXTENT

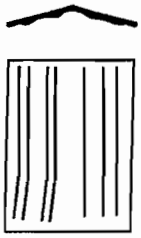
Do not include good patches

1	Low
2	Medium
3	High

5

RUTTING

0



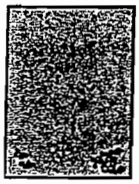
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

None 0

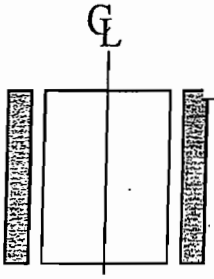


CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE

0



CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

C.S. over C.M.

Excellent Chip Seal Candidate #1A or #1ST (Probably 1A is best due to residences)

LUMBERLAND

W=17' sh=0'-3' Gr 90

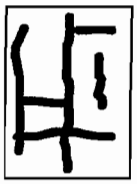
RSMS 2003 Flexible Pavement Condition Survey

Street: Van Tuyl Rd Distance: _____
Section #: 33-1 Start: 0.00
Start: NYS 97 End: 2.30
End: Schwab Rd Length: 2.30

Name: PFM
Date: 6/21/09
Weather: Overcast
Temp (F°/C°): _____

Sc, 6
307.2
304.9
2.3

LONGITUDINAL/ TRANSVERSE CRACKING -6



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		X	5	6
High		7	8	9

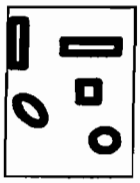
ALLIGATOR CRACKING -2

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		X	2	3
Med		4	5	6
High		7	8	9

EDGE CRACKING -2

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		X	2	3
Med		4	5	6
High		7	8	9

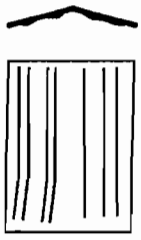
PATCHING / POTHOLES 0



NO Defects	EXTENT
X	1 Low
	2 Medium
	3 High

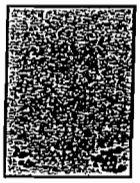
Do not include good patches

RUTTING 0



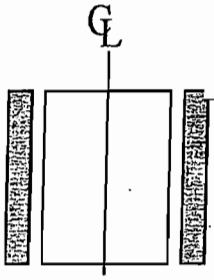
SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low	X	1	2	3
Med		4	5	6
High		7	8	9

BLEEDING None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE, 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

ROUGHNESS 0

Check road for presence of the following:
- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

12

Spray Patch, Crack Fill a little

LUMBERLAND (93)

W=20' Sh = 2'-3' Sandy Gravel

RSMS 2003 Flexible Pavement Condition Survey

Street: White Rd	Distance:	Name:	291.9
Section #: 35-1	Start: 0.00	Date:	291.0
Start: CR 31	End: 0.90	Weather:	
End: Decker Rd	Length: 0.90	Temp (F°/C°):	

LONGITUDINAL/ TRANSVERSE CRACKING 0

NO Defects: X

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING -2

NO Defects:

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING 0

NO Defects: X

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

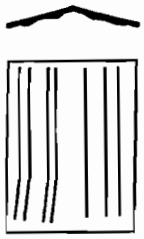
PATCHING / POTHOLES 0

NO Defects: X

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

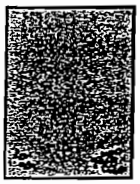
RUTTING 0



NO Defects: X

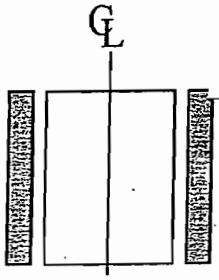
SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING None 0



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE -5



SEVERITY	CONDITION	
1	Good	
4	Fair	X
7	Poor	

ROUGHNESS 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION	
1	Good	X
4	Fair	
7	Poor	

No Maintenance Needed on Pavement
Some Roadside Drainage issues

LUMBERLAND

W = 20' Sh = 2'-3' Gr.

(91)

RSMS 2003

Flexible Pavement Condition Survey

Street: White Rd Distance: ____
Section #: 35-2 Start: 0.90
Start: Decker Rd End: 2.50
End: CR 41 Length: 1.60

Name: DPM
Date: 6/1/09
Weather: Overcast
Temp (F°/C°): ____

293.5
291.9

LONGITUDINAL/ TRANSVERSE CRACKING

0

NO Defects ☒

EXTENT: Low Med High

SEVERITY: Low / Med / High

1	2	3
4	5	6
7	8	9

ALLIGATOR CRACKING

-4

NO Defects ☐

EXTENT: Low Med High

SEVERITY: Low / Med / High

1	X	3
4	5	6
7	8	9

EDGE CRACKING

-2

NO Defects ☐

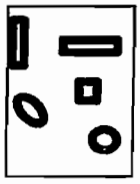
EXTENT: Low Med High

SEVERITY: Low / Med / High

X	2	3
4	5	6
7	8	9

PATCHING / POTHOLES

-3



NO Defects ☐

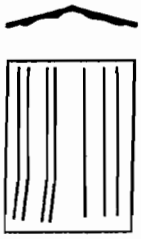
EXTENT

1 Low ☒
2 Medium
3 High

Do not include good patches

RUTTING

0



NO Defects ☒

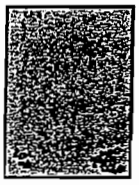
EXTENT: Low Med High

SEVERITY: Low / Med / High

1	2	3
4	5	6
7	8	9

BLEEDING

None 0



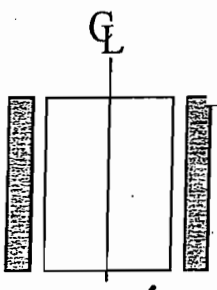
CONDITION

SEVERITY

1 Good
4 Fair
7 Poor

DRAINAGE

0



CONDITION

SEVERITY

1 Good ☒
4 Fair
7 Poor

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY

1 Good ☒
4 Fair
7 Poor

Excellent Patch and Chip Seal Candidate

9

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Road Rating Field Data Sheets

Town of Tusten

W-18

RSMS	Flexible Pavement Condition Survey	
Street: Blind pond Rd	Distance:	Name: PFM
Section#: 29-1	Start: 0.0	Date: 6/14
Start: 22	End: 1.0	Weather: sunny
End: Dexheimer Rd	Length: 1.0	Temp(F°/C°):

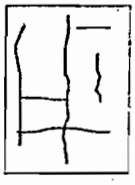
tusten

sht 3

66

LONGITUDINAL/ TRANSVERSE CRACKING

0

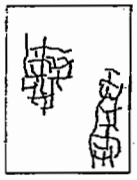


~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-9



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	~~6~~
High	7	8	9

EDGE CRACKING

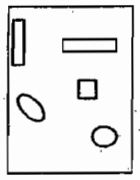
-6

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	~~3~~
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES

-3



NO Defects

Do not include good patches

EXTENT	
1 ~~Low~~	
2 Medium	
3 High	

RUTTING

-4

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	~~2~~	3
Med	4	5	6
High	7	8	9

BLEEDING

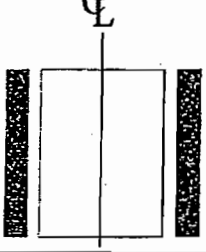
none

-0

CONDITION	
1 ~~Good~~	
4 Fair	
7 Poor	

DRAINAGE

-5



SEVERITY	CONDITION
1 Good	
4 ~~Fair~~	
7 Poor	

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

-7

SEVERITY	CONDITION
1 Good	
4 ~~Fair~~	
7 Poor	

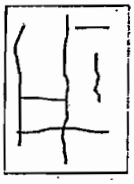
recycle

RSMS	Flexible Pavement Condition Survey	
Street: Blind Pond Rd	Distance:	Name: PFM
Section#: 29-2	Start: 1.0	Date: 6/14
Start: Dexheimer Rd	End: 1.3	Weather: Sunny
End: 1.3 Mi. Pt.	Length: .3	Temp(F°/C°):

(100)

LONGITUDINAL/ TRANSVERSE CRACKING

0

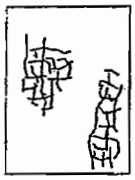


~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

0



~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

Sh=0'-2'

EDGE CRACKING

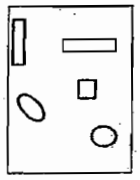
0

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

0



~~NO Defects~~

Do not include good patches

	EXTENT
1	Low
2	Medium
3	High

RUTTING

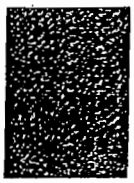
0

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

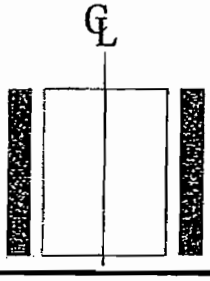
0 None



SEVERITY	CONDITION	
1	~~Good~~	
4	Fair	
7	Poor	

DRAINAGE

0



SEVERITY	CONDITION	
1	~~Good~~	
4	Fair	
7	Poor	

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

SEVERITY	CONDITION	
1	~~Good~~	
4	Fair	
7	Poor	

CM Fresh pavement

tusten

1

RSMS 2003 W=10'-15' Unpaved Condition Survey

Street:	Blind Pond Rd	Distance		Name:	PFM
Section #:	29-3	Start :	1.3	Date:	6/14
Start:	1.3 mi. pt.	End :	1.9	Weather:	sunny
End:	1.9 mi pt.	Length:	0.6	Temp (F°/C°):	

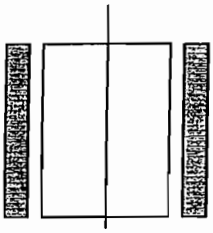
IMPROPER X-SECTION — -20

CONDITION

SEVERITY	
1	Good
4	Fair
7 X	Poor

ROADSIDE DRAINAGE — -20

Sh=0'-1'



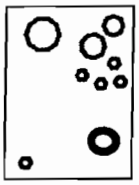
CONDITION

SEVERITY	
1	Good
4	Fair
7 X	Poor

CORRUGATIONS — 0

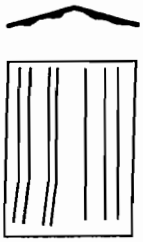
SEVERITY	NO Defects X	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

POTHOLES — -2



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		X	2	3
Med		4	5	6
High		7	8	9

RUTTING — -25



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	X
Med		4	5	6
High		7	8	9

LOOSE AGGREGATE — -2

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		X	2	3
Med		4	5	6
High		7	8	9

DUST — -0

CONDITION

SEVERITY	
1 X	Good
4	Fair
7	Poor

ROUGHNESS — -30

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7 X	Poor

crushed blue stone surface

W-20

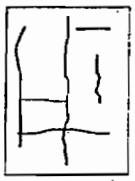
RSMS	Flexible Pavement Condition Survey	
Street: Cohecton-Pk Rd	Distance:	Name: PFM
Section#: 49-1	Start: 0.0	Date: 6/14
Start: Deep Hollow Rd	End: 0.6	Weather: sunny
End: town line	Length: 0.6	Temp(F°/C°):

fusten
sh=0'-2'
gravel
mostly 0

85

LONGITUDINAL/ TRANSVERSE CRACKING

-6



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med	X	X 4	5	6
High		7	8	9

ALLIGATOR CRACKING

-2

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		X 1	2	3
Med		4	5	6
High		7	8	9

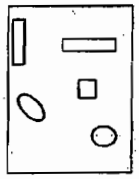
EDGE CRACKING

-2

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low	X	X 1	2	3
Med		4	5	6
High		7	8	9

PATCHING / POTHOLES

0

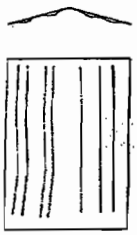


NO Defects X

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

RUTTING

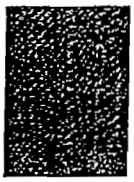


0

SEVERITY	NO Defects X	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

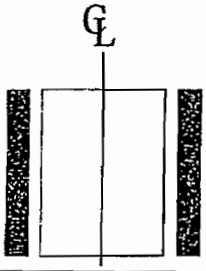
BLEEDING

none 0



SEVERITY	CONDITION	
	1	Good
	4	Fair
	7	Poor

DRAINAGE



-5

SEVERITY	CONDITION	
	1	Good
	X 4	Fair
	7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

SEVERITY	CONDITION	
	X 1	Good
	4	Fair
	7	Poor

CS over HM

"no shoulder" signs

Do nothing

tusten

63

RSMS 2003 W=20' Unpaved Condition Survey

Street: Cohecton-Tpk Rd	Distance	Name: PFM	
Section #: 49-2	Start: 0.6	Date: 6/14	
Start: Deep Hollow Rd	End: 2.7	Weather: Sunny	
End: Mahis pond Rd	Length: 2.1	Temp (F°/C°):	Sh=1'-3'

IMPROPER X-SECTION

-15

Ponding

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROADSIDE DRAINAGE

-30

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

CORRUGATIONS

0

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

0

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

RUTTING

0

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

-2

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

DUST

0

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

fusten

68

RSMS 2003 W=12' Unpaved Condition Survey

Street:	Daub Rd	Distance		Name:	PFM
Section #:	51-12	Start:	0.0	Date:	6/14
Start:	town line	End:	0.4	Weather:	sunny
End:	Hoffman Rd	Length:	0.4	Temp (F°/C°):	

sh=0

IMPROPER X-SECTION

-15

Ponding

CONDITION

SEVERITY

1	Good
4 X	Fair
7	Poor

ROADSIDE DRAINAGE

-15

CONDITION

SEVERITY

1	Good
4 X	Fair
7	Poor

CORRUGATIONS

0

NO Defects

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

0

NO Defects

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

RUTTING

0

NO Defects

EXTENT

SEVERITY

	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

-2

NO Defects

EXTENT

SEVERITY

	Low	Med	High
Low	1 X	2	3
Med	4	5	6
High	7	8	9

DUST

0

CONDITION

SEVERITY

1 X	Good
4	Fair
7	Poor

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY

1 X	Good
4	Fair
7	Poor

Blue stone crusher run surface

Do nothing
Needs Better crown

W-14

RSMS	Flexible Pavement Condition Survey	
Street: Forest pond Rd	Distance:	Name: PFM
Section#: 70-1	Start: 0.0	Date: 6/14
Start: Perry pond Rd	End: 0.4	Weather: Sunny
End: Cul de sac	Length: 0.4	Temp(F°/C°):

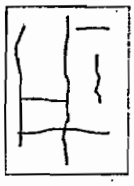
tusten

Sh=0'-3' gravel

88

LONGITUDINAL/ TRANSVERSE CRACKING

0



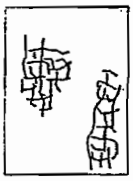
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-5



NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

EDGE CRACKING

-2

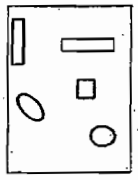
NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	~~1~~	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

0



~~NO Defects~~

EXTENT

Do not include good patches

1	Low
2	Medium
3	High

RUTTING

0

~~NO Defects~~

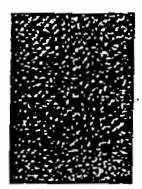
EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

None

0

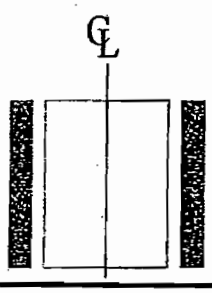


CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE

-5



CONDITION

SEVERITY	
1	Good
4	~~Fair~~
7	Poor

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	~~Good~~
4	Fair
7	Poor

Do nothing Hm Road

W=19

RSMS	Flexible Pavement Condition Survey	
Street: Gables Rd	Distance:	Name: PFM
Section#: 13-1	Start: 0.0	Date: 6/14
Start: Cr 111/52	End: 0.9	Weather: sunny
End: Old Cohecton Rd	Length: 0.9	Temp(F°/C°):

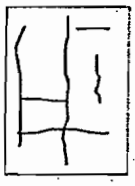
Kusten

Sh=1-3

85

LONGITUDINAL/ TRANSVERSE CRACKING

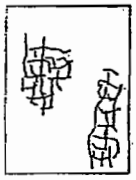
-6



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med	X	4	5	6
High		7	8	9

ALLIGATOR CRACKING

-2



SEVERITY	NO Defects	EXTENT Low	Med	High
Low	X	1	2	3
Med		4	5	6
High		7	8	9

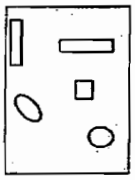
EDGE CRACKING

-2

SEVERITY	NO Defects	EXTENT Low	Med	High
Low	X	1	2	3
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES

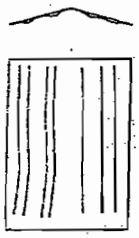
0



NO Defects	EXTENT
X	1 Low
	2 Medium
	3 High

Do not include good patches

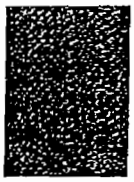
RUTTING



SEVERITY	NO Defects	EXTENT Low	Med	High
Low	X	1	2	3
Med		4	5	6
High		7	8	9

0

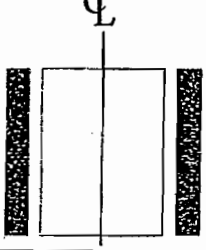
BLEEDING



0 None

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



-5

SEVERITY	CONDITION
1	Good
4 X	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

Looks like CS over HM or CM Do nothing

W-19

Austin

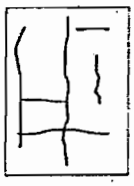
RSMS	Flexible Pavement Condition Survey	
Street: Gables Rd	Distance:	Name: PFM
Section#: 13-2	Start: 0.9	Date: 6/14
Start: Old conectan Rd	End: 1.7	Weather: Sunny
End:	Length: 0.8	Temp(F°/C°):

sh=1'-3'

78

LONGITUDINAL/ TRANSVERSE CRACKING

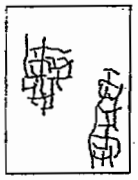
-6



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		~~4~~	5	6
High		7	8	9

ALLIGATOR CRACKING

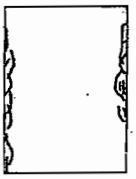
-5



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		~~4~~	5	6
High		7	8	9

EDGE CRACKING

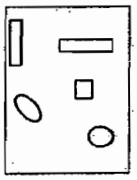
-6



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	~~3~~
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES

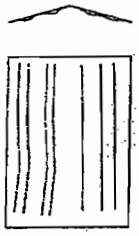
0



~~NO Defects~~	EXTENT
	1 Low
	2 Medium
	3 High

Do not include good patches

RUTTING



0

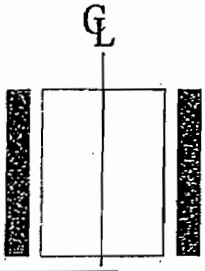
SEVERITY	~~NO Defects~~	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	8	9

BLEEDING

0 none

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



-5

SEVERITY	CONDITION
1	Good
~~4~~	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

SEVERITY	CONDITION
1	~~Good~~
4	Fair
7	Poor

patch a few places

W-13

Tuesday

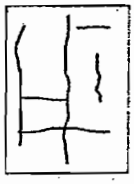
RSMS	Flexible Pavement Condition Survey	
Street: Hoffman Rd	Distance:	Name: PFM
Section#: 40-1	Start: 0.0	Date: 6/14
Start: town line	End: 1.0	Weather: Sunny
End: bridge	Length: 1.0	Temp(F°/C°):

Sh=0

37

LONGITUDINAL/ TRANSVERSE CRACKING

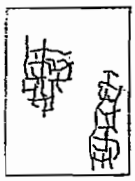
-8



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	X	6
High		7	8	9

ALLIGATOR CRACKING

-15



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	8	X

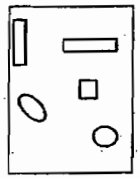
EDGE CRACKING

-6

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	X
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES

-5

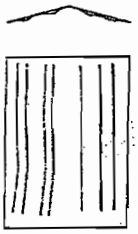


NO Defects	EXTENT
	1 Low
	2 X Medium
	3 High

Do not include good patches

RUTTING

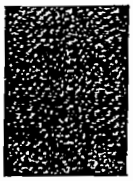
-9



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	X
High		7	8	9

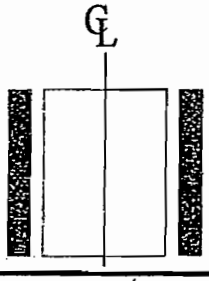
BLEEDING

None 0



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



-9

SEVERITY	CONDITION
1	Good
4	Fair
X 7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

-11

SEVERITY	CONDITION
1	Good
4	Fair
7 X	Poor

totally broken up CS revert to gravel or complete rebuild

W=16

RSMS	Flexible Pavement Condition Survey	
Street: Hoffman	Distance:	Name: PFM
Section#: 40-2	Start: 0.0	Date: 6/14
Start: bridge	End: 0.3	Weather: sunny
End: 52/CR 111	Length: 0.3	Temp(F°/C°):

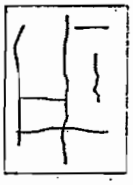
tusten

Sh=0

47

LONGITUDINAL/ TRANSVERSE CRACKING

0



NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-15

NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	☒ 9

EDGE CRACKING

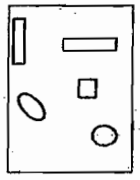
-6

NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2	☒ 3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES

-9



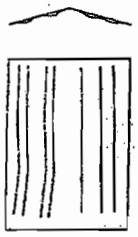
NO Defects ☐

Do not include good patches

EXTENT	
1	Low
2	Medium
3 ☒	High

RUTTING

-7

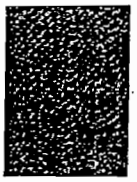


NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	☒ 5	6
High	7	8	9

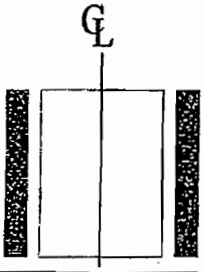
BLEEDING

0 None



SEVERITY	CONDITION	
1	Good	
4	Fair	
7	Poor	

DRAINAGE



-5

SEVERITY	CONDITION	
1	Good	
4 ☒	Fair	
7	Poor	

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

-11

SEVERITY	CONDITION	
1	Good	
4	Fair	
7 ☒	Poor	

revert to gravel or rebuild broken up CS

W-15-15

RSMS	Flexible Pavement Condition Survey	
Street: Irish town Rd	Distance:	Name: PFM
Section#: 20-1	Start: 0.0	Date: 6/14
Start: Cohecton Tpk Rd	End: 1.1	Weather: sunny
End: 1.1 mi. pt.	Length: 1.1	Temp(F°/C°):

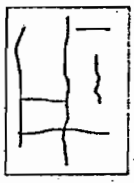
fusten

sh = 0' 1'

89

LONGITUDINAL/ TRANSVERSE CRACKING

-2

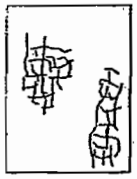


NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-2



NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING

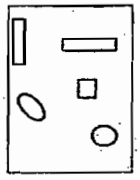
-2

NO Defects ☐

SEVERITY	EXTENT Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES

0



NO Defects ☒

Do not include good patches

EXTENT

1	Low
2	Medium
3	High

RUTTING

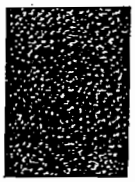
0

NO Defects ☒

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

None

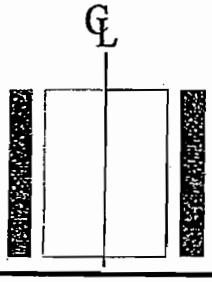


0

CONDITION

SEVERITY		
1	Good	
4	Fair	
7	Poor	

DRAINAGE



-5

CONDITION

SEVERITY		
1	Good	
4	Fair	☒
7	Poor	

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY		
1	Good	☒
4	Fair	
7	Poor	

"no shoulder" signs

tusten

RSMS 2003 W=10' Unpaved Condition Survey

Street:	Irish town Rd	Distance		Name:	PFM
Section #:	20-2	Start :	1.1	Date:	4/14
Start:	1.1 mi. Pt.	End :	1.4	Weather:	Sunny
End:	town line	Length:	.3	Temp (F°/C°):	

sh=0

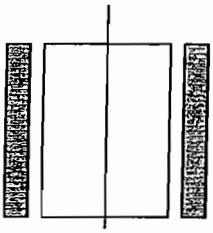
0

IMPROPER X-SECTION — -20

CONDITION

SEVERITY	
1	Good
4	Fair
7 X	Poor

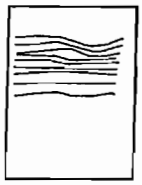
ROADSIDE DRAINAGE — -20



CONDITION

SEVERITY	
1	Good
4	Fair
7 X	Poor

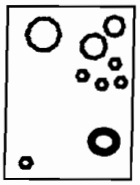
CORRUGATIONS — 0



NO Defects X — EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

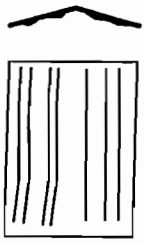
POTHOLES — -10



NO Defects — EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	X	6
High	7	8	9

RUTTING — -45



NO Defects — EXTENT

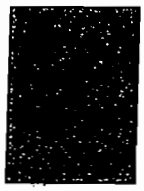
SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	X
High	7	8	9

LOOSE AGGREGATE — -10

NO Defects — EXTENT

SEVERITY	Low	Med	High
Low	1	2	X
Med	4	5	6
High	7	8	9

DUST — 0



CONDITION

SEVERITY	
1 X	Good
4	Fair
7	Poor

ROUGHNESS — -30

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7 X	Poor

Blue stone crusher run gravel nearly

W-22

RSMS	Flexible Pavement Condition Survey	
Street: Kirk Rd	Distance:	Name: PFM
Section#: 33-1	Start: 0.0	Date: 6/14
Start: @	End: 0.7	Weather: sunny
End: CR 24	Length: 0.7	Temp(F°/C°):

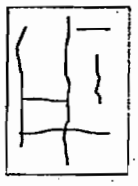
fusion

Sh=4ft paved

87

LONGITUDINAL/ TRANSVERSE CRACKING

-9

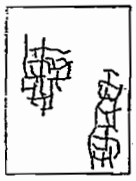


NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	~~5~~	6
High	7	8	9

ALLIGATOR CRACKING

-5



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	~~4~~	5	6
High	7	8	9

EDGE CRACKING

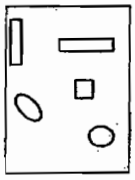
0

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES

0



~~NO Defects~~

Do not include good patches

	EXTENT
1	Low
2	Medium
3	High

RUTTING

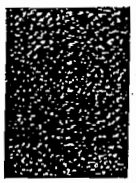
0

~~NO Defects~~

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

None

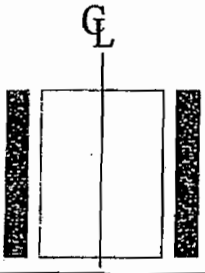


0

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



0

CONDITION

SEVERITY	
1 ~~Good~~	
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY	
1 ~~Good~~	
4	Fair
7	Poor

Full width, Hm asphalt pavement, Fully striped, 4'-6' paved shoulders

Box out patch selected spots, slurry/micro surface treat

W=18.0

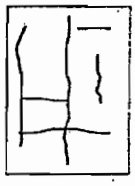
RSMS	Flexible Pavement Condition Survey	
Street: Lachawaxin Rd	Distance:	Name: PFM
Section#: 21-1	Start: 0.0	Date: 6/14
Start: 97	End: 1.3	Weather: Sunny
End: Cohecton Tpk Rd	Length: 1.3	Temp(F°/C°):

Justen
SH=0-2

89

LONGITUDINAL/ TRANSVERSE CRACKING

-2



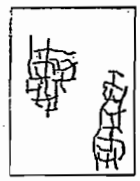
NO Defects ☐

EXTENT: Low Med High

SEVERITY			
Low	X	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-2



NO Defects ☐

EXTENT: Low Med High

SEVERITY			
Low	X	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING

-2

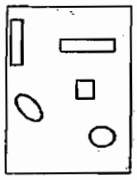
NO Defects ☐

EXTENT: Low Med High

SEVERITY			
Low	X	2	3
Med	4	5	6
High	7	8	9

PATCHING/ POTHOLES

0



NO Defects ☒

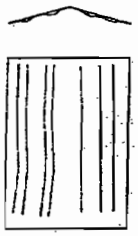
EXTENT

1	Low
2	Medium
3	High

Do not include good patches

RUTTING

0



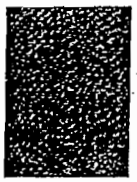
NO Defects ☒

EXTENT: Low Med High

SEVERITY			
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

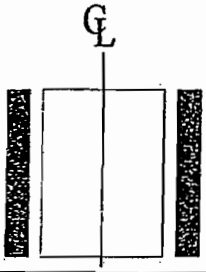
None 0



CONDITION

SEVERITY		
1	Good	
4	Fair	
7	Poor	

DRAINAGE



-5

CONDITION

SEVERITY		
1	Good	
4	X Fair	
7	Poor	

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY		
1	X Good	
4	Fair	
7	Poor	

CS over HM

Do nothing

Shoulder is mostly zero

"no shoulder" signs

fusten

68

RSMS 2003 W=20' Unpaved Condition Survey

Street: Mahls pond Rd	Distance	Name: PFM	
Section #: 27-1	Start: 0.0	Date: 6/14	
Start: Cohecton Hill Rd	End: 1.4	Weather: Sunny	
End: 1.4 mi N	Length: 1.4	Temp (F°/C°):	

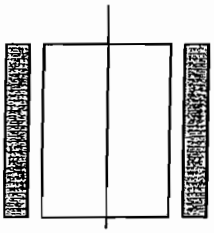
Sh=1'-2'

IMPROPER X-SECTION — -15

CONDITION

SEVERITY: 1 Good; 4 X Fair; 7 Poor

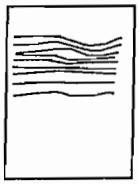
ROADSIDE DRAINAGE — -15



CONDITION

SEVERITY: 1 Good; 4 X Fair; 7 Poor

CORRUGATIONS — 0

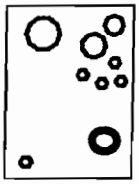


NO Defects X

EXTENT: Low Med High

SEVERITY: Low 1 2 3; Med 4 5 6; High 7 8 9

POTHOLES — 0

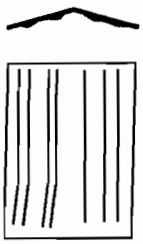


NO Defects X

EXTENT: Low Med High

SEVERITY: Low 1 2 3; Med 4 5 6; High 7 8 9

RUTTING — 0



NO Defects X

EXTENT: Low Med High

SEVERITY: Low 1 2 3; Med 4 5 6; High 7 8 9

LOOSE AGGREGATE — -2

NO Defects

EXTENT: Low Med High

SEVERITY: Low X 2 3; Med 4 5 6; High 7 8 9

DUST — 0

CONDITION

SEVERITY: 1 X Good; 4 Fair; 7 Poor

ROUGHNESS — 0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY: 1 X Good; 4 Fair; 7 Poor

Crown a little flat

w 18 · 20

RSMS	Flexible Pavement Condition Survey	
Street: Mahlspand Rd	Distance:	Name: PFM
Section#: 27-3	Start: 1.4	Date: 6/14
Start: 1.4 mi. pt.	End: 2.4	Weather: Sunny
End: 2.4 mi. pt.	Length: 1.0	Temp(F°/C°):

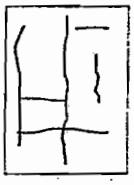
tusten

73

sh = 0'-3'
avg = 2'

LONGITUDINAL/ TRANSVERSE CRACKING

0



~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-12

NO Defects

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	~~8~~	9

EDGE CRACKING

0

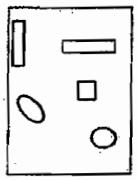
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

-3



NO Defects

EXTENT

Do not include good patches

1	~~Low~~
2	Medium
3	High

RUTTING

0

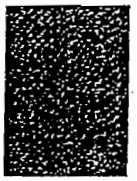
~~NO Defects~~

EXTENT

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

none 0

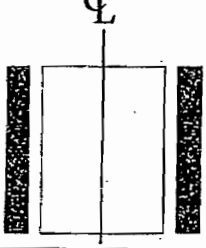


CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE

-5



CONDITION

SEVERITY	
1	Good
~~4~~	~~Fair~~
7	Poor

ROUGHNESS

-7

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
~~4~~	~~Fair~~
7	Poor

scarify CS and Redo CS

W - 20

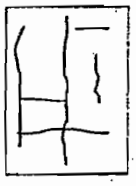
RSMS	Flexible Pavement Condition Survey	
Street: Main Street	Distance:	Name: PFM
Section#: 44-1	Start: 0.0	Date: 6/14
Start: CR 14	End: 0.2	Weather: Sunny
End: Oak Street	Length: 0.2	Temp(F°/C°):

fusten

93

LONGITUDINAL/ TRANSVERSE CRACKING

-2



NO Defects

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING

-2

NO Defects

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	X	2	3
Med	4	5	6
High	7	8	9

EDGE CRACKING

0

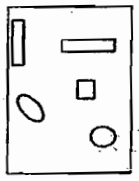
NO Defects

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

-3



NO Defects

EXTENT

1	Low
2	Medium
3	High

Do not include good patches

RUTTING

0

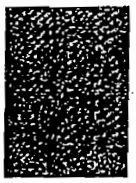
NO Defects

EXTENT: Low Med High

SEVERITY	Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

BLEEDING

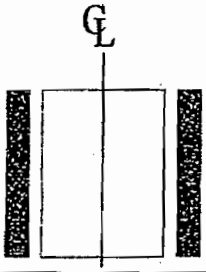
0 None



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



0

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

parking on both sides

C-14

RSMS	Flexible Pavement Condition Survey	
Street: Perry Pond Rd	Distance:	Name: PFM
Section#: 67-1	Start: 0.0	Date: 6/14
Start: Forest Pond Rd	End: 1.6	Weather: sunny
End: 97	Length: 1.6	Temp(F°/C°):

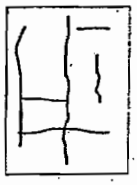
St
Tusten

Sh=0-3'
gravel

89

LONGITUDINAL/ TRANSVERSE CRACKING

-2



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

ALLIGATOR CRACKING

-2

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

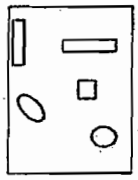
EDGE CRACKING

-2

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		X	2	3
Med		4	5	6
High		7	8	9

PATCHING/ POTHOLES

0



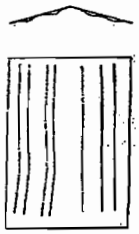
NO Defects

Do not include good patches

EXTENT	
1	Low
2	Medium
3	High

RUTTING

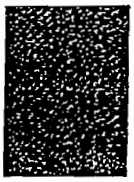
0



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	8	9

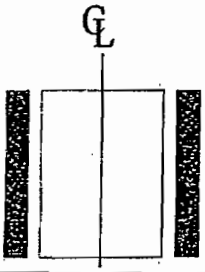
BLEEDING

0 None



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



-5

SEVERITY	CONDITION
1	Good
4 X	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

SEVERITY	CONDITION
1 X	Good
4	Fair
7	Poor

#A1 CS over Hot Mix Do nothing

11 no shoulder" signs

W = 18

RSMS	Flexible Pavement Condition Survey	
Street: Rye Rd	Distance:	Name: PFM
Section#: 31-1	Start: 0.0	Date: 6/14
Start: Camp Utopia Rd	End: 2.3	Weather: sunny
End:	Length: 2.3	Temp(F°/C°):

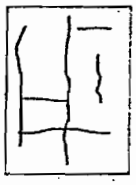
4usten

Sh = 0'-3'

100

LONGITUDINAL/ TRANSVERSE CRACKING

0



NO Defects

EXTENT: Low Med High

SEVERITY: Low 1 2 3; Med 4 5 6; High 7 8 9

ALLIGATOR CRACKING

0

NO Defects

EXTENT: Low Med High

SEVERITY: Low 1 2 3; Med 4 5 6; High 7 8 9

EDGE CRACKING

0

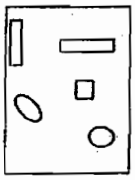
NO Defects

EXTENT: Low Med High

SEVERITY: Low 1 2 3; Med 4 5 6; High 7 8 9

PATCHING/ POTHOLES

0



NO Defects

EXTENT

1 Low
2 Medium
3 High

Do not include good patches

RUTTING

0

NO Defects

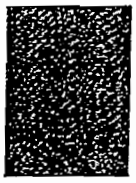
EXTENT: Low Med High

SEVERITY: Low 1 2 3; Med 4 5 6; High 7 8 9

BLEEDING

None

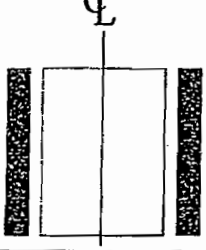
0



CONDITION

SEVERITY: 1 Good; 4 Fair; 7 Poor

DRAINAGE



0

CONDITION

SEVERITY: 1 Good; 4 Fair; 7 Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

0

CONDITION

SEVERITY: 1 Good; 4 Fair; 7 Poor

Fresh cm 3 inch matt #1A mix

tusten

78

RSMS 2003 W=18' Unpaved Condition Survey

Street: Swamp Road	Distance	Name: PFM	
Section #: 37-1	Start: 0.0	Date: 6/14	Sh-2-3: grave
Start: bridge	End: 2.0	Weather: Sunny	
End: town line	Length: 2.0	Temp (F°/C°):	

IMPROPER X-SECTION

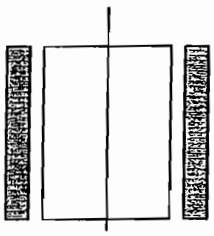
-5

CONDITION

SEVERITY	
1 X	Good
4	Fair
7	Poor

ROADSIDE DRAINAGE

-5



CONDITION

SEVERITY	
1	Good
4 X	Fair
7	Poor

CORRUGATIONS

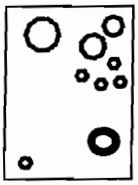
0

EXTENT

SEVERITY	Low	Med	High
NO Defects X			
Low	1	2	3
Med	4	5	6
High	7	8	9

POTHOLES

-2

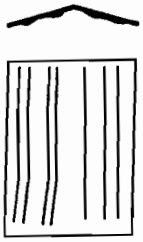


EXTENT

SEVERITY	Low	Med	High
NO Defects			
Low	X	2	3
Med	4	5	6
High	7	8	9

RUTTING

0



EXTENT

SEVERITY	Low	Med	High
NO Defects X			
Low	1	2	3
Med	4	5	6
High	7	8	9

LOOSE AGGREGATE

0

EXTENT

SEVERITY	Low	Med	High
NO Defects X			
Low	1	2	3
Med	4	5	6
High	7	8	9

DUST

0

CONDITION

SEVERITY	
1 X	Good
4	Fair
7	Poor

ROUGHNESS

0

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1 X	Good
4	Fair
7	Poor

Do nothing

Appendix F

Photographs of Rated Roads
(All Towns)

Town of Callicoon

Bethlehem Road

From CR 123 to 1.2 mile point

Weissman Road

From CR 123 to 0.7 mile point

J Young Road

From stump pond Road to Weissman Road

Huber Road

From CR 149 to town line

Stump Pond Road

From CR 149 to c.r.149

Earl Myers Road

From CR 127 to Faubel Road

Esselman Road

From Faubel Road to CR 128

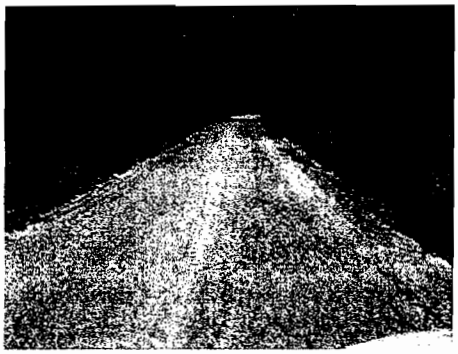
Schaefer Road

From CR 128 to Poley Road

Town of Callicoon

Tonges Road

From Schaefer Road to Delaware line



Poley Road

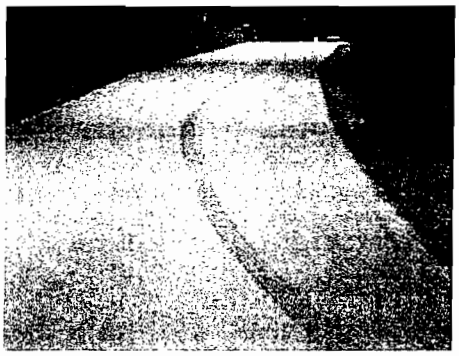
From Scaefer Road to end

Kratz Road

Form Poley Road to Delaware line

Stewart Road

From CR 121 to town line



Buck Brook Road

From Bayer Road to town line

Town of Cochecton

Mill Road

From Mitchell Pond West to dead end sign

Mitchell Pond West

From CR 114 to 0.7 mile point

Mitchell Pond Road

From 0.7 mile point to Mill Road

Brook Road

From Mitchell pond west to 0.4 mile point

Brook Road

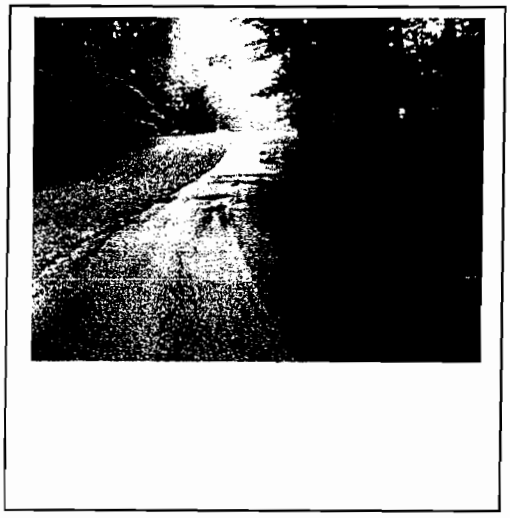
From 0.4 mile point to Johns Road

Brook Road

From 0.55 mile point to 1.55 mile point

Brook Road

From 1.55 mile point to CR 116



Mitchell Pond East

From CR 114 to CR 116

Town of Cochecton

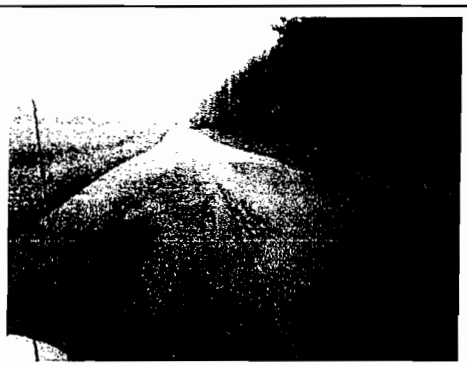
Johns Road

From Mitchell Pond East to 0.7 mile point

Smales Road

From CR 116 to 0.4 mile point

*paved after rated



Shortcut Road

From CR 113 to CR 112

Bernas Road

From Shortcut Road to NY 17b

Mueller Road

From NY 17b to Lounsberry Road

Skipperene Road

From NY 97 to Old County Road

Tyler Road

From CR 115/NY 52 to Erhley Road

Fred White Road

From Tyler Road to NY 52/CR 115

Town of Delaware

Hospital Road

From NYS 97 to Seminary Road

Kautz Road

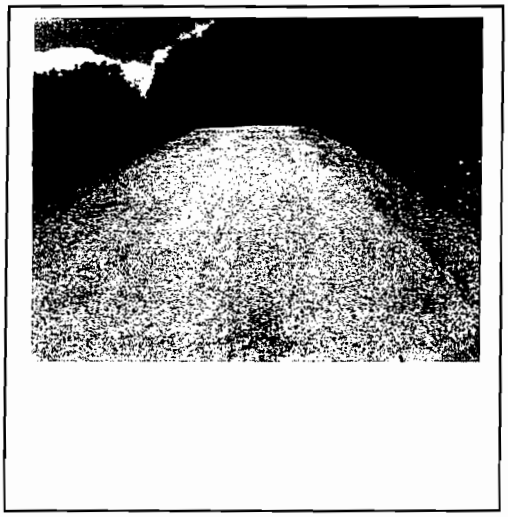
From Seminary Road to 1.5 mile point

Old Hankins Road

From Cross Road to 0.90 mile point

Old hankins Road

From 0.90 mile point to NY 97



Lahm Road

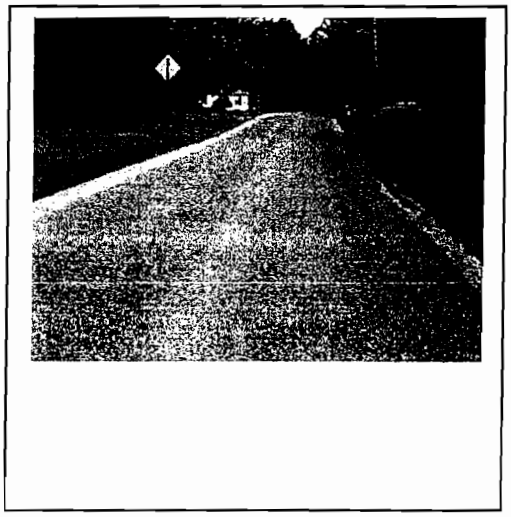
From Cross Road to 0.2 mile point

Lahm Road

From 0.2 mile point to the Town of Fremont

Beechwood Road

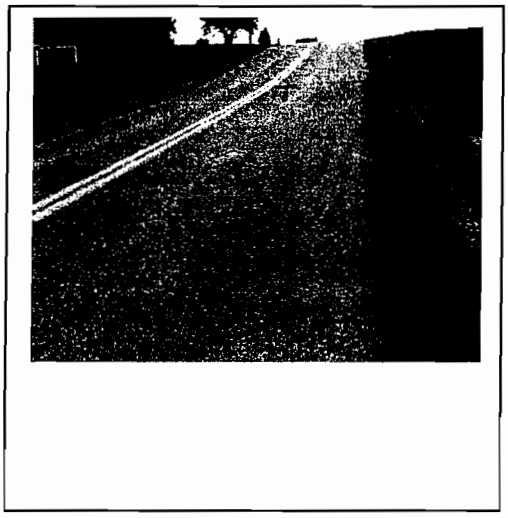
From Main Street to Kratz Road



Gabel Road

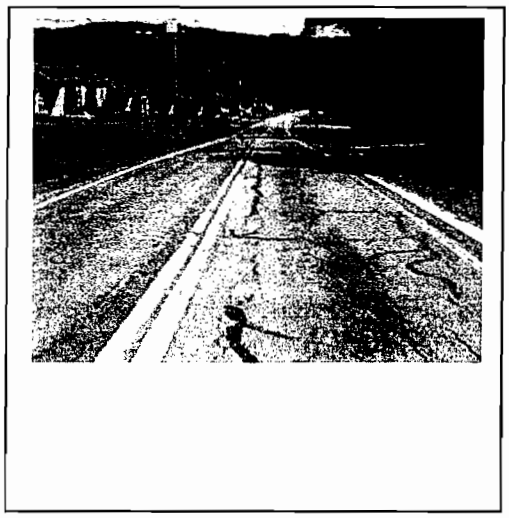
From CR 164 to Reum Road

Town of Delaware



Reum Road

From CR 164 to Gabel Road



Villa Roma

From CR 164 to Polster Road

Miller Road

From CR 164 to 52

Swiss Hill Road

From 52 to 1.6 mile point

Fulton Hill Road

From Mesmer Road to 0.7 mile point

Town of Fremont

Johnston Road

From Basket Road to dead end

Basket Road

From CR 134 to Neer Road

Sket Road

From Neer Road to O'Mara Road

Skyline Road

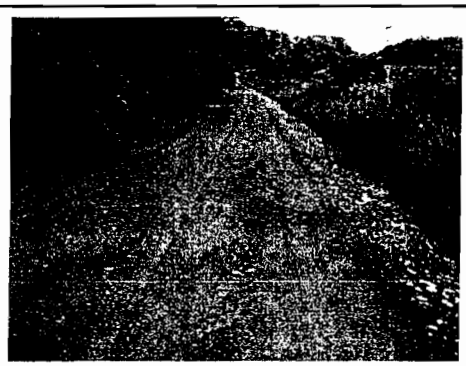
From Nelson Road to Wood Road

Wood Road

From the end of the pavement to the dead end

W. Simmon Road

From Newman Road to County Road 132



Graby Road

From the end of the pavement to Lahm Road

Hammer Road

From CR 131/132

Town of Fremont

Peters Road

From Warner Road to Town line

Warner Road

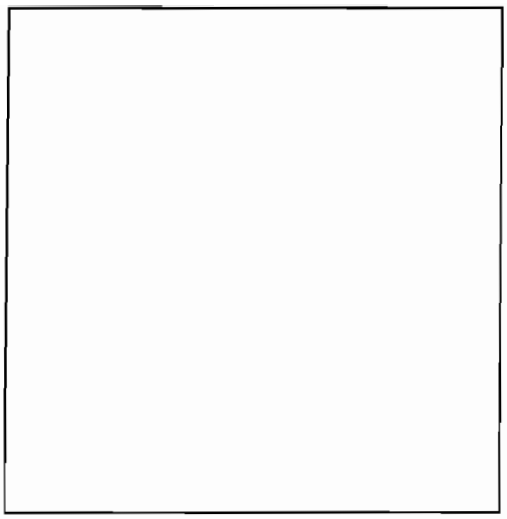
From Peters Road to the start of pavement

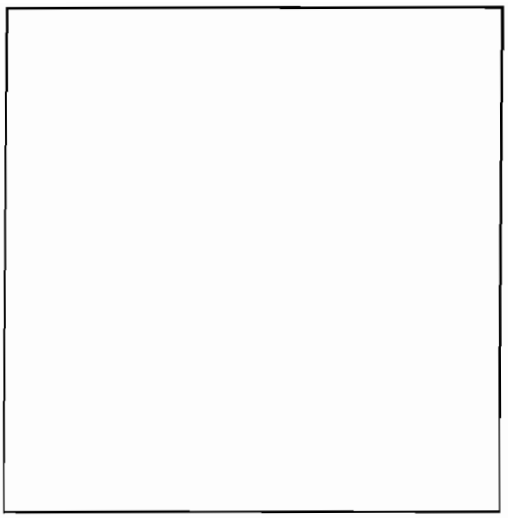
Warner Road

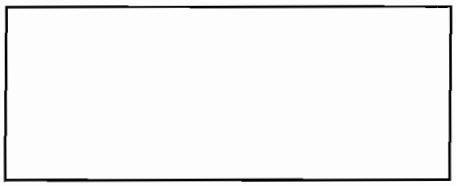
From the end of the gravel to Fink Road

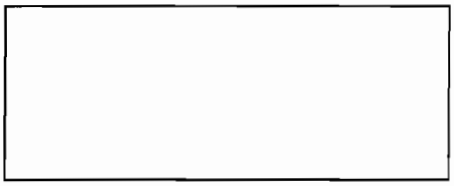
Fink Road

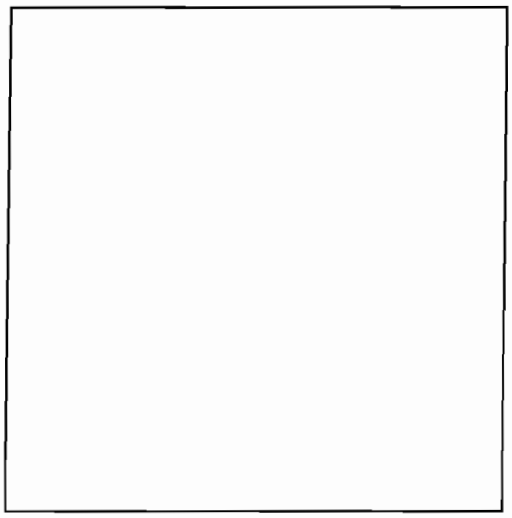
From Warner Road to CR 95

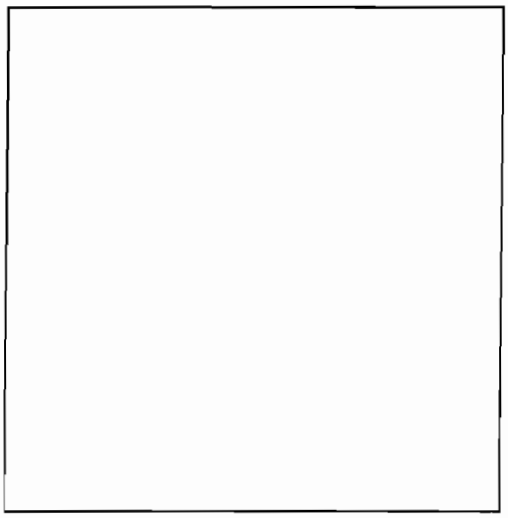


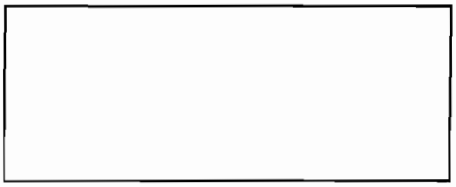


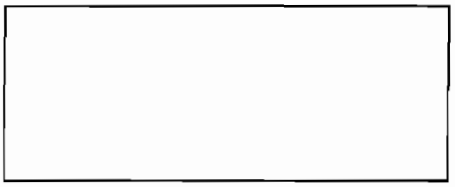












Town of Highland

Schumacher Pond Road

From Woods Road to 0.6 mile point

Mail Road

From CR 21 to NY 97

Crawford Road

From Mail Road to 1.1 mile point

Airport Road

From CR 33 to CR 21/22

Marcel Four Road

Clark Road

From CR 32 to end of pavement

Clark Road

From end of pavement to dead end sign

Highland

Stege Road

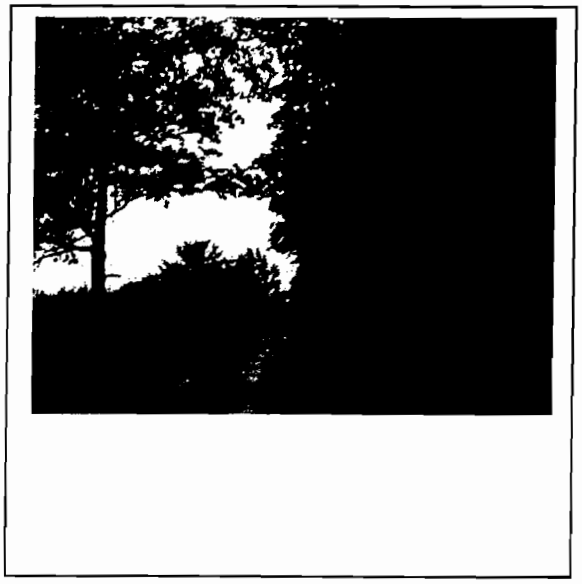
From CR 12 to Bower Road

Bower Road

From Stege Road to dead end sign

Lakeview Drive

From Bower Road to CR 47



Koinonia & Mud Pond Road

From Lakeview Drive to end of pavement

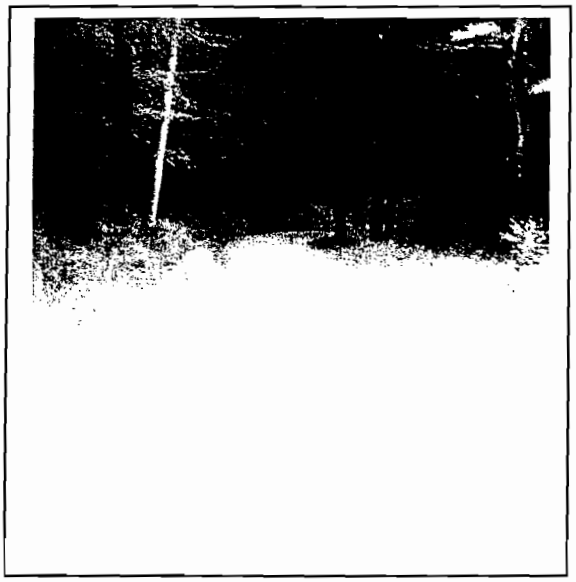
Koinonia & Mud Pond Road

From Koinonia Camp to where road narrows

Devlin Road

From CR 47 to CR 32

Lumberland



Chapin Road

From CR 43 to Lebanon Road

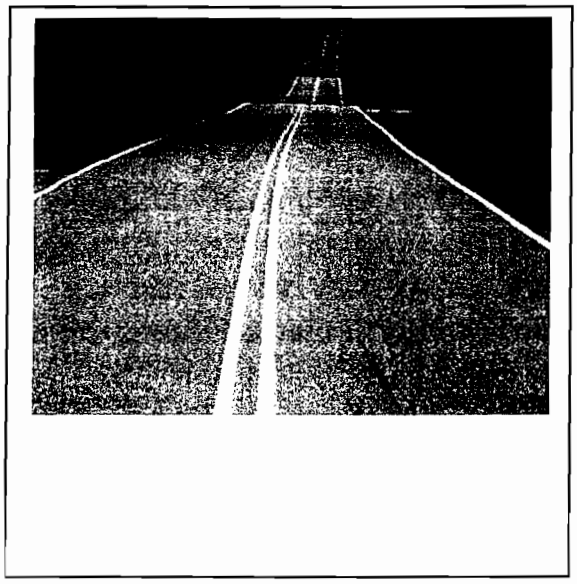
Lebanon Road

From Chapin Road to Leers Road

Leers Road

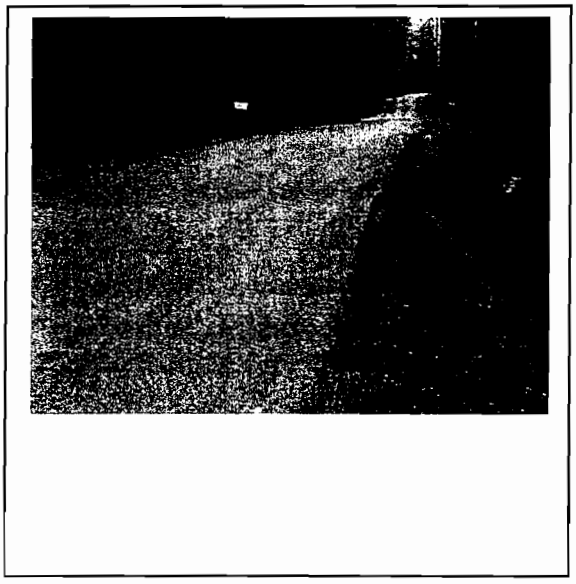
From Lebanon Road to Mohican Lake Road

Leers Road



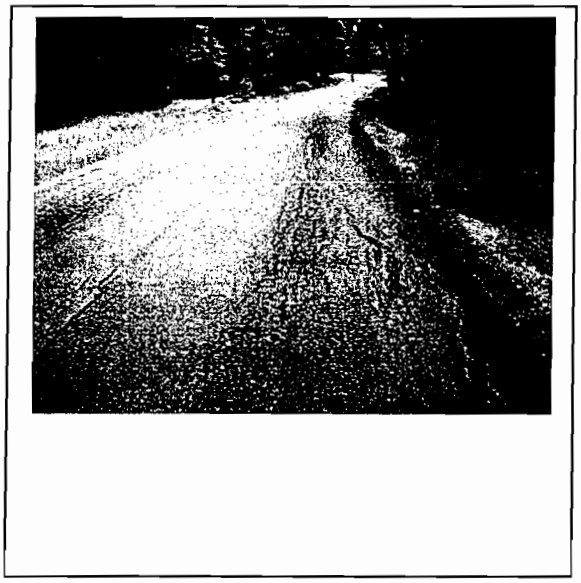
Mohican Lake Road

From town line to 2.9 mile point



Smith Road

From CR 42 to Ogden Road



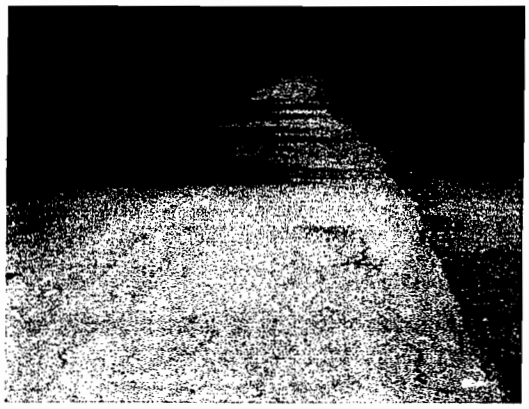
Kalin weber Road

From Smith Road to CR 31

White Road

From CR 31 to CR 41

Lumberland



Hollow Road

From CR 32 to NY 97

Van Tuyl Road

From NY 97 to Schuab Road

Mapes Road

From Van Tuyl Road to Haring Road

Tusten

Lackawaxen Road

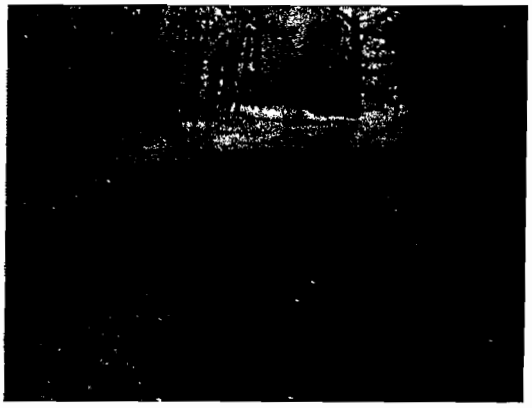
From NY 97 to Cochecton Turnpike Road

Cochecton Turnpike Road

From Deep Hallow Road to town line

Irish Town Road

From Cochecton Turnpike Road to 1.1 mile point



Irish Town Road

From 1.1 mile point to town line

Kirk Road

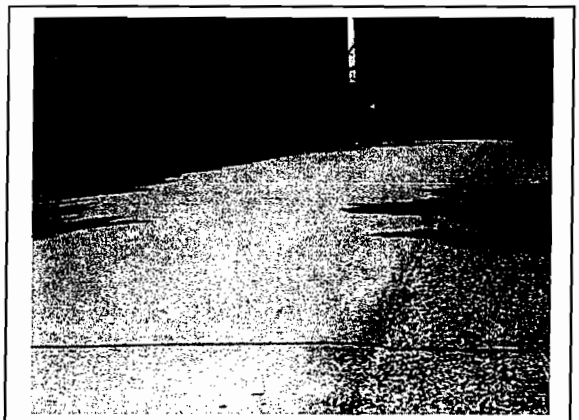
From NY 97 to CR 24

Main Street

From CR 14 to Oak Street

Gables Road

From CR 111/52 to Old Cochecton Road



Perry Pond Road

From Forest Pond Road to NY 97

Tusten

Forest Pond Road

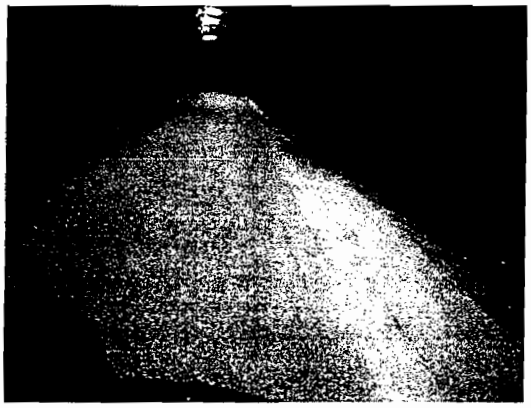
From Perry Pond Road to Cul de sac

Hoffman Road

From town line to CR 111/NY 52

Daub Road

From town line to Hoffman Road



Mahls pond Road

From 1.4 mile point to 2.4 mile point

Blind Pond Road

From Dexheimer Road to 1.3 mile

Blind Pond Road

From 1.3 mile point to 1.9 mile point

Ryer Road

From Camp Utopia Road to 2.3 mile point

Appendix G

RSMS Report: Summary of Road Ratings
(All Towns)

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Report: Summary of Road Ratings

Town of Callicoon

RSMS Network PCI - July 21, 2009

Town	Callicoon			
Road	length			W AVG C
Bethlehem Road 1	1.2		100	6.9
Bethlehem Road 2	1.5		93	8.0
Buck Brook Road	1.4		90	7.2
Earl Myers Road	0.8		75	3.4
Esselman Road	1.3		68	5.1
Huber Road	2.4		59	8.1
J Young Road	2.6	UNP	42	
Kratz Road	0.9	UNP	85	
Poley Road	1.2		78	5.3
Schaefer Road	0.6		38	1.3
Stewart Road	1		56	3.2
Stump Pond Road	3.7		54	11.4
Tonges Road	0.5		46	1.3
Weissman Road 1	0.7		83	3.3
Weissman Road 2	1.2		59	4.0
Total Miles Paved	**17.5**		**PAVED PCI**	**68.5**

Lallicoon

Summary of Results From Road Condition Surveys - Date: 07/18/2009
Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Bethlehem Road 1 7- -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	None
	Asph, Edge Cracking 0-9	None
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 1.200 PCI for this Section - 100 This Asphalt Road's PCI Value = 100 Hard Section Length = 1.200		
Bethlehem Road 2 7-2 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	None
	Asph, Edge Cracking 0-9	None
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 1.500 PCI for this Section - 93 This Asphalt Road's PCI Value = 93 Hard Section Length = 1.500		
Buck Brook Road 6-1 -	Asph, Long/Trans Crack0-9	Med/Low
	Asph, Alligator Crack 0-9	Low/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 1.400 PCI for this Section - 90 T[illegible]sphalt Road's PCI Value = 90 Hard Section Length = 1.400		
[illegible] Meyers Road 40-1 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	Med/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Med
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 0.800 PCI for this Section - 75 This Asphalt Road's PCI Value = 75 Hard Section Length = 0.800		
Esselman Road 14-1 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	Med/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Med
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 1.300 PCI for this Section - 68 This Asphalt Road's PCI Value = 68 Hard Section Length = 1.300		
Huber Road 0-1 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	Med/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Hig
	Asph, Rutting 0-9	Med/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Hig/Low
[illegible]f Section, Length - 2.400 [illegible]CI for this Section - 59 This Asphalt Road's PCI Value = 59 Hard Section Length = 2.400		

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
J Young Road 61-1 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Hig/Low Med/Low None Med/Low None Low/Low Low/Low Med/Low
End of Section, Length - 2.600 PCI for this Section - 42 This Unpaved Road's PCI Value = 42 Hard Section Length = 2.600		
Kratz Road 35-11 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Low/Low Low/Low None None None Low/Med Low/Low Low/Low
End of Section, Length - 0.900 PCI for this Section - 85 This Unpaved Road's PCI Value = 85 Hard Section Length = 0.900		
Poley Road 46-11 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Low/Hig Low/Hig Low/Low Low/Low None Med/Low Low/Low
End of Section, Length - 1.200 PCI for this Section - 78 This Asphalt Road's PCI Value = 78 Hard Section Length = 1.200		
[illegible].efer Road 4[illegible] -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Hig/Hig Low/Hig Low/Hig Med/Med Med/Low Hig/Low Hig/Low
End of Section, Length - 0.600 PCI for this Section - 38 This Asphalt Road's PCI Value = 38 Hard Section Length = 0.600		
Stewart Road 48-11 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Med/Hig Low/Hig Low/Hig None None Hig/Low Hig/Low
End of Section, Length - 1.000 PCI for this Section - 56 This Asphalt Road's PCI Value = 56 Hard Section Length = 1.000		
Stump Pond Road 50-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Hig/Hig Low/Hig Low/Hig None None Med/Low Hig/Low
[illegible]f Section, Length - 3.700 [illegible].or this Section - 54 [illegible]is Asphalt Road's PCI Value = 54 Hard Section Length = 3.700		

Callicoon

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Tonges Road 42A-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Hig/Hig Low/Hig Low/Hig Low/Med None Hig/Low Hig/Low
End of Section, Length - 0.500 PCI for this Section - 46 This Asphalt Road's PCI Value = 46 Hard Section Length = 0.500		
Weissman Road 1 27-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Hig/Low Med/Low Low/Low None None None Low/Low Low/Low
End of Section, Length - 0.700 PCI for this Section - 83 This Asphalt Road's PCI Value = 83 Hard Section Length = 0.700		
Weissman Road 2 27-2 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Hig/Hig Low/Hig None Low/Med None Med/Low Hig/Low
End of Section, Length - 1.200 PCI for this Section - 59 This Asphalt Road's PCI Value = 59 Hard Section Length = 1.200		

Surface	Length	PCI
Unpaved	3.500	53
Asphalt	17.500	69

Total Length = 21.000
Total PCI Value = 66

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Report: Summary of Road Ratings

Town of Cochecton

RSMS Network PCI - July 21, 2009

Town	Cochecton			
Road	length			W AVG C
Bernas Road	2.8	54		7.8
Brook Road 1	0.4	68	UNP	
Brook Road 2	0.15	93		0.7
Brook Road 3	1	68	UNP	
Brook Road 4	0.4	64		1.3
Fred White Road	1	79		4.1
Johns Road	0.7	78		2.8
Mill Pond Road	0.7	78	UNP	
Mitchell Pond East	2.6	82		11.0
Mitchell Pond West 1	0.4	63		1.3
Mitchell Pond West 2	0.7	100		3.6
Mueller Road	1.1	82		4.6
Schalk Road	1.2	56		3.5
Shortcut Road	1.7	82		7.2
Skipperene Road	3.5	75		13.5
Smales Road	0.4	66		1.4
Tyler Road	2.8	57		8.2
Total Miles Paved	**19.45**		**PAVED PCI**	**70.9**

CORRECTION

Summary of Results From Road Condition Surveys - Date: 07/18/2009
Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Bernas Road 22 1 -	Asph, Long/Trans Crack0-9	Hig/Low
	Asph, Alligator Crack 0-9	Hig/Hig
	Asph, Edge Cracking 0-9	Low/Med
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 2.800 PCI for this Section - 54 This Asphalt Road's PCI Value = 54 Hard Section Length = 2.800		
Brook Road 1 1-1 -	Unpv, Cross Section 1,4,7	Med/Low
	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	None
	Unpv, Rutting 0-9	None
	Unpv, Loose Aggregate 0-9	Low/Low
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Low/Low
End of Section, Length - 0.400 PCI for this Section - 68 This Unpaved Road's PCI Value = 68 Hard Section Length = 0.400		
Brook Road 2 1-2 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	Med/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 0.150 PCI for this Section - 93 This Asphalt Road's PCI Value = 93 Hard Section Length = 0.150		
Brook Road 3 1-3 -	Unpv, Cross Section 1,4,7	Med/Low
	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	None
	Unpv, Rutting 0-9	None
	Unpv, Loose Aggregate 0-9	Low/Low
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Low/Low
End of Section, Length - 1.000 PCI for this Section - 68 This Unpaved Road's PCI Value = 68 Hard Section Length = 1.000		
Brook Road 4 1-4 -	Asph, Long/Trans Crack0-9	Hig/Low
	Asph, Alligator Crack 0-9	Med/Hig
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 0.400 PCI for this Section - 64 This Asphalt Road's PCI Value = 64 Hard Section Length = 0.400		
Fred White Road 23-1 -	Asph, Long/Trans Crack0-9	Med/Low
	Asph, Alligator Crack 0-9	Med/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low
of Section, Length - 1.000 PCI for this Section - 79 This Asphalt Road's PCI Value = 79 Hard Section Length = 1.000		

Road Name/RIN	Distress	Severity / Extent
Johns Road 50-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Hig/Low Med/Med Low/Low Low/Low None None Low/Low Low/Low
End of Section, Length - 0.700 PCI for this Section - 78 This Asphalt Road's PCI Value = 78 Hard Section Length = 0.700		
Mill Pond Road 51-1 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Med/Low Low/Low None None None Low/Low Low/Low Low/Low
End of Section, Length - 0.700 PCI for this Section - 78 This Unpaved Road's PCI Value = 78 Hard Section Length = 0.700		
Mitchell Pond East 37-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Med/Low Med/Med Low/Low Low/Low None None Low/Low Low/Low
End of Section, Length - 2.600 PCI for this Section - 82 This Asphalt Road's PCI Value = 82 Hard Section Length = 2.600		
ell Pond West 2 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None None None None None None Low/Low Low/Low
End of Section, Length - 0.400 PCI for this Section - 100 This Asphalt Road's PCI Value = 100 Hard Section Length = 0.400		
Mitchell Pond West 1 25-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7 Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None None None None None None None None Hig/Low Med/Hig Hig/Low Low/Low None None Low/Low Med/Low
End of Section, Length - 0.700 PCI for this Section - 63 This Asphalt Road's PCI Value = 63 Hard Section Length = 0.700		
er Road -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3	Med/Low Med/Low Low/Low None

Road Name/RIN	Distress	Severity / Extent
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low

of Section, Length - 1.100
PCI for this Section - 82
This Asphalt Road's PCI Value = 82 Hard Section Length = 1.100

Schalk Road 41-1 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	Hig/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Med
	Asph, Rutting 0-9	Med/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low

End of Section, Length - 1.200
PCI for this Section - 56
This Asphalt Road's PCI Value = 56 Hard Section Length = 1.200

Shortcut Road 43-1 -	Asph, Long/Trans Crack0-9	Med/Low
	Asph, Alligator Crack 0-9	Med/Med
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low

End of Section, Length - 1.700
PCI for this Section - 82
This Asphalt Road's PCI Value = 82 Hard Section Length = 1.700

Skipperene Road 15-1 -	Asph, Long/Trans Crack0-9	Med/Low
	Asph, Alligator Crack 0-9	Med/Med
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low

End of Section, Length - 3.500
PCI for this Section - 75
This Asphalt Road's PCI Value = 75 Hard Section Length = 3.500

Smales road 24-1 -	Asph, Long/Trans Crack0-9	Hig/Low
	Asph, Alligator Crack 0-9	Med/Med
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low

End of Section, Length - 0.400
PCI for this Section - 66
This Asphalt Road's PCI Value = 66 Hard Section Length = 0.400

Tyler Road 15-1 -	Asph, Long/Trans Crack0-9	Med/Low
	Asph, Alligator Crack 0-9	Hig/Med
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Med
	Asph, Rutting 0-9	Med/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low

End of Section, Length - 2.800
PCI for this Section - 57
This Asphalt Road's PCI Value = 57 Hard Section Length = 2.800

ce	Length	PCI
Unpaved	2.100	71

COLLECTOR

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Asphalt	19.450	70

Total Length = 21.550
PCI Value = 70

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Report: Summary of Road Ratings

Town of Delaware

RSMS Network PCI - July 21, 2009

Town	Delaware			
Road	length			W AVG C
Beechwood Road	3.1		92	15.8
Fulton Hill Road 1	0.7		80	3.1
Fulton Hill Road 2	1.1		58	3.5
Gabel Road	1.8		78	7.8
Hankins Road 1	0.9	UNP	8	
Hankins Road 2	0.4		95	2.1
Hospital Road	1.7		69	6.5
Kautz Road 1	1.5		64	5.3
Kautz Road 2	0.8		86	3.8
Lahm Road 1	0.2		45	0.5
Lahm Road 2	0.6	UNP	19	
Miller Road	1.4		81	6.3
Reum Road 1	0.9		80	4.0
Reum Road 2	0.8		88	3.9
Swiss Hill Road 1	1.6		91	8.0
Swiss Hill Road 2	1.1		55	3.3
Villa Roma	1		73	4.0
Total Miles Paved	**18.1**		**PAVED PCI**	**77.9**

Delaware

Summary of Results From Road Condition Surveys - Date: 07/18/2009
Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Beechwood Rd 5-1 -	Asph, Long/Trans Crack0-9	Low/Low
	Asph, Alligator Crack 0-9	Low/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	Low/Low
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 3.100 PCI for this Section - 92 This Asphalt Road's PCI Value = 92 Hard Section Length = 3.100		
Fulton Hill Rd 2 12-2 -	Asph, Long/Trans Crack0-9	Med/Low
	Asph, Alligator Crack 0-9	Med/Hig
	Asph, Edge Cracking 0-9	Low/Med
	Asph, Patching/Pothole0-3	Low/Hig
	Asph, Rutting 0-9	Med/Med
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 1.100 PCI for this Section - 58 This Asphalt Road's PCI Value = 58 Hard Section Length = 1.100		
Fulton Hill Road 1 12-1 -	Asph, Long/Trans Crack0-9	Hig/Low
	Asph, Alligator Crack 0-9	Med/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 0.700 PCI for this Section - 80 This Asphalt Road's PCI Value = 80 Hard Section Length = 0.700		
[illegible]el Road 23-1 -	Asph, Long/Trans Crack0-9	Hig/Low
	Asph, Alligator Crack 0-9	Med/Low
	Asph, Edge Cracking 0-9	Low/Med
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 1.800 PCI for this Section - 78 This Asphalt Road's PCI Value = 78 Hard Section Length = 1.800		
Hankins Road 1)-1 -	Unpv, Cross Section 1,4,7	Hig/Low
	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	Low/Low
	Unpv, Rutting 0-9	None
	Unpv, Loose Aggregate 0-9	Hig/Hig
	Unpv, Dust Control 1,4,7	Med/Low
	Unpv, Roughness 1,4,	Hig/Low
End of Section, Length - 0.900 PCI for this Section - 8 This Unpaved Road's PCI Value = 8 Hard Section Length = 0.900		
Hankins Road 2 -2 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	None
	Asph, Edge Cracking 0-9	Med/Low
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
[illegible] Section, Length - 0.400 PCI for this Section - 95 This Asphalt Road's PCI Value = 95 Hard Section Length = 0.400		

Delaware

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Hospital Road 31-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Med/Hig Low/Med Low/Med Low/Med Low/Low Low/Low Med/Low
End of Section, Length - 1.700 PCI for this Section - 69 This Asphalt Road's PCI Value = 69 Hard Section Length = 1.700		
Kautz Road 1 22-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Med/Hig Low/Hig Low/Med Low/Med None Med/Low Med/Low
End of Section, Length - 1.500 PCI for this Section - 64 This Asphalt Road's PCI Value = 64 Hard Section Length = 1.500		
Kautz Road 2 22-2 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Low/Low Med/Low Low/Low Low/Low Low/Low None Low/Low Low/Low
End of Section, Length - 0.800 PCI for this Section - 86 This Asphalt Road's PCI Value = 86 Hard Section Length = 0.800		
. Road 1 3[illegible] -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Hig/Hig Hig/Hig Low/Hig None None Hig/Low Hig/Low
End of Section, Length - 0.200 PCI for this Section - 45 This Asphalt Road's PCI Value = 45 Hard Section Length = 0.200		
ahm Road 2 36-2 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Med/Low Hig/Low None Low/Med Med/Low Low/Low Low/Low Hig/Low
End of Section, Length - 0.600 PCI for this Section - 19 This Unpaved Road's PCI Value = 19 Hard Section Length = 0.600		
Miller Road 7-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Hig/Low Med/Low Low/Low None None Low/Low Low/Low Low/Low
f Section, Length - 1.400 r this Section - 81 his Asphalt Road's PCI Value = 81 Hard Section Length = 1.400		

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Reum Road 1	Asph, Long/Trans Crack0-9	None
35-1 -	Asph, Alligator Crack 0-9	Med/Med
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Med
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 0.900		
PCI for this Section - 80		
This Asphalt Road's PCI Value = 80 Hard Section Length = 0.900		
Reum Road 2	Asph, Long/Trans Crack0-9	None
35-2 -	Asph, Alligator Crack 0-9	Med/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 0.800		
PCI for this Section - 88		
This Asphalt Road's PCI Value = 88 Hard Section Length = 0.800		
Swiss Hill Road 1	Asph, Long/Trans Crack0-9	Low/Low
2-1 -	Asph, Alligator Crack 0-9	Low/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 1.600		
PCI for this Section - 91		
This Asphalt Road's PCI Value = 91 Hard Section Length = 1.600		
Hill Road 2	Asph, Long/Trans Crack0-9	Med/Low
-	Asph, Alligator Crack 0-9	Med/Hig
	Asph, Edge Cracking 0-9	Low/Med
	Asph, Patching/Pothole0-3	Low/Hig
	Asph, Rutting 0-9	Med/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Hig/Low
End of Section, Length - 1.100		
PCI for this Section - 55		
This Asphalt Road's PCI Value = 55 Hard Section Length = 1.100		
Villa Roma	Asph, Long/Trans Crack0-9	Hig/Low
0-1 -	Asph, Alligator Crack 0-9	Hig/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 1.000		
PCI for this Section - 73		
This Asphalt Road's PCI Value = 73 Hard Section Length = 1.000		

Surface	Length	PCI
Unpaved	1.500	12
Asphalt	18.100	78

Total Length = 19.600
Total PCI Value = 73

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Report: Summary of Road Ratings

Town of Freemont

RSMS Network PCI - July 21, 2009

Town	Freemont			
Road	**length**			**W AVG C**
Anawanda Lake Road	1.6	paved	87	8.0
Basket Road 1	1.6	paved	79	7.3
Basket Road 2	2	Paved	64	7.4
Bowers Road	1.8	Unpaved	61	
Fink Road	0.6	paved	65	2.2
Graby Road 1	1.1	paved	60	3.8
Graby Road 2	0.4	Unpaved	78	
Hammer Road	0.8	paved	100	4.6
Johnston Road	0.8	Unpaved	40	
Peters Road 1	1.3	paved	87	6.5
Peters Road 2	1.3	paved	50	3.7
Skyline Drive	1	Unpaved	36	
Tennanah Lake Rd 1	1.6	paved	82	7.5
Tennanah Lake Rd 2	2.1	paved	46	5.6
Tennanah Lake Rd 3	0.5	paved	88	2.5
West Simmon Road	1.6	paved	61	5.6
Warner Road 1	0.8	Unpaved	68	
Warner Road 2	0.9	paved	50	2.6
Wood Road 1	0.4	paved	66	1.5
Wood Road 2	0.9	Unpaved	61	
Total Miles Paved	**17.4**		**PAVED PCI**	**68.8**

FREEMONT

Summary of Results From Road Condition Surveys - Date: 08/11/2009
Survey Results ALL Road Types For Dates Between: 06/01/2009 - 08/11/2009

Road Name/RIN	Distress	Severity / Extent
Anawana Lake Road 32 -	Asph, Long/Trans Crack0-9	Med/Low
	Asph, Alligator Crack 0-9	Med/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 1.600 PCI for this Section - 87 This Asphalt Road's PCI Value = 87 Hard Section Length = 1.600		
Basket Road 1 5-1 -	Asph, Long/Trans Crack0-9	Med/Low
	Asph, Alligator Crack 0-9	Med/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 1.600 PCI for this Section - 79 This Asphalt Road's PCI Value = 79 Hard Section Length = 1.600		
Basket Road 2 5-2 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	Med/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Med
	Asph, Rutting 0-9	Low/Med
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 2.000 PCI for this Section - 64 This Asphalt Road's PCI Value = 64 Hard Section Length = 2.000		
Bowers Road 4-1 -	Unpv, Cross Section 1,4,7	Med/Low
	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	Low/Low
	Unpv, Rutting 0-9	Low/Low
	Unpv, Loose Aggregate 0-9	Low/Low
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Low/Low
End of Section, Length - 1.800 PCI for this Section - 61 This Unpaved Road's PCI Value = 61 Hard Section Length = 1.800		
Fink Road 25-1 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	Hig/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Med
	Asph, Rutting 0-9	Low/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 0.600 PCI for this Section - 65 This Asphalt Road's PCI Value = 65 Hard Section Length = 0.600		
Graby Rd 2 29-2 -	Unpv, Cross Section 1,4,7	Low/Low
	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	None
	Unpv, Rutting 0-9	None
	Unpv, Loose Aggregate 0-9	Low/Low
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Low/Low
	Asph, Long/Trans Crack0-9	Low/Low
	Asph, Alligator Crack 0-9	Med/Low
	Asph, Edge Cracking 0-9	None

FREEMONT

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 08/11/2009

Road Name/RIN	Distress	Severity / Extent
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	Low/Low
	Asph, Drainage 1,4,7	None
	Asph, Roughess 1,4,7	None
End of Section, Length - 0.400		
PCI for this Section - 69		
This Unpaved Road's PCI Value = 69 Hard Section Length = 0.400		
Graby Road 1	Asph, Long/Trans Crack0-9	None
19-1 -	Asph, Alligator Crack 0-9	Hig/Hig
	Asph, Edge Cracking 0-9	Low/Med
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Hig
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 1.100		
PCI for this Section - 60		
This Asphalt Road's PCI Value = 60 Hard Section Length = 1.100		
Hammer Road	Asph, Long/Trans Crack0-9	None
16-1 -	Asph, Alligator Crack 0-9	None
	Asph, Edge Cracking 0-9	None
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 0.800		
PCI for this Section - 100		
This Asphalt Road's PCI Value = 100 Hard Section Length = 0.800		
Johnston Road	Unpv, Cross Section 1,4,7	Med/Low
18-1 -	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	None
	Unpv, Rutting 0-9	Low/Low
	Unpv, Loose Aggregate 0-9	Low/Hig
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Med/Low
nd of Section, Length - 0.800		
CI for this Section - 40		
his Unpaved Road's PCI Value = 40 Hard Section Length = 0.800		
eters Road 1	Asph, Long/Trans Crack0-9	None
7-1 -	Asph, Alligator Crack 0-9	Med/Low
	Asph, Edge Cracking 0-9	None
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low
nd of Section, Length - 1.300		
CI for this Section - 87		
his Asphalt Road's PCI Value = 87 Hard Section Length = 1.300		
eters Road 2	Asph, Long/Trans Crack0-9	None
7-2 -	Asph, Alligator Crack 0-9	Hig/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Hig
	Asph, Rutting 0-9	Low/Med
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Hig/Low
nd of Section, Length - 1.300		
CI for this Section - 50		
his Asphalt Road's PCI Value = 50 Hard Section Length = 1.300		
Drive	Unpv, Cross Section 1,4,7	Hig/Low
-1 -	Unpv, Drainage 1,4,7	Hig/Low
	Unpv, Corrugations 0-9	None

FREEMONT

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 08/11/2009

Road Name/RIN	Distress	Severity / Extent
	Unpv, Potholes 0-9	Low/Low
	Unpv, Rutting 0-9	Low/Low
	Unpv, Loose Aggregate 0-9	Low/Low
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Med/Low
End of Section, Length - 1.000		
PCI for this Section - 36		
This Unpaved Road's PCI Value = 36 Hard Section Length = 1.000		
Tennanah Lake Rd 1	Asph, Long/Trans Crack0-9	Med/Low
14-1 -	Asph, Alligator Crack 0-9	Med/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 1.600		
PCI for this Section - 82		
This Asphalt Road's PCI Value = 82 Hard Section Length = 1.600		
Tennanah Lake Rd 2	Asph, Long/Trans Crack0-9	None
14-2 -	Asph, Alligator Crack 0-9	Hig/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Hig
	Asph, Rutting 0-9	Low/Med
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Hig/Low
	Asph, Roughess 1,4,7	Hig/Low
End of Section, Length - 2.100		
PCI for this Section - 46		
This Asphalt Road's PCI Value = 46 Hard Section Length = 2.100		
Tennanah Lake Rd 3	Asph, Long/Trans Crack0-9	Low/Low
14-3 -	Asph, Alligator Crack 0-9	Med/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 0.500		
PCI for this Section - 88		
This Asphalt Road's PCI Value = 88 Hard Section Length = 0.500		
W. Simmon Road	Asph, Long/Trans Crack0-9	Med/Low
15-1 -	Asph, Alligator Crack 0-9	Med/Hig
	Asph, Edge Cracking 0-9	Med/Low
	Asph, Patching/Pothole0-3	Low/Med
	Asph, Rutting 0-9	Low/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 1.600		
PCI for this Section - 61		
This Asphalt Road's PCI Value = 61 Hard Section Length = 1.600		
Warner Road 1	Unpv, Cross Section 1,4,7	Med/Low
11-1 -	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	None
	Unpv, Rutting 0-9	None
	Unpv, Loose Aggregate 0-9	Low/Low
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Low/Low
End of Section, Length - 0.800		
PCI for this Section - 68		
This Unpaved Road's PCI Value = 68 Hard Section Length = 0.800		
...ers Road 2	Asph, Long/Trans Crack0-9	None
1-2 -	Asph, Alligator Crack 0-9	Hig/Hig
	Asph, Edge Cracking 0-9	Low/Hig

FREE MONT

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 08/11/2009

Road Name/RIN	Distress	Severity / Extent
	Asph, Patching/Pothole0-3	Low/Hig
	Asph, Rutting 0-9	Low/Med
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Hig/Low

End of Section, Length - 0.900
PCI for this Section - 50
This Asphalt Road's PCI Value = 50 Hard Section Length = 0.900

Wood Road 1	Asph, Long/Trans Crack0-9	None
34-1 -	Asph, Alligator Crack 0-9	Hig/Hig
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low

End of Section, Length - 0.400
PCI for this Section - 66
This Asphalt Road's PCI Value = 66 Hard Section Length = 0.400

Wood Road 2	Unpv, Cross Section 1,4,7	Med/Low
34-2 -	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	Low/Low
	Unpv, Rutting 0-9	Low/Low
	Unpv, Loose Aggregate 0-9	Low/Low
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Low/Low

End of Section, Length - 0.900
PCI for this Section - 61
This Unpaved Road's PCI Value = 61 Hard Section Length = 0.900

Surface	Length	PCI
Unpaved	5.700	55
Asphalt	17.400	69

Total Length = 23.100
Total PCI Value = 65

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Report: Summary of Road Ratings

Town of Highland

RSMS Network PCI - July 21, 2009

Town	Highland			
Road	length			W AVG C
Airport Road	3.4		82	14.2
Bower Road	0.16	UNP	-35	
Clark Road 1	1.2		58	3.5
Clark Road 2	0.2	UNP	90	
Clark Road 3	1	UNP	-8	
Clark Road 4	0.1	UNP	-20	
Crawford Road 1	1.1		100	5.6
Crawford Road 2	1.3		66	4.4
Devlin Road	1		83	4.2
Koinonia & Mud Pond 1	0.6		48	1.5
Koinonia & Mud Pond 2	0.8	UNP	46	
Lake View Drive	2.1		84	9.0
Mail Road 1	1.2		55	3.4
Mail Road 2	0.6		61	1.9
Mail Road 3	1.1		60	3.4
Marcel Four Road 1	0.1		58	0.3
Marcel Four Road 2	0.3		34	0.5
Schumacher Road 1	0.6		100	3.0
Schumacher Road 2	0.3		68	1.0
Stege Road	1.7		73	6.3
Woods Road	3.1		61	9.6
Total Miles Paved	**19.7**		**PAVED PCI**	**71.6**

Nyanza

Summary of Results From Road Condition Surveys - Date: 07/18/2009
Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Airport road 1- -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Med/Med Low/Hig Low/Low Low/Low None Low/Low Low/Low
End of Section, Length - 3.400 PCI for this Section - 82 This Asphalt Road's PCI Value = 82 Hard Section Length = 3.400		
Bower Road 2-1 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Hig/Low Hig/Low None Med/Hig Hig/Hig None Low/Low Hig/Low
End of Section, Length - 0.160 PCI for this Section - -35 Negative number indicates very poor road This Unpaved Road's PCI Value = -35 Hard Section Length = 0.160		
Clark Road 1 27-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Hig/Hig Low/Hig Low/Low Med/Low None Med/Low Med/Low
End of Section, Length - 1.200 PCI for this Section - 58 This Asphalt Road's PCI Value = 58 Hard Section Length = 1.200		
Clark Road 2 27-2 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Low/Low Low/Low None None None None Low/Low Low/Low
End of Section, Length - 0.200 PCI for this Section - 90 This Unpaved Road's PCI Value = 90 Hard Section Length = 0.200		
Clark Road 3 27-3 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Hig/Low Hig/Low None Low/Med Med/Med Low/Low Low/Low Hig/Low
End of Section, Length - 1.000 PCI for this Section - -8 Negative number indicates very poor road This Unpaved Road's PCI Value = -8 Hard Section Length = 1.000		
Clark Road 4 27-4 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Hig/Low Hig/Low None None Hig/Hig None Low/Low Hig/Low
End of Section, Length - 0.100 PCI for this Section - -20 Negative number indicates very poor road This Unpaved Road's PCI Value = -20 Hard Section Length = 0.100		

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Crawford Road 1 10-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None None None None None None Low/Low Low/Low
End of Section, Length - 1.100 PCI for this Section - 100 This Asphalt Road's PCI Value = 100 Hard Section Length = 1.100		
Crawford Road 2 10-2 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Med/Med Low/Med Low/Med Med/Low None Med/Low Med/Low
End of Section, Length - 1.300 PCI for this Section - 66 This Asphalt Road's PCI Value = 66 Hard Section Length = 1.300		
Devlin Road 20-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Med/Med Low/Low Low/Low None None Med/Low Low/Low
End of Section, Length - 1.000 PCI for this Section - 83 This Asphalt Road's PCI Value = 83 Hard Section Length = 1.000		
...ia & Mud Pond 1 ... -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Hig/Hig Low/Hig Low/Hig Low/Hig None Med/Low Hig/Low
nd of Section, Length - 0.600 CI for this Section - 48 his Asphalt Road's PCI Value = 48 Hard Section Length = 0.600		
pinonia & Mud Pond 2 1-2 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Med/Low Med/Low None Low/Low Low/Med Low/Low Low/Low Low/Low
ıd of Section, Length - 0.800 CI for this Section - 46 iis Unpaved Road's PCI Value = 46 Hard Section Length = 0.800		
ıke View Drive -1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Low/Low Med/Low Low/Low None None Low/Low Med/Low Low/Low
Section, Length - 2.100 this Section - 84 is Asphalt Road's PCI Value = 84 Hard Section Length = 2.100		

Highland

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	Low/Low
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 2.100		
PCI for this Section - 84		
This Asphalt Road's PCI Value = 84 Hard Section Length = 2.100		
Mail Road 1	Asph, Long/Trans Crack0-9	Med/Low
12-1 -	Asph, Alligator Crack 0-9	Med/Med
	Asph, Edge Cracking 0-9	Hig/Hig
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Hig
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 1.200		
PCI for this Section - 55		
This Asphalt Road's PCI Value = 55 Hard Section Length = 1.200		
Mail Road 2	Asph, Long/Trans Crack0-9	None
12-2 -	Asph, Alligator Crack 0-9	Med/Med
	Asph, Edge Cracking 0-9	Hig/Hig
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Med/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 0.600		
PCI for this Section - 61		
This Asphalt Road's PCI Value = 61 Hard Section Length = 0.600		
Mail Road 3	Asph, Long/Trans Crack0-9	None
12-3 -	Asph, Alligator Crack 0-9	Med/Med
	Asph, Edge Cracking 0-9	Med/Hig
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Med/Low
	Asph, Bleeding 1,4,7	Med/Low
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 1.100		
PCI for this Section - 60		
This Asphalt Road's PCI Value = 60 Hard Section Length = 1.100		
Marcel Four Road 1	Asph, Long/Trans Crack0-9	None
12-1 -	Asph, Alligator Crack 0-9	Hig/Hig
	Asph, Edge Cracking 0-9	None
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Med
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Hig/Low
	Asph, Roughess 1,4,7	Hig/Low
End of Section, Length - 0.100		
PCI for this Section - 58		
This Asphalt Road's PCI Value = 58 Hard Section Length = 0.100		
Marcel Four Road 2	Unpv, Cross Section 1,4,7	Hig/Low
12-2 -	Unpv, Drainage 1,4,7	Hig/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	Med/Low
	Unpv, Rutting 0-9	Low/Low
	Unpv, Loose Aggregate 0-9	None
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Med/Low
End of Section, Length - 0.300		
PCI for this Section - 34		
This Unpaved Road's PCI Value = 34 Hard Section Length = 0.300		
...nacher Rd 1	Asph, Long/Trans Crack0-9	None
9-1 -	Asph, Alligator Crack 0-9	None
	Asph, Edge Cracking 0-9	None

Highland

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 0.600		
PCI for this Section - 100		
This Asphalt Road's PCI Value = 100 Hard Section Length = 0.600		
Schumacher Road 2	Asph, Long/Trans Crack0-9	Low/Med
29-2 -	Asph, Alligator Crack 0-9	Med/Hig
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 0.300		
PCI for this Section - 68		
This Asphalt Road's PCI Value = 68 Hard Section Length = 0.300		
Stege Road	Asph, Long/Trans Crack0-9	Med/Low
33-1 -	Asph, Alligator Crack 0-9	Med/Med
	Asph, Edge Cracking 0-9	Low/Med
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 1.700		
PCI for this Section - 73		
This Asphalt Road's PCI Value = 73 Hard Section Length = 1.700		
Woods road	Asph, Long/Trans Crack0-9	None
28-1 -	Asph, Alligator Crack 0-9	Med/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Hig
	Asph, Rutting 0-9	Low/Med
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Hig/Low
End of Section, Length - 3.100		
PCI for this Section - 61		
This Asphalt Road's PCI Value = 61 Hard Section Length = 3.100		

Surface	Length	PCI
Unpaved	2.560	19
Asphalt	19.400	72

Total Length = 21.960
Total PCI Value = 66

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Report: Summary of Road Ratings

Town of Lumberland

RSMS Network PCI - July 21, 2009

Town	Lumberland			
Road	length			W AVG C
Chapin Road	1.2	UNP	63	
Hollow Road 1	2.4		69	10.5
Hollow Road 2	1		84	5.4
Kalin Weber Road	2.6		52	8.6
Lebanon Road	3.2	UNP	2	
Leers Road	1.4		87	7.8
Mapes Road	2.5	UNP	46	
Mohican Lake Road	2.9		87	16.1
Smith Road	0.6		94	3.6
Van Tuyl Road	2.3		90	13.2
White Road 1	0.9		93	5.3
White Road 2	1.6		91	9.3
Total Miles Paved	**15.7**		**PAVED PCI**	**79.7**

Lumber farms

Summary of Results From Road Condition Surveys - Date: 07/18/2009
Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Chapin Road 25 1 -	Unpv, Cross Section 1,4,7	Med/Low
	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	Low/Low
	Unpv, Rutting 0-9	Low/Low
	Unpv, Loose Aggregate 0-9	None
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Low/Low
End of Section, Length - 1.200 PCI for this Section - 63 This Unpaved Road's PCI Value = 63 Hard Section Length = 1.200		
Hollow Road 1 14-1 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	Hig/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Low
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 2.400 PCI for this Section - 69 This Asphalt Road's PCI Value = 69 Hard Section Length = 2.400		
Hollow Road 2 14-2 -	Asph, Long/Trans Crack0-9	Med/Low
	Asph, Alligator Crack 0-9	Low/Med
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 1.000 PCI for this Section - 84 This Asphalt Road's PCI Value = 84 Hard Section Length = 1.000		
[illegible] Weber Road 17-1 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	Hig/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Hig/Hig
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Hig/Low
End of Section, Length - 2.600 PCI for this Section - 52 This Asphalt Road's PCI Value = 52 Hard Section Length = 2.600		
Lebanon Road 8-1 -	Unpv, Cross Section 1,4,7	Hig/Low
	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	Low/Hig
	Unpv, Potholes 0-9	Med/Low
	Unpv, Rutting 0-9	Med/Med
	Unpv, Loose Aggregate 0-9	Low/Low
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Med/Low
nd of Section, Length - 3.200 CI for this Section - 2 his Unpaved Road's PCI Value = 2 Hard Section Length = 3.200		
eers Road 1-1 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	Low/Hig
	Asph, Edge Cracking 0-9	Low/Med
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
Section, Length - 1.400 CI for this Section - 87 his Asphalt Road's PCI Value = 87 Hard Section Length = 1.400		

Lumberland

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Mapes Road 19-1 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Med/Low Med/Low None Low/Low Low/Low Low/Low Low/Low Med/Low
End of Section, Length - 2.500 PCI for this Section - 46 This Unpaved Road's PCI Value = 46 Hard Section Length = 2.500		
Mohican Lake Road 22-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Med/Low Med/Med None None None None Low/Low Low/Low
End of Section, Length - 2.900 PCI for this Section - 87 This Asphalt Road's PCI Value = 87 Hard Section Length = 2.900		
Smith Road 38-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Low/Low Low/Med None None None None Low/Low Low/Low
End of Section, Length - 0.600 PCI for this Section - 94 This Asphalt Road's PCI Value = 94 Hard Section Length = 0.600		
[illegible]uyl Road 3[illegible] -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Med/Low Low/Low Low/Low None None None Low/Low Low/Low
End of Section, Length - 2.300 PCI for this Section - 90 This Asphalt Road's PCI Value = 90 Hard Section Length = 2.300		
White Road 1 35-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Low/Low None None None None Med/Low Low/Low
End of Section, Length - 0.900 PCI for this Section - 93 This Asphalt Road's PCI Value = 93 Hard Section Length = 0.900		
White Road 2 35-2 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Low/Med Low/Low Low/Low None None Low/Low Low/Low
[illegible]f Section, Length - 1.600 [illegible]r this Section - 91 This Asphalt Road's PCI Value = 91 Hard Section Length = 1.600		

Lumberton

Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Surface	Length	PCI
Jr ved	6.900	29
A alt	15.700	80

Total Length = 22.600
Total PCI Value = 64

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Report: Summary of Road Ratings

Town of Tusten

RSMS Network PCI - July 21, 2009

Town	Tusten			
Road	length			W AVG C
Blind Pond Road 1	1	66		4.9
Blind Pond Road 2	0.3	100		2.2
Blind Pond Road 3	0.6	1	UNP	
Cochecton Turnpike Road 1	0.6	85		3.8
Cochecton Turnpike Road 2	2.1	63	UNP	
Daub Road	0.4	68	UNP	
Forest Pond Road	0.4	88		2.6
Gables Road 1	0.9	85		5.7
Gables Road 2	0.8	78		4.6
Hoffman Road 1	1	37		2.7
Hoffman Road 2	0.3	47		1.0
Irish Town Road 1	1.1	89		7.3
Irish Town Road 2	0.3	35	UNP	
Kirk Road	0.7	87		4.5
Lackawaxen Road	1.3	89		8.6
Mahls Pond Road 1	1.4	68	UNP	
Mahls Pond Road 2	1	73		5.4
Main Street	0.2	93		1.4
Perry Pond Road	1.6	89		10.5
Ryer Road	2.3	100		17.0
Stump Pond Road	2	78	UNP	
Total Miles Paved	**13.5**		**PAVED PCI**	**82.3**

Summary of Results From Road Condition Surveys - Date: 07/18/2009
Survey Results ALL Road Types For Dates Between: 06/01/2009 - 07/18/2009

Road Name/RIN	Distress	Severity / Extent
Blind Pond Road 1 29-1 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	Med/Hig
	Asph, Edge Cracking 0-9	Low/Hig
	Asph, Patching/Pothole0-3	Low/Low
	Asph, Rutting 0-9	Low/Med
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Med/Low
End of Section, Length - 1.000 PCI for this Section - 66 This Asphalt Road's PCI Value = 66 Hard Section Length = 1.000		
Blind Pond Road 2 29-2 -	Asph, Long/Trans Crack0-9	None
	Asph, Alligator Crack 0-9	None
	Asph, Edge Cracking 0-9	None
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 0.300 PCI for this Section - 100 This Asphalt Road's PCI Value = 100 Hard Section Length = 0.300		
Blind Pond Road 3 29-3 -	Unpv, Cross Section 1,4,7	Hig/Low
	Unpv, Drainage 1,4,7	Hig/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	Low/Low
	Unpv, Rutting 0-9	Low/Hig
	Unpv, Loose Aggregate 0-9	Low/Low
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Hig/Low
End of Section, Length - 0.600 PCI for this Section - 1 This Unpaved Road's PCI Value = 1 Hard Section Length = 0.600		
Ochecton Tpk Rd 1 29-1 -	Asph, Long/Trans Crack0-9	Med/Low
	Asph, Alligator Crack 0-9	Low/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 0.600 PCI for this Section - 85 This Asphalt Road's PCI Value = 85 Hard Section Length = 0.600		
Ochecton Tpk Rd 2 29-2 -	Unpv, Cross Section 1,4,7	Med/Low
	Unpv, Drainage 1,4,7	Hig/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	None
	Unpv, Rutting 0-9	None
	Unpv, Loose Aggregate 0-9	Low/Low
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Low/Low
End of Section, Length - 2.100 PCI for this Section - 63 This Unpaved Road's PCI Value = 63 Hard Section Length = 2.100		
Laub Road 29-1 -	Unpv, Cross Section 1,4,7	Med/Low
	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	None
	Unpv, Rutting 0-9	None
	Unpv, Loose Aggregate 0-9	Low/Low
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Low/Low
Section, Length - 0.400 PCI for this Section - 68 This Unpaved Road's PCI Value = 68 Hard Section Length = 0.400		

Road Name/RIN	Distress	Severity / Extent
Forest Pond Road 70-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Med/Low Low/Low None None None Med/Low Low/Low
End of Section, Length - 0.400 PCI for this Section - 88 This Asphalt Road's PCI Value = 88 Hard Section Length = 0.400		
Gables Road 1 13-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Med/Low Low/Low Low/Low None None None Med/Low Low/Low
End of Section, Length - 0.900 PCI for this Section - 85 This Asphalt Road's PCI Value = 85 Hard Section Length = 0.900		
Gables Road 2 13-2 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Med/Low Med/Low Low/Hig None None None Med/Low Low/Low
End of Section, Length - 0.800 PCI for this Section - 78 This Asphalt Road's PCI Value = 78 Hard Section Length = 0.800		
[illegible]an Road [illegible] -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Med/Med Hig/Hig Low/Hig Low/Med Med/Hig None Hig/Low Hig/Low
nd of Section, Length - 1.000 CI for this Section - 37 his Asphalt Road's PCI Value = 37 Hard Section Length = 1.000		
offman Road 2)-2 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Hig/Hig Low/Hig Low/Hig Med/Med None Med/Low Hig/Low
id of Section, Length - 0.300 CI for this Section - 47 iis Asphalt Road's PCI Value = 47 Hard Section Length = 0.300		
sh Town Road 1 -1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Low/Low Low/Low Low/Low None None None Med/Low Low/Low
d of Section, Length - 1.100 this Section - 89 phalt Road's PCI Value = 89 Hard Section Length = 1.100		

Road Name/RIN	Distress	Severity / Extent
rish Town Road 2 20-2 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Hig/Low Hig/Low None Med/Med Med/Hig Low/Hig Low/Low Hig/Low
End of Section, Length - 0.300 PCI for this Section - -35 Negative number indicates very poor road This Unpaved Road's PCI Value = -35 Hard Section Length = 0.300		
Kirk Road 33-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Med/Med Med/Low None None None None Low/Low Low/Low
End of Section, Length - 0.700 PCI for this Section - 87 This Asphalt Road's PCI Value = 87 Hard Section Length = 0.700		
ackawaxen Road 21-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Low/Low Low/Low Low/Low None None None Med/Low Low/Low
End of Section, Length - 1.300 PCI for this Section - 89 This Asphalt Road's PCI Value = 89 Hard Section Length = 1.300		
Pond Rd 1 -	Unpv, Cross Section 1,4,7 Unpv, Drainage 1,4,7 Unpv, Corrugations 0-9 Unpv, Potholes 0-9 Unpv, Rutting 0-9 Unpv, Loose Aggregate 0-9 Unpv, Dust Control 1,4,7 Unpv, Roughness 1,4,	Med/Low Med/Low None None None Low/Low Low/Low Low/Low
nd of Section, Length - 1.400 CI for this Section - 68 his Unpaved Road's PCI Value = 68 Hard Section Length = 1.400		
lahls Pond Rd 2 7-2 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	None Hig/Med None Low/Low None None Med/Low Med/Low
nd of Section, Length - 1.000 CI for this Section - 73 his Asphalt Road's PCI Value = 73 Hard Section Length = 1.000		
lain Street 4-1 -	Asph, Long/Trans Crack0-9 Asph, Alligator Crack 0-9 Asph, Edge Cracking 0-9 Asph, Patching/Pothole0-3 Asph, Rutting 0-9 Asph, Bleeding 1,4,7 Asph, Drainage 1,4,7 Asph, Roughess 1,4,7	Low/Low Low/Low None Low/Low None None Low/Low Low/Low
f Section, Length - 0.200 this Section - 93 is Asphalt Road's PCI Value = 93 Hard Section Length = 0.200		

Road Name/RIN	Distress	Severity / Extent
Perry Pond Road	Asph, Long/Trans Crack0-9	Low/Low
37-1 -	Asph, Alligator Crack 0-9	Low/Low
	Asph, Edge Cracking 0-9	Low/Low
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Med/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 1.600		
PCI for this Section - 89		
This Asphalt Road's PCI Value = 89 Hard Section Length = 1.600		
Ryer Road	Asph, Long/Trans Crack0-9	None
31-1 -	Asph, Alligator Crack 0-9	None
	Asph, Edge Cracking 0-9	None
	Asph, Patching/Pothole0-3	None
	Asph, Rutting 0-9	None
	Asph, Bleeding 1,4,7	None
	Asph, Drainage 1,4,7	Low/Low
	Asph, Roughess 1,4,7	Low/Low
End of Section, Length - 2.300		
PCI for this Section - 100		
This Asphalt Road's PCI Value = 100 Hard Section Length = 2.300		
Stump Pond Road	Unpv, Cross Section 1,4,7	Low/Low
17-1 -	Unpv, Drainage 1,4,7	Med/Low
	Unpv, Corrugations 0-9	None
	Unpv, Potholes 0-9	Low/Low
	Unpv, Rutting 0-9	None
	Unpv, Loose Aggregate 0-9	None
	Unpv, Dust Control 1,4,7	Low/Low
	Unpv, Roughness 1,4,	Low/Low
End of Section, Length - 2.000		
PCI for this Section - 78		
This Unpaved Road's PCI Value = 78 Hard Section Length = 2.000		

Surface	Length	PCI
Unpaved	6.800	59
Asphalt	13.500	82

Total Length = 20.300
Total PCI Value = 74

Appendix H

Labor, Equipment, and Material Unit Costs

(Typical values in County; Used for Repair Cost Estimates for all Towns)

Treatment Cost Summary Treatment	Material Cost/Sq Yd	Town Labor & Equip/Sq Yd	Total Cost/Sq Yd
Cold-in-Place Recycle	$ 4.17	None	$ 4.17
3" CM #1 & #2 Stone	$ 6.92	$ 1.20	$ 8.13
3" CM (Millings & Crusher Run)	$ 5.62	$ 2.20	$ 7.82
3" Hot Mix Overlay	$ 11.02	$ 2.78	$ 13.79
1 1/2 inch Black Top Overlay	$ 6.44	$ 2.78	$ 9.21
2" Hot Mix Overlay	$ 7.96	$ 2.78	$ 10.74
2 1/2" Hot Mix Overlay	$ 9.49	$ 2.78	$ 12.27
Slurry Seal	$ 1.34	None	$ 1.34
Crackseal	$ 0.15	None	$ 0.15
Box Out, #1A CS	$ 1.02	$ 0.98	$ 1.99
Crackseal, Box out, #1A CS	$ 1.16	$ 0.98	$ 2.14
Surface Patch	$ 0.32	$ 0.51	$ 0.83
Boxout Patch	$ 0.32	$ 0.76	$ 1.09
Boxout and Crackseal	$ 0.47	$ 0.76	$ 1.23
Crackseal and Slurry Seal	$ 1.49	None	$ 1.49
Microsurfacing	$ 2.86	None	$ 2.86
#1ST/#1A Double Chip Seal	$ 1.92	$ 0.42	$ 2.34
#1A Single Chip Seal	$ 0.69	$ 0.21	$ 0.90
Prep and #1A Chip Seal	$ 1.16	$ 0.98	$ 2.14
Fabric, 12" Gravel	$ 7.98	$ 5.35	$ 13.34
Fab, 12" Grvl, 6" Emul Injection	$ 7.21	$ 5.38	$ 12.58
9" FDR with 4" Add Gravel	$ 8.33	$ 2.68	$ 11.01
6" FDR, 4" Stab. Gravel	$ 6.80	$ 1.31	$ 8.11
9" FDR	$ 5.63	$ 0.14	$ 5.77

Gravel Road Treatments Cost Summary			
Treatment	**Material & Services Cost/Sq Yd**	**Town Labor & Equip Costs/Sq Yd**	**Total**
Regrade	None	$ 2.59	$ 2.59
Spot Gravel	$ 2.56	3.55	$ 6.11
CaCl Dust Control	$ 1.60	None	$ 1.60
AEP Dust Control	$ 0.33	None	$ 0.33
4" Gravel	$ 1.08	$ 2.68	$ 3.76
Fabric, 12" Gravel	$ 4.44	$ 5.52	$ 9.96

Town Lumberland

GRAVEL ~~Paved~~ **Repair Strategies**

	Routine Maintenance
1	EARTHEN: 1 X yr Grade/Shape/Roll
2	Ad HOC Crushed
3	
4	GRAVEL: 1 X yr Grade/Shape/Roll
5	Ad HOC Crushed
6	~~including the Berms~~
7	
8	
	Preventive Maintenance
1	
2	~~GRADE~~
3	
4	
5	
6	
7	
8	
	Rehabilitation
1	
2	GRAVEL: SCARIFY, 2-3 in Crusher Run
3	Stone, Mix-IN - ROLL/COMPACT
4	1 X yr
5	
6	
7	
8	
	Reconstruction
1	
2	
3	
4	
5	
6	
7	
8	

Town	Lumberland	
Labor		

Title	Hourly Wage	Benefits Multiplier	Total
MEO I Class A	$ 17.83	1.71	
MEO II Class B	$ ~~NA~~ 17.35		
HEO I	NA		
HEO II	NA		
Laborer Part time	$ 9.00		
Summer Hire			
Foreman	$ 18.58		
Mechanic	$ 18.35		
Part Time MEE	$ 11.25	MA	

Equipment (If no Data use State Rates)

Item	Ownership/Overhaul	Hourly Operating Cost	Total
		Fuel, Lube, etc	
10 wheel Dump Truck			
6 Wheel dump Truck			
Backhoe			
Steel Drum Roller			
Pneumatic Roller			
Track Hoe			
Rubber Tired Hoe			
Grader			
Dozer			
Loader			

Town	Lumberland

PAVED ~~Gravel~~ Repair Strategies

	Routine Maintenance
1	COLD PATCH
2	
3	
4	
5	
6	
7	
8	

	Preventive Maintenance
1	Single Chip Seal (cold or Hot Mix)
2	
3	
4	
5	
6	
7	
8	

	Rehabilitation
1	- MIX IN STONE, GRADE & ROLL
2	SURFACE W/ 3" Custom Cold-Mix (CURE
3	Surface Chink W/ 1A Chip Seal)
4	
5	- Full Depth In-Place Recycle W/ 50 lb/SY
6	No 2 Stone, 1.5 gal/SY Emulsion
7	5" Cold Mix (Mohican Lake Rd)
8	

	Reconstruction
1	- SCARIFY 10-12 in. into Subgrade
2	- Add in 150 lb Crushed Stone/SY + 1.5 gal/SY oil
3	Grade & Roll
4	- Surface W/ 3" Custom Cold-Mix
5	(Van Tuyl, White, Hanna)
6	
7	
8	

Town	Lumberland			
Vendor Services				
Item	**$/hour**	**$/Day**	**$/Week**	**$/Sq Yd**
Pugmill w/Operator Custom Cold-Mix		$1500		
Paver w/Operators		$2650		
Roller w/Operator				
CMI Recycling Machine w/Operator				.90
Pavement Milling Machine w/Operator		$5,500		
Self Propelled Chipper w/Operator		$1,300		
Pneumatic Roller w/operator				
Steel Drum Roller w/Operator				
Recycling, Paving, and Miscillaneous Vendor Operations				
Item	**Unit**	**$/Unit**		
Cold -In- Place Recycle	Square Yards			
~~Suite Kote~~				~~[illegible]~~
~~Stone Pit~~ All Labo				5.75
Equip Matl by				
Suit-Kote				

Need Bid Sheets for Matls

Need L-M-H traffic Estim

Priority 1-5

Town	

Road Network Information

1	List of Roads by Name
2	Length and width of road
3	Shoulder type and width (gravel, paved etc.)
2	Traffic Level on Each Road (L, ML,M,MH,H or Actual ADT)
3	Road Type - Gravel, Chip Seal, Cold Mix, Hot Mix
4	Importance of Road (L, ML, M, MH, H)

The above information is needed for each of the 20 miles of road for each town
This will provide the overall characteristics of the system.
Also, please provide a general description or cross section sketch of the typical layer thicknesses for each type of road. If bases under asphalt have a range of thickness from 6 to 12 inches then specify the range.

Town	
Road Type	
Repair Strategy	
Repair Type	

Labor

Position	Number	Hours/Day	Days	$/Hr	Total $
		Total Labor Cost			

Equipment

Item	Number	Hours/Day	Days	$/Hour	Total $
		Total Equipment Cost			

Materials

Item	Unit	Unit Cost	Amount	Total Cost	
		Total Material Cost			

Appendix I

RSMS Reports

- Road Repair Priority Listing
- Repair Treatments Cost Summary

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Reports:

1) Road Repair Priority List;

2) Repair Treatments Cost Summary

Town of Callicoon

CALLICOON

Inventory RSMS 111

ROAD NAME	VALUE	PCI	FROM ST	TO ST
›ley Road	1500	78	Schaefer Road	1.2 mile point
/eissman Road 1	1350	83	CR 123	0.7 mile point
J Young Road	1200	42	Stump Pond Road	Weissman Road
Bethlehem Road 2	1200	93	1.2 mile point	end of pavement
Buck Brook Road	1200	90	Bayer Road	Town Line
Esselman Road	1125	68	Faubel Road	CR 128
Bethlehem Road 1	1050	100	CR 123	1.2 mile point
Earl Meyers Road	975	75	CR 127	Faubel Road
Kratz Road	500	85	Poley Road	Delaware Town Line
Stump Pond Road	475	54	CR 149	CR 149
Tonges Road	475	46	Schaefer Road	Delaware Town Line
Schaefer Road	475	38	CR 128	Poley Road
Huber Road	375	59	CR 149	Town Line
Weissman Road 2	375	59	0.7 mile point	Stump Pond Road
Stewart Road	375	56	CR 121	Town Line

Uses The Following Weight Factors

Traffic 25

Importance 25

Roughness 25

Condition 25

CALLICOON

Maint Summary of Road Condition Survey - Date:08/11/2009

Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Category / Start	Length	Est. Cost / Description
ehem Road 1			AC Nothing Needed		
7-1 -	1	18.0	0.000	1.200	
0 Months Added		Do Nothing AC			$ 0.00
Bethlehem Road 2			AC Defer Rehab		
7-2 -	1	18.0	1.200	1.500	
0 Months Added		Defer Rehab AC			$ 0.00
Buck Brook Road			AC Crack Repair		
5-1 -	1	18.0	0.000	1.400	
60 Months Added		Crack Seal			$ 2,173.47
Earl Meyers Road			AC Rehab		
10-1 -	1	17.0	0.000	0.800	
180 Months Added		1 1/2" HM Overlay			$ 72,021.20
180 Months Added		3" CM (millings, CR)			$ 61,151.55
180 Months Added		3" Cold Mix (#1&#2)			$ 63,575.72
240 Months Added		3" HM Overlay			$ 107,836.30
180 Months Added		CIP Recycle			$ 32,608.95
120 Months Added		DBL Chip Seal			$ 18,298.55
Esselman Road			AC Rehab		
4-1 -	1	17.0	0.000	1.300	
180 Months Added		1 1/2" HM Overlay			$ 117,034.45
180 Months Added		3" CM (millings, CR)			$ 99,371.27
180 Months Added		3" Cold Mix (#1&#2)			$ 103,310.54
240 Months Added		3" HM Overlay			$ 175,233.99
180 Months Added		CIP Recycle			$ 52,989.54
120 Months Added		DBL Chip Seal			$ 29,735.14
luber Road			AC Reconstruction		
0-1 -	1	19.0	0.000	2.400	
Months Added		12" Bank R, Emul Inj			$ 329,843.01
Months Added		2" HM Pavement			$ 281,598.88
300 Months Added		3" Cold Mix Pavement			$ 213,165.63
300 Months Added		6" FDR, 4" Stab Grvl			$ 212,641.24
300 Months Added		9" FDR Base			$ 151,287.30
300 Months Added		9" FDR w/4" Add Grvl			$ 288,678.18
50 Months Added		Double Chip Seal			$ 61,353.95
300 Months Added		Fabric & 12" Crush R			$ 349,769.93
Young Road			Major Rehab UNP		
1-1 -	1	15.0	0.000	2.600	
60 Months Added		4" Gravel			$ 84,316.83
atz Road			Rout Maint UNP		
5-11 -	1	15.0	0.000	0.900	
12 Months Added		Regrade			$ 0.00
36 Months Added		Spot Gravel			$ 2,483.97
ley Road			AC Surface Treatment		
5-11 -	1	18.0	0.000	1.200	
60 Months Added		#1A Chip Seal			$ 11,177.84
96 Months Added		Slurry Seal			$ 16,642.57
haefer Road			AC Reconstruction		
5-1 -	1	17.0	0.000	0.600	
300 Months Added		12" Bank R, Emul Inj			$ 73,780.67
300 Months Added		2" HM Pavement			$ 62,989.22
300 Months Added		3" Cold Mix Pavement			$ 47,681.79
300 Months Added		6" FDR, 4" Stab Grvl			$ 47,564.49
300 Months Added		9" FDR Base			$ 33,840.58
300 Months Added		9" FDR w/4" Add Grvl			$ 64,572.75
50 Months Added		Double Chip Seal			$ 13,723.91
300 Months Added		Fabric & 12" Crush R			$ 78,238.01
... Road			AC Reconstruction		
5-11 -	1	15.0	0.000	1.000	

Road Name / RIN	Div	Width	Start	Length	Description	Est. Cost
300 Months Added		12" Bank R, Emul Inj				$ 108,500.99
) Months Added		2" HM Pavement				$ 92,631.21
0 Months Added		3" Cold Mix Pavement				$ 70,120.27
300 Months Added		6" FDR, 4" Stab Grvl				$ 69,947.78
300 Months Added		9" FDR Base				$ 49,765.56
300 Months Added		9" FDR w/4" Add Grvl				$ 94,959.93
50 Months Added		Double Chip Seal				$ 20,182.22
300 Months Added		Fabric & 12" Crush R				$ 115,055.90
Stump Pond Road			AC Reconstruction			
50-1 -	1	19.0	0.000	3.700		
300 Months Added		12" Bank R, Emul Inj				$ 508,507.98
300 Months Added		2" HM Pavement				$ 434,131.61
300 Months Added		3" Cold Mix Pavement				$ 328,630.35
300 Months Added		6" FDR, 4" Stab Grvl				$ 327,821.91
300 Months Added		9" FDR Base				$ 233,234.58
300 Months Added		9" FDR w/4" Add Grvl				$ 445,045.53
50 Months Added		Double Chip Seal				$ 94,587.33
300 Months Added		Fabric & 12" Crush R				$ 539,228.65
Tonges Road			AC Reconstruction			
52A-1 -	1	18.0	0.000	0.500		
300 Months Added		12" Bank R, Emul Inj				$ 65,100.59
300 Months Added		2" HM Pavement				$ 55,578.73
300 Months Added		3" Cold Mix Pavement				$ 42,072.16
300 Months Added		6" FDR, 4" Stab Grvl				$ 41,968.67
300 Months Added		9" FDR Base				$ 29,859.33
300 Months Added		9" FDR w/4" Add Grvl				$ 56,975.96
50 Months Added		Double Chip Seal				$ 12,109.33
300 Months Added		Fabric & 12" Crush R				$ 69,033.54
Veissman Road 1			AC Patching			
57-1 -	1	19.0	0.000	0.700		
60 Months Added		Box Out and Crk Fill				$ 9,406.29
Months Added		Boxout Patch				$ 8,335.66
0 Months Added		Zipper CMR Patch				$ 1,147.11
Veissman Road 2			AC Reconstruction			
57-2 -	1	19.0	0.700	1.200		
300 Months Added		12" Bank R, Emul Inj				$ 164,921.51
300 Months Added		2" HM Pavement				$ 140,799.44
300 Months Added		3" Cold Mix Pavement				$ 106,582.82
300 Months Added		6" FDR, 4" Stab Grvl				$ 106,320.62
300 Months Added		9" FDR Base				$ 75,643.65
300 Months Added		9" FDR w/4" Add Grvl				$ 144,339.09
50 Months Added		Double Chip Seal				$ 30,676.97
300 Months Added		Fabric & 12" Crush R				$ 174,884.97

Multi-Municipal Gas Drilling Task Force
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Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Reports:

1) Road Repair Priority List;

2) Repair Treatments Cost Summary

Town of Cochecton

COCHECTION

Inventory RSMS 111

ROAD NAME	VALUE	PCI	FROM ST	TO ST
Mueller Road	2250	82	NY 17 B	Lounsberry Road
rook Road 3	1800	68	0.55 mile point	Start of Asphalt
Brook Road 1	1800	68	Mitchell Pond Road	0.4 mile point
Mitchell Pond East	1800	82	CR 114	CR 116
Shortcut Road	1800	82	CR 113	CR 112
Fred White Road	1650	79	Tyler Road	NY 52/CR 115
Brook Road 2	1650	93	0.4 mile point	Johns Road
Skipperene Road	1600	75	NY 97	Old County Road
Smales road	1600	66	0.0	0.4 miles
Mitchell Pond West 2	1400	100	0.70 mile point	Mill Road
Johns Road	1400	78	Mitchell Pond East	0.7 mile point
Bernas Road	1275	54	Short Cut Road	NY 17B
Tyler Road	1275	57	NY 52/CR 115	Erhley Road
Mitchell Pond West 1	1125	63	CR 114	0.7 mile point
Schalk Road	1125	56	Tyler Road	Ehrley Road
Brook Road 4	1125	64	1.55 mile point	CR 116
Mill Pond Road	800	78	Mitchell Pond West	Dead end sign

Uses The following Weight Factors:

Traffic 25

Importance 25

Roughness 25

Condition 25

Road Name / RIN	Div	Width / Start	Category / Length	Est. Cost / Description
300 Months Added		6" FDR, 4" Stab Grvl		$ 103,056.39
) Months Added		9" FDR Base		$ 73,321.25
) Months Added		9" FDR w/4" Add Grvl		$ 139,907.63
50 Months Added		Double Chip Seal		$ 29,735.14
300 Months Added		Fabric & 12" Crush R		$ 169,515.69
Skyline Drive			Major Rehab UNP	
34-1 -	1	12.0	0.000 1.000	
60 Months Added		4" Gravel		$ 25,943.64
Tennanah Lake Rd 1			AC Patching	
14-1 -	1	20.0	0.000 1.600	
60 Months Added		Box Out and Crk Fill		$ 22,631.69
60 Months Added		Boxout Patch		$ 20,055.72
60 Months Added		Zipper CMR Patch		$ 2,759.96
Tennanah Lake Rd 2			AC Reconstruction	
4-2 -	1	17.0	1.600 2.100	
300 Months Added		12" Bank R, Emul Inj		$ 258,232.36
300 Months Added		2" HM Pavement		$ 220,462.28
300 Months Added		3" Cold Mix Pavement		$ 166,886.25
300 Months Added		6" FDR, 4" Stab Grvl		$ 166,475.71
300 Months Added		9" FDR Base		$ 118,442.03
300 Months Added		9" FDR w/4" Add Grvl		$ 226,004.63
50 Months Added		Double Chip Seal		$ 48,033.68
300 Months Added		Fabric & 12" Crush R		$ 273,833.04
Tennanah Lake Rd 3			AC Patching	
4-3 -	1	17.0	3.700 0.500	
60 Months Added		Box Out and Crk Fill		$ 6,011.54
60 Months Added		Boxout Patch		$ 5,327.30
60 Months Added		Zipper CMR Patch		$ 733.11
W Simmon Road			AC Rehab	
-	1	17.0	0.000 1.600	
60 Months Added		1 1/2" HM Overlay		$ 144,042.40
180 Months Added		3" CM (millings, CR)		$ 122,303.10
180 Months Added		3" Cold Mix (#1&#2)		$ 127,151.43
240 Months Added		3" HM Overlay		$ 215,672.60
180 Months Added		CIP Recycle		$ 65,217.89
120 Months Added		DBL Chip Seal		$ 36,597.09
Warner Road 1			Rout Maint UNP	
W-1 -	1	16.0	0.000 0.800	
12 Months Added		Regrade		$ 0.00
36 Months Added		Spot Gravel		$ 2,355.17
Warners Road 2			AC Reconstruction	
W-2 -	1	16.0	0.800 0.900	
300 Months Added		12" Bank R, Emul Inj		$ 104,160.95
300 Months Added		2" HM Pavement		$ 88,925.96
300 Months Added		3" Cold Mix Pavement		$ 67,315.46
300 Months Added		6" FDR, 4" Stab Grvl		$ 67,149.87
300 Months Added		9" FDR Base		$ 47,774.94
300 Months Added		9" FDR w/4" Add Grvl		$ 91,161.53
50 Months Added		Double Chip Seal		$ 19,374.93
300 Months Added		Fabric & 12" Crush R		$ 110,453.66
Wood Road 1			AC Rehab	
W-1 -	1	15.0	0.000 0.400	
180 Months Added		1 1/2" HM Overlay		$ 31,774.06
180 Months Added		3" CM (millings, CR)		$ 26,978.62
180 Months Added		3" Cold Mix (#1&#2)		$ 28,048.11
240 Months Added		3" HM Overlay		$ 47,574.84
180 Months Added		CIP Recycle		$ 14,386.30
120 Months Added		DBL Chip Seal		$ 8,072.89
Wood Road 2			Rout Maint UNP	
W- -	1	16.0	0.400 0.900	
12 Months Added		Regrade		$ 0.00

Road Name		Category		Est. Cost	
RIN	Div	Width	Start	Length	Description
36 Months Added		Spot Gravel			$ 2,649.56

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Town of Highland

HIGHLITIUL

Inventory RSMS 111

ROAD NAME	VALUE	PCI	FROM ST	TO ST
lark Road 3	2000	-8	1.4 mi pt/dead end	Road Closed
ake View Drive	1650	84	Bower Road	CR 47
Devlin Road	1600	83	CR 47	CR 32
Marcel Four Road 2	1600	34	0.10 point	Log Cabin
Airport road	1600	82	CR 33	Cr 33/21
Koinonia & Mud Pond 2	1400	46	Koinonia Camp	Road Narrowing
Stege Road	1400	73	CR 12	Bower Road
Crawford Road 1	1400	100	Mail Road	House #84
Mail Road 3	1400	60	House #101	Cr 21/NYS 97
Schumacher Rd 1	1400	100	Woods Road	NYSEG Plole 1247
Clark Road 1	1125	58	CR 32	Pavement end
Crawford Road 2	1125	66	House #84	CR 33
Mail Road 2	1125	61	Mail Road 1	House #101
Mail Road 1	1125	55	CR 21	Crawford Road
Schumacher Road 2	1125	68	NYSEG Pole 1247	CR 21
Bower Road	1100	-35	Stege Road	Dead End
Clark Road 4	1100	-20	Road Closed Sign	Could not proceed
Koinonia & Mud Pond 1	425	48	Lake View Drive	End of Pavement
Woods road	425	61	York Lake Rd	Cr 22
Marcel Four Road 1	325	58	0.00 point	0.10 point
Clark Road 2	0	90	Pavement end	Dead end sign

Uses The following weight Factors:

Traffic 25
Importance 25
Roughness 25
condition 25

FREEMONT

Maint Summary of Road Condition Survey - Date:08/11/2009
Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Category / Start	Length	Est. Cost / Description
ana Lake Road			AC Patching		
32-1 -	1	17.0	0.000	1.600	
60 Months Added		Box Out and Crk Fill			$ 19,236.93
60 Months Added		Boxout Patch			$ 17,047.36
60 Months Added		Zipper CMR Patch			$ 2,345.97
Basket Road 1			AC Patching		
1-1 -	1	16.5	0.000	1.600	
60 Months Added		Box Out and Crk Fill			$ 18,671.14
60 Months Added		Boxout Patch			$ 16,545.97
60 Months Added		Zipper CMR Patch			$ 2,276.97
Basket Road 2			AC Rehab		
1-2 -	1	17.0	0.000	2.000	
180 Months Added		1 1/2" HM Overlay			$ 180,052.99
180 Months Added		3" CM (millings, CR)			$ 152,878.87
180 Months Added		3" Cold Mix (#1&#2)			$ 158,939.29
240 Months Added		3" HM Overlay			$ 269,590.75
180 Months Added		CIP Recycle			$ 81,522.37
120 Months Added		DBL Chip Seal			$ 45,746.36
Bowers Road			Rout Maint UNP		
1-1 -	1	14.0	0.000	1.800	
12 Months Added		Regrade			$ 0.00
36 Months Added		Spot Gravel			$ 4,636.74
Fink Road			AC Rehab		
15-1 -	1	16.0	0.000	0.600	
180 Months Added		1 1/2" HM Overlay			$ 50,838.49
180 Months Added		3" CM (millings, CR)			$ 43,165.80
180 Months Added		3" Cold Mix (#1&#2)			$ 44,876.98
240 Months Added		3" HM Overlay			$ 76,119.74
180 Months Added		CIP Recycle			$ 23,018.08
120 Months Added		DBL Chip Seal			$ 12,916.62
Graby Rd 2					
9-2 -	1	16.0	1.100	0.400	
No Maintenance Available					
Graby Road 1			AC Rehab		
9-1 -	1	15.0	0.000	1.100	
180 Months Added		1 1/2" HM Overlay			$ 87,378.66
180 Months Added		3" CM (millings, CR)			$ 74,191.22
180 Months Added		3" Cold Mix (#1&#2)			$ 77,132.30
240 Months Added		3" HM Overlay			$ 130,830.80
180 Months Added		CIP Recycle			$ 39,562.32
120 Months Added		DBL Chip Seal			$ 22,200.44
Hammer Road			AC Nothing Needed		
5-1 -	1	20.5	0.000	0.800	
0 Months Added		Do Nothing AC			$ 0.00
Johnston Road			Prevent Maint UNP		
3-1 -	1	13.0	0.000	0.800	
12 Months Added		AEPM Dust Control			$ 1,973.37
12 Months Added		CaCl Dust Control			$ 9,567.87
Peters Road 1			AC Patching		
1-1 -	1	17.5	0.000	1.300	
60 Months Added		Box Out and Crk Fill			$ 16,089.71
60 Months Added		Boxout Patch			$ 14,258.36
60 Months Added		Zipper CMR Patch			$ 1,962.16
Peters Road 2			AC Reconstruction		
2-2 -	1	17.0	1.300	1.300	
Months Added		12" Bank R, Emul Inj			$ 159,858.13
300 Months Added		2" HM Pavement			$ 136,476.65
300 Months Added		3" Cold Mix Pavement			$ 103,310.54

Maint Summary of Road Condition Survey - Date:08/11/2009
Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Start	Length	Category / Description	Est. Cost
rt road			AC Defer Rehab			
1-1 -	1	19.0	0.000	3.400		
0 Months Added		Defer Rehab AC				$ 0.00
Bower Road			Rebuild UNP			
2-1 -	1	14.0	0.000	0.160		
120 Months Added		Fabric, 12" Gravel				$ 5,718.64
Clark Road 1			AC Rehab			
27-1 -	1	20.0	0.000	1.200		
180 Months Added		1 1/2" HM Overlay				$ 127,096.23
180 Months Added		3" CM (millings, CR)				$ 107,914.50
180 Months Added		3" Cold Mix (#1&#2)				$ 112,192.44
240 Months Added		3" HM Overlay				$ 190,299.35
180 Months Added		CIP Recycle				$ 57,545.20
120 Months Added		DBL Chip Seal				$ 32,291.55
Clark Road 3			Major Rehab UNP			
27-3 -	1	11.0	1.400	1.000		
60 Months Added		4" Gravel				$ 23,781.67
Clark Road 4			Rebuild UNP			
27-4 -	1	10.0	2.400	0.100		
120 Months Added		Fabric, 12" Gravel				$ 2,552.96
Crawford Road 1			AC Nothing Needed			
10-1 -	1	19.0	0.000	1.100		
0 Months Added		Do Nothing AC				$ 0.00
Crawford Road 2			AC Rehab			
10-2 -	1	19.0	1.100	1.300		
[illegible] Months Added		1 1/2" HM Overlay				$ 130,803.21
[illegible] Months Added		3" CM (millings, CR)				$ 111,062.00
[illegible]0 Months Added		3" Cold Mix (#1&#2)				$ 115,464.72
240 Months Added		3" HM Overlay				$ 195,849.75
180 Months Added		CIP Recycle				$ 59,223.60
120 Months Added		DBL Chip Seal				$ 33,233.39
Devlin Road			AC Defer Rehab			
10-1 -	1	22.0	0.000	1.000		
0 Months Added		Defer Rehab AC				$ 0.00
Goinonia & Mud Pond 1			AC Reconstruction			
1-1 -	1	18.0	0.000	0.600		
300 Months Added		12" Bank R, Emul Inj				$ 78,120.71
300 Months Added		2" HM Pavement				$ 66,694.47
300 Months Added		3" Cold Mix Pavement				$ 50,486.60
300 Months Added		6" FDR, 4" Stab Grvl				$ 50,362.40
300 Months Added		9" FDR Base				$ 35,831.20
300 Months Added		9" FDR w/4" Add Grvl				$ 68,371.15
50 Months Added		Double Chip Seal				$ 14,531.20
300 Months Added		Fabric & 12" Crush R				$ 82,840.25
Goinonia & Mud Pond 2			Rout Maint UNP			
1-2 -	1	16.0	0.600	0.800		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 2,355.17
Lake View Drive			AC Patching			
7-1 -	1	19.0	0.000	2.100		
60 Months Added		Box Out and Crk Fill				$ 28,218.88
60 Months Added		Boxout Patch				$ 25,006.98
60 Months Added		Zipper CMR Patch				$ 3,441.33
[illegible]oad 1			AC Rehab			
[illegible] -	1	18.0	0.000	1.200		
[illegible]0 Months Added		1 1/2" HM Overlay				$ 114,386.61
180 Months Added		3" CM (millings, CR)				$ 97,123.05

Road Name / RIN	Div	Width	Category / Start	Length	Est. Cost / Description
180 Months Added		3" Cold Mix (#1&#2)			$ 100,973.20
) Months Added		3" HM Overlay			$ 171,269.42
0 Months Added		CIP Recycle			$ 51,790.68
120 Months Added		DBL Chip Seal			$ 29,062.40
Mail Road 2			AC Rehab		
22-2 -	1	19.0	0.000	0.600	
180 Months Added		1 1/2" HM Overlay			$ 60,370.71
180 Months Added		3" CM (millings, CR)			$ 51,259.39
180 Months Added		3" Cold Mix (#1&#2)			$ 53,291.41
240 Months Added		3" HM Overlay			$ 90,392.19
180 Months Added		CIP Recycle			$ 27,333.97
120 Months Added		DBL Chip Seal			$ 15,338.49
Mail Road 3			AC Defer Rehab		
22-3 -	1	20.0	0.600	1.100	
0 Months Added		Defer Rehab AC			$ 0.00
Marcel Four Road 1			AC Reconstruction		
32-1 -	1	12.1	0.000	0.100	
300 Months Added		12" Bank R, Emul Inj			$ 8,752.41
300 Months Added		2" HM Pavement			$ 7,472.25
300 Months Added		3" Cold Mix Pavement			$ 5,656.37
300 Months Added		6" FDR, 4" Stab Grvl			$ 5,642.45
300 Months Added		9" FDR Base			$ 4,014.42
300 Months Added		9" FDR w/4" Add Grvl			$ 7,660.10
50 Months Added		Double Chip Seal			$ 1,628.03
300 Months Added		Fabric & 12" Crush R			$ 9,281.18
Marcel Four Road 2			Major Rehab UNP		
32-2 -	1	12.0	0.100	0.300	
60 Months Added		4" Gravel			$ 7,783.09
ich macher Rd 1			AC Nothing Needed		
-	1	18.0	0.000	0.600	
0 Months Added		Do Nothing AC			$ 0.00
chumacher Road 2			AC Rehab		
9-2 -	1	18.0	0.600	0.300	
180 Months Added		1 1/2" HM Overlay			$ 28,596.65
180 Months Added		3" CM (millings, CR)			$ 24,280.76
180 Months Added		3" Cold Mix (#1&#2)			$ 25,243.30
240 Months Added		3" HM Overlay			$ 42,817.35
180 Months Added		CIP Recycle			$ 12,947.67
120 Months Added		DBL Chip Seal			$ 7,265.60
tege Road			AC Defer Rehab		
3-1 -	1	20.0	0.000	1.700	
0 Months Added		Defer Rehab AC			$ 0.00
Woods road			AC Reconstruction		
3-1 -	1	20.0	0.000	3.100	
300 Months Added		12" Bank R, Emul Inj			$ 448,470.76
300 Months Added		2" HM Pavement			$ 382,875.67
300 Months Added		3" Cold Mix Pavement			$ 289,830.47
300 Months Added		6" FDR, 4" Stab Grvl			$ 289,117.48
300 Months Added		9" FDR Base			$ 205,697.64
300 Months Added		9" FDR w/4" Add Grvl			$ 392,501.04
50 Months Added		Double Chip Seal			$ 83,419.84
300 Months Added		Fabric & 12" Crush R			$ 475,564.38

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Town of Lumberland

LUMBERLAND

Inventory RSMS 111

ROAD NAME	VALUE	PCI	FROM ST	TO ST
ers Road	1875	87	Lebanon Road	Mohican Lake Road
anTuyl Road	1800	90	NYS 97	Scwab Road
Mohican Lake Road	1800	87	Town Line	2.9 mile point
Hollow Road 2	1750	84	Bridge	NYS 97
White Road 2	1625	91	Decker Road	CR 41
White Road 1	1575	93	CR 31	Decker Road
Smith Road	1500	94	CR 42	Ogden Road
Hollow Road 1	1275	69	CR 32	Bridge
Mapes Road	1200	46	Van Tuyl Road	Haring Road
Chapin Road	1000	63	CR 43	Lebanon Rd
Lebanon Road	800	2	Chapin Road	Leers Road
Kalin Weber Road	425	52	Smith Road	CR 31

LUMBERLAND

Maint Summary of Road Condition Survey - Date:08/11/2009
Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Start	Length	Category / Description	Est. Cost
[illegible]pin Road					Rout Maint UNP	
25-1 -	1	15.0	0.000	1.200		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 3,311.95
Hollow Road 1					AC Rehab	
14-1 -	1	21.0	0.000	2.400		
180 Months Added		1 1/2" HM Overlay				$ 266,902.09
180 Months Added		3" CM (millings, CR)				$ 226,620.45
180 Months Added		3" Cold Mix (#1&#2)				$ 235,604.12
240 Months Added		3" HM Overlay				$ 399,628.64
180 Months Added		CIP Recycle				$ 120,844.92
120 Months Added		DBL Chip Seal				$ 67,812.26
Hollow Road 2					AC Surface Treatment	
14-2 -	1	21.0	2.400	1.000		
60 Months Added		#1A Chip Seal				$ 10,867.35
96 Months Added		Slurry Seal				$ 16,180.27
Kalin Weber Road					AC Reconstruction	
17-1 -	1	20.0	0.000	2.600		
300 Months Added		12" Bank R, Emul Inj				$ 376,136.77
300 Months Added		2" HM Pavement				$ 321,121.53
300 Months Added		3" Cold Mix Pavement				$ 243,083.62
300 Months Added		6" FDR, 4" Stab Grvl				$ 242,485.63
300 Months Added		9" FDR Base				$ 172,520.60
300 Months Added		9" FDR w/4" Add Grvl				$ 329,194.42
50 Months Added		Double Chip Seal				$ 69,965.03
300 Months Added		Fabric & 12" Crush R				$ 398,860.45
[illegible]ebanon Road					Major Rehab UNP	
[illegible] -	1	10.0	0.000	3.200		
Months Added		4" Gravel				$ 69,183.04
[illegible]eers Road					AC Surface Treatment	
11-1 -	1	19.0	0.000	1.400		
60 Months Added		#1A Chip Seal				$ 13,765.31
96 Months Added		Slurry Seal				$ 20,495.01
Mapes Road					Rout Maint UNP	
9-1 -	1	12.0	0.000	2.500		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 5,519.92
Mohican Lake Road					AC Defer Rehab	
2-1 -	1	20.0	0.000	2.900		
0 Months Added		Defer Rehab AC				$ 0.00
[illegible]mith Road					AC Surface Treatment	
8-1 -	1	18.0	0.000	0.600		
60 Months Added		#1A Chip Seal				$ 5,588.92
96 Months Added		Slurry Seal				$ 8,321.28
[illegible]anTuyl Road					AC Crack Repair	
3-1 -	1	17.0	0.000	2.300		
60 Months Added		Crack Seal				$ 3,372.33
White Road 1					AC Nothing Needed	
5-1 -	1	20.0	0.000	0.900		
0 Months Added		Do Nothing AC				$ 0.00
White Road 2					AC Surface Treatment	
5-2 -	1	20.0	0.900	1.600		
60 Months Added		#1A Chip Seal				$ 16,559.77
Months Added		Slurry Seal				$ 24,655.66

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Town of Tusten

1 WS1 E/U

Maint Summary of Road Condition Survey - Date:08/11/2009

Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

RIN	Div	Width	Start	Length	Description	
Road Name			Category		Est. Cost	
B[illegible] Pond Road 1			AC Rehab			
29-1 -	1	18.0	0.000	1.000		
180 Months Added		1 1/2" HM Overlay			$	95,322.17
180 Months Added		3" CM (millings, CR)			$	80,935.87
180 Months Added		3" Cold Mix (#1&#2)			$	84,144.33
240 Months Added		3" HM Overlay			$	142,724.51
180 Months Added		CIP Recycle			$	43,158.90
120 Months Added		DBL Chip Seal			$	24,218.66
Blind Pond Road 2			AC Nothing Needed			
29-2 -	1	18.0	1.000	0.300		
0 Months Added		Do Nothing AC			$	0.00
Blind Pond Road 3			Major Rehab UNP			
29-3 -	1	18.0	1.300	0.600		
60 Months Added		4" Gravel			$	23,349.28
Cochecton Tpk Rd 1			AC Crack Repair			
29-1 -	1	20.0	0.000	0.600		
60 Months Added		Crack Seal			$	1,034.99
Cochecton Tpk Rd 2			Major Rehab UNP			
29-2 -	1	20.0	0.600	2.100		
60 Months Added		4" Gravel			$	90,802.74
Daub Road			Rout Maint UNP			
31-1 -	1	12.0	0.000	0.400		
12 Months Added		Regrade			$	0.00
36 Months Added		Spot Gravel			$	883.19
Forest Pond Road			AC Patching			
[illegible] -	1	19.0	0.000	0.400		
[illegible] Months Added		Box Out and Crk Fill			$	5,375.03
[illegible]0 Months Added		Boxout Patch			$	4,763.23
60 Months Added		Zipper CMR Patch			$	655.49
Gables Road 1			AC Crack Repair			
33-1 -	1	19.0	0.000	0.900		
60 Months Added		Crack Seal			$	1,474.85
Gables Road 2			AC Patching			
33-2 -	1	19.0	0.900	0.800		
60 Months Added		Box Out and Crk Fill			$	10,750.05
60 Months Added		Boxout Patch			$	9,526.47
60 Months Added		Zipper CMR Patch			$	1,310.98
Hoffman Road			AC Reconstruction			
31-1 -	1	13.0	0.000	1.000		
300 Months Added		12" Bank R, Emul Inj			$	94,034.19
300 Months Added		2" HM Pavement			$	80,280.38
300 Months Added		3" Cold Mix Pavement			$	60,770.90
300 Months Added		6" FDR, 4" Stab Grvl			$	60,621.41
300 Months Added		9" FDR Base			$	43,130.15
300 Months Added		9" FDR w/4" Add Grvl			$	82,298.60
50 Months Added		Double Chip Seal			$	17,491.26
300 Months Added		Fabric & 12" Crush R			$	99,715.11
Hoffman Road 2			AC Reconstruction			
31-2 -	1	18.0	0.000	0.300		
300 Months Added		12" Bank R, Emul Inj			$	39,060.36
300 Months Added		2" HM Pavement			$	33,347.24
300 Months Added		3" Cold Mix Pavement			$	25,243.30
300 Months Added		6" FDR, 4" Stab Grvl			$	25,181.20
300 Months Added		9" FDR Base			$	17,915.60
[illegible] Months Added		9" FDR w/4" Add Grvl			$	34,185.57
[illegible]onths Added		Double Chip Seal			$	7,265.60
300 Months Added		Fabric & 12" Crush R			$	41,420.12

Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Category / Start	Length	Description	Est. Cost
ish Town Road 1			AC Nothing Needed			
-	1	14.0	0.000	1.100		
Months Added		Do Nothing AC				$ 0.00
ish Town Road 2			Rebuild UNP			
0-2 -	1	10.0	1.100	0.300		
120 Months Added		Fabric, 12" Gravel				$ 7,658.89
irk Road			AC Patching			
3-1 -	1	22.0	0.000	0.700		
60 Months Added		Box Out and Crk Fill				$ 10,891.50
60 Months Added		Boxout Patch				$ 9,651.82
60 Months Added		Zipper CMR Patch				$ 1,328.23
ackawaxen Road			AC Nothing Needed			
1-1 -	1	18.0	0.000	1.300		
0 Months Added		Do Nothing AC				$ 0.00
ahls Pond Rd 1			Rout Maint UNP			
7-1 -	1	20.0	0.000	1.400		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 5,151.93
ahls Pond Rd 2			AC Rehab			
7-2 -	1	18.0	1.400	1.000		
180 Months Added		1 1/2" HM Overlay				$ 95,322.17
180 Months Added		3" CM (millings, CR)				$ 80,935.87
180 Months Added		3" Cold Mix (#1&#2)				$ 84,144.33
240 Months Added		3" HM Overlay				$ 142,724.51
180 Months Added		CIP Recycle				$ 43,158.90
120 Months Added		DBL Chip Seal				$ 24,218.66
ain Street			AC Patching			
1 -	1	36.0	0.000	0.200		
onths Added		Box Out and Crk Fill				$ 5,092.13
Months Added		Boxout Patch				$ 4,512.54
60 Months Added		Zipper CMR Patch				$ 620.99
rry Pond Road			AC Nothing Needed			
-1 -	1	19.0	0.000	1.600		
0 Months Added		Do Nothing AC				$ 0.00
er Road			AC Nothing Needed			
-1 -	1	18.0	0.000	2.300		
0 Months Added		Do Nothing AC				$ 0.00
mp Pond Road			Rout Maint UNP			
1 -	1	18.0	0.000	2.000		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 6,623.91

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Maint Summary of Road Condition Survey - Date:08/11/2009

Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Category / Start	Length	Description	Est. Cost
[illegible]as Road			AC Rehab			
22-1 -	1	18.0	0.000	2.800		
180 Months Added		1 1/2" HM Overlay				$ 266,902.09
180 Months Added		3" CM (millings, CR)				$ 226,620.45
180 Months Added		3" Cold Mix (#1&#2)				$ 235,604.12
240 Months Added		3" HM Overlay				$ 399,628.64
180 Months Added		CIP Recycle				$ 120,844.92
120 Months Added		DBL Chip Seal				$ 67,812.26
Brook Road 1			Rout Maint UNP			
1-1 -	1	12.0	0.000	0.400		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 883.19
Brook Road 2			AC Patching			
1-2 -	1	12.0	0.400	0.150		
60 Months Added		Box Out and Crk Fill				$ 1,273.03
60 Months Added		Boxout Patch				$ 1,128.13
60 Months Added		Zipper CMR Patch				$ 155.25
Brook Road 3			Rout Maint UNP			
1-3 -	1	12.0	0.550	1.000		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 2,207.97
Brook Road 4			AC Rehab			
1-4 -	1	18.0	1.550	0.400		
180 Months Added		1 1/2" HM Overlay				$ 38,128.87
180 Months Added		3" CM (millings, CR)				$ 32,374.35
180 Months Added		3" Cold Mix (#1&#2)				$ 33,657.73
240 Months Added		3" HM Overlay				$ 57,089.81
[illegible] Months Added		CIP Recycle				$ 17,263.56
[illegible] Months Added		DBL Chip Seal				$ 9,687.47
[illegible]red White Road			AC Patching			
[illegible]3-1 -	1	17.0	0.000	1.000		
60 Months Added		Box Out and Crk Fill				$ 12,023.08
60 Months Added		Boxout Patch				$ 10,654.60
60 Months Added		Zipper CMR Patch				$ 1,466.23
[illegible]ohns Road			AC Defer Rehab			
[illegible]0-1 -	1	18.0	0.000	0.700		
0 Months Added		Defer Rehab AC				$ 0.00
[illegible]ill Pond Road			Rout Maint UNP			
1-1 -	1	15.0	0.000	0.700		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 1,931.97
[illegible]itchell Pond East			AC Defer Rehab			
7-1 -	1	18.0	0.000	2.600		
0 Months Added		Defer Rehab AC				$ 0.00
[illegible]itchell Pond West 2			AC Nothing Needed			
5-2 -	1	18.0	0.700	0.400		
0 Months Added		Do Nothing AC				$ 0.00
[illegible]itchell Pond West 1			AC Rehab			
5-1 -	1	18.0	0.000	0.700		
180 Months Added		1 1/2" HM Overlay				$ 66,725.52
180 Months Added		3" CM (millings, CR)				$ 56,655.11
180 Months Added		3" Cold Mix (#1&#2)				$ 58,901.03
240 Months Added		3" HM Overlay				$ 99,907.16
180 Months Added		CIP Recycle				$ 30,211.23
[illegible] Months Added		DBL Chip Seal				$ 16,953.06
[illegible]ueller Road			AC Patching			
[illegible]1-1 -	1	20.0	0.000	1.100		

Road Name / RIN	Div	Width	Category / Start	Length	Est. Cost / Description
60 Months Added		Box Out and Crk Fill			$ 15,559.28
) Months Added		Boxout Patch			$ 13,788.31
0 Months Added		Zipper CMR Patch			$ 1,897.47
Schalk Road			AC Rehab		
41-1 -	1	18.0	0.000	1.200	
180 Months Added		1 1/2" HM Overlay			$ 114,386.61
180 Months Added		3" CM (millings, CR)			$ 97,123.05
180 Months Added		3" Cold Mix (#1&#2)			$ 100,973.20
240 Months Added		3" HM Overlay			$ 171,269.42
180 Months Added		CIP Recycle			$ 51,790.68
120 Months Added		DBL Chip Seal			$ 29,062.40
Shortcut Road			AC Defer Rehab		
43-1 -	1	19.0	0.000	1.700	
0 Months Added		Defer Rehab AC			$ 0.00
Skipperene Road			AC Defer Rehab		
15-1 -	1	18.0	0.000	3.500	
0 Months Added		Defer Rehab AC			$ 0.00
Smales road			AC Defer Rehab		
24-1 -	1	18.0	0.000	0.400	
0 Months Added		Defer Rehab AC			$ 0.00
Tyler Road			AC Rehab		
45-1 -	1	17.0	0.000	2.800	
180 Months Added		1 1/2" HM Overlay			$ 252,074.19
180 Months Added		3" CM (millings, CR)			$ 214,030.42
180 Months Added		3" Cold Mix (#1&#2)			$ 222,515.00
240 Months Added		3" HM Overlay			$ 377,427.05
180 Months Added		CIP Recycle			$ 114,131.31
120 Months Added		DBL Chip Seal			$ 64,044.91

Multi-Municipal Gas Drilling Task Force
Highway Impacts Study and Report
Towns of; Tusten, Delaware, Highland,
Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Reports:

1) Road Repair Priority List;

2) Repair Treatments Cost Summary

Town of Delaware

DELAWARE *

Inventory RSMS 111

ROAD NAME	VALUE	PCI	FROM ST	TO ST
'illa Roma	2250	73	CR 164	Polster Road
ahm Road 2	2000	19	0.2 mile point	Town Line
Miller Road	1650	81	CR 164	NY 52
Swiss Hill Road 1	1650	91	NY 52	1.6 mile point
Reum Road 2	1650	88	Gabel Road	NY 52A
Kautz Road 2	1650	86	1.5 mile point	CR 131
Gabel Road	1650	78	CR 164	Reum Rd
Hankins Road 2	1500	95	0.9 mile point	NYS 97
Reum Road 1	1400	80	CR 164	Gabel Road
Beechwood Rd	1400	92	Main Street	Kratz Rd
Hospital Road	1275	69	NYS 97	Seminary Road
Kautz Road 1	1125	64	Seminary Road	1.5 mile point
Fulton Hill Road 1	1050	80	Mesmer Road	0.7 mile point
Hankins Road 1	1000	8	Cross Road	0.90 mile point
Swiss Hill Road 2	425	55	1.6 mile point	Eggler Road
Lahm Road 1	375	45	Crass Road	0.2 mile point
Fulton Hill Rd 2	325	58	0.7 mile point	NHY52

Uses the following Weight Factors:

Traffic	25
Importance	25
Roughness	25
Condition	25

DELAWARE

Maint Summary of Road Condition Survey - Date:08/11/2009

Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Category / Start	Length	Description	Est. Cost
;nwood Rd			AC Nothing Needed			
)-1 -	1	21.0	0.000	3.100		
0 Months Added		Do Nothing AC				$ 0.00
Fulton Hill Rd 2			AC Reconstruction			
12-2 -	1	16.0	0.700	1.100		
300 Months Added		12" Grav, 6" Eml Inj				$ 127,307.83
300 Months Added		2" HM Pavement				$ 204,599.58
300 Months Added		3" Cold Mix Pavement				$ 82,274.46
300 Months Added		6" FDR, 4" Stab Grvl				$ 82,072.06
300 Months Added		9" FDR Base				$ 109,919.88
300 Months Added		9" FDR w/4" Add Grvl				$ 111,419.65
50 Months Added		Double Chip Seal				$ 23,680.47
300 Months Added		Fabric & 12" Gravel				$ 134,998.92
Fulton Hill Road 1			AC Patching			
12-1 -	1	16.0	0.000	0.700		
60 Months Added		Box Out and Crk Fill				$ 7,921.09
60 Months Added		Boxout Patch				$ 7,019.50
60 Months Added		Zipper CMR Patch				$ 965.99
Gabel Road			AC Patching			
13-1 -	1	18.0	0.000	1.800		
60 Months Added		Box Out and Crk Fill				$ 22,914.58
60 Months Added		Boxout Patch				$ 20,306.42
60 Months Added		Zipper CMR Patch				$ 2,794.46
Hankins Road 1			Major Rehab UNP			
1-1 -	1	15.0	0.000	0.900		
60 Months Added		4" Gravel				$ 29,186.59
H[illegible]ns Road 2			AC Patching			
-	1	15.0	0.900	0.400		
60 Months Added		Box Out and Crk Fill				$ 4,243.44
60 Months Added		Boxout Patch				$ 3,760.45
60 Months Added		Zipper CMR Patch				$ 517.49
Hospital Road			AC Rehab			
11-1 -	1	16.0	0.000	1.700		
180 Months Added		1 1/2" HM Overlay				$ 144,042.40
180 Months Added		3" CM (millings, CR)				$ 122,303.10
180 Months Added		3" Cold Mix (#1&#2)				$ 127,151.43
240 Months Added		3" HM Overlay				$ 215,672.60
180 Months Added		CIP Recycle				$ 65,217.89
120 Months Added		DBL Chip Seal				$ 36,597.09
Hautz Road 1			AC Rehab			
12-1 -	1	16.0	0.000	1.500		
180 Months Added		1 1/2" HM Overlay				$ 127,096.23
180 Months Added		3" CM (millings, CR)				$ 107,914.50
180 Months Added		3" Cold Mix (#1&#2)				$ 112,192.44
240 Months Added		3" HM Overlay				$ 190,299.35
180 Months Added		CIP Recycle				$ 57,545.20
120 Months Added		DBL Chip Seal				$ 32,291.55
Hautz Road 2			AC Patching			
12-2 -	1	16.0	1.500	0.800		
60 Months Added		Box Out and Crk Fill				$ 9,052.67
60 Months Added		Boxout Patch				$ 8,022.29
60 Months Added		Zipper CMR Patch				$ 1,103.98
Hahm Road 1			AC Reconstruction			
5-1 -	1	18.0	0.000	0.200		
300 Months Added		12" Grav, 6" Eml Inj				$ 26,040.24
[illegible] Months Added		2" HM Pavement				$ 37,199.92
Months Added		3" Cold Mix Pavement				$ 16,828.87
300 Months Added		6" FDR, 4" Stab Grvl				$ 16,787.47
300 Months Added		9" FDR Base				$ 19,985.43

Road Name / RIN	Div	Width	Start	Length	Description	Est. Cost
300 Months Added		9" FDR w/4" Add Grvl				$ 22,790.38
) Months Added		Double Chip Seal				$ 4,843.73
0 Months Added		Fabric & 12" Gravel				$ 27,613.42
ahm Road 2			Major Rehab UNP			
56-2 -	1	18.0	0.200	0.600		
60 Months Added		4" Gravel				$ 23,349.28
Miller Road			AC Patching			
27-1 -	1	18.0	0.000	1.400		
60 Months Added		Box Out and Crk Fill				$ 17,822.45
60 Months Added		Boxout Patch				$ 15,793.88
60 Months Added		Zipper CMR Patch				$ 2,173.47
Reum Road 1			AC Defer Rehab			
35-1 -	1	21.0	0.000	0.900		
0 Months Added		Defer Rehab AC				$ 0.00
Reum Road 2			AC Patching			
35-2 -	1	21.0	0.900	0.800		
60 Months Added		Box Out and Crk Fill				$ 11,881.63
60 Months Added		Boxout Patch				$ 10,529.25
60 Months Added		Zipper CMR Patch				$ 1,448.98
Swiss Hill Road 1			AC Patching			
2-1 -	1	18.0	0.000	1.600		
60 Months Added		Box Out and Crk Fill				$ 20,368.52
60 Months Added		Boxout Patch				$ 18,050.15
60 Months Added		Zipper CMR Patch				$ 2,483.97
Swiss Hill Road 2			AC Reconstruction			
2-2 -	1	18.0	1.600	1.100		
300 Months Added		12" Grav, 6" Eml Inj				$ 143,221.31
300 Months Added		2" HM Pavement				$ 204,599.58
) Months Added		3" Cold Mix Pavement				$ 92,558.76
00 Months Added		6" FDR, 4" Stab Grvl				$ 92,331.07
300 Months Added		9" FDR Base				$ 109,919.88
300 Months Added		9" FDR w/4" Add Grvl				$ 125,347.11
50 Months Added		Double Chip Seal				$ 26,640.53
300 Months Added		Fabric & 12" Gravel				$ 151,873.79
Villa Roma			AC Patching			
10-1 -	1	21.0	0.000	1.000		
60 Months Added		Box Out and Crk Fill				$ 14,852.04
60 Months Added		Boxout Patch				$ 13,161.57
60 Months Added		Zipper CMR Patch				$ 1,811.22

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Highway Impacts Study and Report
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Cochecton, Freemont, Lumberland, Callicoon
Sullivan County, New York

RSMS Reports:

1) Road Repair Priority List;

2) Repair Treatments Cost Summary

Town of Freemont

FREEMONT

Inventory RSMS 111

ROAD NAME	VALUE	PCI	FROM ST	TO ST
nawana Lake Road	2250	0	Town Line	CR 93
ennanah Lake Rd 1	1950	0	CR 93	1.6 mi point
Hammer Road	1750	0	CR 131/132	Peters Road
Basket Road 1	1650	0	Neer Road	O'Mara Road
Peters Road 1	1650	0	New Hill Road	Warner Road
Tennanah Lake Rd 3	1650	0	3.7 mi point	CR 96
Skyline Drive	1600	0	Nelson Road	Wood Road
Graby Road 1	1275	0	CR 131	End of Pavement
Basket Road 2	1125	0	CR 134	Neer Road
W. Simmon Road	1125	0	Newman Road	CR 132
Johnston Road	1050	0	Basket Road	Dead End
Wood Road 2	1000	0	End of Pavement	Dead End
Warner Road 1	1000	0	Peters Road	Start of Pavement
Bowers Road	1000	0	CR 96	Town Line
Fink Road	975	0	Warner Road	CR 95
Wood Road 1	825	0	CR 94	Gravel Section
Peters Road 2	425	0	Warner Road	Town Line
Tennanah Lake Rd 2	425	0	1.6 mi point	3.7 mi point
Warners Road 2	375	0	End of Gravel	Fink Road
Graby Rd 2	350	0	End of Pavment	Lahm Rd

- USED ASSUMED IMPORTANCE AND TRAFFIC SCORES AS NO DATA WAS PROVIDED

- USED THE FOLLOWING WEIGHT FACTORS

Traffic	25
Importance	25
Roughness	25
Condition	25

PRECINCT 1

Maint Summary of Road Condition Survey - Date:08/11/2009
Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Category / Start	Length	Description	Est. Cost
ana Lake Road			AC Patching			
32-1 -	1	17.0	0.000	1.600		
60 Months Added		Box Out and Crk Fill				$ 19,236.93
60 Months Added		Boxout Patch				$ 17,047.36
60 Months Added		Zipper CMR Patch				$ 2,345.97
Basket Road 1			AC Patching			
1-1 -	1	16.5	0.000	1.600		
60 Months Added		Box Out and Crk Fill				$ 18,671.14
60 Months Added		Boxout Patch				$ 16,545.97
60 Months Added		Zipper CMR Patch				$ 2,276.97
Basket Road 2			AC Rehab			
1-2 -	1	17.0	0.000	2.000		
180 Months Added		1 1/2" HM Overlay				$ 180,052.99
180 Months Added		3" CM (millings, CR)				$ 152,878.87
180 Months Added		3" Cold Mix (#1&#2)				$ 158,939.29
240 Months Added		3" HM Overlay				$ 269,590.75
180 Months Added		CIP Recycle				$ 81,522.37
120 Months Added		DBL Chip Seal				$ 45,746.36
Bowers Road			Rout Maint UNP			
1-1 -	1	14.0	0.000	1.800		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 4,636.74
Fink Road			AC Rehab			
15-1 -	1	16.0	0.000	0.600		
180 Months Added		1 1/2" HM Overlay				$ 50,838.49
180 Months Added		3" CM (millings, CR)				$ 43,165.80
180 Months Added		3" Cold Mix (#1&#2)				$ 44,876.98
240 Months Added		3" HM Overlay				$ 76,119.74
Months Added		CIP Recycle				$ 23,018.08
0 Months Added		DBL Chip Seal				$ 12,916.62
Graby Rd 2						
19-2 -	1	16.0	1.100	0.400		
No Maintenance Available						
Graby Road 1			AC Rehab			
19-1 -	1	15.0	0.000	1.100		
180 Months Added		1 1/2" HM Overlay				$ 87,378.66
180 Months Added		3" CM (millings, CR)				$ 74,191.22
180 Months Added		3" Cold Mix (#1&#2)				$ 77,132.30
240 Months Added		3" HM Overlay				$ 130,830.80
180 Months Added		CIP Recycle				$ 39,562.32
120 Months Added		DBL Chip Seal				$ 22,200.44
Hammer Road			AC Nothing Needed			
5-1 -	1	20.5	0.000	0.800		
0 Months Added		Do Nothing AC				$ 0.00
Johnston Road			Prevent Maint UNP			
3-1 -	1	13.0	0.000	0.800		
12 Months Added		AEPM Dust Control				$ 1,973.37
12 Months Added		CaCl Dust Control				$ 9,567.87
Peters Road 1			AC Patching			
7-1 -	1	17.5	0.000	1.300		
60 Months Added		Box Out and Crk Fill				$ 16,089.71
60 Months Added		Boxout Patch				$ 14,258.36
60 Months Added		Zipper CMR Patch				$ 1,962.16
Peters Road 2			AC Reconstruction			
8 -	1	17.0	1.300	1.300		
Months Added		12" Bank R, Emul Inj				$ 159,858.13
000 Months Added		2" HM Pavement				$ 136,476.65
300 Months Added		3" Cold Mix Pavement				$ 103,310.54

Road Name / RIN	Div	Width	Category / Start	Length	Est. Cost / Description
300 Months Added		6" FDR, 4" Stab Grvl			$ 103,056.39
) Months Added		9" FDR Base			$ 73,321.25
J Months Added		9" FDR w/4" Add Grvl			$ 139,907.63
50 Months Added		Double Chip Seal			$ 29,735.14
300 Months Added		Fabric & 12" Crush R			$ 169,515.69
Skyline Drive			Major Rehab UNP		
34-1 -	1	12.0	0.000	1.000	
60 Months Added		4" Gravel			$ 25,943.64
Tennanah Lake Rd 1			AC Patching		
14-1 -	1	20.0	0.000	1.600	
60 Months Added		Box Out and Crk Fill			$ 22,631.69
60 Months Added		Boxout Patch			$ 20,055.72
60 Months Added		Zipper CMR Patch			$ 2,759.96
Tennanah Lake Rd 2			AC Reconstruction		
4-2 -	1	17.0	1.600	2.100	
300 Months Added		12" Bank R, Emul Inj			$ 258,232.36
300 Months Added		2" HM Pavement			$ 220,462.28
300 Months Added		3" Cold Mix Pavement			$ 166,886.25
300 Months Added		6" FDR, 4" Stab Grvl			$ 166,475.71
300 Months Added		9" FDR Base			$ 118,442.03
300 Months Added		9" FDR w/4" Add Grvl			$ 226,004.63
50 Months Added		Double Chip Seal			$ 48,033.68
300 Months Added		Fabric & 12" Crush R			$ 273,833.04
Tennanah Lake Rd 3			AC Patching		
4-3 -	1	17.0	3.700	0.500	
60 Months Added		Box Out and Crk Fill			$ 6,011.54
60 Months Added		Boxout Patch			$ 5,327.30
60 Months Added		Zipper CMR Patch			$ 733.11
W Simmon Road			AC Rehab		
-	1	17.0	0.000	1.600	
60 Months Added		1 1/2" HM Overlay			$ 144,042.40
180 Months Added		3" CM (millings, CR)			$ 122,303.10
180 Months Added		3" Cold Mix (#1&#2)			$ 127,151.43
240 Months Added		3" HM Overlay			$ 215,672.60
180 Months Added		CIP Recycle			$ 65,217.89
120 Months Added		DBL Chip Seal			$ 36,597.09
Warner Road 1			Rout Maint UNP		
1-1 -	1	16.0	0.000	0.800	
12 Months Added		Regrade			$ 0.00
36 Months Added		Spot Gravel			$ 2,355.17
Warners Road 2			AC Reconstruction		
1-2 -	1	16.0	0.800	0.900	
300 Months Added		12" Bank R, Emul Inj			$ 104,160.95
300 Months Added		2" HM Pavement			$ 88,925.96
300 Months Added		3" Cold Mix Pavement			$ 67,315.46
300 Months Added		6" FDR, 4" Stab Grvl			$ 67,149.87
300 Months Added		9" FDR Base			$ 47,774.94
300 Months Added		9" FDR w/4" Add Grvl			$ 91,161.53
50 Months Added		Double Chip Seal			$ 19,374.93
300 Months Added		Fabric & 12" Crush R			$ 110,453.66
Wood Road 1			AC Rehab		
1 -	1	15.0	0.000	0.400	
180 Months Added		1 1/2" HM Overlay			$ 31,774.06
180 Months Added		3" CM (millings, CR)			$ 26,978.62
180 Months Added		3" Cold Mix (#1&#2)			$ 28,048.11
240 Months Added		3" HM Overlay			$ 47,574.84
180 Months Added		CIP Recycle			$ 14,386.30
120 Months Added		DBL Chip Seal			$ 8,072.89
Road 2			Rout Maint UNP		
-	1	16.0	0.400	0.900	
12 Months Added		Regrade			$ 0.00

Road Name	Category	Est. Cost
RIN	Div Width Start Length	Description
36 Months Added	Spot Gravel	$ 2,649.56

Multi-Municipal Gas Drilling Task Force
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Sullivan County, New York

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2) Repair Treatments Cost Summary

Town of Highland

HIGHLATITUDE

Inventory RSMS 111

ROAD NAME	VALUE	PCI	FROM ST	TO ST
lark Road 3	2000	-8	1.4 mi pt/dead end	Road Closed
ake View Drive	1650	84	Bower Road	CR 47
Devlin Road	1600	83	CR 47	CR 32
Marcel Four Road 2	1600	34	0.10 point	Log Cabin
Airport road	1600	82	CR 33	Cr 33/21
Koinonia & Mud Pond 2	1400	46	Koinonia Camp	Road Narrowing
Stege Road	1400	73	CR 12	Bower Road
Crawford Road 1	1400	100	Mail Road	House #84
Mail Road 3	1400	60	House #101	Cr 21/NYS 97
Schumacher Rd 1	1400	100	Woods Road	NYSEG Plole 1247
Clark Road 1	1125	58	CR 32	Pavement end
Crawford Road 2	1125	66	House #84	CR 33
Mail Road 2	1125	61	Mail Road 1	House #101
Mail Road 1	1125	55	CR 21	Crawford Road
Schumacher Road 2	1125	68	NYSEG Pole 1247	CR 21
Bower Road	1100	-35	Stege Road	Dead End
Clark Road 4	1100	-20	Road Closed Sign	Could not proceed
Koinonia & Mud Pond 1	425	48	Lake View Drive	End of Pavement
Woods road	425	61	York Lake Rd	Cr 22
Marcel Four Road 1	325	58	0.00 point	0.10 point
Clark Road 2	0	90	Pavement end	Dead end sign

Uses The following weight Factors:

Traffic 25

Importance 25

Roughness 25

condition 25

RTLGHL/HIVD

Maint Summary of Road Condition Survey - Date:08/11/2009

Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Start	Length	Description	Est. Cost
ort road			AC Defer Rehab			
1-1 -	1	19.0	0.000	3.400		
0 Months Added		Defer Rehab AC				$ 0.00
Bower Road			Rebuild UNP			
2-1 -	1	14.0	0.000	0.160		
120 Months Added		Fabric, 12" Gravel				$ 5,718.64
Clark Road 1			AC Rehab			
27-1 -	1	20.0	0.000	1.200		
180 Months Added		1 1/2" HM Overlay				$ 127,096.23
180 Months Added		3" CM (millings, CR)				$ 107,914.50
180 Months Added		3" Cold Mix (#1&#2)				$ 112,192.44
240 Months Added		3" HM Overlay				$ 190,299.35
180 Months Added		CIP Recycle				$ 57,545.20
120 Months Added		DBL Chip Seal				$ 32,291.55
Clark Road 3			Major Rehab UNP			
27-3 -	1	11.0	1.400	1.000		
60 Months Added		4" Gravel				$ 23,781.67
Clark Road 4			Rebuild UNP			
27-4 -	1	10.0	2.400	0.100		
120 Months Added		Fabric, 12" Gravel				$ 2,552.96
Crawford Road 1			AC Nothing Needed			
10-1 -	1	19.0	0.000	1.100		
0 Months Added		Do Nothing AC				$ 0.00
Crawford Road 2			AC Rehab			
10-2 -	1	19.0	1.100	1.300		
180 Months Added		1 1/2" HM Overlay				$ 130,803.21
Months Added		3" CM (millings, CR)				$ 111,062.00
0 Months Added		3" Cold Mix (#1&#2)				$ 115,464.72
240 Months Added		3" HM Overlay				$ 195,849.75
180 Months Added		CIP Recycle				$ 59,223.60
120 Months Added		DBL Chip Seal				$ 33,233.39
Devlin Road			AC Defer Rehab			
10-1 -	1	22.0	0.000	1.000		
0 Months Added		Defer Rehab AC				$ 0.00
Goinonia & Mud Pond 1			AC Reconstruction			
11-1 -	1	18.0	0.000	0.600		
300 Months Added		12" Bank R, Emul Inj				$ 78,120.71
300 Months Added		2" HM Pavement				$ 66,694.47
300 Months Added		3" Cold Mix Pavement				$ 50,486.60
300 Months Added		6" FDR, 4" Stab Grvl				$ 50,362.40
300 Months Added		9" FDR Base				$ 35,831.20
300 Months Added		9" FDR w/4" Add Grvl				$ 68,371.15
50 Months Added		Double Chip Seal				$ 14,531.20
300 Months Added		Fabric & 12" Crush R				$ 82,840.25
Goinonia & Mud Pond 2			Rout Maint UNP			
11-2 -	1	16.0	0.600	0.800		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 2,355.17
Lake View Drive			AC Patching			
7-1 -	1	19.0	0.000	2.100		
60 Months Added		Box Out and Crk Fill				$ 28,218.88
60 Months Added		Boxout Patch				$ 25,006.98
60 Months Added		Zipper CMR Patch				$ 3,441.33
Mill Road 1			AC Rehab			
-	1	18.0	0.000	1.200		
300 Months Added		1 1/2" HM Overlay				$ 114,386.61
180 Months Added		3" CM (millings, CR)				$ 97,123.05

Road Name / RIN	Div	Width	Category / Start	Length	Est. Cost / Description
180 Months Added		3" Cold Mix (#1&#2)			$ 100,973.20
) Months Added		3" HM Overlay			$ 171,269.42
J Months Added		CIP Recycle			$ 51,790.68
120 Months Added		DBL Chip Seal			$ 29,062.40
Mail Road 2			AC Rehab		
22-2 -	1	19.0	0.000	0.600	
180 Months Added		1 1/2" HM Overlay			$ 60,370.71
180 Months Added		3" CM (millings, CR)			$ 51,259.39
180 Months Added		3" Cold Mix (#1&#2)			$ 53,291.41
240 Months Added		3" HM Overlay			$ 90,392.19
180 Months Added		CIP Recycle			$ 27,333.97
120 Months Added		DBL Chip Seal			$ 15,338.49
Mail Road 3			AC Defer Rehab		
22-3 -	1	20.0	0.600	1.100	
0 Months Added		Defer Rehab AC			$ 0.00
Marcel Four Road 1			AC Reconstruction		
32-1 -	1	12.1	0.000	0.100	
300 Months Added		12" Bank R, Emul Inj			$ 8,752.41
300 Months Added		2" HM Pavement			$ 7,472.25
300 Months Added		3" Cold Mix Pavement			$ 5,656.37
300 Months Added		6" FDR, 4" Stab Grvl			$ 5,642.45
300 Months Added		9" FDR Base			$ 4,014.42
300 Months Added		9" FDR w/4" Add Grvl			$ 7,660.10
50 Months Added		Double Chip Seal			$ 1,628.03
300 Months Added		Fabric & 12" Crush R			$ 9,281.18
Marcel Four Road 2			Major Rehab UNP		
32-2 -	1	12.0	0.100	0.300	
60 Months Added		4" Gravel			$ 7,783.09
Schumacher Rd 1			AC Nothing Needed		
-	1	18.0	0.000	0.600	
- Months Added		Do Nothing AC			$ 0.00
Schumacher Road 2			AC Rehab		
9-2 -	1	18.0	0.600	0.300	
180 Months Added		1 1/2" HM Overlay			$ 28,596.65
180 Months Added		3" CM (millings, CR)			$ 24,280.76
180 Months Added		3" Cold Mix (#1&#2)			$ 25,243.30
240 Months Added		3" HM Overlay			$ 42,817.35
180 Months Added		CIP Recycle			$ 12,947.67
120 Months Added		DBL Chip Seal			$ 7,265.60
Stege Road			AC Defer Rehab		
3-1 -	1	20.0	0.000	1.700	
0 Months Added		Defer Rehab AC			$ 0.00
Woods road			AC Reconstruction		
3-1 -	1	20.0	0.000	3.100	
300 Months Added		12" Bank R, Emul Inj			$ 448,470.76
300 Months Added		2" HM Pavement			$ 382,875.67
300 Months Added		3" Cold Mix Pavement			$ 289,830.47
300 Months Added		6" FDR, 4" Stab Grvl			$ 289,117.48
300 Months Added		9" FDR Base			$ 205,697.64
300 Months Added		9" FDR w/4" Add Grvl			$ 392,501.04
50 Months Added		Double Chip Seal			$ 83,419.84
300 Months Added		Fabric & 12" Crush R			$ 475,564.38

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RSMS Reports:

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Town of Lumberland

LUMBERLAND

Inventory RSMS 111

ROAD NAME	VALUE	PCI	FROM ST	TO ST
ɜers Road	1875	87	Lebanon Road	Mohican Lake Road
anTuyl Road	1800	90	NYS 97	Scwab Road
Mohican Lake Road	1800	87	Town Line	2.9 mile point
Hollow Road 2	1750	84	Bridge	NYS 97
White Road 2	1625	91	Decker Road	CR 41
White Road 1	1575	93	CR 31	Decker Road
Smith Road	1500	94	CR 42	Ogden Road
Hollow Road 1	1275	69	CR 32	Bridge
Mapes Road	1200	46	Van Tuyl Road	Haring Road
Chapin Road	1000	63	CR 43	Lebanon Rd
Lebanon Road	800	2	Chapin Road	Leers Road
Kalin Weber Road	425	52	Smith Road	CR 31

LUMBERLAND

Maint Summary of Road Condition Survey - Date:08/11/2009
Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Category / Start	Length	Est. Cost / Description
[illegible]pin Road			Rout Maint UNP		
25-1 -	1	15.0	0.000	1.200	
12 Months Added		Regrade			$ 0.00
36 Months Added		Spot Gravel			$ 3,311.95
Hollow Road 1			AC Rehab		
14-1 -	1	21.0	0.000	2.400	
180 Months Added		1 1/2" HM Overlay			$ 266,902.09
180 Months Added		3" CM (millings, CR)			$ 226,620.45
180 Months Added		3" Cold Mix (#1&#2)			$ 235,604.12
240 Months Added		3" HM Overlay			$ 399,628.64
180 Months Added		CIP Recycle			$ 120,844.92
120 Months Added		DBL Chip Seal			$ 67,812.26
Hollow Road 2			AC Surface Treatment		
14-2 -	1	21.0	2.400	1.000	
60 Months Added		#1A Chip Seal			$ 10,867.35
96 Months Added		Slurry Seal			$ 16,180.27
Kalin Weber Road			AC Reconstruction		
17-1 -	1	20.0	0.000	2.600	
300 Months Added		12" Bank R, Emul Inj			$ 376,136.77
300 Months Added		2" HM Pavement			$ 321,121.53
300 Months Added		3" Cold Mix Pavement			$ 243,083.62
300 Months Added		6" FDR, 4" Stab Grvl			$ 242,485.63
300 Months Added		9" FDR Base			$ 172,520.60
300 Months Added		9" FDR w/4" Add Grvl			$ 329,194.42
50 Months Added		Double Chip Seal			$ 69,965.03
300 Months Added		Fabric & 12" Crush R			$ 398,860.45
Lebanon Road			Major Rehab UNP		
18[illegible] -	1	10.0	0.000	3.200	
[illegible] Months Added		4" Gravel			$ 69,183.04
Leers Road			AC Surface Treatment		
21-1 -	1	19.0	0.000	1.400	
60 Months Added		#1A Chip Seal			$ 13,765.31
96 Months Added		Slurry Seal			$ 20,495.01
Mapes Road			Rout Maint UNP		
9-1 -	1	12.0	0.000	2.500	
12 Months Added		Regrade			$ 0.00
36 Months Added		Spot Gravel			$ 5,519.92
Mohican Lake Road			AC Defer Rehab		
2-1 -	1	20.0	0.000	2.900	
0 Months Added		Defer Rehab AC			$ 0.00
Smith Road			AC Surface Treatment		
8-1 -	1	18.0	0.000	0.600	
60 Months Added		#1A Chip Seal			$ 5,588.92
96 Months Added		Slurry Seal			$ 8,321.28
VanTuyl Road			AC Crack Repair		
3-1 -	1	17.0	0.000	2.300	
60 Months Added		Crack Seal			$ 3,372.33
White Road 1			AC Nothing Needed		
5-1 -	1	20.0	0.000	0.900	
0 Months Added		Do Nothing AC			$ 0.00
White Road 2			AC Surface Treatment		
5-2 -	1	20.0	0.900	1.600	
60 Months Added		#1A Chip Seal			$ 16,559.77
[illegible] Months Added		Slurry Seal			$ 24,655.66

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RSMS Reports:

1) Road Repair Priority List;

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Town of Tusten

1 OF 10

Maint Summary of Road Condition Survey - Date:08/11/2009

Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Category / Start	Length	Description	Est. Cost
[illegible] Pond Road 1			AC Rehab			
29-1 -	1	18.0	0.000	1.000		
180 Months Added		1 1/2" HM Overlay				$ 95,322.17
180 Months Added		3" CM (millings, CR)				$ 80,935.87
180 Months Added		3" Cold Mix (#1&#2)				$ 84,144.33
240 Months Added		3" HM Overlay				$ 142,724.51
180 Months Added		CIP Recycle				$ 43,158.90
120 Months Added		DBL Chip Seal				$ 24,218.66
Blind Pond Road 2			AC Nothing Needed			
29-2 -	1	18.0	1.000	0.300		
0 Months Added		Do Nothing AC				$ 0.00
Blind Pond Road 3			Major Rehab UNP			
29-3 -	1	18.0	1.300	0.600		
60 Months Added		4" Gravel				$ 23,349.28
Cochecton Tpk Rd 1			AC Crack Repair			
29-1 -	1	20.0	0.000	0.600		
60 Months Added		Crack Seal				$ 1,034.99
Cochecton Tpk Rd 2			Major Rehab UNP			
29-2 -	1	20.0	0.600	2.100		
60 Months Added		4" Gravel				$ 90,802.74
Daub Road			Rout Maint UNP			
31-1 -	1	12.0	0.000	0.400		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 883.19
Forest Pond Road			AC Patching			
[illegible] -	1	19.0	0.000	0.400		
[illegible] Months Added		Box Out and Crk Fill				$ 5,375.03
[illegible]0 Months Added		Boxout Patch				$ 4,763.23
60 Months Added		Zipper CMR Patch				$ 655.49
Gables Road 1			AC Crack Repair			
33-1 -	1	19.0	0.000	0.900		
60 Months Added		Crack Seal				$ 1,474.85
Gables Road 2			AC Patching			
33-2 -	1	19.0	0.900	0.800		
60 Months Added		Box Out and Crk Fill				$ 10,750.05
60 Months Added		Boxout Patch				$ 9,526.47
60 Months Added		Zipper CMR Patch				$ 1,310.98
Hoffman Road			AC Reconstruction			
31-1 -	1	13.0	0.000	1.000		
300 Months Added		12" Bank R, Emul Inj				$ 94,034.19
300 Months Added		2" HM Pavement				$ 80,280.38
300 Months Added		3" Cold Mix Pavement				$ 60,770.90
300 Months Added		6" FDR, 4" Stab Grvl				$ 60,621.41
300 Months Added		9" FDR Base				$ 43,130.15
300 Months Added		9" FDR w/4" Add Grvl				$ 82,298.60
50 Months Added		Double Chip Seal				$ 17,491.26
300 Months Added		Fabric & 12" Crush R				$ 99,715.11
Hoffman Road 2			AC Reconstruction			
31-2 -	1	18.0	0.000	0.300		
300 Months Added		12" Bank R, Emul Inj				$ 39,060.36
300 Months Added		2" HM Pavement				$ 33,347.24
300 Months Added		3" Cold Mix Pavement				$ 25,243.30
300 Months Added		6" FDR, 4" Stab Grvl				$ 25,181.20
300 Months Added		9" FDR Base				$ 17,915.60
[illegible] Months Added		9" FDR w/4" Add Grvl				$ 34,185.57
[illegible]onths Added		Double Chip Seal				$ 7,265.60
300 Months Added		Fabric & 12" Crush R				$ 41,420.12

Maint in NAME ORDER ALL Road Types For Dates Between: 06/01/2009 and 08/11/2009

Road Name / RIN	Div	Width	Category / Start	Length	Description	Est. Cost
ish Town Road 1			AC Nothing Needed			
-	1	14.0	0.000	1.100		
Months Added		Do Nothing AC				$ 0.00
ish Town Road 2			Rebuild UNP			
0-2 -	1	10.0	1.100	0.300		
120 Months Added		Fabric, 12" Gravel				$ 7,658.89
irk Road			AC Patching			
3-1 -	1	22.0	0.000	0.700		
60 Months Added		Box Out and Crk Fill				$ 10,891.50
60 Months Added		Boxout Patch				$ 9,651.82
60 Months Added		Zipper CMR Patch				$ 1,328.23
ackawaxen Road			AC Nothing Needed			
1-1 -	1	18.0	0.000	1.300		
0 Months Added		Do Nothing AC				$ 0.00
ahls Pond Rd 1			Rout Maint UNP			
-1 -	1	20.0	0.000	1.400		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 5,151.93
ahls Pond Rd 2			AC Rehab			
-2 -	1	18.0	1.400	1.000		
180 Months Added		1 1/2" HM Overlay				$ 95,322.17
180 Months Added		3" CM (millings, CR)				$ 80,935.87
180 Months Added		3" Cold Mix (#1&#2)				$ 84,144.33
240 Months Added		3" HM Overlay				$ 142,724.51
180 Months Added		CIP Recycle				$ 43,158.90
120 Months Added		DBL Chip Seal				$ 24,218.66
ain Street			AC Patching			
1 -	1	36.0	0.000	0.200		
Months Added		Box Out and Crk Fill				$ 5,092.13
Months Added		Boxout Patch				$ 4,512.54
60 Months Added		Zipper CMR Patch				$ 620.99
rry Pond Road			AC Nothing Needed			
-1 -	1	19.0	0.000	1.600		
0 Months Added		Do Nothing AC				$ 0.00
er Road			AC Nothing Needed			
-1 -	1	18.0	0.000	2.300		
0 Months Added		Do Nothing AC				$ 0.00
mp Pond Road			Rout Maint UNP			
1 -	1	18.0	0.000	2.000		
12 Months Added		Regrade				$ 0.00
36 Months Added		Spot Gravel				$ 6,623.91

Appendix J

RSMS Pavement Management System User's Manual

ROAD SURFACE MANAGEMENT SYSTEM

(RSMS 2003)

-distributed by:

Cornell Local Roads Program
416 Riley-Robb Hall
Ithaca, NY 14853-5701

(607) 255-8033
Fax 255-4080
e-mail: clrp@cornell.edu

Prepared for:
THE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

By:
Henderson Associates, Inc.
7961 Eastern Avenue
Silver Spring, MD 20910
Contract Number: DTFH61-95-Z-00133

Technology Transfer Center
University of New Hampshire

New York Specific Modifications:
Cornell Local Roads Program
May 2003

ROAD SURFACE MANAGEMENT SYSTEM

(RSMS 2003)

-distributed by:

Cornell Local Roads Program
416 Riley-Robb Hall
Ithaca, NY 14853-5701

(607) 255-8033
Fax 255-4080
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Technology Transfer Center
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New York Specific Modifications:
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May 2003

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1. INTRODUCTION TO RSMS

1.1. BACKGROUND

For most municipalities throughout the United States, road and street surfaces represent the largest single cost for local government. In addition, forty to fifty percent of public funds spent on roadway systems are for the road surface. For many smaller communities, this percentage can be much higher.

Because of this tremendous investment in roadway systems, local agencies must be able to control cost by preventing deterioration of roadway surfaces. This requires making cost effective decisions regarding the maintenance, repair, rehabilitation and reconstruction of the roadway network within the municipality. Developing a maintenance budget based on cost-effective decisions requires a rational, systematic process of evaluating the condition of the road network and allocating limited funds where they can do the most good.

However, today most maintenance budgets are developed without a systematic decision making process. Typically, agencies develop road maintenance budgets using one or more of the following methods:

LAST YEAR'S BUDGET
- *This year's budget is last year's budget, with an arbitrary increase or decrease.*

STANDARD PROGRAM
- *Establish a program based on periodic maintenance, such as seal coats every five years and overlays every 10 years.*

SQUEAKY WHEEL
- *Respond to emergency demands and citizen complaints as they arise.*

WORST FIRST
- *Major maintenance is prioritized on a "worst first" basis. Those streets that look bad get attention. This approach has a certain logical (although not correct) appeal that satisfies the public and city council.*

POLITICAL PRESSURE
- *Use political considerations to establish programs and budgets.*

GUT FEEL
- *Base the budget on the knowledge, experience, and "gut feel" of experienced employees.*

These criteria, individually or in combination, may have worked adequately in the past and could work now if there are the required funds and the majority of surfaces are in satisfactory condition. However, if the network is in bad shape and getting worse at the same time that funding sources are becoming scarce, and pressure exists to lower taxes, then it is clear that a better decision-making process based on reliable information is needed. In this tight fiscal environment, the types of questions that might be asked by municipal officials are:

- How many miles of roads and what types of pavement must we maintain?

- Should maintenance resources be used on our best or our worst roads?
- What will happen to our road system if maintenance funds are increased or decreased?
- What is the most cost-effective treatment for a particular road?
- What are our maintenance and rehabilitation requirements over the next five years?
- How can available money be spent in the most cost-effective way?

It is essential that we are able to answer these questions. Municipalities need a system that can assess the condition of the network, weigh alternatives, and establish long-term programs and budgets. Although informal approaches to maintaining roads may have worked in the past, it is time to take a much more effective approach. This can be accomplished by the use of an effective road surface management system.

1.2. PAVEMENT COSTS

It is unfortunate, but true, that in many municipalities the roads and streets built at considerable cost are allowed to deteriorate and are now showing signs of major distress. If these problems are not corrected in time, the cost of bringing the road back to an acceptable condition can be many times more than the cost of timely repair. Too often treatment is deferred, allowing the problems to worsen to the point where complete reconstruction may be necessary. This is a recipe for economic disaster.

Many municipalities are following the scenario described above. This will result in a maintenance budget that gets worse, not better. Under this scenario there are more deteriorated streets each year, and the cost per mile for maintenance increases disproportionately.

There is a reason for this chronic crisis. Road or Street costs really "sky-rocket" if they are delayed beyond a certain point. Figure 1-1 illustrates a typical relationship between pavement condition and the cost of pavement rehabilitation at various times in the pavement life. After the first 75 percent of a pavement's service life, the performance level only drops from excellent to fair. In other words, after 75 percent of a pavement's life has expired, it is still in satisfactory condition, and to the untrained eye, looks good. However, in the next 12 percent of life, the performance level of the pavement deteriorates to very poor. More importantly, a pavement that would cost a dollar to renovate at 75 percent of its life will cost $4 to $5 to renovate at 87 percent of its life. Therefore, allowing the pavement condition to deteriorate from fair to very poor will be approximately four to five times more costly.

The reason for this drastic increase in rehabilitation costs can be seen by reviewing Figure 1-2. It shows what types of maintenance and rehabilitation techniques are required to upgrade the condition of a pavement as it ages. You can see that if rehabilitation is performed at the right time, the pavement only requires preventive maintenance such as an overlay. If rehabilitation is delayed only a few years, the pavement requires reconstruction which is much more expensive. Notice that the rate of deterioration begins to rapidly increase after the 75% use point. Beyond that point a much more expensive rehabilitation procedure is necessary to upgrade the street.

Therefore, the primary goal of any pavement management system is to keep the good streets in good shape, and delay rehabilitation of the streets in bad shape until funds are available.

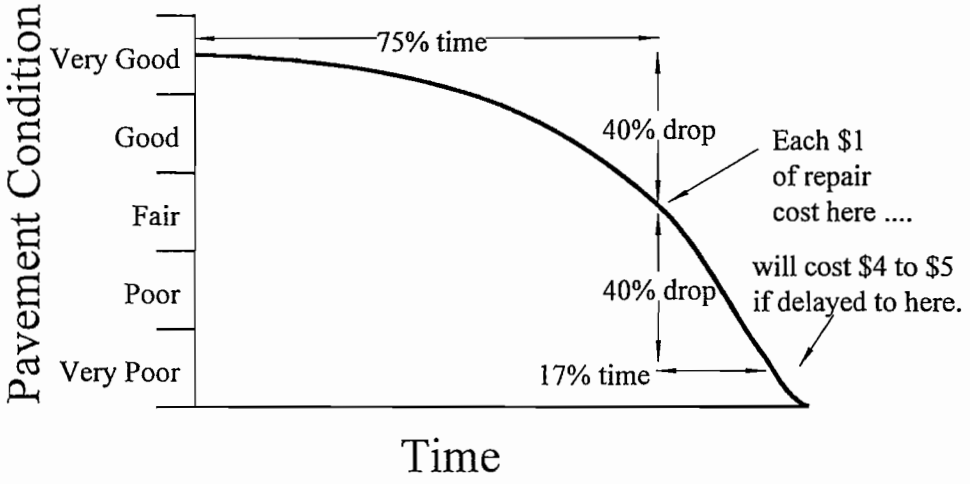


FIGURE 1-1. Pavement Deterioration/Rehabilitation Relationship.

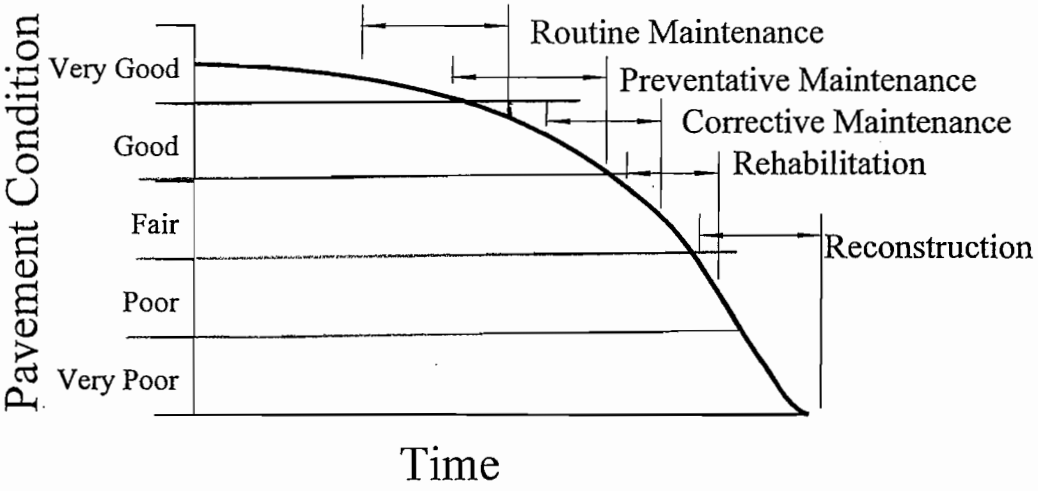


FIGURE 1-2. Maintenance and Rehabilitation Strategies

Often, pavement maintenance is a case of being "penny wise and dollar foolish". As the Fram oil filter TV commercial stated, "Pay me a little now or a lot later". It makes little sense to save "pennies" now by putting off needed maintenance if those deferred repairs are going to cost you "dollars" later. A good comparison is that deferred maintenance is like a debt at very high interest rates. The debt will have to be paid at some time in the future and the longer you put it off; the more it is going to cost.

The following scenario is a simple example of how the cost of pavement maintenance can drastically increase. Suppose a section of pavement that was built twelve years ago needs a

preventive maintenance treatment (i.e. slurry seal) today, estimated at $20,000. If the action is deferred for four years allowing time for the pavement to become structurally damaged, it may require a thick overlay. It will now cost $60,000 to $80,000 to rehabilitate the same pavement to an acceptable condition. If the rehabilitation treatment is deferred until complete reconstruction of the roadway is needed, then an expenditure of $150,000 may be necessary.

The problem is more complicated than the previous example. Towns are not managing just one section of pavement but a whole network of roads, all at different levels of condition and at different rates of deterioration. Moreover, there is never enough money to adequately fund all maintenance needs for the entire roadway network. Therefore, as stated earlier, local agencies need a systematic, rational approach to invest their limited funds in the most cost-effective manner possible. Instituting a pavement management system is a big step in that direction.

1.3. PAVEMENT MANAGEMENT SYSTEMS

A pavement management system is not something entirely new to most local agencies. Every agency has some method of managing the maintenance of their existing road surfaces. PMS does not replace the current practices of an agency. It improves them. PMS is a formal maintenance program that provides a systematic, consistent approach to evaluate the present condition of each pavement surface, determines the proper type of pavement maintenance to obtain an acceptable level of service (prevent accelerated degradation from occurring), prioritizes necessary repairs within the network and produces reports. The reports include a variety of information such as the current overall condition of the network and the cost to return the entire network to an acceptable level of service.

1.3.1. BASIC THEORY

The underling conceptual framework of a pavement management system is the pavement deterioration curve shown in Figure 1-1 which illustrates that roads in good shape cost less to maintain than roads in bad shape. With that concept in mind, pavement management systems were created to provide a structured framework for keeping the network in good shape. The main goal of PMS is to assist decision makers in developing cost-effective strategies so that available maintenance funds are first spent on the good roads and additional monies are spent on the remaining roads.

1.3.2. KEY ELEMENTS

In concept, a state-of-the-art pavement management system would include a broad range of activities including:

- *Collection and retrieval of information*
- *Planning of maintenance strategies*
- *Analysis of data*
- *Developing a long-term maintenance program using elaborate software programs based on deterioration curves and present condition of each road*
- *Design of Maintenance, Rehabilitation and Reconstruction (MR& R) projects*

- *Construction of MR& R projects*
- *Research to support the PMS, including life expectancy, cost of MR&R, new repair alternatives, etc.*
- *Feedback process to improve the PMS*

Although implementation can vary greatly in magnitude, a PMS is flexible in nature and can be adapted to the needs and available resources of any agency. Most municipalities have limited budgets and manpower and cannot institute a state-of-the-art PMS program as described above that requires complex software to do extensive analysis of strategies and develop long term plans, as well as, embark on in-depth research to support the management system. Limitations on resources should not be an obstacle, because an elaborate PMS is not mandatory. The benefits from implementing some form of PMS are far too important not to start as soon as possible.

The key to success is that the PMS provides the information needed to make cost-effective decisions. For most agencies, a pavement management system will be fairly simple in nature. The system should provide the information that local officials need to make informed decisions about how they are going to spend available funds on rehabilitation and reconstruction of roadways within the network.

This may seem too complex for people who are not well-trained in the field of pavement maintenance. This should not be a major concern because implementing a basic PMS is less difficult than you may think. The remaining portion of this reference manual will explain how to set-up and successfully implement a PMS. However, it must be stressed that untrained personnel should receive training by attending a session on pavement management systems offered by your state technology transfer (T^2) center.

1.3.3. PMS LEVELS

Any PMS can be viewed at two levels. The first is the network level. This is where the entire network is analyzed to determine which MR&R activities should be funded. The second is the project level. After each individual MR&R project is selected, it must be studied in detail to determine the type and extent of the maintenance required.

1.3.3.1. Network-Level PMS

An entire network typically encompasses many miles of roadway. Most municipalities cannot afford to do an in-depth survey of each street or segment of roadway because of the extremely high costs of a detailed analysis. Therefore, the minimum amount of information is collected at the network level to support the analysis of overall condition of the network. This will be used to determine which streets require repairs. The information is collected by drive-by windshield surveys.

Network-level PMS includes:

- *Defining the limits of the network*
- *Developing an inventory of the roads within the network*
- *Conducting a condition survey of different pavement distresses*

- *Developing maintenance strategies, cost estimates, and life expectancy*
- *Determining funding needs*
- *An interactive process to:*
  - *select candidate projects*
  - *analyze the impact of decisions on future conditions and funding*
- *Implementing a feedback system to:*
- *update costs and life expectancies*
- *revise MR&R strategies*
- *improve reliability of the system*

Network analysis includes:

- *MR&R needs*
- *Analyzing costs of MR&R*
- *Determining necessary funding*
- *Prioritizing MR&R needs based on limited funds*
- *Forecasting the future condition of the network and impact of proposed or current funding*

1.3.3.2. Project-Level PMS

The MR&R alternatives generated by the network-level PMS are based on the data collected by a windshield survey, and better information is needed to analyze each individual project. After a list of candidate projects has been identified at the network level PMS, more detailed information must be gathered to ensure that each project is properly designed and constructed. Then after the exact scope of work has been defined for each project, accurate cost estimates are determined. Collection of data at the project level could include an up close survey of each street to investigate all pavement distresses, field measurements to determine extent of work area, and soil and pavement samples. Existing drainage facilities, and non-destructive tests to ascertain the remaining structural capacity of the pavement could also be investigated.

Project-Level PMS elements include:

- *Identifying the cause of all pavement distresses*
- *Determining feasible MR&R strategies to address the cause of each distress*
- *Selecting most cost-effective MR&R technique*
- *Analysis and design of project requirements*
- *Write contracts and specifications for each project, and provide inspection*

1.4. THE "RSMS" SYSTEM

Now comes the $64,000 question that town officials have been asking!

> "Since I am not familiar with pavement management, how do I select a pavement management system to meet the needs of my municipality? I don't know what features the system should have."

When starting out, it is best to implement a system that is basic, easy to use, but still provides the necessary information to make prudent investment decisions. What local agencies need is a method that meets the following basic criteria:

1. Easy to learn and apply because most decision makers will have no formal technical training.

2. Systematic and provides an organized approach to assure that all contributing factors are taken into account.

3. It must be practical. Taking care of road and street systems is an ongoing real life activity and the management process must be both workable and realistic.

4. Understandable and accepted by the local board because there are no "free lunches" and a total commitment to the program is vital to make it work.

As stated earlier, the concept of systematically managing one's road maintenance and rehabilitation program is not a new one. In fact, a number of packaged systems have been available for several years. Most are too complex and require the use of confusing software programs to handle and process the data. However, the concept of managing road surface programs is actually a simple one and need not overwhelm the user. The approach called Road Surface Management Systems (RSMS) because it meets this requirement.

ANY MUNICIPALITY CAN LEARN AND IMPLEMENT RSMS.

1.5. THE RSMS PROCESS

This section provides a brief overview of the RSMS process. The remaining chapters of this manual include more detail about each of the tasks listed below. Before we review the basic process, it must be stressed at this point that RSMS is not a complete PMS, but rather a network-level decision support tool. The main function of RSMS is to store and analyze data, and to generate reports that will assist municipal officials in making cost-effective decisions.

1.5.1. NETWORK-LEVEL TASKS

The RSMS process includes the following tasks at the network level:

- *Taking an inventory of the pavement network*
- *Assessing the condition of the network*
- *Developing maintenance and rehabilitation alternatives*
- *Assigning repair alternatives to repair a distress*
- *Prioritizing maintenance needs*
- *Generating reports, budgets, work schedules and work orders*

The first two tasks require developing a database of information pertaining to the physical features of the network and the present condition of the pavement surfaces. The third task is the careful development of maintenance strategies that are right for the local situation. Strategies that make sense for a small beach community along Lake Ontario may not be used on Long

Island. The remaining activities are analysis of data which is performed by the software program.

1.5.2. RSMS DATABASE

RSMS is a data intensive program that uses three categories of data: 1) road network inventory, 2) road surface condition survey, and 3) MR&R strategies and associated unit costs and life expectancy. The following is a brief overview of each category, for a more detailed explanation see chapter 4.

1.5.2.1. Road Network Inventory

The road network inventory files contain basic information about each road segment in the network. An inventory file contains the following information:

- *Name of Segment*
- *Starting Point*
- *Ending Point*
- *Number of Lanes*
- *Width*
- *Surface Type*
- *Shoulder Type*
- *Starting Mileage*
- *Ending Mileage*
- *Length*
- *Inventory Number*
- *Road Section*
- *Maintenance Division*
- *Jurisdiction*
- *Road Classification*
- *Traffic*
- *Importance*
- *US or Metric Units*
- *Speed Limit*
- *Inventory Year*

Information for the road inventory file can be obtained from existing roadway, right-of-way, or utility drawings, municipal data files or state DOT data files. If there is no data or it is incomplete data, a field survey will have to be performed to obtain the necessary information.

1.5.2.2. Road Surface Condition Survey

The purpose of the condition survey is to determine the condition of each segment by visually observing the distresses. The condition survey is crucial to PMS since different distresses are very much related to certain causes of pavement deterioration. Due to this direct correlation, PMS links distress types to MR&R strategies. Therefore, restoration of a pavement to an acceptable level requires an accurate condition survey and the proper selection of MR&R strategies.

To facilitate the condition survey, descriptive scales are used instead of a numerical scale. These descriptive scales record the SEVERITY and EXTENT of a distress. The use of descriptive scales allows the use of survey personnel with less training or experience and also tends to produce more consistent results. Another benefit of descriptive scales is that distress surveys can be more easily understood by non-technical people who are involved in the decision making process.

The types of distresses include:

Unpaved	Asphalt Concrete or Surface Treated
Cross-Section	Alligator cracking
Roadside drainage	Long/Trans. cracking
Corrugations	Edge cracking
Potholes	Patch/Potholes
Rutting	Roughness
Loose aggregate	Rutting
Dust Control	Bleeding
Roughness	Drainage

- For a detailed explanation of each distress, please refer to Chapter 2.

Road condition data is gathered by surveying each segment and recording the results on a specialized data entry sheet or, if the surveyor is using a laptop computer, entering it directly into the program's condition survey data file. If the condition survey information is recorded on data sheets, it is entered into the RSMS computer program at the office at some later date.

1.5.2.3. Repair Strategies

The RSMS computer program comes with Maintenance Repair and Rehabilitation (MR&R) strategies already installed in the maintenance strategies file. Decisions trees are used to relate to surfaces distresses. Each distress category (i.e. alligator cracking, potholes, etc.) has a decision tree that relates each severity/extent condition (i.e. low severity/ medium extent) with a MR&R strategy (i.e. patch). The decision trees can be modified, however, adjustments can greatly affect results and should only be done by personnel who fully understand the possible ramifications of each modification.

Each type of pavement has certain types of MR&R techniques that are commonly used. The following table lists the most common MR&R techniques for each type of pavement:

Unpaved	Asphalt Concrete or Surface Treatment
Defer Maintenance	Defer Maintenance
Dust Control	Crack Repairs
Additional Gravel	Patching
Reshaping	Surface Treatment
Regrading	Overlays
Rehabilitation	Rehabilitation
Reconstruction	Reconstruction

Estimated costs and life expectancy of each strategy must also be entered into RSMS. This information has a significant effect on which strategies the program will select as the most cost-effective alternative. As such, it is important to have the most accurate information available. Initially, a municipality may have to rely on generic data from reference manuals, data from the state DOT or other municipalities if it does not have adequate records to extrapolate good data for input into RSMS. However, over time a municipality should keep good records to develop reliable data for use in the RSMS program. This is important because cost data and life

expectancy of different techniques can vary greatly from location to location due to many local factors.

1.6. BENEFITS OF RSMS

There are many benefits that can be derived from utilizing a rational, systematic method to manage the maintenance of your municipality's road surfaces with RSMS, assuming it is effectively implemented. The benefits of an RSMS system include:

1. Efficient Use of Limited Resources

   Since most local agencies do not have adequate funding to support all the required maintenance and rehabilitation each year, prioritization of candidate project is essential to ensure that the available funds are spent wisely.

2. Substantiate Results

   Annual budgets can be developed logically, with a minimum amount of guesswork or "gut feel." Agencies can review information contained within pavement management reports, such as the condition, costs, and needs of the network to determine consequences of their decisions.

3. Quantify Condition of the Network

   After the condition survey has been completed and all data entered into the computer, RSMS can generate the overall condition of the network that will serve as a baseline to determine if the overall condition is improving from one year to the next. The condition index ranges from 0 indicating every street must be rebuilt to 100 indicated that all streets are in very good shape. An increase in the condition index from one year to the next shows that your agency is making progress, while a decrease in the index indicates that the overall condition of the network is getting worse.

4. Communicate Results in a Convincing Format

   To obtain approval from a skeptical board of elected officials, the maintenance needs of the municipality must be conveyed in a convincing manner. It is much harder to disagree with a plan that is based on a rational decision making process which uses facts and figures as opposed to an arbitrary method.

   RSMS generates simple, easy to read reports that can be reviewed by non-technical personnel with a minimal amount of interpretation. The reports include all the input data such as inventory and distress survey results, as well as projected repairs and budget reports.

5. Better Understanding of the Overall Situation

   When a manger has more in-depth knowledge of the situation, he or she will be better able to explain the plan and handle grueling cross-examination by municipal officials or angry citizens. By understanding the condition and needs of the network and considering it to the available funds, a manager can explain why it is essential to obtain the required

funding. This is especially important when it comes to asking for the additional funds required to prevent the network from further deterioration.

6. Better Support Data

   The old saying, "garbage in is garbage out" is so true when it comes to PMS. Since a PMS is data intensive and data sensitive, good data is necessary to provide good results. It was stated earlier that initial data for performance of various MR&R strategies and cost information that were gathered from many different sources are usually generic in nature. They are not specific to a particular agency. Over time, collection of data for a PMS will result in a data bank of information that can be analyzed to provide information specific to your local situation.

   Tracking the performance of various MR&R techniques may result in changing some life expectancies, or certain maintenance strategies may have to be changed because of poor results. Reviewing bid proposals from contractors will provide better unit cost information for predicting the cost of repairs. After analyzing the collected information, RSMS allows easy updating of those files to incorporate the new information. Updating the MR&R tables will produce more accurate results matched to your local conditions.

7. More Accurate and Accessible Information

   As with any PMS, RSMS requires a tremendous amount of information and extensive analysis of this information. The data files provide an easy to use set of file cabinets that are available at the touch of a few keys. Also, the files can be easily updated and revised. Calculations are performed quickly and accurately but do not guarantee good results. Then reports can be quickly produced. Input data must be validated for accuracy to ensure a good analysis.

8. Team-Like Atmosphere

   One of the most overlooked benefits of RSMS is that it can produce a team atmosphere among municipal officials. By producing a credible report that is based on a rational, systematic approach and good data, RSMS can help to reduce the frustration and anger that frequently develops during the budgeting process. Also, knowing that you are effectively managing your resources by taking a pro-active approach rather than fighting fires, will provide job satisfaction.

1.7. MISCELLANEOUS QUESTIONS ABOUT RSMS

The following are answers to some basic questions frequently asked by cost-conscious local officials.

1. What Does Road Surface Management Cost?

   There is no single answer because the costs are directly related to how extensive a road inventory you do, how many miles of road you have to evaluate, what reports you want and whether or not you need to purchase office equipment to support it.

As far as staff time is concerned, one town manager in the State of Maine with about 50 miles of town roads reported that the staff costs (town manager and road superintendent) of RSMS is one week's time - a small investment for the many benefits received. No matter how elaborate or how simple the program, it is worth investing the time to begin some form of Road Surface Management. Of course, the actual savings of implementing a RSMS will vary with each particular situation. However, it can definitely be said that good road maintenance doesn't cost, it pays!

2. Who is the Manager?

In towns that have full time staff, the Public Works Director, Road Superintendent or Supervisor will likely be the "front line manager". These are the people directly responsible for the maintenance and repair of town roads. However, in many cases, town managers are actively involved in the field implementation of the RSMS process because it greatly improves their ability to use the system to its best advantage.

The council, managers, and other local government officials who are the financial controllers, are the behind the scenes "second line managers". The system works best with cooperation and trust between these two groups.

3. What Is Being Managed?

A Road Surface Management System is a tool to help town officials take care of their roads more efficiently by managing both time and money. Road moneys are best managed by finding the most cost-effective way to distribute limited maintenance dollars among the many roads needing attention.

Time is managed by taking into account the expected life of different types of road repairs to establish when and how often maintenance work should be done. The organized approach to road issues that RSMS requires will also make better use of staff time.

4. Why Is Road Management Becoming So Popular?

Because it has been successful. It provides a disciplined, systematic way for a town to identify its road maintenance needs, to decide on a plan of action, and to substantiate the need for a plan to town officials and voters. In short, it takes much of the guess work and confusion out of town road improvement programs.

5. Who Benefits From RSMS?

Everyone does. Applying the system improves communication and trust between staff and financial decision makers. The system provides a uniform procedure for relating road surface performance to specific maintenance and repair methods with known costs. It helps to establish and defend road budget needs and to confirm the importance of adequate funding. It replaces "gut feel" and political decisions with defensible alternatives. PMS makes it much easier to respond to citizen complaints and avoid crisis responses when there is a logical, prioritized road improvement plan in place.

Perhaps the most important benefit is that RSMS allows priorities and needs to be explained in a clear and concise manner so that road funding decisions can be made with confidence and that there is reasonable assurance that maximum benefit is being obtained for every tax dollar spent.

1.8. QUALITY CONTROL

In addition to implementing a pavement management system for making cost-effective decisions relative to maintaining existing pavement surfaces, other factors influence maintenance cost. New roads should be required to meet reasonably high quality standards. A poorly built road can deteriorate quickly and thereby become a money pit that will drain the municipality of precious maintenance funds for many years to come. Additional maintenance problems created by low quality construction and repairs must be added to an already strained maintenance budget, the results can be devastating.

2. PAVEMENT DISTRESS

2.1. INTRODUCTION

There is a wide variety of pavement distresses. In addition, the cause of the different pavement distresses can vary. Certain distresses if not repaired immediately can lead to a very quick deterioration of the pavement, while other types of distress can be relatively insignificant. Before a proper maintenance plan can be developed, we must be able to determine the type of distress and understand the cause. The knowledge of the different types of pavement distress and their causes is essential in selecting an appropriate maintenance and rehabilitation technique.

Therefore, the purpose of this chapter is to provide a brief overview of the various types of distresses, including: a description of the different types of pavement distress, discussion of the significance of each type of distress, explanation of the possible causes of each type of distress, and provide a list of possible corrective maintenance procedures. As for illustrations of the various types of distresses, including pictures of the various levels of severity, please refer to the SHRP manual, SHRP-P-338, "Distress Identification Manual for the Long-Term Pavement Performance Project".

Although deterioration in pavements can be a result of improper engineering, it is also due to poor construction practices, inferior materials, lack of inspection, and inadequate maintenance after construction. As a result of these deficiencies, pavements will deteriorate over time. However, the time at which the distresses first appear and the rate of deterioration can vary greatly. For example, in the case of rutting, the distress will appear shortly after construction. At first, the rutting will progress rapidly and then will decrease with time. On the other hand, distresses such as fatigue cracking or raveling usually do not occur until later in the life of the pavement, but will accelerate with age.

The two main external forces which have a significant impact on the deterioration of pavements are:

1 Structural forces: caused by repeated traffic loadings

2 Environmental forces: due to weathering and aging

Obviously, most pavement deterioration results from a combination of structural and environmental causes. However, it is important to be able to distinguish between the two in order to select the most effective rehabilitation techniques. If the distress is not properly distinguished, an inappropriate maintenance technique will usually be less effective in stopping the deterioration, thereby wasting an already limited maintenance budget.

2.2. *ASPHALT PAVEMENT DISTRESSES*

The four major categories of common asphalt pavement surface distress are:

1. Cracking
2. Surface deformation
3. Disintegration
4. Surface defects

2.2.1. CRACKING

Cracks in asphalt pavements can take many forms. The most common types of cracking are:

1. Fatigue cracking
2. Longitudinal cracking
3. Transverse cracking
4. Block cracking
5. Slippage cracking
6. Reflective cracking
7. Edge cracking

2.2.1.1. Fatigue Cracking (Alligator cracking)

Description:

Fatigue cracking is commonly called alligator cracking. This type of cracking is a series of interconnected cracks creating small, irregular shaped pieces of pavement. The small pieces vary in size, but are usually less than twelve to twenty four inches. The cracking pattern gives the appearance of alligator skin or chicken wire.

Cause:

This is caused by failure of the surface layer or stabilized base due to repeated traffic loading. The cracking starts at the bottom of the surface course or stabilized base where the tensile stresses are the highest. As the pavement is continually subjected to wheel loads, the flexing of the pavement causes the cracks to migrate upwards toward the surface. Over time more and more cracks are formed creating an interconnected series of cracks.

Alligator cracking is considered to be a structural failure that results from excessive deflection. This is caused by poor support from the supporting layers below the pavement surface, usually accompanied by poor drainage conditions.

Repair:

Repair by excavating localized areas and replacing the base and surface. Large areas require reconstruction. Improvements in drainage may be required.

2.2.1.2. Longitudinal Cracking

Description:

Longitudinal cracks are not a series of interconnected like fatigue cracking, but are individual cracks that run relatively parallel to the pavement centerline. Cracks usually start as hairline or very narrow and widen and erode with age. Without crack filling, they can ravel, develop multiple cracks and become wide enough to require patching.

Cause:

They can be caused by several reasons including: inadequate bonding between paving lanes due to poor construction techniques (improper joint compaction), shrinkage of asphalt surface due to low temperatures or hardening of the asphalt cement, or reflective cracks caused by cracks below the surface. Longitudinal cracks are not normally considered to be caused by a structural failure.

Repair:

Filling and sealing longitudinal cracks will reduce moisture penetration and prevent further subgrade weakening. Multiple longitudinal cracks in the wheel path or pavement edge indicate a need for strengthening with an overlay or reconstruction.

2.2.1.3. Transverse Cracks

Description:

Transverse cracks form at approximately right angles to the centerline of the roadway. They are regularly spaced and have the same causes as longitudinal cracks. Transverse cracks will initially be widely spaced (over 50 feet). Additional cracking will occur with aging until they are closely spaced (within several feet). They usually begin as hairline or very narrow cracks and widen with age. If not properly sealed and maintained, secondary or multiple cracks develop parallel to the initial crack. The crack edges can further deteriorate by raveling and eroding the adjacent pavement.

Cause:

The same as longitudinal cracks.

Repair:

Prevent water intrusion and damage by sealing cracks which are more than 1/4 inch wide.

2.2.1.4. Block Cracking

Description:

Block cracking is an interconnected series of cracks which divides the pavement into rectangular pieces. The cracks usually intersect at right angles and the blocks can vary in size up to one

hundred square feet (10' by 10'). If the blocks are much bigger, they usually are considered to be transverse and longitudinal cracks.

Cause:

Block cracking is caused by the change in volume of the pavement surface due to changes in temperature combined with the hardening of the asphalt cement as the pavement ages. It is not considered to be load related but can be aggravated by traffic loading.

Repair:

Repair with sealcoating during early stages to reduce weathering of the asphalt. Overlay or reconstruction is required in the advanced stages.

2.2.1.5. Slippage Cracking

Description:

Slippage cracks are half-moon shaped cracks with both ends pointed into the direction of traffic resulting from the horizontal forces created by traffic.

Cause:

They are usually caused by poor bonding between the asphalt surface layer and the layer below. The poor bonding can be due to dust, dirt, oil or lack of a tack coat. It may also result from a surface course that has a low strength and cannot adequately resist the horizontal forces from traffic (stopping and starting).

Repair:

Repair by removing the damaged area to ensure adequate stability of the new surface and bonding with the layer below, and then resurface.

2.2.1.6. Reflective Cracking

Description.

Reflective cracking occurs in older pavements overlaid with hot mix asphalt concrete. It is called reflective cracking because it reflects the crack pattern of the pavement structure below.

Cause:

This type of cracking results from the horizontal or vertical movement of supporting layers beneath the surface layer due to temperature changes or moisture.

Repair:

It is difficult to prevent without taking preventive measures (i.e. sub-sealing, rubblizing the pcc pavement, etc.) prior to placing the overlay. Thick overlays or reconstruction is usually required.

2.2.1.7. Edge Cracking

Description.

Edge cracks typically start crescent shaped and at the edge of the pavement. They will expand from the one edge until they begin to resemble alligator cracking.

Cause:

This type of cracking results from lack of support of the shoulder due to weak material or excess moisture. They may occur in curbed section when subsurface water causes a weakness in the pavement.

Repair:

At low severity, the cracks may be filled. As the severity increases, patches and replacement of distressed areas may be needed. In all cases, excess moisture should be eliminated, and the shoulders rebuilt with good materials.

2.2.2. SURFACE DEFORMATION

Pavement deformation is the result of weakness in one or more layers of the pavement which has experienced additional compaction or movement after completion of construction. The deformation may or may not be accompanied by cracking. Surface distortions can be a traffic hazard and create moisture problems that will accelerate pavement deterioration.

The basic types of surface deformation are:

1. Rutting
2. Corrugations
3. Shoving
4. Depressions
5. Swell

2.2.2.1. Rutting

Description:

Rutting is the displacement of pavement material which creates channels in the wheel path and is sometimes referred to as channeling.

Cause:

It is caused by the compaction and/or movement of unstable material in one or more of the layers. Rutting in the surface course is either due to inadequate compaction during construction

or an unstable asphalt concrete mixture (plastic movement). Severe rutting (greater than two inches) is probably caused by base or subgrade consolidation.

Repair:

Minor rutting can be repaired with surface milling or an overlay. Severe rutting requires that the initial cause be corrected. If the surface course is unstable, it should be milled. In the case of an unstable base, the roadbed may require reconstruction.

2.2.2.2. Corrugation

Description:

Corrugation is referred to as washboarding because the pavement surface has become distorted like a washboard. Plastic movement of the pavement surface creates a rippled surface with the corrugations running perpendicular to the centerline of the pavement.

Cause:

The plastic movement (instability) of the asphalt concrete surface course may be caused by too much asphalt cement (lubrication effect), too much fine aggregate (ball-bearing effect), or rounded or smooth textured course aggregate (marbles effect). Corrugations usually occur at places where vehicles accelerate or decelerate and on hills where vehicles brake on the downgrade.

Repair:

Minor corrugations can be repaired with an overlay or surface milling. Severe corrugations require a deeper milling before resurfacing.

2.2.2.3. Shoving

Description:

Shoving is also a form of plastic movement in the asphalt concrete surface layer which creates a localized bulging of the pavement.

Cause:

Locations and causes of shoving are similar to those for corrugations.

Repair:

Repair minor shoving by removing and replacing. For large areas, milling the surface may be required followed by an overlay.

2.2.2.4. Depressions

Description:

Depressions are small, localized bowl-shaped areas that may include cracking. Depressions cause roughness, are a hazard to motorists, and allows water to collect. The water can become a source of pavement deterioration due to seepage into lower layers and possibly cause vehicles to lose control.

Cause:

Depressions are typically caused by localized consolidation or movement of the supporting layers beneath the surface course due to instability.

Repair:

Repair by excavating and rebuilding localized depressions. Reconstruction is required for extensive depressions.

2.2.2.5. Swell

Description:

A swell is a localized upward bulge on the pavement surface and can be accompanied by cracking.

Cause:

Swells are caused by an expansion of the supporting layers beneath the surface course or the subgrade. The expansion is typically caused by frost action (frost heave) or by moisture (expansive clay). Also, a blowup in a concrete slab can cause a swell in an asphalt overlay placed over a portland cement concrete pavement.

Repair:

Repair by excavating inferior subgrade material and rebuilding the removed area. Reconstruction may be required for extensive swelling.

2.2.3. DISINTEGRATION

The progressive breaking up of the pavement into small, loose pieces is called disintegration. If the disintegration is not repaired in its early stages, complete reconstruction of the pavement may be needed. The two most common types of disintegration are:

1. Potholes
2. Patches

2.2.3.1. Potholes

Description:

Potholes are bowl-shaped holes similar to depressions. Potholes are a progressive failure. First, small fragments of the top layer are dislodged. Over time, the distress will progress downward into the lower layers of the pavement. Potholes are often located in areas of poor drainage.

Cause:

Potholes are formed when the pavement disintegrates under traffic loading, due to inadequate strength in one or more layers of the pavement, usually accompanied by the presence of water. They are usually a result of not properly maintaining the roads. Most potholes would not develop if the root cause (various types of cracking or other distress) was repaired before it developed into a pothole.

Repair:

Repair by excavating and rebuilding localized potholes. Reconstruction may be required for extensive potholes.

2.2.3.2. Patches

Description:

A patch is defined as a portion of the pavement that has been removed and replaced. Patches are usually used to repair defects in a pavement or to cover a utility trench. Patch failure can lead to a more widespread failure of the surrounding pavement.

Cause:

Patches with cracking, settlement, or distortions are created when the underlying cause of the original pavement defect is not corrected or if the utility trench was not properly backfilled.

Repair:

Repair by excavating and rebuilding localized patches. Extensive settlement in utility trenches may require additional repair to the utility trench prior to pavement repairs or reconstruction.

2.2.4. SURFACE DEFECTS

Whereas the previous types of distress are mostly related to the supporting layers beneath the surface, surface defects are related to problems in the surface layer. The three most common types of surface distress are:

1. Raveling
2. Bleeding
3. Polishing

2.2.4.1. Raveling

Description:

Raveling is the loss of material from the pavement surface. Initially, fine aggregate breaks loose and leaves small, rough patches in the surface of the pavement. As the disintegration continues, larger aggregates break loose leaving larger rough surfaces.

Cause:

It is the result of a loss of adhesion between the asphalt cement and the aggregate. The loss of adhesion can be caused by: hardening of the asphalt cement due to aging or premature hardening due to overheating during production, lack of compaction - especially during cold weather construction, stripping of the bituminous film from the aggregate, dirty or disintegrated (weak) aggregate, or insufficient asphalt content in the mix. Raveling can be accelerated by traffic.

Repair:

Repair the weathered surface with a seal coat, or a thin overlay if additional strength is required.

2.2.4.2. Bleeding

Description:

Bleeding is defined as the presence of excess asphalt on the road surface which creates patches of asphalt cement. Excessive asphalt cement reduces the skid-resistance of a pavement and can become very slippery when wet, creating a safety hazard.

Cause:

This is caused by an excessively high asphalt cement content in the mix, using an asphalt cement with too low a viscosity (too flowable), too heavy a prime or tack coat, or an improperly applied seal coat. Bleeding usually occurs in hot weather when the asphalt cement is less viscous (flowable) and the traffic forces the asphalt to the surface.

Repair:

Repair in some cases can be made by applying hot sand or slag to blot up the excess asphalt. Other alternatives may include a chip seal (using absorptive aggregate), or planing machine to remove the excess asphalt.

2.2.4.3. Polishing

Description:

Polishing is the wearing down of exposed aggregate on the pavement surface due to repeated traffic.

Cause:

When the asphalt concrete is placed and compacted, small portions of the angular aggregate are exposed providing good skid resistance. However, the exposed edges of the aggregate are worn down by the repeated traffic, leaving a smooth surface that does not provide good skid resistance. The rate at which the aggregate wear down is a function of the quality of the aggregate. Certain types of aggregate wear down much quicker than do other types. Therefore, it is important to use hard, durable aggregate in the surface course.

Repair:

Repair with a chip seal, sand seal, slurry seal or a thin overlay.

2.3. UNPAVED ROAD DISTRESSES

While a paved road that is properly designed and constructed should last for many years before signs to deterioration become visible, this does not hold true for unpaved roads. Since the surface is not stabilized, even a well built unpaved road will deteriorate relatively quickly. This is especially true if the road surface and drainage facilities are not routinely maintained.

The main types of unpaved road distresses:

1. Improper cross-section
2. Inadequate roadside drainage
3. Corrugation
4. Potholes
5. Rutting
6. Loose aggregate

2.3.1. IMPROPER CROSS-SECTION

Description:

An unsurfaced road is not as smooth as a paved road and therefore requires more cross slope to ensure that the runoff will drain to the ditches. If water is allowed to pond on the road surface, potholes and ruts can develop as well as creating safety problems. The typical recommended minimum cross-slope is 1/2 inch per 1 foot of lane width. For example, a road with a 10 feet wide lane would have a centerline that is 5 inches higher than the outside edge of the lane (0.5 inches/foot x 10 feet = 5 inches). An adequate cross-slope will help to prevent the formation of false ditches.

Cause:

Since an unpaved road does not have a stabilized surface, the crown can change over time due to "aggregate loss" which refers to base material sinking into soft subgrade, or aggregate in the crown that becomes displaced by traffic and moves towards the outside edge. Loss of fine "binder" material leads to instability and can help to accelerate this problem.

Repair:

Reshaping or regrading depending upon the severity of the distress.

2.3.2. INADEQUATE ROADSIDE DRAINAGE

Description:

Since water is a road's worst enemy, adequate drainage is essential to an unpaved road. Unpaved roads rely on the strength of the base and subgrade to support the vehicle loads. Without a stabilized surface course, an unpaved road that becomes saturated will quickly fail. Poor roadside drainage refers to ditches, culverts and shoulders that are inadequate to carry runoff water away from the road. This distress does not include insufficient cross-slope or other roadway defects that may hinder rainfall from running off the road surface. Poor drainage may be the result of poor construction and/or inadequate maintenance, but whatever the reason, it must be corrected.

Cause:

Inadequate drainage is caused by one or more problems including: insufficient ditch slope, loss of capacity due to sedimentation or debris, clogged culverts, undersized culverts with insufficient capacity, or false ditches.

Repair:

Ditches shall be regraded to improve slope and/or capacity. Culverts with inadequate capacity must be cleaned or replaced with a larger diameter pipe.

2.3.3. CORRUGATION

Description:

Corrugations, or washboarding, are closely spaced ridges and valleys, spaced at relatively close intervals. These ridges and valleys run perpendicular to the centerline of the road. They can typically form on hills, curves, areas where vehicles accelerate or decelerate, or in areas where the road is soft.

Cause:

Corrugation is caused by loss of fine material which leads to loss of aggregate, or by poor blading.

Repair:

Low severity corrugation is corrected by blading. Severe corrugation is corrected by reshaping. Additional material may need to be added.

2.3.4. POTHOLES

Description:

Potholes or "chuckholes" are areas where portions of the road have been worn away, and loss of material has resulted in a bowl shaped depression. Without a stabilized surface, unpaved roads can quickly develop these potholes. Potholes serve as water collectors as well as creating a safety hazard.

Cause:

Development of potholes are caused by poor drainage, traffic, loss of aggregate, saturated or weak subgrade, or frost heave.

Repair:

Minor potholes may be corrected by blading. More extensive potholes must be reconstructed by removing unstable material and replacing with suitable material. This may require base reconstruction.

2.3.5. RUTTING

Description:

Ruts are continuous channels or depressions. Unpaved roads will normally develop rutting in the wheel paths. Rutting can create a drainage problem because the depressions act as an interceptor channel that will collect runoff water, and can be a safety problem. Significant rutting can destroy a road.

Cause:

Rutting is normally caused by a weak base or subgrade that cannot adequately resist wheel loads. As a result, the base material becomes displaced creating ruts. This distress is common on roads that lack an adequate cross-slope or poor roadside drainage which results in a saturated base, especially when exposed to heavy truck traffic. Minor rutting may be caused by traffic that displaced the cover material.

Repair:

Subgrade problems will require reconstruction. Unstable material must be removed or stabilized with a stabilizing agent or by geosynthetics. Drainage or cross-slope problems will require correction.

2.3.6. LOOSE AGGREGATE

Description:

Unpaved road surfaces lack stability to resist traffic. Over time, traffic will cause aggregate to become loose and the particles moves into small berms along the shoulders or center of the roadway. The instability of the surface aggregate typically results from a lack of fine material to act as a binder to hold the larger aggregate together.

Cause:

Loose aggregate may be due to one or more problems such as high traffic volumes, loss of fines due to poor surface drainage or in the form of dust during dry periods, insufficient amount of fines in original surface material to act as a binder (poor gradation).

Repair:

Loose aggregate is repaired by reshaping. If the road material does not contain enough fines, additional fines must be added to obtained the proper gradation for stability. Excessive aggregate loss may require stabilization.

3. MAINTENANCE ALTERNATIVES

3.1. INTRODUCTION

When setting up a road surface management system, one of the tasks is to determine which maintenance options are to be used. There is a broad array of alternatives to select from. They range from low cost preventive maintenance techniques which are typically intended to keep roads in good shape to expensive reconstruction options required to replace badly deteriorated pavements.

Since there are so many alternatives to choose from, road supervisors and street commissioners must have a fundamental knowledge of all possible maintenance techniques to select from and when they should be used. Otherwise, it is virtually impossible to maximize the benefits of a road surface management system.

Although, there are many alternatives to choose from, most local areas use only a small number of alternatives. Factors which influence local maintenance practices include climate (temperatures, rainfall, etc.), traffic, soil types, drainage, type of road construction, and contractor's expertise (usually related to state DOT practices). This chapter will cover many of the most popular techniques which are used throughout the U.S.

3.2. FLEXIBLE PAVEMENT

The five basic types of maintenance alternatives used for flexible pavements are:

1. Surface Treatments
2. Crack Repairs
3. Pothole Patching
4. Surface Overlays
5. Reconstruction / Rehabilitation

3.2.1. SURFACE TREATMENTS

Asphalt surface treatments cover a broad range of maintenance techniques which are used to improve the pavement surface. All surface treatments include an application of asphalt cement that may or may not include aggregate. Any treatment that is less than one inch in thickness is generally considered to be a surface treatment.

A surface treatment is intended to provide one or more of the following:

- *Long-lasting, economical surfaces for granular base roads having light and medium traffic*
- *Preventing surface water from penetrating granular bases or old pavements that have become weathered or cracked*
- *Fill voids, coat and bond loose particles in pavement surfaces*
- *Renew a surface and restore skid resistance*
- *Restore weathered surfaces and rejuvenate oxidized pavement surfaces*
- *Improve the bonding between different asphalt concrete layers*
- *Minimize moisture damage to the asphalt concrete layers*

3.2.1.1. Types of Surface Treatments

There are many types of surface treatments. They range from a single application of emulsified asphalt intended to seal cracks to a slurry seal that is both preventive and corrective maintenance. Although none of these procedures will add structural strength to the pavement, they will extend the life of the existing surface. Asphalt surface treatments can be categorized as follows:

1. Sprayed asphalt and aggregate surface treatment (Chip Seal)
   -Single surface treatment
   -Multiple surface treatment
   -Sand seal
2. Slurry seal
3. Sprayed asphalt treatment (Fog Seal)

3.2.1.2. Disadvantages Of Surface Treatments

Although chip seals can be an excellent low-cost routine maintenance technique, many problems can arise if they are improperly used or poorly constructed. The three main reasons that there can be dissatisfaction with chip seals are:

1. High expectations

   People except too much from them. The purpose is simply to prevent moisture penetration and air infiltration by sealing the pavement surface and to restore the surface texture.

2. Improper application

   Chip seals do not restore structural strength and are not intended to be used on a pavement that serves high traffic volumes, high speed traffic, or heavy trucks. Also, they will not correct imperfections on a rough surface such as rutting or corrugations.

3. Poor construction techniques

   There are many factors that can affect how well a chip seal will perform, including the following:

   - *Type of emulsion and aggregate size*
   - *Timing of the application of aggregate and compaction*
   - *Temperature and humidity during construction*
   - *Amount of dust and dirt on the road surface and aggregate*

3.2.1.3. Single Surface Treatment (Chip Seal)

A single surface treatment is usually referred to as a "chip seal". This treatment typically consists of a single application of an emulsified asphalt that is immediately covered with a single layer of aggregate. The gradation of the aggregate can be uniform (same size stone chips) or well graded (different sizes of stone chips). The aggregate must be immediately imbedded into the asphalt emulsion before it breaks (evaporation of water). The aggregate should be seated with a pneumatic-tired roller.

Chip Seal is used for one or more of the following reasons:

- *As a short term measure to extend the life of a deteriorated pavement until another type of treatment is applied (i.e. overlay)*
- *To prevent further oxidation and surface raveling of old pavements*
- *To waterproof an existing pavement which has cracking*
- *To improve skid resistance*

3.2.1.4. Multiple Surface Treatments

A multiple surface treatment usually consists of two or three layers of emulsified asphalt and aggregate. It provides a wearing and waterproofing surface that is more durable than an single surface treatment. If properly designed and constructed, a double surface treatment will provide two times the service life for approximately 1 1/2 times the construction cost.

When constructing a double layer, the size of the aggregate for the first course should be twice the size of the second course. The first layer forms the base for the surface treatment, but the larger aggregate leaves many voids. By applying a second layer, the smaller aggregate fills the voids in the base layer. Therefore, the thickness of the double surface treatment will be the thickness of the first layer. How well the second layer of aggregate fills the voids in the first layer will determine the texture and riding quality of the treatment. Also, the amount of aggregate loss is decreased as compared with single layer treatments, because the size of the second layer is smaller and they are imbedded in the voids of the first layer to increase stability.

3.2.1.5. Sand Seals

Sand seals are different from chip seals in that they use fine aggregate instead of course aggregate. It is constructed by applying a spray coat of emulsified asphalt that is immediately covered with a light application of fine aggregate, usually clean sand or screenings. Sand seals are used primarily for the following reasons :

- To rejuvenate weathered or oxidized surfaces. The sand seal will help prevent the loss of material from the old surface due to traffic abrasion.
- To form a barrier to prevent the infiltration of moisture and air. When an existing pavement surface begins to crack, moisture and air may pass into the underlying pavement structure thereby reducing its load carrying capability.
- To provide a skid-resistant surface texture. A sharp, angular sand will provide a highly skid-resistant surface. The sand may also be used to "soak up" spots where the asphalt cement has bled to the surface

3.2.1.6. Slurry Seal

A slurry seal is a mixture of well-graded fine aggregate, mineral filler, emulsified asphalt water and additives (if needed), that is applied to an existing pavement surface. It is used as both a preventive and corrective maintenance procedure. However, it cannot correct major deficiencies in a pavement such as rutting, potholes and severe alligator cracking. As with other surface treatments, these deficiencies must be corrected prior to application of the surface treatment.

A slurry seal can be quite effective when applied to the surface of an older pavement. It will seal the cracks, stop raveling, prevent infiltration of water and air, and improve skid resistance. Its timely application will help reduce surface distress caused by oxidation of the asphalt cement. The slurry is usually applied in a thickness of 1/8 to 3/8 inch. However, it requires a special slurry seal machine to apply the slurry.

The three types of slurry seals are shown in Table 3.1 below:

Type	Usage	Traffic	Application Rate
I	Crack filling and fine seal	Low Traffic	6-10 lbs/sq. yd
II	Seal, Improve wearing surface.	Medium to heavy traffic	10-15 lbs/sq. yd
III	Correct surface conditions - rutting and depressions	Medium to heavy traffic	15-20 lbs/sq. yd

Table 3.1 - Types of Slurry Seals

Slurry seals have a number of advantages, including:

- *Rapid application*
- *No loss of cover aggregate*
- *Excellent surface texture for paint stripping*
- *Ability to correct minor surface irregularities*
- *Minimal loss of curb height*
- *No need for manhole and other structural adjustments*
-

3.2.1.7. Sprayed Asphalt Surface Treatments (Fog seal)

This type of treatment consist only of sprayed asphalt. It does not include aggregate. The main purpose is to prevent water and air from infiltrating into the pavement. This type of seal is called a fog seal. The fog seal consists of a light application of slow-setting emulsified asphalt diluted with water that renews old surfaces, seals small cracks and surface voids, and slows down raveling.

The primary advantage of a fog seal is that it provides a cheap surface coating. The primary disadvantages are:

- *Has a short expected life*
- *Can reduce skid resistance*
- *Traffic lanes must remain closed until the treatment has cured*

3.2.2. CRACK REPAIRS (Sealing and Filling)

In the past, it was common to refer to both crack sealing and filling operations as crack sealing. However, SHRP's manual on crack sealing and filling differentiates between the two activities. SHRP recommends that joints with less than 0.1 inches of horizontal movement are filled and those with greater than 0.1 inches of horizontal movement are sealed.

SHRP further recommends rubberized asphalts as most appropriate for crack sealing operations. For crack filling purposes, asphalt cement and liquid asphalt with fibers and/or mineral fillers are commonly used. In general, crack treatment operations should be conducted in the spring or fall when the cracks are approximately half way open to minimize the amount of expansion or contraction. This is important since excessive movement creates high stresses that could result in joint failure. Cleaning of the cracks to remove debris and water is important to assure good bonding. A hot air lance may also be used in colder weather.

If there are too many cracks to reasonably treat, it may be more economical to seal the whole surface using a different type of surface treatment.

3.2.3. POTHOLE PATCHING

Repair of potholes as well as failed patches requires patching to prevent further damage to the pavement as well as to improve safety. Potholes and failed patches could be the result of inferior pavement materials, or could be caused by a weak subgrade and/or poor drainage.

In the case of inferior materials, the damaged portion of the pavement should be removed and replaced with adequate materials. The SHRP Manual, "Asphalt Pavement Repair Manuals of Practice" states that it is important to use good materials and achieve good compaction. In other words, the throw and roll techniques work just as well as the semi-permanent patch (the standard, old-fashion method) if good materials are used. However, in newer roads where the patch must last for many years, a permanent patch using hot mix asphalt and proper construction techniques is necessary. When the underlying subgrade is the problem, it must be removed and replaced with good fill material or the problem will continue to reoccur.

3.2.4. SURFACE OVERLAYS

Overlays are used to correct surface deficiencies such as rutting and raveling, and to increase the structural capacity. When used to correct surface deficiencies, the overlay is usually less than 1 1/2 inches in thickness. Thicker overlays are used to increase structural capacity. The exact thickness of a structural overlay is dependent upon the existing condition of the pavement and the anticipated traffic loading.

When applied before the pavement starts to severely deteriorate, an overlay can be a very cost effective way of extending the life of the pavement as well as immediately improving the surface. The life of the pavement is extended since the structural capacity has been increased and the cracks are sealed preventing air and moisture infiltration. The new surface will also provide a smooth, safe ride. Also, proper cross slope can be added.

It is important to make sure that the existing pavement is in adequate condition to receive an overlay and does not require partial or full reconstruction. If the pavement is in poor structural shape, the new overlay may fail prematurely due to inadequate support from the layers below. Prior to the overlay, all deficiencies should be corrected. This includes repairing all potholes, localized weak areas (i.e. severe alligator cracking, depressions, and swells), and making sure

that drainage is adequate. You do not want to waste limited maintenance funds on an overlay if the existing pavement requires reconstruction.

3.2.5. RECONSTRUCTION/ REHABILITATION

If the pavement has not been properly maintained or was poorly constructed and has started to severely deteriorate, any surface treatment or overlay would be a waste of limited maintenance funds. In this case, the existing pavement must be removed and replaced. Prior to placing the new pavement, all deficiencies such as weak soils, soils susceptible to swelling or capillary action, or poor drainage must be improved. If all deficiencies are not properly corrected, the new pavement will deteriorate prematurely.

The old fashion way of reconstruction was to breakup the existing pavement and haul it to a landfill and replace the pavement using all virgin material. However, in recent years, recycling has become more popular. The three main factors that have influenced the increased use of recycling are economics, limited resources, and the environment. With improved technology and experience, it is usually more economical to recycle. Also, with limited natural resources, it only makes sense to reuse as much of the existing road as possible.

The two main types of recycling are:

1. Hot-mix Recycling
2. Cold In-place Recycling

3.2.5.1. Hot-mix Recycling

This type of recycling involves a central plant or a drum mix hot recycling operation. The mix may include a blend or some combination of reclaimed asphalt pavement, reclaimed aggregate, new asphalt, new aggregate and recycling agents.

The process starts by removing the old pavement, usually by ripping and crushing or by cold milling. In either case, the reclaimed asphalt pavement must be kept separate from the underlying aggregate courses. The asphalt pavement material must usually be downsized to provide proper gradation. After testing of the existing materials to determine gradation of aggregate, content and condition of asphalt cement, a mix design is performed to determine how the old materials will be combined with the new materials, including the amount of new asphalt cement and rejuvenators. After the subgrade has been properly prepared and drainage is improved, if required, the aggregate courses are placed and compacted. This is followed by placing the recycled asphalt concrete.

The performance of pavements which have been reconstructed by this method has shown to equal that of conventional mixes. However, most towns would probably not have sufficient quantity of work to justify the move-in and mixing plant set-up expenses for the contractor.

3.2.5.2. Cold In-place Recycling

This type of recycling reuses the existing paved surface and, in some cases, the underlying untreated base material. In addition, all work is done on the existing roadway and normally does not require transporting new material. Although cold in-place recycling of asphalt pavements is not being used everywhere, it is being used in many states with good success. As this relatively new construction method develops a track record and the technology continues to improve, it is becoming more popular. For example, more than 150 townships in Pennsylvania currently recycle roads, compared with only three townships ten years ago.

An equipment train which includes an asphalt tanker, milling machine, and a paver is used for cold in-place recycling. The process starts with a milling machine that grinds up the old asphalt pavement and mixes it with emulsified asphalt cement from the oil tanker. The recycled asphalt is conveyed to the paving machine which trails the milling machine. The paver then places the recycled material as a base course for the new pavement. After the recycled asphalt has been compacted and properly cured, it is covered with a new surface course. In certain light duty applications, a chip seal or slurry seal may be sufficient.

Advantages of Cold In-place recycling include:

- Reduced cost of construction as compared to traditional reconstruction. The cost savings result from utilization of existing materials, less asphalt cement is required, and no hauling and disposing of old materials. Actual cost savings can approach 50 percent.
- Recycling is faster than conventional reconstruction. Time savings usually varies from 30 to 50 percent. Also, one side of the roadway can usually be kept open to traffic while the other side is being recycled.
- Recycling eliminates cracks and potholes, improves skid resistance and ride quality, as well as restoring curb reveal, proper grade and cross-slope.

Not all roads qualify for cold in-place recycling. To determine if an existing pavement qualifies samples of the old pavement must be analyzed in the laboratory to determine: the amount and condition of the asphalt, and the type and condition of the aggregate. Other factors which must be considered include the condition of the existing subgrade and the type of traffic.

3.3. UNPAVED ROADS

As with other types of roads, unpaved surfaces require proper maintenance to prevent premature failure. Since unpaved roads do not have stabilized surfaces, they can deteriorate more quickly than asphalt or concrete pavements. Since poor drainage and incorrect aggregate gradation (insufficient fine material) are contributing factors to most types of distresses, these deficiencies must be corrected wherever they occur. If not, the problems will continue to occur.

Maintenance alternatives for unpaved roads typically include the following six activities:

1. Dust Control and Stabilization
2. Roadside Drainage
3. Spot Additional Gravel

4. Reshaping (blading)
5. Regrading
6. Reconstruction

3.3.1. DUST CONTROL AND STABILIZATION

Dust can be more than just a nuisance on unpaved roads, it can cause loss of materials, be a safety hazard, and create environmental problems for nearby residents. As stated in chapter 4, an unpaved road relies on fine material to help form a hard, crusted surface. Therefore, the primary goal of dust control is to improve the cohesion of the fine, binder material in the road surface.

The loss of material can represent a significant cost factor. Studies have shown that the yearly loss of road materials can average 45 cu. yd. per mile of 18-ft. wide roadway with a traffic volume of 100 cars per day. With a traffic volume of 300 vehicles per day, which is ordinarily considered the upper limit for economical maintenance of an unpaved road, the yearly loss averages 135 cy of material per mile. This can be a very costly item. Dust palliatives can cut this amount by 50 per cent.

Although water can temporarily suppress dust, it is not a long-term answer. A more long lasting answer is to use a dust palliative. The most common type of dust palliative is calcium chloride in flake or liquid form. Calcium chloride attracts moisture and improves the cohesion and ability of fine aggregates to retain moisture. It should be applied after the road has been graded or bladed. In addition, the road should not be too dried out or dusty. Other possible dust control additives include liquid asphalt and sodium chloride.

The use of dust control can be justified under the following conditions: 1) when the amount of traffic warrants a permanent surface but funds are not available; 2) when the dust becomes an extreme nuisance, safety hazard, or leads to excessive soil-aggregate loss.

3.3.2. ROADSIDE DRAINAGE

Roadside drainage improvement should not be confused with proper cross-slope. Proper cross-slope will help to shed water quickly to the road's edge. At this point, the roadside drainage system must be able to carry the water away from the road to prevent the base and subgrade from becoming saturated. Inadequate road side drainage can lead to serious surface deterioration such as rutting and potholes, and roads can become flooded.

This alternative includes activities such as:

- *Removing debris and excess vegetation from the bottom of ditches and culverts*
- *Grading ditches to remove sediment, reestablish proper longitudinal and side slopes. Removing sediment from the ditches can provide a source for fine material for future surface maintenance.*
- *Grading shoulders to reestablish proper slope. Shoulder must have the same or more slope than the road surface to prevent water from flowing back onto the road surface.*
- *Repairing or upgrading culverts*

Since a wet unpaved road can deteriorate very quickly, especially under heavy traffic, it is imperative that deficiencies in the drainage system be repaired quickly. Failure to do so could result in having to reconstruct the road.

3.3.3. ADDITIONAL GRAVEL

One application for adding aggregate to an unpaved road is spot regraveling for localized problems such as to fill in potholes or correct slippery spots (i.e. too much clay). Prior to filling in the pothole, any unacceptable materials should be removed and replaced. However, more commonly, additional gravel is added to correct larger problems such as to restore the cross-slope and grade, fill in rutting, or to increase the depth of the surface. These problems are corrected by dumping well-graded aggregate in windrows and spreading with a motor grader. The maximum size of the aggregate should be less than or equal to 3/4 inch with 7 to 15 percent of the material passing the number 200 sieve.

3.3.4. RESHAPING (BLADING)

Compaction of unpaved roadways by traffic should produce a hard surface crust that helps to hold the surface aggregates in place if the correct mixture of aggregate, fines and water dries. A crusted road surface requires maintenance to keep it in good shape and to improve rideability and maintain adequate stormwater runoff. This is accomplished by reshaping. Reshaping is a smoothing operation performed with the moldboard tilted forward with light downward pressure on the grader blade to minimize disturbance of the surface crust.

Reshaping smoothes the road by pushing loose aggregate from the side of the road to fill in irregularities in the surface. It can also put back a minor amount of crown into the road surface. Here are two important factors that can influence the quality of reshaping. It should take place when there is sufficient moisture in the road, such as following a rain or after the road surface has been sprayed by a water truck, to prevent loss of fine material. However, if too much moisture is present, blading can break up the crust. The grader must travel slow enough so that the blade will not bounce. Also, care must be taken near railroad crossing to prevent material from creating a safety hazard.

Reshaping is a routine maintenance operation that is intended to smooth without damaging the crusted surface. This is not intended to fix major problems such as corrugations or rutting.

3.3.5. REGRADING

Regrading is necessary when the surface cannot be smoothed to provide an acceptable riding surface. Regrading will eliminate major surface defects such as large potholes, deep ruts or a flattened crown. To accomplish this, the gravel subbase may have to be reworked. The grader blade must cut well below the defects to eliminate them.

Regrading involves remixing the soils to get a proper blend of aggregate and fines, then blading and compacting this blended mixture into a properly crowned road surface. When remixing, it may be necessary to add more gravel or fines. The art of proper blending is not a cut-and-dried

procedure. Experience is the best guide to correct blending. The quality of the crust and its length of useful life depend on the skill used in blending coarse and fine materials and moisture to form the desired crust.

If the road requires additional stability to improve load carrying capability, stabilizing agents can be added during regrading. Additives such as portland cement, asphalt cement, lime-fly ash or calcium chloride are used to improve stability by acting as a binder. After scarifying the road base, the stabilizing agent is added, mixed, graded and compacted.

3.3.6. RECONSTRUCTION

In situations where regrading is not sufficient, reconstruction may be required. If the base or subgrade is inferior and cannot withstand imposed traffic loading, a more stable roadway may be more cost effective in the long run. The existing roadway is removed, including any inferior subgrade material and replaced with suitable material with proper gradation and durability characteristics. If there is a possibility of upgrading the road to a paved road in the future, the base material used in the reconstruction should be of such quality that it will be suitable for the upgraded road. In the case of weak subgrade, geosynthetics may provide an economical alternative to removing and replacing large amounts of soil. Also, reconstruction provides a good opportunity to improve any drainage deficiencies.

3.3.7. LIFE EXPECTANCY

There are many factors which effect the expected life of a maintenance procedure. The main factors include:

- Traffic
- Drainage
- Environmental factors
- Condition of the existing pavement
- Quality of construction
- Load carrying capability of the road
- Timing of the procedure
- Quality and timing of maintenance

The service lives estimated in Table 3.2 attempt to account for the presence of these variables in practice by stating a reasonable range in years of service life. However, it would not be uncommon for an application to fall outside of these ranges and result in a shorter or longer life depending upon the number and severity of the factors noted above.

Table 3.2 Service Life for Maintenance Alternatives

a) Flexible Pavement

ALTERNATIVE	SERVICE LIFE
Crack Sealing	1/2 to 2 years
Patching	1/2 to 3 years
Chip Seal - Single	2 to 4 years
Chip Seal - Double	4 to 7 years
Fog Coat	2 years
Sand Seal	2 to 3 years
HMA Overlay - 1 inch	4 to 6 years
HMA Overlay - 2 inches	8 to 10 years
Reconstruction	15 to 20 years

b) Unpaved

ALTERNATIVE	SERVICE LIFE
Dust Control	1 to 4 months
Stabilization	2 to 8 years
Add Material	1 to 2 years
Blading	2 to 5 months
Regrading	1 to 2 years
Reconstruction	5 to 10 years

Selecting the most economical treatment for any given set of circumstances can still be a bit of a "shell game", even for an experienced manager. A crystal ball would come in very handy, but if none is available, be sure of at least two things:

- Know the strength and load carrying capability of the road being treated.
- Make sure that the treatment is constructed properly.

It goes without saying that any surface deformity like rutting or loss of "crown" that allows water to pond on the road surface must be corrected before applying a surface treatment. After good drainage, the amount of traffic is probably the next most significant factor to consider when selecting the most effective treatment.

4. THE RSMS PROCES

4.1. INTRODUCTION

This chapter provides an overview of a basic method for developing a program to gather data, develop strategies and generate reports to assist in the managing of road maintenance and repair. The method is designed to provide a simplified approach for those who cannot devote a lot of time to planning, but who recognize the need for a systematic approach with documented results.

The following is a list of the basic steps necessary to build a road surface management program. Each of the steps is discussed briefly in the following sections.

4.2 Road Inventory

4.3 Road Surface Condition Survey

4.4 Repair Strategies and Alternatives

4.5 Analysis of Needs, Priority, and Budgets

4.2. ROAD INVENTORY

A road/street inventory is the process of collecting the information necessary to adequately describe the roads in the local network. The amount and type of information gathered can be adjusted to fit the specific needs of an individual community. However, a good rule of thumb to follow in starting an inventory system is, "DON'T GET CARRIED AWAY!" The objective is to gather what you need without gathering too much.

A good inventory does not require the use of a computer. Manual systems work very well. The inventory might be as simple as a map showing all town roads with notations as to section length, width, pavement type, and date of construction or last improvement. Additional information can be kept on manual tally sheets. Some samples are included later in this chapter.

4.2.1. DEFINING SECTION BOUNDARIES

Before actually starting the inventory, a system of dividing each road into manageable sections must be selected. Since each section requires its own inventory form, it is important to keep the number of sections to a minimum for a manual system.

Sections are defined so that the pavement within their boundaries is the same in terms of physical characteristics and other factors that contribute to deterioration. Any one of the following would define the boundary between two sections:

- *A change in number of traffic lanes*
- *A change in pavement type*
- *Abrupt change in traffic patterns or volume*
- *Change in drainage characteristics (such as curb and gutter to a drainage ditch section)*
- *Change in pavement structure (thickness, material, etc.)*
- *Boundary between previous construction projects (different projects can reflect differences in design, materials, age, and other factors)*

In addition, geographic or man-made boundaries may offer or force section limits. Examples include:

- *Rivers or streams*
- *City or town limits*
- *County lines*
- *Railroad grade crossings*

Urban streets can be divided easily into sections using intersections or blocks. The physical characteristics cited earlier will determine whether one or several blocks comprise a section. One important consideration is the manner in which the pavement area within the intersection is counted. The intersection areas should be carefully defined to avoid duplication. Two methods of accomplishing this are discussed below:

1. In municipalities where the street orientation is a rectangular grid, an arbitrary designation can be made as to which street sections will include intersections. For example, all North-South sections might include the area within intersections and East-West section would exclude them, or vice versa.

2. A hierarchy of street classes can be used for defining the street to which the intersection belongs. For example, an "arterial" would include all intersections along its length. A "collector" would exclude all arterial intersections; and "residential" streets would exclude both arterials and collector intersections. Residential cross streets could be managed with a combination of these two methods or with a notation on the inventory form as to which intersections are included.

The main point is that intersections must be included in the inventory, but should not be duplicated at cross streets. The method the local agency is most comfortable with that avoids this duplication should be used.

4.2.2. ESSENTIAL INFORMATION

The inventory process can be completed over time and should be as simple as possible while still collecting the required information. The process of assembling inventory information should be accomplished in three phases:

1. Determine the types of data needed
2. Determine which data currently exists in office records
3. Determine the remaining data which must be gathered by the survey team

Listed below are types of information that should be considered:

- Section Description - The description includes the name or route number of the road.
- Functional and Administrative Classification - The functional classification of the street or road (arterial, collector and residential) and special designations such as school bus routes should be recorded if this information will be used in priority setting.
- Pavement Structure - This includes pavement thickness and type, and materials.

- History - The date of construction, dates and type of successive major maintenance procedures such as surface treatments, or reconstruction should be recorded if available.
- Cost Data - The cost of major repairs plus the costs of other pavement maintenance such as patching, and crack sealing should be included.
- Traffic - This should include both Average Daily Traffic (ADT) and percent (%) trucks. This information may be estimated for low volume roads.
- Roadway Geometry - Geometry is the visible features of a road and includes pavement width, number of lanes, median width, shoulder width and type, and parking locations.
- Drainage Characteristics - This should describe the drainage system for the section, such as storm sewers, side ditches, curb and gutter, and all subsurface drainage.
- Other Data - A complete physical inventory is costly and the most time consuming portion of road surface management. Any data not directly related to surface performance but which may be beneficial to the municipality can be collected by the survey team. This would eliminate the need for a follow-up survey to collect additional data. Some types of other data which might be considered include:

- *location and condition of signs*
- *location and description of pavement markings*
- *location of utilities*
- *right-of-way width*
- *location, size, and type of culverts*
- *location of guardrail*

It is possible to attempt too much during the initial inventory. It is also possible to get your road surface management program underway with less data than is mentioned above. The benefits of collecting additional data must be weighed against the increased costs and the ability to manage large amounts of data.

4.2.3. STORING AND RECALLING DATA

The success of the inventory will depend not only on the data collected, but the method for storing and recalling the data. Inventory data forms must be easy to complete by the survey team and at the same time include all the necessary data. The filing system must be designed to permit easy access to the data for any section of road. The objective should be to store inventory data that can be easily retrieved by street or road name or number, as well as section number. Such a filing system could be easily adapted for computer use.

Once the filing system is chosen, inventory and data forms must be designed to collect the essential information. The figure below can be used to collect data for RSMS. Users can develop their own forms as needed.

RSMS Pavement Inventory Survey Name:_____Date:_____

Road Name: _____ Inventory #: _____

Section Description From: To:	Road Sec. : Maintenance Div.: Jurisdiction :
# Lanes : Width : Surface : Shoulder: Shoulder Width: 1-Other 3-Gravel 4-Surf. Treat. 5-Asphalt 6-Concrete	Fed.Class : Traffic : 1 - 5 Importance: 1 - 5 US/METRIC : US/ ME
Distance - Start: End: Length:	Speed Limit : Inventory Yr:
Comments: _____	

Figure 4 – 1: Example of Data Collection Form

Notice that no information relating to the pavement condition is placed on the forms. The Pavement Inventory Survey Form is essentially a permanent record, in that it is updated only as physical characteristics change. Pavement condition is inspected on some recurring interval, say yearly, but the physical inventory is updated only as major projects occur.

4.2.4. CONDUCTING AN INVENTORY

Once data forms have been designed, a two-man survey team should be selected to conduct the physical inventory. The team members should have a basic knowledge of:

- *Streets or roads in the network*
- *The inventory Data Form*
- *The concept of sections and reference points as previously discussed*
- *Existing records system of the agency*

The local agency should then establish priorities for the inventory of the road network. All roads will eventually become part of the inventory. However, if the inventory cannot be completed within one year, the following sequence is suggested:

1. Arterials
2. Collectors
3. Residential streets and subdivisions

The survey team should be provided a map showing:

- *Road or street class*
- *All established section boundaries*
- *All route numbers or names*
- *Geographic details and political boundaries*

Note: Any or all of the section boundaries may be established in the field by the survey team.

The survey team must also be assigned a vehicle and some type of distance measuring equipment. Both vehicle mounted devices and walk-behind wheels are available. The use of the vehicle odometer is not recommended because the accuracy is usually questionable and frequently measures distances in 1/10 mile increments which is not acceptable to define many features.

The survey team should now be ready to begin the inventory. The following sequence is suggested:

1. Determine area to be inventoried
2. Drive along the selected route to establish section boundaries
3. Measure and record physical dimensions
4. Drive back through section and complete inventory form and record section length

As much data as possible should be gathered in the office before beginning the field inventory. In the field, the office data should be verified and all additional data gathered that can be added to the inventory later, as time permits.

4.3. SURFACE CONDITION SURVEY

The gathering of pavement distress data yields information that points out structural or material defects which could lead to reduced performance and eventual failure. The purpose of the surface condition survey is to identify existing distresses in the road surface which may affect pavement performance. Once the distress type is identified and evaluated as to the **extent** and **severity**, appropriate corrective measures can be identified.

The surface condition survey is a visual inspection of 100 percent of the street system. The survey is conducted in a vehicle traveling at a slow speed (approximately 15 - 30 miles per hour). It is necessary that the personnel performing the condition survey be properly trained to produce correct, consistent results. Since the data from the distress survey serves as the basis for RSMS to determine which repair strategies will be used, it is imperative that this data be accurate.

It was stated in Section 4.2 that the goal of the road inventory was to gather only the necessary information that is needed. The same is true for the condition survey. Although there are many types of distresses that can be detected, only those distresses that are considered important should be recorded. The types of distresses to be surveyed will depend upon many factors such as the size, type and condition of the road network, available resources, etc. Keep it as simple as possible. It must be remembered that the surveyors performing this task must be knowledgeable in distress types and severity, and be able to produce consistent results. The implementation of RSMS is a dynamic process that may require modifications as the municipality moves up the learning curve. As the surveyors gain experience and the municipality develops a better

understanding of the process and determine which distresses need to be added or deleted from the condition survey changes can be made.

The following is a list of distresses included as defaults with RSMS'98. As stated above, this list can be modified based on the needs of the individual agency:

1. Flexible Pavements
   - *Alligator cracking*
   - *Longitudinal/transverse cracking*
   - *Edge cracking*
   - *Potholes/patching*
   - *Roughness*
   - *Rutting*
   - *Bleeding*
   - *Drainage*
2. Surface Treatments
   - *Alligator cracking*
   - *Longitudinal/transverse cracking*
   - *Treatment Condition*
   - *Potholes/patching*
   - *Roughnes*
   - *Rutting*
   - *Bleeding*
   - *Drainage*
3. Unpaved Roads
   - *Improper Cross-slope*
   - *Corrugations*
   - *Potholes*
   - *Rutting*
   - *Loose Aggregate*
   - *Dust*
   - *Roughness*
   - *Drainage*

In addition to recording the types of existing distresses, the severity and extent of the distress must be recorded. Figures 4-2 to 4-4 show typical forms that may be used. Severity refers to the degree of deterioration of the various distresses. Extent refers to the frequency of occurrence, or amount of road surface (usually based on a percentage) subjected to a particular distress. The severity and extent of the distress will directly determine which repair strategy is required.

Both the severity and the extent of road surface distresses are rated on a pre-established scale. A brief, general description of each level is listed below. A more specific description of the severity and extent of each distress is listed in Appendix B.

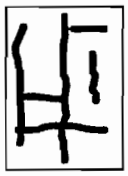
1. Severity
   - *Low - present but not causing a problem*
   - *Moderate - needs attention or will be a problem shortly*
   - *High - maintenance is needed immediately*
2. Extent
   - *Low - Isolated to a few locations.*
   - *Moderate - between 10 and 30 percent of the total surface is affected.*
   - *High - greater than 30 percent of the total surface of the road segment is affected.*

The manual produced by the SHRP project (SHRP-P-338) entitled, "Distress Identification Manual for the Long Term Pavement Performance Project" provides color illustrations of the different types of distresses for flexible and rigid pavements, as well as, the different severity levels for each distress. This is an excellent reference that will aid in producing consistent evaluations of the distress levels for each pavement segment.

RSMS 2003 Flexible Pavement Condition Survey

Street:_____ Distance:_____ Name:_____
Section #:_____ Start :_____ Date:_____
Start:_____ End :_____ Weather:_____
End:_____ Length:_____ Temp (F°/C°):_____

LONGITUDINAL/ TRANSVERSE CRACKING



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

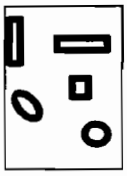
ALLIGATOR CRACKING

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

EDGE CRACKING

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

PATCHING / POTHOLES

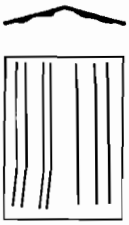


NO Defects

Do not include good patches

EXTENT
1 Low
2 Medium
3 High

RUTTING



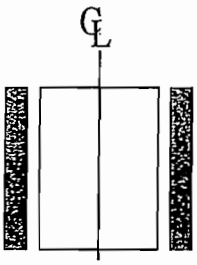
SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

BLEEDING

CONDITION

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



CONDITION

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

Figure 4-2 - Typical Road Condition Survey Sheet - Flexible Pavement

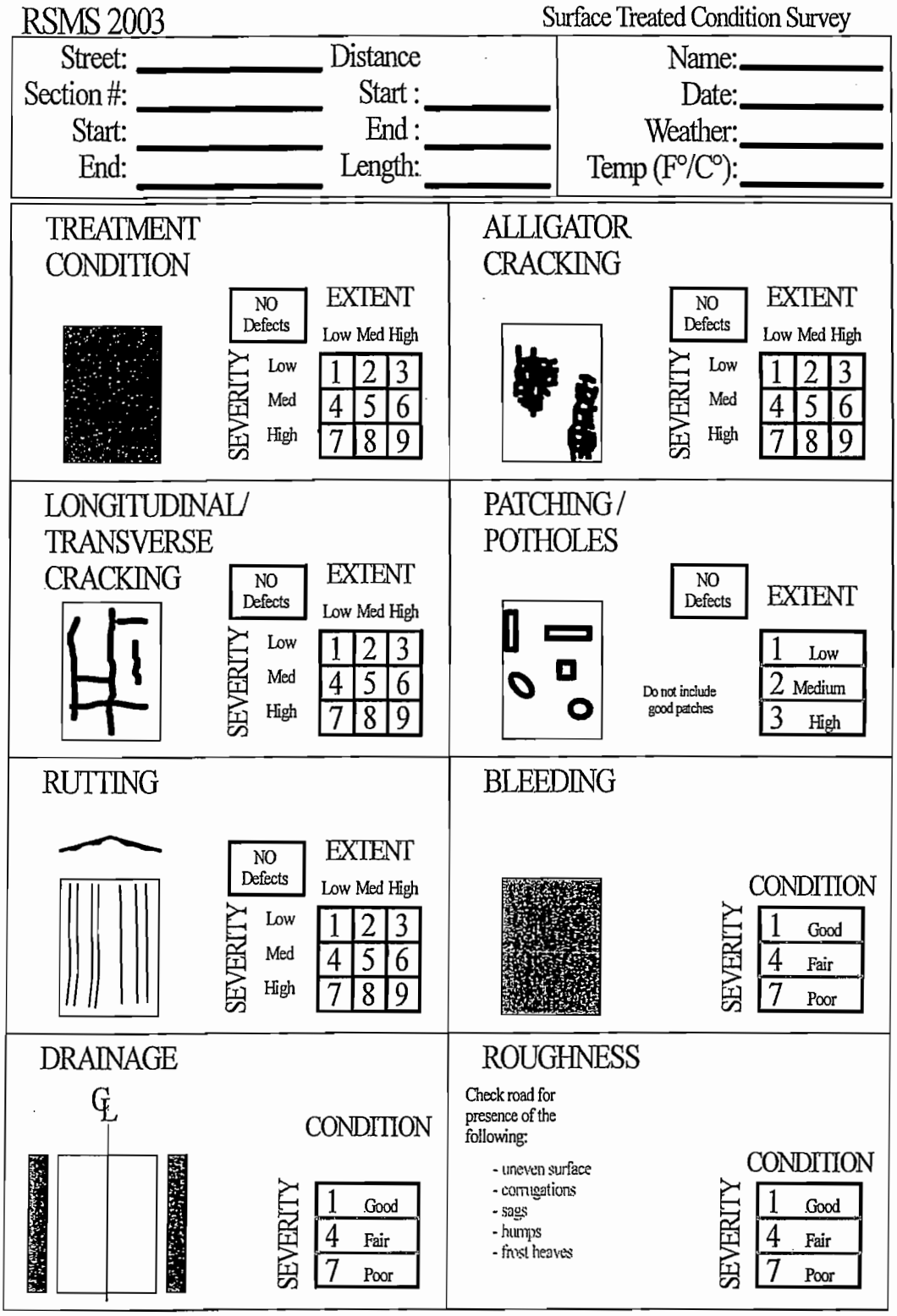
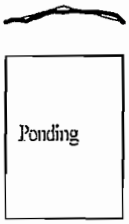


Figure 4-3 - Typical Road Condition Survey Sheet - Surface Treated Pavements

RSMS 2003 Unpaved Condition Survey

Street: _____	Distance	Name: _____	
Section #: _____	Start : _____	Date: _____	
Start: _____	End : _____	Weather: _____	
End: _____	Length: _____	Temp (F°/C°): _____	

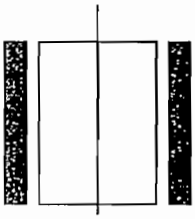
IMPROPER X-SECTION



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROADSIDE DRAINAGE



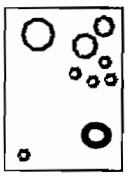
CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

CORRUGATIONS

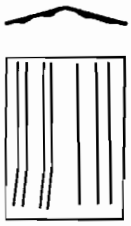
SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	8	9

POTHOLES



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	8	9

RUTTING



SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	8	9

LOOSE AGGREGATE

SEVERITY	NO Defects	EXTENT Low	Med	High
Low		1	2	3
Med		4	5	6
High		7	8	9

DUST

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

Figure 4-5 - Typical Road Condition Survey Sheet - Unpaved Road

4.4. *REPAIR STRATEGIES & ALTERNATIVES*

4.4.1. REPAIR STRATEGIES

Having briefly introduced and discussed some of the various repair alternatives in Chapter 3, we can now think in terms of how and when these treatments are used. It is very important for a road surface manager to be able to choose repair alternatives that are reasonable and appropriate for the present road conditions.

These treatment alternatives are often grouped under major categories called "repair strategies". The term "repair strategy" is used to show that the emphasis of this step is an overall approach to maintenance and repair actions. Before RSMS determines which repair alternative should be used for each road segment, the program first selects a repair strategy based upon the distresses found during the road condition survey and the related decision trees. The role of the decision trees is to provide a link between the type, severity and extent of a distress, and the recommended repair strategy. Table 4-1 provides an example of a decision tree. Upon review of the generic decision trees provided with the computer program, it may be necessary for a municipality to modify the decision trees to meet the specific needs and practices of the local agency. Be very careful when modifying these tables since modifications can have a drastic affect upon the results of the program. *Modifications to the decision trees should only be done by people who are knowledgeable in pavement management and fully understand how the changes will affect the results of the program.*

Table 4-1
Decision Tree
Alligator Cracking - Flexible Pavement - Repair Strategies

	Severity		
Extent	Low	Moderate	High
Low	1	3	3
Moderate	2	4	4
High	4	5	6

Repair Strategies:

1	Defer Work	4	Corrective Maintenance
2	Routine Maintenance	5	Rehabilitation
3	Preventative Maintenance	6	Reconstruction

There are six overall strategies which should be considered for road surfaces:

1. Preventive Maintenance

This strategy is an activity designed to stop deterioration before it becomes a serious problem. Crack sealing is an excellent example of preventative maintenance. The idea is to do a repair which prevents larger problems, such as potholes, from beginning.

2. Routine Maintenance

For roads in reasonably good condition, routine maintenance is generally a cost-effective use of funds. If possible, all routine maintenance needs should be funded each year. Routine maintenance usually includes local patching, and other relatively low cost actions. Localized distresses, such as isolated severe bumps or potholes are usually corrected first. Routine maintenance may or may not prevent a problem from occurring.

3. Corrective Maintenance

Maintenance which corrects an existing defect is corrective maintenance. Corrective maintenance is limited and not as cost effective as other maintenance. Examples of corrective maintenance include: boxing out and patching or installing subsurface drainage. Corrective maintenance differs from rehabilitation in the scope of work and the cost.

4. Deferred Action

The road sections which fall into this category receive minimum funds for the current budget year. These sections are beyond the point where preventive maintenance will be effective but have not yet deteriorated to the point of needing rehabilitation. Or the distresses are so slight that repairs are not cost effective. When an agency defers action, it must be prepared to fund rehabilitation or reconstruction when it becomes necessary. This deferred action strategy does NOT mean it will never be necessary to expend funds. It may be necessary to take care of any severe problems (deep potholes, washouts, etc.) with temporary repairs.

5. Rehabilitation

Rehabilitation usually includes overlays or extensive recycling. Generally, rehabilitation differs from reconstruction in whether base replacement or recycling is done. Funding for completion of these major projects may depend upon long range planning and careful scheduling of improvements to be done in stages.

6. Reconstruction

The comments on rehabilitation projects also apply to reconstruction projects. The main difference is the costs that might be expected. Reconstruction would involve complete removal and replacement of a failed pavement and might also involve features other than just pavement such as widening, improved alignment, grade changes, guard rail, and major drainage work. Lead times of several years may be required because of the more costly nature of full reconstruction and the time required to develop a complete plan of action, to secure required permits, and to establish special funding needs.

4.4.2. REPAIR ALTERNATIVES

The figures starting on the next page illustrate the relationship between different treatments and the six general road improvement strategies. The list should help differentiate which treatments are appropriate for routine maintenance, preventive maintenance, corrective maintenance,

deferred maintenance, rehabilitation or reconstruction. A manager has to consider a wide variety of alternative treatments available and then select the one or two most appropriate ones for each section of roadway included in the local road surface management system. The number and variety of available selections often make these choices confusing and difficult.

The figures show typical treatment actions within each general maintenance or repair strategy. The figures also show that there is considerable overlap between the different strategies. This is evidenced by the fact that the same treatment actions often appear under more than one strategy. Treatment overlap is a realistic condition because deterioration of pavements is a gradual process and there is no such thing as a precise boundary between the strategies discussed.

Within certain ranges of surface condition, one must remember to consider the factors that went into developing the overall condition rating. For example, a road which exhibits minor cracks and occasional potholes would indicate a need for preventive maintenance. On the other hand, it would probably be wise not to spend money on preventive maintenance on a road which exhibits structural damage like alligator cracking, severe rutting or failed patches. It would be a better decision to consider putting funds into a rehabilitation effort.

The overall condition rating, the actual distresses and their causes and the manner in which the surface has held up over time should all be taken into account to arrive at the most appropriate strategy. The manager should try to think of a strategy in terms of an overall approach rather than a specific decision about how many inches of overlay is needed or what type of seal coat is best.

4.4.3. ACTIONS AND THE RSMS PROGRAM

A powerful feature of RSMS is the ability to adapt strategies and analysis to local conditions and requirements. This is accomplished by making changes or additions to the following tables:

- *Repair Strategies*
- *Repair Categories*
- *Importance*
- *Traffic*
- *Jurisdiction*
- *Surface Type*
- *Road Surface Distress*
- *Shoulders*
- *Measurement Units*

RSMS is distributed with the default values found in the tables 4.4-4.12

WARNING: Contact the Cornell Local Roads Program before attempting to make changes to the tables. The tables are interrelated and the values have a major impact on the computed Priority and PCI values.

TABLE 4-2 TYPICAL ACTIONS FOR ASPHALT ROADS

GENERAL STRATEGY	RECOMMENDED ACTION	OTHER STRATEGIES
A. Routine Maintenance	▪ *Crack Sealing*	B,C
	▪ *Clean Gutters/Ditches*	C
	▪ *Grade Shoulders*	B,C
	▪ *High Performance Cold Patch*	
B. Preventive Maintenance	▪ *Sand Seal*	A
	▪ *Fog Coat*	A,D
	▪ *Chip Seal- Single*	A,C
	▪ *Chip Seal - Double*	D
	▪ *Slurry Seal*	C,D
	▪ *Thin Overlay (<1")*	C,E
C. Corrective Maintenance	▪ *Box Out and Replace Base*	A,B B
	▪ *Install Underdrains*	A,B
	▪ *Digout and Cold Patch*	A,B,E
	▪ *Digout and Hot Patch*	
D. Deferred Maintenance	▪ *No Action*	A,B
	▪ *Revert to Gravel*	B,E
	▪ *Patch High Severity Defects*	C
E. Rehabilitation	▪ *Hot Mix Shim (leveling)*	C,D C
	▪ *Cold Planning*	C,F
	▪ *Thick Hot Overlay (>1")*	C,F
	▪ *Surface Recycling*	
F. Reconstruction	▪ *Base Repair and Pavement Replacement*	D,E D,E
	▪ *Base Replacement and Pavement Replacement*	D,E,C
	▪ *Base and Pavement Recycling*	

TABLE 4.3 TYPICAL ACTIONS FOR UNPAVED ROADS

GENERAL STRATEGY	RECOMMENDED ACTION	OTHER STRATEGIES
A. Routine Maintenance	▪ *Spot Regravel (Potholes)* ▪ *Grade Shoulders* ▪ *Clean Ditches* ▪ *Blading*	B, C B, C B, C C
B. Preventive Maintenance	▪ *Dust Control - Liquid CaCl2* ▪ *Dust Control - Flake CaCl2* ▪ *Spot Regravel*	C, A C, A C
C. Corrective Maintenance	▪ *Reshape* ▪ *Reshape with Minor Additional Material*	A B
D. Deferred Maintenance	▪ *No Action*	C, E
E. Rehabilitation	▪ *Regrade* ▪ *Add Gravel, Regrade, Compact*	C D, F
F. Reconstruction	▪ *Reconstruct Road and Base* ▪ *Reconstruct Road, Base and Ditches*	E E

4.5. ANALYSIS OF NEEDS, PRIORITY, AND BUDGETS

4.5.1. NEEDS

One way to determine network needs is to determine surface condition and assign repair strategies, as noted previously, and then apply average unit cost information to each roadway section. Then a road manager will know the total cost of total network needs based on the strategy selected to fit current roadway conditions.

Knowing that the total needed funds cannot be raised immediately, it is possible to incorporate average service life information for selected repair strategies and work out, with plenty of good judgment, a program to gradually attain established goals and objectives for improvement of the road network.

4.5.2. PRIORITIES

Most methods of setting priorities are somewhat subjective based on general policies set by local officials after assessing needs, costs, and objectives. RSMS uses a simplified weighting system

to determine the priority ranking to the various types of repairs. The four weighting factors are importance, traffic volume, roughness, and road condition. Also, the six maintenance categories can be ranked so as to prioritize the roads in best condition or the roads in the worst condition.

4.5.3. PROGRAMS AND BUDGETS

More input is needed in order to convert the raw data gathered into a reasonable long-term road improvement program. The cost of each of the available maintenance treatments should be known. Your own records, if there are any, will provide the most accurate information. In the absence of such data, approximate costs will provide a starting point and figures can be refined as experience is gained over the first few years of the road maintenance program.

In addition to treatment cost, the manager needs to have some idea of how long each of the treatments being considered can be expected to last and what amount of routine maintenance will be expected each year during their service life. There is no accurate information of this kind. Each application of each type of maintenance is different in how well it performs because of the many factors that have an effect on performance. These factors vary all the way from geographic location to quality of materials and workmanship. However, do not let the fact that you may not have accurate cost and performance information stop you from getting started with planning and budgeting for your new road maintenance program.

Estimated costs and expected lives have been provided by the Local Roads Program to establish the prioritized road improvements list that the RSMS program gives for your particular road network. You should make changes and check the information to be sure it meets typical costs and lifespans for work done in your area.

Take your road funds and use your best judgment to do as much maintenance as you can with the dollars you have.

And remember:

> It is generally most cost effective to spend your money keeping the good roads good than it is to put all your funds in to fixing the worst roads. This idea may be exactly opposite to what personal tendencies would be, but it is basically correct. Keep the good roads good and plan ahead for the extra money you will need to gradually rebuild the poor roads.

Each year, adjust your costs for each kind of treatment to fit what you actually pay and keep track of what you really spend for your program. Compare this with what your yearly condition survey shows would be the cost to repair your whole system. You will be able to see the results (good or bad!) and you will have some strong arguments to use in supporting your funding requests.

Get Started - NOW !!!

RSMS Basic Data Base Files (Cornell Local Roads Program defaults)
The file name is in parentheses.

Table 4.4 -
REPAIR CATEGORIES (*DEFCAT.DBF*)

KEY	CATEGORY	VALUE
1	No work Needed	0
2	Defer Maintenance	1
3	Spot Dust Cont.-UNPAVED	2
4	Dust Control-UNPAVED	3
5	Spot Add Material - UNPAVED	3
6	Surface Reshape - UNPAVED	4
7	Regrade - UNPAVED	5
8	Regrade w/ new mater. -UNPA	6
13	Crack Repairs - ASPHALT	2
14	Patching - ASPHALT	3
15	Surface Treat - ASPHALT	4
16	Overlays - ASPHALT	5
17	Rehab - ASPHALT	6
23	Crack Repairs - ST	2
24	Spot Repairs - ST	3
25	Patching - ST	4
26	Surface Treat -ST	5
27	Asphalt Overlay - ST	6
40	Reconstruction	7
41	Drainage, Good	1
42	Drainage, Fair	4
43	Drainage, Poor	6
99	Reenter - Nonapplicable	0

Table 4.5 -
REPAIR STRATEGIES (*DEFSTRAT.DBF*)

KEY	STRATEGY	VALUE
1	No Work Needed	0
2	Defer Maint.	3
3	Routine Maint.	5
4	Routine Maint.	5
5	Corrective Maint.	4
6	Routine Maint.	5
7	Corrective Maint.	4
8	Rehabilitation	2
13	Preventive Maint.	6
14	Routine Maint.	5
15	Routine Maint.	5
16	Corrective Maint.	4
17	Rehabilitation	2
23	Preventive Maint.	6
24	Preventive Maint.	6
25	Routine Maint.	5
26	Corrective Maint.	4
27	Rehabilitation	2
40	Reconstruction	1
41	Drainage Maint.	6
42	Drainage Rehabs	4
43	Drainage Reconstruct	1

Table 4.6 - IMPORTANCE (*DEFIMP.DBF*)

KEY	IMPORTANCE
1	Very Low
2	Low
3	Medium
4	High
5	Very High

Table 4.7 - TRAFFIC (*DEFVOL.DBF*)

KEY	TRAFFIC
1	Very Low
2	Low
3	Medium
4	High
5	Very High

Table 4.8 - JURISDICTION (*DEFJURIS.DBF*)

KEY	JURISDICT
I	City
N	Not Maintained
O	County
P	Private
S	State
T	Town
V	Village

Table 4.9 - SURFACE TYPE (*DEFSURF.DBF*)

KEY	SURFACE TYPE
1	Other
3	Unpaved
4	Surface Treated
5	Asphalt
6	Concrete
7	Brick / Block

Table 4.10 - ROAD SURFACE DISTRESSES (*DEFDIS.DBF*)

KEY	DISTRESS
0	None
1	Unpaved, Cross Section 1-3
2	Unpaved, Drainage 1-3
3	Unpaved, Corrugations 0-9
4	Unpaved, Potholes 0-9
5	Unpaved, Rutting 0-9
6	Unpaved, Loose Aggregate 0-9
7	Unpaved, Dust Control 1-3
8	Unpaved, Roughness 1-3
11	Asphalt, Long/Trans Cracking 0-9
12	Asphalt, Alligator Cracking 0-9
13	Asphalt, Edge Cracking 0-9
14	Asphalt, Patching/Pothole 0-3
15	Asphalt, Rutting 0-9
16	Asphalt, Bleeding 1-3
17	Asphalt, Drainage 1-3
18	Asphalt, Roughness 1-3
21	ST, Treatment Condition 0-9
22	ST, Alligator Cracking 0-9
23	ST, Long/Trans Cracking 0-9
24	ST, Patching/Pothole 0-3
25	ST, Rutting 0-9
26	ST, Bleeding 1-3
27	ST, Drainage 1-3
28	ST, Roughness 1-3

Table 4.11-
SHOULDERS (DEFSHO.DBF)

KEY	SHOULDER
0	None
1	Paved, Asphalt
2	Gravel
3	Earth
4	Curb
5	None
6	Curbed, Asphalt
7	Curbed, Concrete
8	Curbed, Granite
9	Paved, Concrete

Table 4.12
Table 4.10 MEASUREMENT UNITS (DEFUNITS.DBF)

KEY	UNIT
LF	Linear Feet
SF	Square Feet
SY	Square Yards

or

LM	Linear Meter
SM	Square Meter

5. IMPLEMENTATION

5.1. INTRODUCTION

The most important objective of a Pavement Management System (PMS) is to improve the effectiveness of highway investment. In other words, a PMS is a tool intended to help spend taxpayer dollars prudently and gain the best return on the use of public funds. No one can argue with this goal. Yet, public works officials often find it hard to convince board members of the wisdom of implementing a PMS. Even if the board does mandate the use of PMS, achieving effective implementation can be quite difficult. If the PMS does not influence the maintenance budget decisions, then the system is not working. Therefore, any successful PMS must include a strategy for educating board members about the benefits of PMS to gain their support.

The work necessary to gain support from those who govern and pass budgets is a necessary component of an effective PMS. This work has two key aspects. First, it is important to develop a plan for working with your governing board. This plan will focus on helping the board understand what you are doing, promoting their involvement and communicating key information you are developing. Second, you must be willing to translate the information developed with a PMS into a language the board can understand -- budget language and service to citizens language. Preparation and presentation of your PMS information must be effectively timed to coincide with preparation for the budget process.

5.2. PMS ROADBLOCKS

Although PMS has been used successfully by many government agencies and much literature has been published that supports its benefits, there are many roadblocks that can slow down or prevent its successful implementation. These barriers include:

5.2.1. RESISTANCE TO CHANGE

Some people just do not want to change. These people are present in many public agencies. Some of the other issues described may be a part of the reasons they don't want to change, but some people just do not want to expend the effort needed to reshape their thinking, decision making process, and work habits. They will set up barriers because they prefer to keep everything the way it is until they retire. They will find all kinds of excuses for not changing, and will only change when they are forced. Most of these individuals are insecure with their own positions and knowledge, and they are afraid to try something different.

5.2.2. TURF PROTECTION

Information is power in an organization, and access to information may influence who has the formal authority or informal power to make decisions. This often affects not only the decisions currently being made by planning, maintenance, design, operations, administrative groups within a single organization, but it may also affect who makes those decisions in the future. When a PMS is implemented, other groups within the organization often feel threatened by the manpower of the PMS group, especially if the PMS group appears to be preparing to make

decisions for which the other groups were previously responsible. They may resist implementation of a PMS to prevent a perceived loss of power.

5.2.3. FEAR OF EXPOSURE

Pavement management systems provide structured information that often is not widely available prior to the adoption and implementation of a PMS. Those who have been making decisions with less than complete information may resist implementation of a PMS because they fear that the PMS will show their decisions were incorrect or less accurate than they have previously stated. They are afraid of possible censure or ridicule by their superiors or others in the organization who now have access to pavement information.

5.2.4. ONE PERSON SHOW

Some agencies have invested their pavement management knowledge experience in one or two people in the organization. The PMS positions often are at a relatively low pay level, but they are often filled with young, bright individuals with skills such as computer expertise that are in high demand. These talented individuals often only stay for a limited time. When a promotion, transfer, or job change removes that person from responsibility for pavement management, it often takes several weeks to several months to replace the pavement manager. By the time the position is filled, the pavement management knowledge is often lost. The new person must start over on much of the system. Some smaller agencies have abandoned their PMS efforts when this key individual has left.

5.2.5. ORGANIZATIONAL LEVEL

Since a PMS provides new information affecting many major operating units within the organization, new communication channels, both formal and informal, must often be established. When the PMS operating unit is buried deep within the organizational structure, it is difficult for the person responsible for the PMS to communicate and have access to all of those affected by the implementation of the system. This may result in the development of new informal communication channels; however, it may also hinder the full implementation and use of the PMS because the real decision makers are not getting or not using the information prepared by the lower operator in another unit.

5.3. IMPLEMENTATION

Implementation of the PMS process can be divided into several phases. Depending upon the amount of resistance and the size of the municipality, any of the following steps may need to be modified or deleted, or additional steps may be necessary. It is assumed that you have chosen to use the RSMS road evaluation process, software, and reports. If you have not yet chosen to use RSMS, an evaluation phase for reviewing different pavement management systems must be added.

- *Phase I - Getting Started*
- *Phase II - Limited Test Run*
- *Phase III - Determining Entire Network Needs*
- *Phase IV - Developing a Multi-Year Investment Plan*

5.3.1. GETTING STARTED

The first phase of implementing a PMS is similar to the old saying about stepping off of a cliff, "the first step is a big one". This is so true because the first phase will usually determine if you will be successful in convincing the board that a PMS should be mandated. Additionally, first impressions can have a long lasting affect on how the members embrace a PMS, if it is approved. Therefore, it is essential that this step be planned in detail and carefully executed.

Before you can make a presentation, pavement management must become a part of the agenda, formal or informal, from which the decision makers work. Getting pavement management on the agenda could be the most difficult step of all and may require considerable effort and time. For many agencies, an advocate on the board can be critical to getting pavement management on the agenda. An advocate can be extremely helpful in obtaining board approval and in succeeding with the board over the long haul.

An advocate is someone who generally goes to bat for public works or highway issues and funding, someone who carries a concern for public works and infrastructure. Another possible advocate could be someone with a financial background who could quickly understand the basic principles behind PMS. It could also be someone who has learned about PMS through one of many sources such as publications, attending a training session, or from attending a professional association meeting. If you have an advocate you probably know it. If you don't have an advocate, try to cultivate one. Advocates can help in a variety of ways including to serve as a:

- *Communicator to help present PMS ideas and results to the board*
- *First critic to review your plans and thoughts*
- *Supporter in budget allocation decisions.*

Introduction Meeting:

At this first meeting, the main goal is to convince the board that the current process needs to be changed and that a PMS can provide the needed help. A general overview of the PMS process should be presented with a focus on the potential benefits. Since a PMS can save money and ease board decision making, it is important to help them see these benefits. It is important to explain the pavement deterioration curve and how proper timing of maintenance is crucial to minimizing expenditures. When presenting the PMS process, be ready with a suggested plan of action for discussion by the board. Your plan of action should contain: a time frame for completing the PMS process, identification of key points where board input and consideration are needed (indicating the need for a meeting), a plan for public communication, and the creation of a board steering committee. The PMS steering committee could be the full board, a standing committee, or a special committee created specifically for the PMS process.

Paul Sachs with the Metropolitan Transportation Authority in San Francisco has helped a number of communities implement PMS, he notes:

> "It is crucial to prepare the board with a carefully planned introduction to PMS long before presenting them with PMS results. Often this critical step is overlooked. Without a solid foundation in PMS, the board could become bogged down in the basics of how PMS works, losing sight of the results presentation."

Discussing goals and policies sounds dry and difficult but most boards often enter into such discussions without knowing it. For example, most board members have some opinion regarding the overall condition of the road network. Do they believe current road conditions are adequate or below acceptable standards? Are certain streets considered worthy of priority treatment? Other issues may include the closing of an existing road or the possible upgrading of an unpaved road to a paved road. Probing around these kinds of questions and issues can provide important guidance as you move through the PMS process and prioritize investment.

5.3.2. LIMITED TEST RUN

In situations were the board is skeptical, it may be a good idea to suggest that the public works department will implement a limited PMS that will cover a small portion of the overall network. By limiting the investment, board members will be more likely to approve a limited test run. This may be especially beneficial for a large road network that would require a significant investment in time. However, this step may be skipped if the board has embraced the concept of PMS and does not need additional convincing before mandating its use.

This phase can be very beneficial for three reasons. First, it means that you have been given a chance to prove your case. Second, the job of selling the benefits of a PMS should be easier because the officials will have a set of tangible reports to see exactly what information is generated. Also, the reports will be much smaller than if the entire network was analyzed. This will make it easier for board members to review information without becoming bogged down in volumes of raw data. Third, it allows the personnel who will be doing the work to get their feet wet before plunging headfirst into the entire network. Typically, the smaller the scope of work, the easier it is to plan and execute the work, as well as, to trouble shoot any problems. This will be extremely beneficial when trying to implement PMS for the entire network.

Since this step is being executed because the board is skeptical, no short cuts should be taken. It must run as smoothly as possible and produce the desired results. Even though you are only implementing PMS for a small segment of the overall network, all steps must be carefully planned in detail to ensure success. It is important to work closely with the steering committee to educate them and to insure that all needed information will be provided. An added benefit of active participation is that the committee members will feel part of the process and are more likely to embrace it.

The first step is to develop a road inventory of the selected portion of the entire network. If an existing road inventory is available, it should be verified for accuracy and completeness. Then, appropriate road segments are determined, the road conditions are evaluated by segment, traffic data is collected, and costs for repair and reconstruction strategies are estimated. All of this data is entered into RSMS for analysis and prioritization. When these tasks are complete RSMS can produce a variety of reports that are useful for review and evaluation by the steering committee.

5.3.3. DETERMINING ENTIRE NETWORK NEEDS

In this phase of the PMS calendar, the bulk of the data collection and analysis takes place. The steps will be very similar to those of phase II, except that the scale of this phase is much larger. As such, much care should be taken to ensure that the process is unfolding correctly since problems or errors can increase greatly in magnitude as compared with phase II.

If available funds are inadequate to allow for complete implementation, then staging phase III may be necessary. The segments to be included in each stage can be based on importance. For example, the first stage would include all major collector streets. The second stage would include minor collectors and the third stage would include the local residential streets. In order to improve efficiency, this approach may be recommended for larger networks even though the municipality has sufficient funds.

As stated earlier, a major benefit of phase II is that it serves as "dress rehearsal" for full implementation. The lessons learned from phase II must be used to modify the implementation process. This may include changing the initial procedures for collecting and inputting data, how reports are generated, what information is needed, etc.

5.3.4. DEVELOPING A MULTI-YEAR INVESTMENT PLAN

Divide the list of prioritized streets for repair and reconstruction into groups and schedule the projects over a 3 to 6 year planning period. Use the board or committee established investment limit to determine the total number of projects to be scheduled each year.

Some adjustment from the prioritized list established by RSMS will often need to be made. Many times it will be difficult to schedule a particularly large project within a given year. In this case, it may be necessary to hold money in reserve from one year to accomplish this large project the next year. In some cases, substantial money can be saved by scheduling improvements on two or more adjacent street segments in the same year even though a sequential use of the RSMS repair list would put the improvements in different years. For similar reasons the highway official may want to adjust the prioritized list to achieve important work crew, equipment or timing efficiencies that the RSMS software does not capture.

Using the process outlined above, governing board input has been used to:

- *Guide goals and priorities in the RSMS prioritization of streets for repair*
- *Evaluate the choice of repair alternatives*
- *Determine an acceptable investment level for street and highway capital projects*

Given board approval and input to this point, converting this program to an annual capital budget should require calculation but not extensive board interaction for general acceptance.

5.3.5. CONVERTING THE PLAN TO THE BUDGET

Each year the current group of projects in the multi-year capital plan must be translated into figures suitable for the annual budget and one more year of projects should be added to the plan. This process can be called the annual updating of the capital plan. Some modification of the

other years of the plan will usually need to be made as new road condition ratings and priorities necessitate change.

- *For each repair strategy to be used during the year, calculate percentage of total repair cost for each account type.*
- *Use these percentages to allocate total repair strategy costs for the year.*
- *Aggregate costs across all repair strategies to determine total capital plan budget amounts to be included in the annual budget.*

If project costs are likely to vary dramatically from those used to calculate RSMS repair alternatives, then a direct calculation of materials, labor, contractual work, etc. should be done in estimating budgeted amounts to accomplish the capital plan.

5.4. SOME CLOSING THOUGHTS

The annual budget is the central planning document in most local governments. In many communities it is the only significant planning activity. Without a structured approach based upon a rational decision making process, the quality or objectives of the budget can be questioned. PMS is a tool that can help you to positively impact the quality of public planning by clarifying objectives and targeting investment in a cost effective manner.

Improving the budget and planning process does not depend upon good information alone. Budgeting is a negotiation process. A PMS gives you better information and therefore a firmer basis for negotiation. This kind of information equips you to negotiate "on the merits" rather than positional bargaining. "On the merits" means that you have a sound basis for the goals behind your budget proposal and documentation for the dollars needed to accomplish the previously agreed upon goals for the local road system. This is a much stronger and "less stressful" approach than both sides merely taking positions to bargain from and haggling until a compromise can be reached. Negotiating on the merits will push the governing board to consider whether or not their goals for the road system and raising revenues are realistic.

Keep in mind that budgeting is a well established local process. Efforts to bring PMS information into the process of budget decision making in an attempt to add to or change that process. Expect and anticipate resistance. Organizations don't like change. Look for ways to communicate early and affirm and assure others that your efforts are aimed at doing a better job, improving information and improving public investment. Don't be discouraged if it takes more than one run at it to bring about better budgeting or more local road resources.

Developing an implementation plan can take considerable effort and time, but this planning is essential if the system is to be implemented. Failure to involve all users in the process has had dire consequences in several agencies.

The concept of Pavement Management is not new. Pavement Management Systems, whether manual or computerized, provide a systematic way for local officials to answer basic questions about their road system to guide future improvement and investment. With adequate commitment to a PMS, officials can get clear insight into the condition of their road system, how it is changing, what road investments should be a priority and a general estimate of the cost of

priority improvements. A PMS can be structured to reflect the specific goals and priorities of local leaders.

6. USING RSMS SOFTWARE

6.1. INSTALLATION

6.1.1. BEFORE USING THE COMPUTER

Minimum System Requirements

- *IBM/compatible computer with 486 or higher processor*
- *4 MB RAM*
- *3.5" floppy disk drive*
- *Windows 3.1 or higher*
- *Contact the Cornell Local Roads Program if your computer has 3.5" floppy drives*

Recommended System

- *IBM/compatible computer with Pentium processor or better*
- *16 MB RAM*
- *CD-ROM drive*
- *Windows95, WindowsNT or higher*

(RSMS may not work on a WindowsME or WindowsXP machine)

6.1.2. GETTING STARTED WITH RSMS

Installing RSMS (assumes a CD-ROM Installation)

- *Insert the CD-ROM into the drive*
- *From Win95 or NT, click on Start, Run.*
- *Type d:\InstallRSMS.exe (or equivalent) and press ENTER.*
- *Follow the on screen instructions to specify into what drive and directory to install RSMS. The default is the c: drive and the RSMS2003 directory. You may change the installation location, but do not change the defaults for what components are installed for a first-time installation.*
- *If you wish to install to a different location, click on the "Browse..." button to the right of the line that says "c:\RSMS2003" and follow the instructions.*
- *A READ.ME file is on the CD-ROM (and is installed with the program). Please read for more details about installation and current information about the program.*
- *The READ.ME file contains a current list of known bugs. Please read.*

6.1.3. UPGRADING RSMS98 FROM PREVIOUS VERSIONS

6.1.3.1. RSMS96 (DOS)

A READ.ME2 file on the second diskette explains the process of updating data. Please read for more information.

To upgrade RSMS2003 for Windows with data from RSMS96 (DOS) perform the following:

- *INSTALL RSMS2003 as per section 6.1.2.*
- *RUN RSMS2003 at least once*
- *EXIT RSMS2003*
- *RUN InstallRSMS.exe from CD-ROM*
- *Change the components to be installed (usually only the*
- *PACK and INDEX FILES (Under Utilities Menu in RSMS98) immediately.*

6.1.3.2. Components in UPDATE

6.1.3.2.1. Inventory & Condition Surveys (Default Installation)

If you have old inventory or condition surveys you should use this component. It will bring in the data for all fields. However, if you have made any changes to the traffic volume defaults, you should check the values in the Inventory before proceeding with use of the program.

6.1.3.2.2. Repairs

If you generated your own repair cost and prices, you should use this component.

If you install your old repairs you will need to do some maintenance of the data to get RSMS to work optimally for you. When you open RSMS, go to the Update Maintenance Information (repairs) screen. Notice the Category and Strategy values may not be filled in properly. For each repair you will need to assign a Condition AND Strategy which have the same key value. Once this is done, you can use RSMS as before.

6.1.3.2.3. Distress Types

If you eliminated or added your own distresses (versus the eight default values), you should use this component. You will need to update some of your information. When you open RSMS, go to the Maintenance Decision Trees screen. Check all of the data and edit to match what you had in RSMS'96 for DOS. It may be easier to just edit the data in RSMS'98 instead of adding this component. You can always add the Distress Types component later.

6.1.3.3. RSMS93 and earlier versions

Installing RSMS98 from version 93.2 or earlier requires a two step process. Contact the Cornell Local Roads Program for more information.

6.1.4. STARTING RSMS

In Windows 3.1, double-click on the RSMS2003 icon.

In Win95 or NT, click Start, Programs, RSMS2003 group, then RSMS2003.

6.2. *MENUS/SCREEN COMPONENTS/ KEYSTROKES*

6.2.1. RSMS MENU :

Inventory
- Update Road Inventory
- Exit the Program

Browse
- Change a Label
- Change a Picture
- Change the Width
- Change the Order
- Query
- Report
- Mail Merge
- Send

Condition
- Update Road Sequence List
- Collect Survey Data
- Survey Status

Repairs
- Update Maintenance Information
- Maintenance Decision Trees

Analysis
- Road Surface Condition Summary
- Maintenance Summary Priority
- Budget Work

Work
- Update Work History
- Print Work Schedule

Utilities
- Update Options
- Index and Pack Files
- Input Data from a laptop output
- Data Dictionary
- Print Setup
- Database Viewer

Window

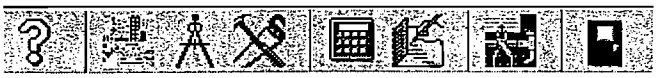
Help

The menus under Window and Help are similar to most Windows applications. Specific details on the various menu items are provided in the sections below. Not all items are reviewed in this documentation. See on-line help or try it out.

Choose one of the menus by clicking on the word with the mouse, or by pressing and holding the ALT key while tapping the key underlined in the menu. For example, to choose Condition, press ALT+C.

6.2.2. RSMS TOOLBAR

The RSMS Toolbar is the line of icons underneath the menus, and the buttons listed below provide shortcuts to various sections of the program or other functions. Access to the toolbar is with a mouse.



Get Help on RSMS

Go to Road Inventory Browse screen

Go to Survey Browse screen

Go to Work Order Browse screen

Open the Windows Calculator (for calculating numbers)

Use Windows Notepad (for writing/ copying text)

Check Database Files

Exit RSMS

6.2.3. KEYSTROKES:

<ESC> Exits and returns to the previous screen without saving changes.

<TAB> Moves to next field in database screen.

<SHIFT-TAB> Moves to previous field in database screen.

<ALT-Letter> **ALT** key plus the underlined letter in a menu choice will select that choice.

<ENTER> Selects a record for editing in a browse screen.

6.2.4. STANDARD BROWSE SCREEN

In some of the menu choices, the Standard Browse Screen menu bar shown above will appear at the top of the window. The only way to access some of these menu items is with a mouse.

The menu choices with this menu bar are:

Inventory	Update Road Inventory
Condition	Update Road Sequence List
Repairs	Update Maintenance Information
	Maintenance Decision Trees
Utilities	Update Options

Additional buttons are available in certain commands. These will be explained as needed with the specific command.

The Icons have the following meanings (keystrokes in parentheses):

	Go Top (Home)	Goes to the first record
	Page Up (Page Up)	Goes one page up
	Page Down (Page Down)	Goes one page down
	Go Bottom (End)	Goes to the last record
	Arrange the Columns * (Browse, Change the Order)	Change which fields are shown and in what order
	Find a record	Find a specific record in file
	Change the Index Order	Changes the field used as index
	Ascending/ Descending	Changes the index order
	Query (Browse, Query) *	Query to show only records of interest
	Add a field	Sums the values of certain fields
	Print (Browse, Report) *	Prints a report
	Edit a record (Enter)	Edits the highlighted record
	New Record (Insert)	Generates a new record
	Exit (Esc)	Exits and clears the window

Specific Details are discussed below.

See section 6.4 Browse for details on the three buttons marked with a *.

6.2.4.1. Moving Around

-To move up a line or down a line, click on the arrow on the scroll bar on the right side of the screen or use the arrow keys.

-To see more of the columns to the right, click on the right arrow on the scroll bar at the bottom of the screen or use the <CTRL+ Arrow> keystroke.

-To move in large "jumps" through the list of signs, use the "VCR"buttons on the left side of the Browse screen toolbar.

6.2.4.2. Changing the Order and Width of Columns in the Browse Screen

See section 5.4 for more information on the Arrange the Columns (Change the Order) button.

Change the order on the Browse Screen

To move columns around on the Browse screen, position the mouse pointer over the column you would like to move until you get the "hand" symbol as shown.

ROAD NAME	SURFACE	RIN
FFROST	ASPHALT	01.000000000
SANDY BROOK DR	ASPHALT	.0000000001

Hold down the mouse button and "drag" the column to the right or left, as desired. Move the pointer (hand symbol) over the column you want to the right of the one you're dragging, and release the mouse button.

Change the width of a column on the browse screen.

ROAD NAME	SURFACE	RIN
FFROST	ASPHALT	01.000000000
SANDY BROOK DR	ASPHALT	.0000000001

To change the width of a column, click with the mouse pointer on the line to the right of that column's heading.

Then drag the edge of the column to the right to make it larger or to the left to make it smaller.

6.2.4.3. Finding a Record

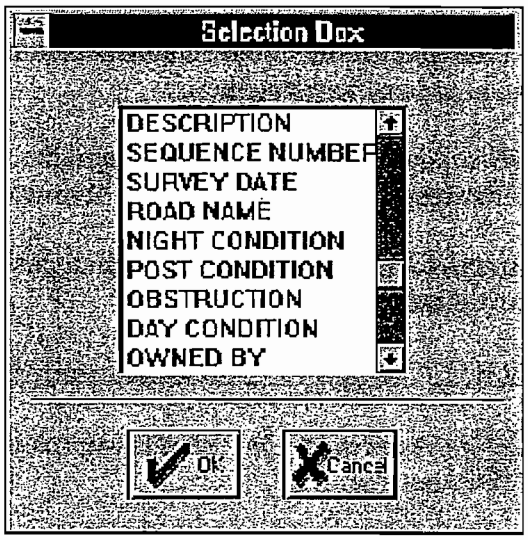
Click on the *Find* button

Type in the text you wish to search for and click OK

The *FIND* button allows you to search for text in the field that is currently the Index. To search in a different field, you must first change the *Index*, then use *FIND*.

6.2.4.4. Changing the Index

Click on the Index button



This brings up the list of items which you can use as an Index.

Double-click on the field you wish to search on and click OK.

The field chosen in the Index box also determines how the Browse screen is sorted. For example, if Road Name is the Index, the signs will be sorted alphabetically by Road Name.

6.2.4.5. Change from Ascending to Descending

Click on the Ascending to Descending button to change the sort from ascending to descending and back.

6.3. INVENTORY

6.3.1. UPDATE ROAD INVENTORY

Select **Inventory**, then **Update Road Inventory** from the **Main Menu** (or the **Road Inventory Browse** button).

6.3.1.1. New Roads

Click on the **New** button to bring up the screen for a new road. (Or hit the **INSERT** button on the keypad)

Update data as per section 6.3.1.3. When done hit ***Save*** to save new road. A new blank screen will be shown. Either enter the next road section or hit ***Cancel*** to return to the main browse screen.

6.3.1.2. Edit Existing Roads

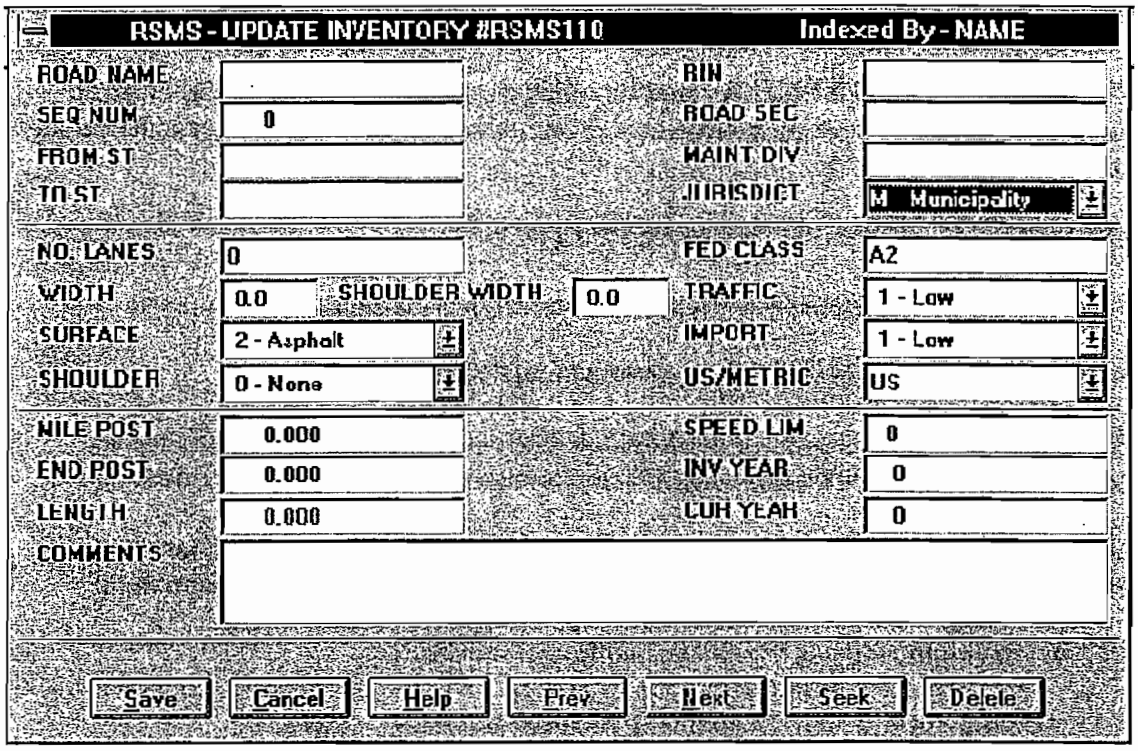
Click on the **Edit** button to bring up the screen for the highlighted road.
(or double click on the road with the mouse or hit the **ENTER** key)

Update data as per section 6.3.1.3. When done hit ***Save*** to save new changes and return to the main browse.

Cancel will return to the main browse screen without saving changes.

Prev or ***Next*** will go to the previous or next road segment in the inventory.

6.3.1.3. Update Inventory Screen (#RSMS110)



The main difference between a new road and editing an existing road is the information shown and the buttons at the bottom of the screen.

Buttons at the bottom of the Road Inventory screen

Save - saves the current record (road section)

Cancel - closes the road inventory screen and does NOT save the record

Help * - activates help screens for this area

Prev * - moves to the previous record (road section)

Next * - moves to the next record (road section)

Delete * - deletes the record of the current road section

The items marked with a * are not available in the New Inventory Screen.

Entering Data

Enter the information into this screen as indicated below. Essential items are indicated with an * ; all other fields are optional and can be used at the agency's discretion.

***ROAD NAME** - enter unique name of Road section. If this road is broken into more than one section, use "-1" on end of name to differentiate sections.

SEQUENCE NUMBER - can be used by the local agency to number the roads in the order they were surveyed. This number's function is to help plan the next road survey.

***FROM STREET AND *TO STREET**- starting and ending points for this road section. In addition to crossroads, other types of landmarks can be entered in these fields to indicate the start and end of a road section.

***NO. LANES** - number of lanes on road section, normally 2.

***WIDTH** - total width of road not including shoulders, in feet or meters.

SHOULDER WIDTH - total width of both shoulders, in feet or meters.

***SURFACE** - road surface material. - Pick from the "drop-down" list. Default options are changed in the Utilities, Update Options menu item. See section 5.9 for more information.

***SHOULDER** - shoulder material. - Pick from the "drop-down" list. Default options are changed in the Utilities, Update Options menu item. See section 5.9 for more information.

***MILE POST** - beginning mileage of "From" point on road section.

***END POST** - ending mileage of "To" point or end of road section.

LENGTH - automatically calculated by RSMS98 program. Should be the length of the section of road.

RIN - road identification number that the local agency can assign to each road. This can be used to match the state line drawings, or any other local numbering system.

ROAD SEC - used to differentiate sections of a road with the same RIN.

MAINT DIV - Maintenance Division or other grouping useful to the municipality.

JURISDICT - Agency with legal authority over this section of road. - Pick from the "drop-down" list. Default options are changed in the **Utilities, Update Options** menu item. See section 5.9 for more information.

FED CLASS - Federal Classification of road type.

***TRAFFIC** - relative level of traffic on this road section. Rate the town's busiest road as "Very High" and then rate all other roads relative to that road. Increase traffic at least one level when a large portion is heavy trucks. Default options are:

5 - Very High 4 - High 3 - Medium 2 - Low 1 - Very Low

***IMPORT.** - relative importance of road section. Roads to certain key services, such as hospitals and schools, may be given a higher importance. Default options are:

5 - Very High 4 - High 3 - Medium 2 - Low 1 - Very Low

***US/METRIC** - measuring system used for width, shoulder width, and road length.

SPEED LIMIT - speed limit on this road section.

INV YEAR - year this road was originally inventoried.

CUR YEAR - current year, or year last changes were made to this road section inventory.

COMMENTS - any comments or remarks that don't fit anywhere else.

6.3.2. EXIT THE PROGRAM

Use this menu option to exit the program. Clicking on the "Red Door" will also exit the program.

6.4. BROWSE

The browse menu is accessed directly on the menu bar or from specific commands in various parts of the RSMS program. The menu is only active when a screen is opened for editing or modification.

6.4.1. CHANGE A LABEL

In order to change the labels at the top of the columns on a report, you must change them at the top of the columns in the Browse screen.

- *Select Change a Label from the Browse menu.*
- *Double click on the label in the right column that you wish to change.*
- *Once you have typed in your change, click OK.*

Note: The changes you made to the label will be reflected anywhere that label shows in the database as well as in your report heading.

6.4.2. CHANGE A PICTURE

This is a mask which changes the way information is presented in various fields. Do not change without calling the Cornell Local Roads Program to discuss.

6.4.3. CHANGE THE WIDTH

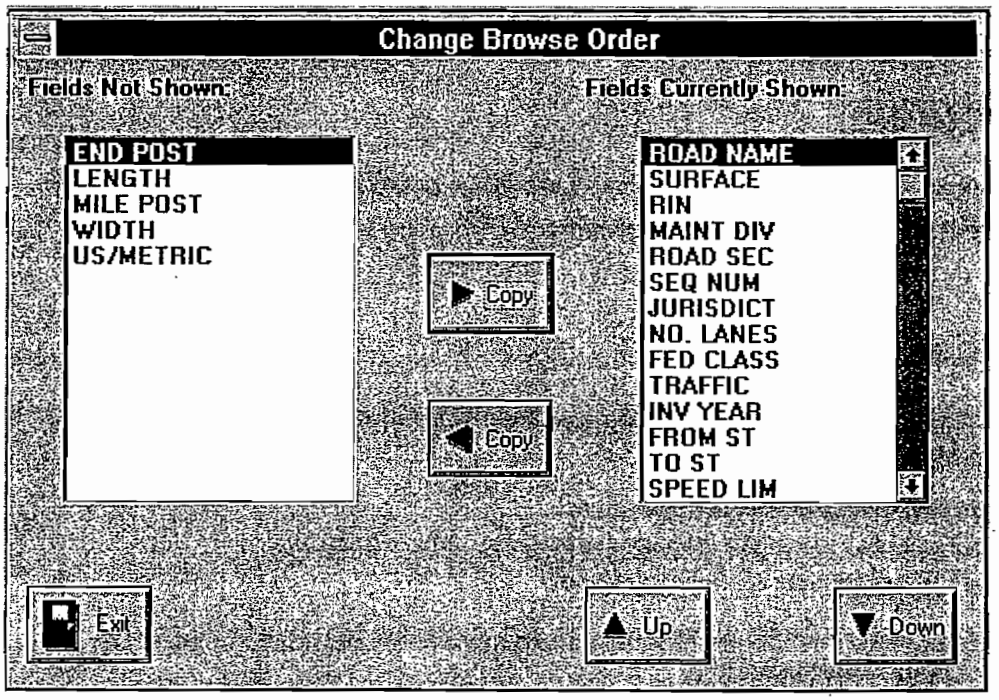
In order to change the width at the top of the columns on a report, you must change them at the top of the columns in the Browse screen.

- *Select Change a Width from the Browse menu.*
- *Double click on the column width that you wish to change.*
- *Once you have typed in your change, click OK.*

Note: The changes you made to the label will be reflected anywhere that width is used in the database as well as in your reports.

6.4.4. CHANGE THE ORDER

-To change which database fields are visible in Browse screen , click on the **Change the Order** button



To show a field - Click on a field in the left box (Fields Not Shown) and then click the top COPY > button to add a field to the Browse screen.

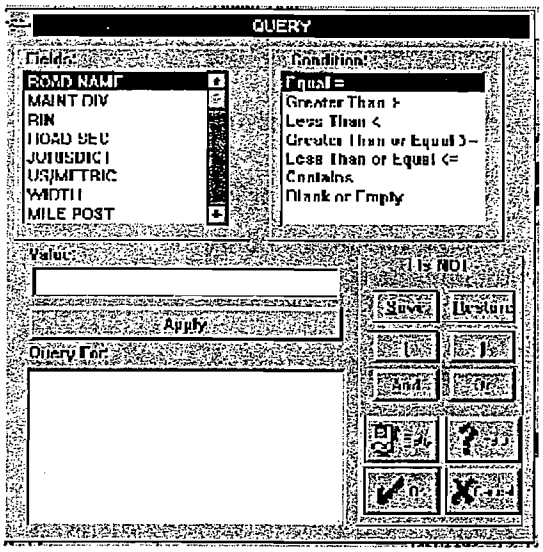
To remove a field - Click on a field in the right box (Fields Shown) and then click the lower COPY < button to take a field off of the Browse screen.

To change the order in which the columns are shown - Click on the field you wish to move in the right box (Fields Shown) and then click the UP ^ button to move it further to the left on the screen. Each click moves that field one column to the left. If you wish to move a field to the right, click on the field and then click the DOWN button.

When the fields are in the desired order in the right box, click the Exit button to save your changes and return to the Browse screen.

6.4.5. QUERY

Use the Query button to find and display only a certain set of roads or other information.



Use this screen by working from left to right and top to bottom.

For example, to find all roads whose length is greater than one mile.

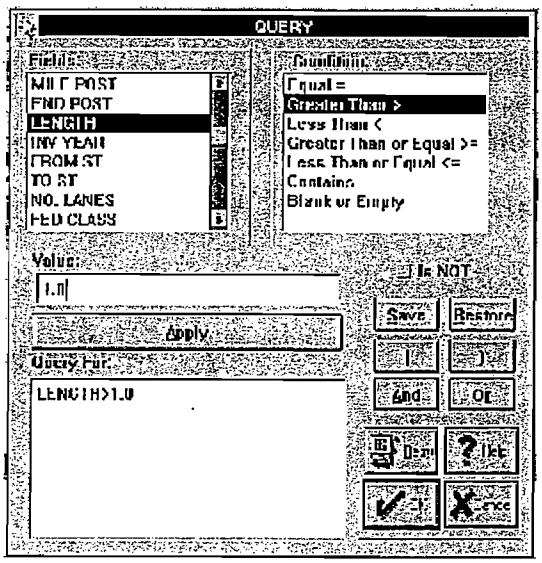
1) Click on the field in the Field box
- in this case it would be LENGTH.

2) Click on the type of match in Condition
- *in this case it would be Greater Than >.*

3) Click in the box under "Value" and type what you want the field to match
- *in this case, type 1.0 in the Value box.*

4) Click the Apply button.

5) Now your screen should show this condition in the "Query For:" box.



Click **OK** in the lower right side to set the Browse screen to show only records that meet this condition.

If you change your mind, click Retry to clear the "Query For:" box. Then click OK to show all of the records (while the Query For: box is blank), or set another condition.

**Note: If you are using a field that is in one of the drop-down boxes, you must Query using the value of the "key."

For example, if you wanted to Query for all Unpaved roads, you would have to choose SURFACE=1, because the key for "Unpaved" is "1".

Click Save to Save a set of conditions you use frequently. Then click on Restore next time you want to select only those records that meet that condition.

To set more than one condition, specify the first condition as described above, but before you click OK, click on either the AND or the Or button. Then start from the top left again and specify another condition and click the Apply button. The second condition will be added on to the end of the first one in the Query For: box.

AND means the record must meet BOTH conditions.

OR means it could meet either one.

Once you click on OK, you will return to the Browse screen, but will see only the records that met the Query conditions.

Your other records are not lost!

To see all the records again:

- click the Query button
- click the Retry button so that the Query For: box is empty
- click OK.

All the records will appear back on the Browse screen.

6.4.6. REPORT

You can create reports from the Inventory Browse screen by clicking on the Printer icon or using the Report command in the Browse menu.

This will bring up the Print screen:

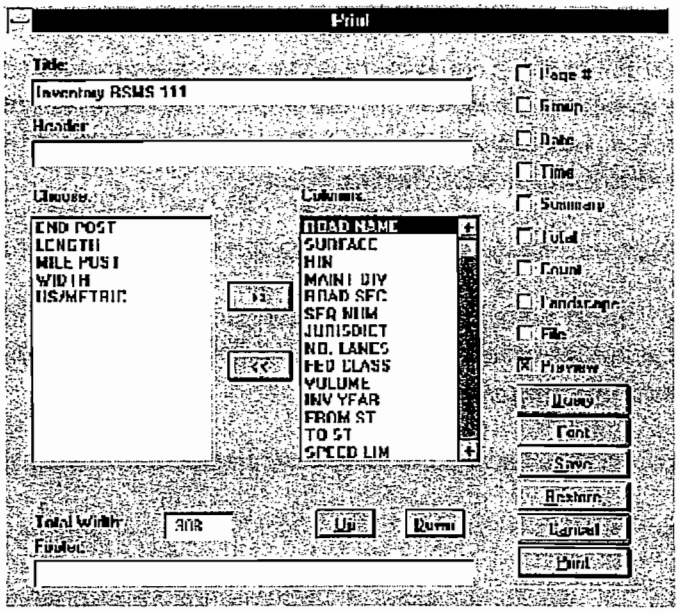
TITLE - This line will show on only the first page of your report. By default, it comes up with the name of the Browse from which you are printing. You can click on this line and overwrite with whatever you wish.

HEADER- This line will print at the top of every page.

FOOTER- This line will print at the bottom of every page.

COLUMNS- This box shows which columns will appear in the report.

By default, it shows columns in the Browse screen. This box is the same as the "Columns Shown" in the Browse screen and the box titled "Choose" is the same as "Columns Not Shown".



Removing Columns

To remove columns from the report, click on the column in the Columns box and click the left arrow. You can remove more than one column by clicking the first, then holding down the CTRL key and clicking one or more others. Once a group is selected, click on the left arrow to transfer them to the box on the left.

Adding Columns

To add columns to the report, click on the field name in the "Choose" box on the left, then click the right arrow.

Changing the Column Order

To change the order of the columns, click on the column you want to move in the COLUMNS box, then click the "Up" button to move the column to the left or the "DOWN" button to move the column to the right. The top column in the list will be the first listed on the left side of the report and the last column at the bottom will be at the far right side of the report.

TOTAL WIDTH

The number shown is the total number of spaces taken up by printing all of the columns in the COLUMNS box. Check this number to make sure your information will fit on one page. Generally, if you are printing portrait, the number should not be more than 90, or 120 if printing Landscape.

CHECKBOX OPTIONS

The boxes on the right side help organize the report:

Page # - Automatically numbers the pages in the upper right-hand corner

Group - Allows selection of one field on which to group the information. For example, if Surface was selected, all Unpaved roads would be listed together, as would all asphalt roads.

Date & Time - Automatically places the system date and time in the upper left-hand corner.

Summary - Provides one number for each item in the field "Grouped" by.

Total & Count - Use Total to add up numbers in a numeric field, or Count to add up "how many" in a non-numeric field. For example, if the report is grouped by Surface, the Summary box is checked, and the Count box is checked, the report will only show the count of how many road sections fall into each surface category.

Landscape - prints the report with the long edge at the top.

File - Send the report to a file with the name you specify. The file extension is .PRN. The file is placed in the \rsmsdata subdirectory. Any standard word processor of spreadsheet should be able to read this file as text.

Preview - shows you a preview on the screen before printing.

Other buttons

QUERY - works the same as Query in the Browse screen (see section III).

FONT - allows the user to change the size and style of the characters.

SAVE - allows the user to give the report a name and store it for later use.

RESTORE - allows the user to retrieve a stored report.

CANCEL - exits out of the Report screen.

PRINT - Prints the report - does NOT save the format!

Click Save BEFORE printing if you want to save the format of your report.

6.4.7. MAIL MERGE

Mail Merge lets you format and print information from just one record in a format similar to the screen layout.

To use Mail Merge, you must have a Browse screen open. Then choose Mail Merge under Browse on the main menu.

This brings up the Mail Merge screen.

Type in a short name in "Mail Name" at the top of the screen. This does not print, but is the name you use to retrieve your report later.

Other parts of the screen are:

TITLE: - Line that prints once at the very beginning of the report

HEADER - Line that prints at the top of every page.

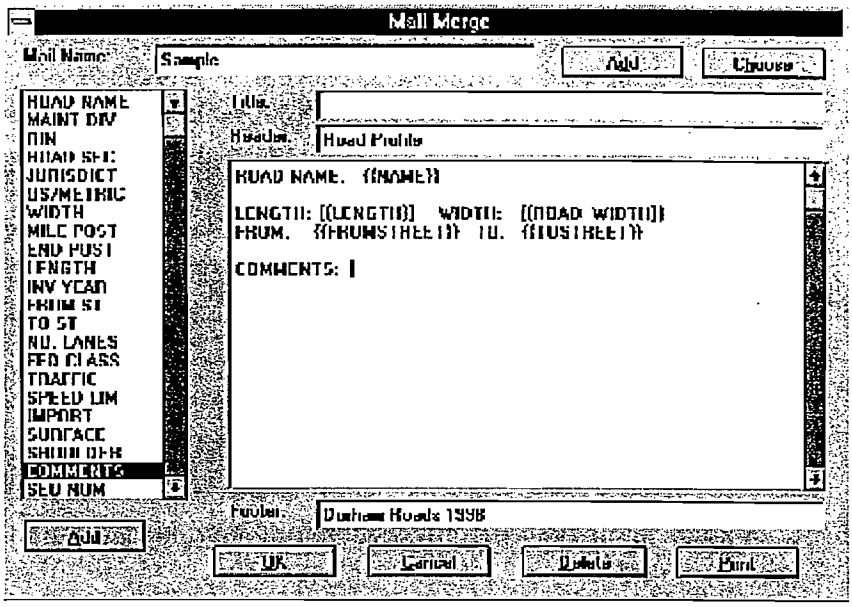
FOOTER - Line that prints at the bottom of every page.

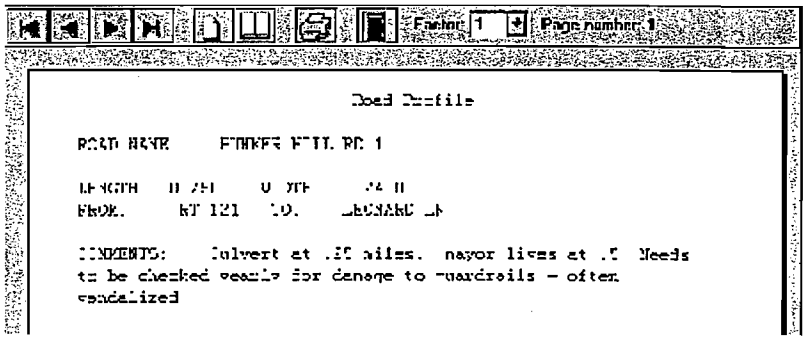
Fields box - list of field names listed in box on left side.

Pasteboard - box on right where you can click with mouse and type in text.

To place fields in your document:

Click with the mouse and position your cursor where you want the field to go in the Pasteboard box on the right side. Click on the name of the field in the box on the left, then click the Add button underneath that box. The code for the field will appear in the Pasteboard on the right. When you print, the information from the field will print instead of the code that you now see.





To **save** your document, click OK at the bottom of the screen.

To **retrieve** a Mail Merge report, click on Mail Merge from the Browse menu, then click the **Choose** button in the upper right corner of the mail merge screen.

This brings up a list of the mail merge reports you have saved. Double-click on the report you want to use.

To print a Mail Merge for just one record, first open the Browse screen and select (highlight) the record you want to print.

Then click Mail Merge from the Browse menu, create or Choose your report, and then click Print in the Mail Merge screen. Click Yes when asked if you only want to print one record. The resulting report may look something like the screen below:

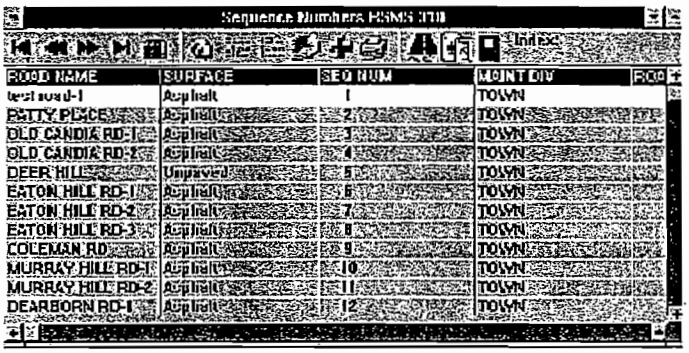
6.4.8. SEND

This is used to send data updates to the database. It should not be needed at anytime. Please call the Cornell Local Roads Program if you feel you need to use this feature.

6.5. *CONDITION*

6.5.1. UPDATE ROAD SEQUENCE LIST

To list your road inventory in the sequence that you plan to do your survey, choose Update Road Sequence List from the Condition menu.

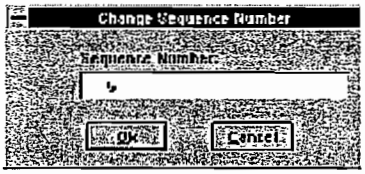


To move a road in the list to a certain spot, change the sequence number of that road to the same number as the road you want it to appear before.

For example, to move Deer Hill Road before Patty Place, note that Patty Place currently has sequence number 2.

Double-click on Deer Hill Road, or click on Deer Hill Road and then click on the **Change Sequence** button.

This brings up a screen to input the new sequence number for that road.



Type in the number desired, then click OK.

In this case, type in 2 to put this road before the road that is currently number 2 (Patty Place).

You will now see two roads with the same sequence number.

ROAD NAME	SURFACE	SEQ NUM	MAINT DIV
test road-1	Asphalt	1	TOWN
DEER HILL	Unpaved	2	TOWN
PATTY PLACE	Asphalt	2	TOWN
OLD CANDIA RD-1	Asphalt	3	TOWN
OLD CANDIA RD 2	Asphalt	4	TOWN

Instead of having to go through the list and renumber every road after the one you changed, you can click on the Shuffle button.

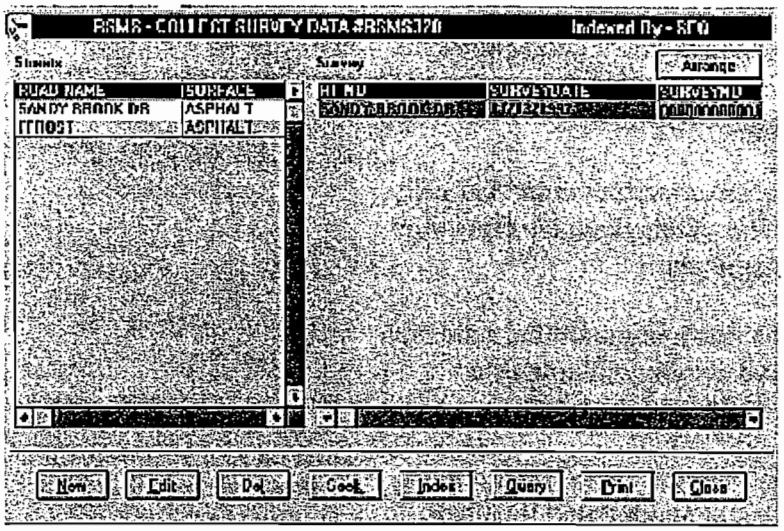
Your roads will now be neatly renumbered in the order you designated.

ROAD NAME	SURFACE	SEQ NUM	MAINT DIV
test road-1	Asphalt	1	TOWN
DEER HILL	Unpaved	2	TOWN
PATTY PLACE	Asphalt	3	TOWN
OLD CANDIA RD-1	Asphalt	4	TOWN
OLD CANDIA RD 2	Asphalt	5	TOWN

6.5.2. COLLECT SURVEY DATA

To enter the condition surveys on your roads, choose Collect Survey Data from the Condition menu or click the Survey Data button.

This brings up the Survey Browse screen.



The box on the left shows the roads in your inventory.

You can use the scroll bar on the right side of this box to view the rest of your road inventory.

The box on the right side shows **ONLY** the surveys entered on the road currently highlighted in the left box. In the diagram above, the right side shows only the surveys for Sandy Brook Drive because that is the road highlighted on the left side. To show surveys for other roads, select the road on the left side by clicking on it or using the down arrow to highlight it.

You can rearrange the column order in both the Roads box on the left and the Surveys box on the right. To change the order of columns, click on the Arrange button over the box you want to change.

NEW - creates a new survey for the road selected (highlighted) in the box on left.

EDIT - opens up the survey highlighted in box on right.

DELETE - deletes the survey highlighted in the box on right.

PRINT - prints survey of the highlighted survey in the box on right.

SEEK - same as find in the standard Browse screen - use to find a road in box on left.

INDEX - determines how the roads in the box on left are sorted - default is by Road Name.

QUERY - allows selection of only certain roads to show in box on left.

CLOSE - closes the Survey Browse screen and goes back to the main menu.

Entering a new survey -

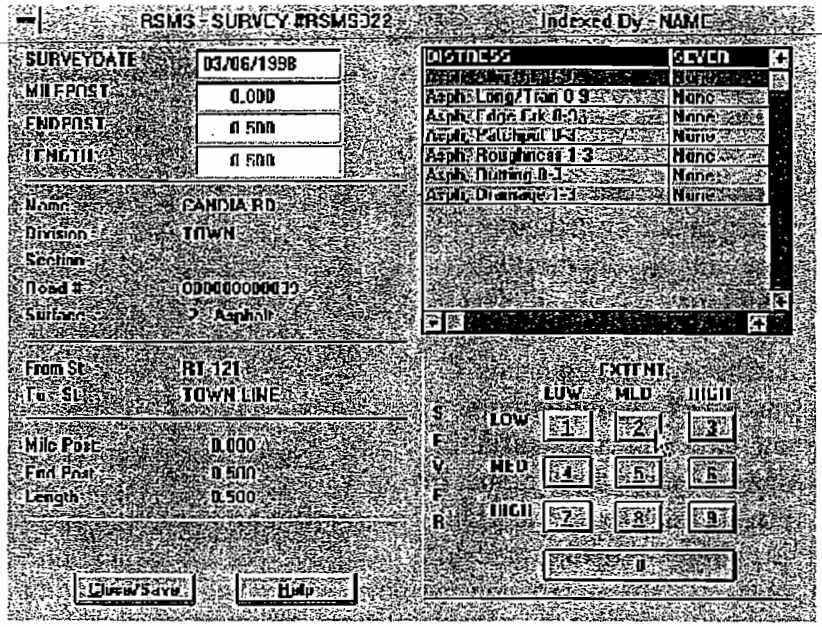
Click on the road to be surveyed in the left box, then click on the NEW button. This brings up the Condition Survey screen.

By default, the computer's date is entered as the survey date. Normally, you should overwrite this with the date the survey was actually completed.

The information on the left side of the screen is pulled from your road inventory.

The information on the right side is where you will enter the distresses of your road.

For NO defects, use 0 or do not select a number and the level defaults to None.



KEYBOARD ALTERNATIVES:

If you are using the keyboard only, press the TAB key until you have highlighted the first distress. Then press the ALT key and the corresponding number for that level of distress (ALT-2, for example). You can use the arrow keys to move through the list of distresses on the right.

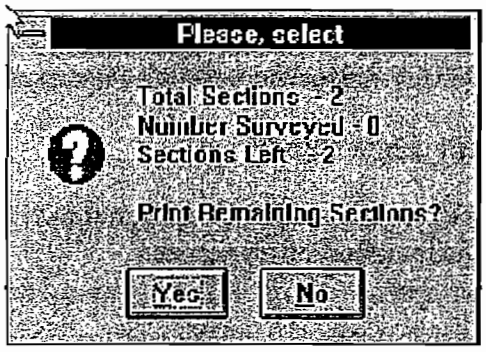
When you have completed entering your levels of distresses, click the CLOSE/SAVE button at the bottom of the screen.

Once you start a survey, you have no choice but to Save it. If you don't want to keep that particular survey, you can Delete it from the Condition Survey Browse screen.

When entering distresses, be sure to only use the values available for the given distress. They are listed along with the distress in the right-hand box.

6.5.3. SURVEY STATUS

You can check which roads have not been surveyed and print out a list by closing the Survey Browse screen (click CLOSE button), and then selecting Survey Status from the Condition menu.



You will be asked what date you want the program to scan for surveys - enter the start date in the first box, then the end date in the second box.

You will then be shown the number of roads surveyed and how many remain to be surveyed.

At this point, you can click Yes to print those sections that haven't been surveyed.

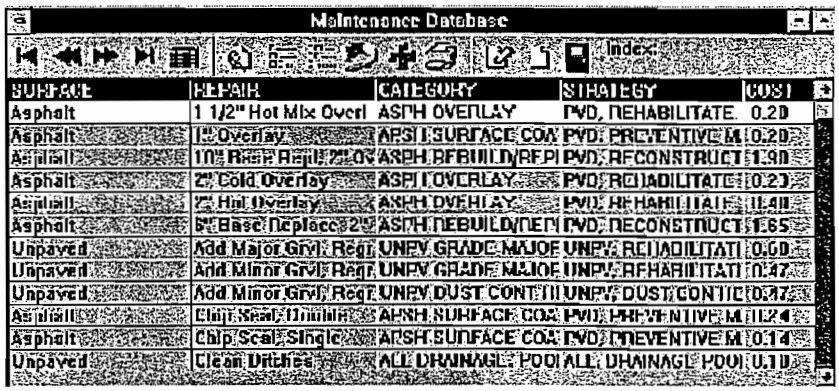
Clicking No returns you to the main menu.

6.6. REPAIRS

6.6.1. UPDATE MAINTENANCE INFORMATION

Changing the Repairs Maintenance Database

You can customize what repairs should appear as choices in response to a certain distress by choosing Update Maintenance Information from the Repairs menu.



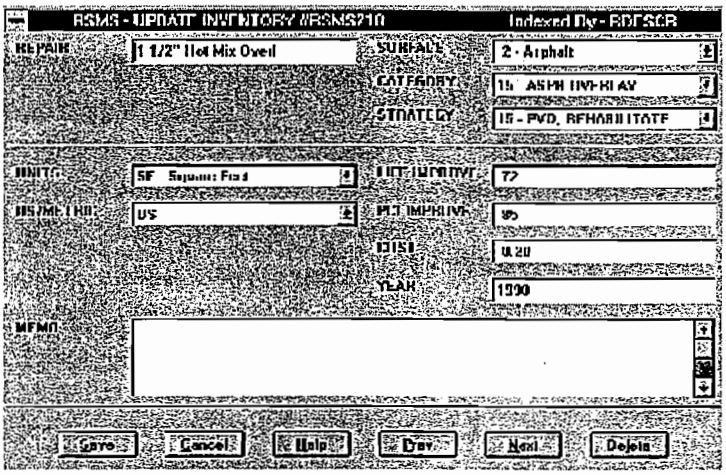
UPDATE INVENTORY

REPAIR - A brief description of the repair.

SURFACE - The type of surface where this repair is used.

CATEGORY - The category of work being performed.

STRATEGY - The strategy of work being performed (Should match the key value of the Category).



UNITS - The units for the cost of this repair.

US/METRIC - Whether the unit is a metric of U.S. standard unit.

LIFE IMPROVE - The typical length of the improvement in MONTHS.

PCI IMPROVE - The relative percentage of defects fixed by this kind of repair.

You should calculate and change the cost to match the cost of a given repair in your municipality.

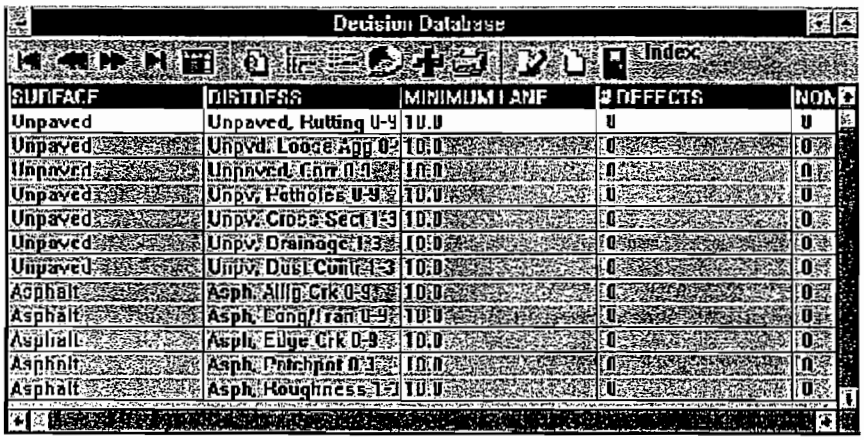
CAUTION: These values affect the entire scope of calculations for Maintenance Priority and Budget Work. Quality calculations of cost and proper selection of the categories and strategies will provide the best data. Poor data entry will result in poor analysis with RSMS.

6.6.2. MAINTENANCE DECISION TREES

Editing the Maintenance Decision Trees

To change what type of strategy is applied to each type of distress, you can edit the Maintenance Decision Trees by selecting that option from the Repair menu.

NOTE: Changing the decision trees has a fundamental impact on the calculations of Maintenance Priority and Repair Strategy. ***Do so with only the greatest of care!***

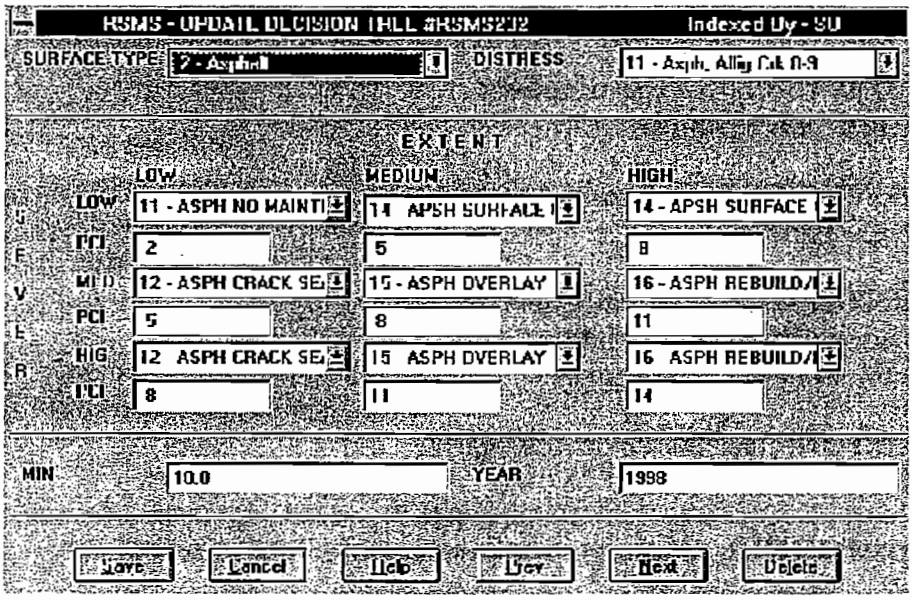


One record is listed for each type of distress for each surface type.

Double click on the line to edit the decision tree for a certain distress. This brings up the screen for that distress.

This screen determines what type of strategy will be recommended for a certain level of this distress.

In the screen above, the strategies listed are methods to correct different levels of Alligator Cracking on a road section.



Each repair also lists the PCI deducted from 100 for a given level of distress.

This screen works together with the Maintenance Information screen (described earlier) as demonstrated in the following example:

Let's say you have a road with a medium extent/medium severity of Alligator Cracking.

From this decision tree above, the program would calculate repairs that fall into the Asphalt Overlay strategy. If you go back to the Maintenance Information screen in the previous section, you will see that there are three repairs that fall into this strategy:

- 11/2" Hot Mix Overlay
- 2" Cold Overlay
- 2" Hot Overlay

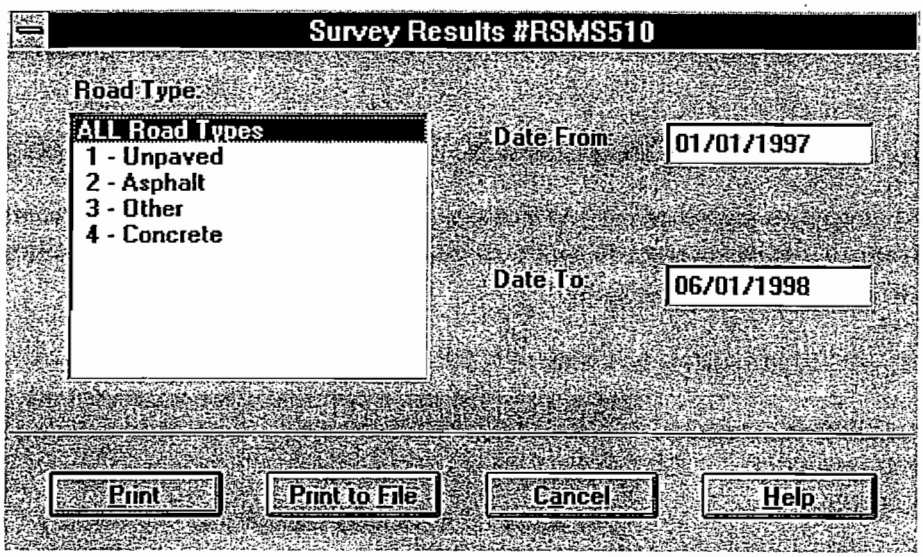
These are the repairs that will show up in the recommended actions in the Maintenance Summary Report, Budget Work, and Work Orders in the ANALYSIS menu item.

6.7. ANALYSIS

6.7.1. ROAD SURFACE CONDITION SUMMARY

After you have entered in your Road Inventory and your Condition Surveys, you are ready to run your Road Surface Condition Summary. This report gives you a listing of the roads in your inventory, the levels of distresses, and the PCI value for each road and overall PCI for the road system.

To run this report, select Road Surface Condition Summary from the Analysis menu.



This will bring up the following screen:

You can run the report for only one surface type by clicking on that type in the box on the left, or run it for all of your roads by leaving All Road Types highlighted.

On the right side, type in the dates of the surveys you wish to include. The report will only print roads with condition surveys that were done between these two dates. Typically you will type in January 01 for the year to be surveyed and leave the current date in the To field.

If you want to save the report, click on the **Print to File** button.

If you want to just print it, click the **Print** button.

Click **Cancel** to quit this screen and go back to the main menu.

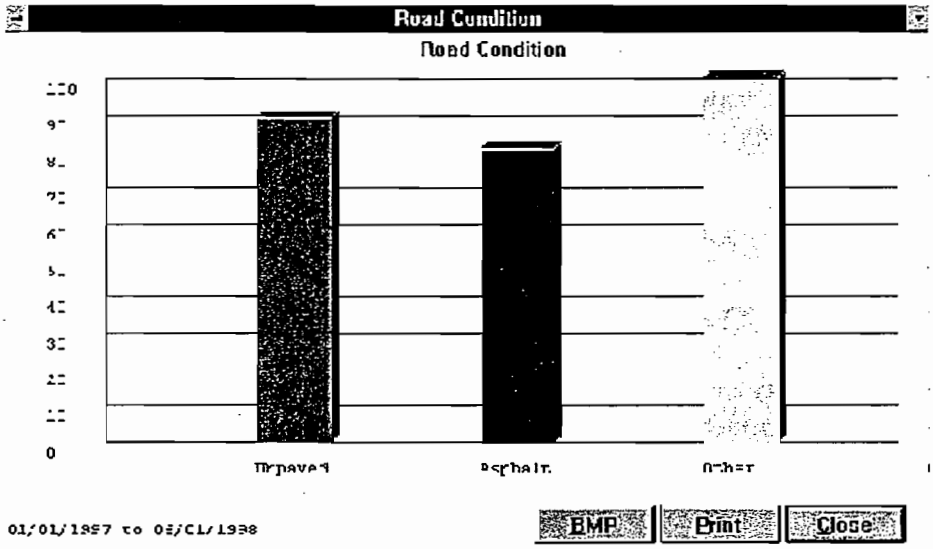
Once you print the report, you will see a preview on your screen.

Click the printer button to actually send the report to the printer.

After the report prints, click on the Exit button to see a graph showing the overall PCI value of each type of road you have surveyed.

You can print the PCI graph separately by clicking on the Print button, or save it as a BMP file by clicking on the BMP button.

To get out of the graph screen and return to the main menu, click **Close**.



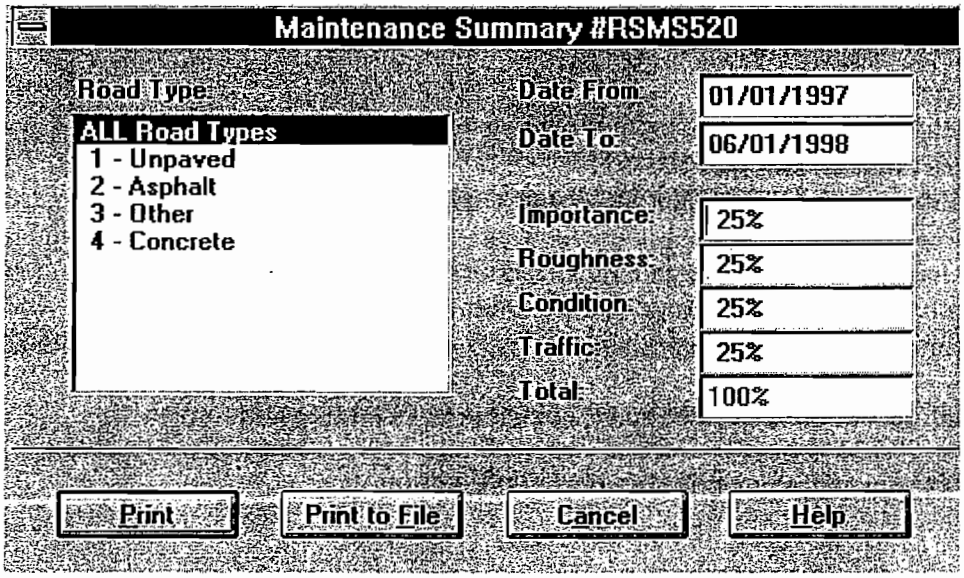
6.7.2. MAINTENANCE SUMMARY PRIORITY

This report shows your roads listed in name order but with the calculated maintenance priority. It shows all roads surveyed within a certain time frame with repair options and estimated cost of various repairs for each road.

To run this report, select Maintenance Summary Priority from the Analysis menu.

You will again have the choice of reporting on only one road or all road types by clicking on that type in the box on the left.

Type in the dates of the surveys you want to include in the Date From and Date To boxes.



Below the dates, you can specify how much weight should be given to each of the four priority factors (Importance, Roughness, Condition, and Traffic) in determining the priority of the road's need for repair. By default, each is weighted equally.

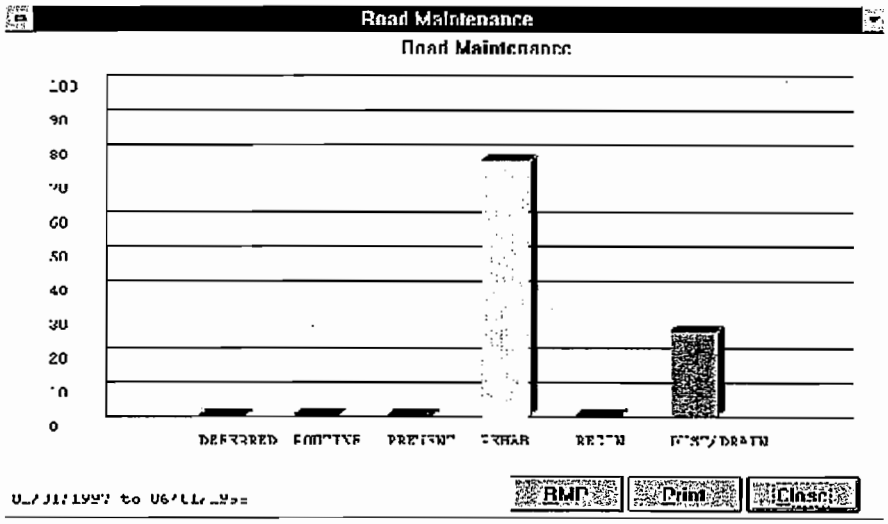
If you change the weight for one factor, change another so that the total equals 100%.

Click on the **Print to File** button to save the report in a file.

Click on **Print** to print the report to the screen and then the printer.

Similar to the Road Condition Summary, when looking at the report preview on the screen, you can click on the **Exit** button to see a graph.

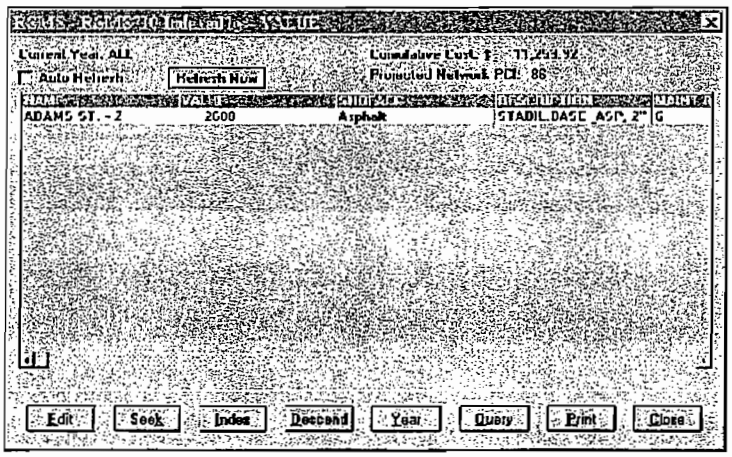
The graph shows the percentage of roads that fall into different repair strategies.



6.7.3. BUDGET WORK

The last choice under the Analysis menu, Budget Work, allows you to choose road repairs and come up with an estimated budget for one or more years. You should run this after you have run the other two reports in the Analysis menu.

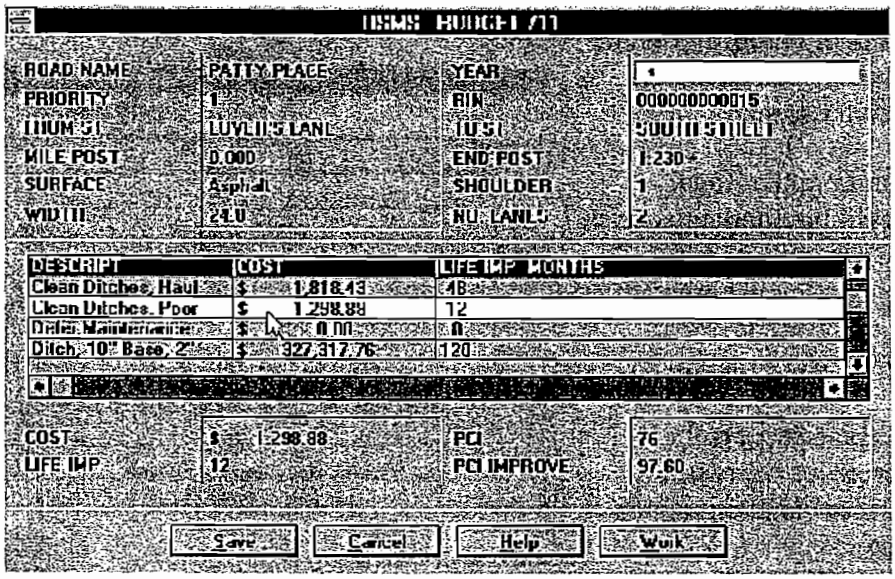
By default, the Budget screen shows your roads in order by value from low to high. Hit the Descend button to put the highest priority (highest value) road at the top of the screen.



To budget for a repair to one of the roads, double click on the line with that road, or highlight the road using the mouse or arrow keys, then click on Edit.

You will get a screen that shows the repairs recommended for the distresses on this road, and the estimated cost for those repairs. Note that these costs are based on what is entered in the Maintenance Information database, under the Repairs menu.

You can only change two items on this screen - the Year and the selected repair.

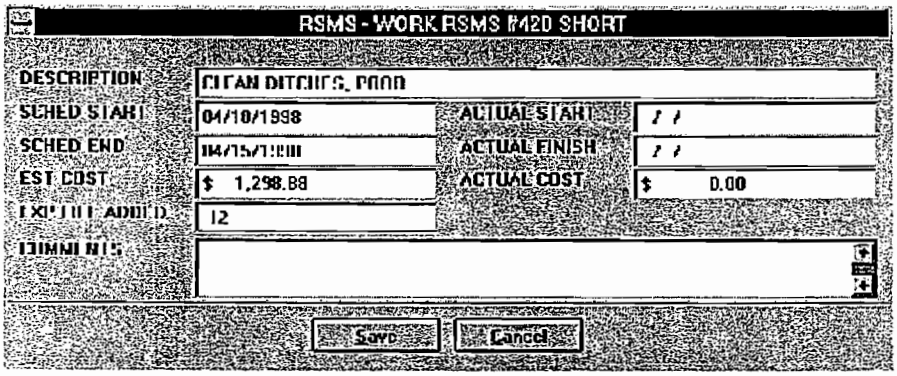


The Year, in the upper right corner, defaults to "1". If you wish to create a 5 year budget, for example, you could specify which road repairs would be done each year by entering a Year 1 for roads to repair this year, Year 2 for roads to repair next year, and so on. Then you can run your budget report and select only those roads budgeted for a certain year.

The second item to change in the budget screen is the type of repair. The repairs applicable to the worst distress listed for this type of road are listed in the box in the middle of the screen. Click on the line of one of these repairs to add it and its associated cost to the budget for the year indicated.

In the lower half of the screen, you will see the cost, the life improvement in months added, and the PCI improvement associated with the chosen repair.

Click the **Work** button to schedule a work order for this repair. This will take you to the work order screen.



Here you can add the scheduled start date and scheduled end date, as well as any comments desired.

Click **Save** to keep the work order or Cancel to delete it.

Back at the Budget screen, click **Save** to add this repair to the total for your budget. Click **Cancel** if you change your mind and do not want to add this repair to the budget.

When you **Save** a repair, you return to the Budget browse screen, where you can click on other roads and add repairs for those roads to your budget.

In order to calculate the Total (Cumulative) Cost for all of the repairs selected, click on the **Refresh Now** button at the top of the screen.

To show the Cumulative Cost for only repairs in a certain year, click the **Year** button at the bottom of the screen, then type in the year desired. **Type 0** to see all years.

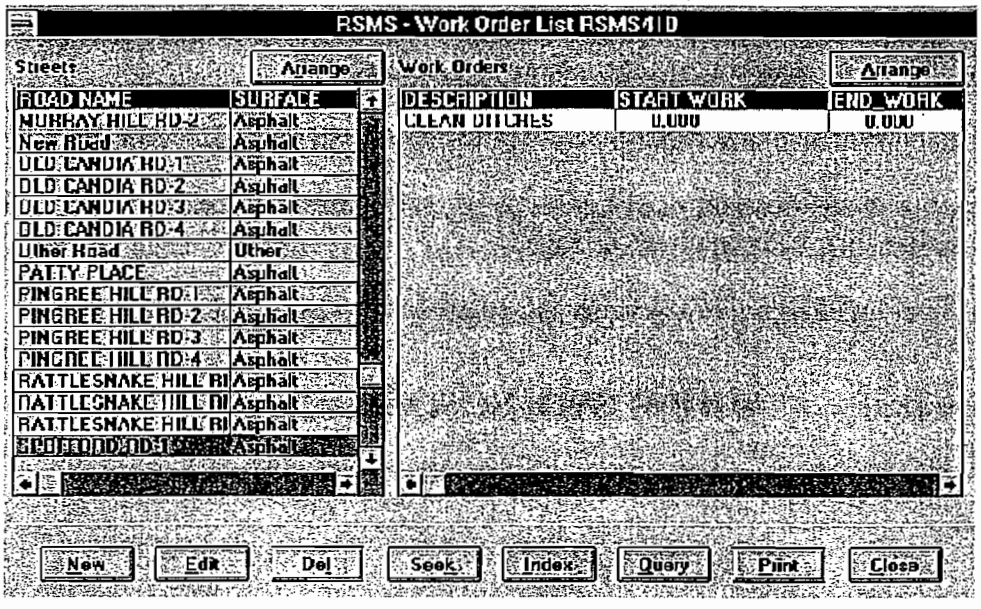
To print a budget report, click on the Print button at the bottom of the Budget Work browse screen. This brings up the same options to pick and choose columns and set other report formatting options just like the Print button from the standard Browse screen.

6.8. WORK

6.8.1. UPDATE WORK HISTORY

In addition to scheduling work through the budget screen, you can also create a work order by selecting Update Work History from the Work menu. This brings you to a Browse screen similar to that of the Condition Survey Browse screen.

Road sections are listed on the left side, and work orders for the road highlighted are listed on the right side.



NEW - Creates a new work order for the highlighted road section

EDIT - Edits the highlighted work order

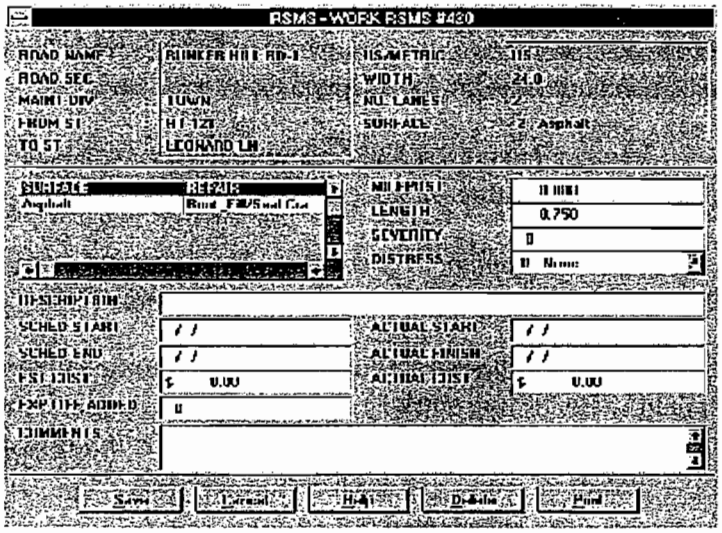
DEL - Deletes the highlighted work order

SEEK, INDEX, and **QUERY** allow you to find certain roads or change the way the roads on left are displayed similar to other locations in RSMS

PRINT - To print a report showing a group of work orders

CLOSE - Closes the Browse screen and returns to the main menu

When you create or edit a work order, you will see the screen:



The top third of the screen is copied from your road inventory. On the left side of the middle third of this screen, you have a list of suggested repairs to choose from, based on the repairs in your Maintenance Information database.

You may need to click the up arrow on the side of the box to see additional repair choices. Select one of these choices by clicking on that line. The description, estimated cost, and expected life added will automatically be copied down into the bottom third of the screen. You can overwrite any of these fields, or even manually type in all of these items instead of selecting a repair from the list.

On the right side, you can select the distress that this repair should correct from the drop-down box, as well as enter the severity and the length of road repaired. The length defaults to the total length of the road section.

Below the Description line are fields for Scheduled Start and End Dates, which can be used to plan maintenance schedules by using those fields in a report. Opposite the Scheduled Dates are fields for Actual Start and End Dates, as well as Actual Cost. The Actual fields can be used in reports to show timing and cost of work completed.

You can enter any comments about this work order in the Comments box.

To save the work order, click Save. To get out of this screen without saving, click Cancel. To delete this work order, click Delete.

To print this single work order in a mail-merge type format, click Print.

6.8.2. PRINT WORK SCHEDULE

This menu item is accessed in the Update Work History menu item.

6.9. UTILITIES

6.9.1. UPDATE OPTIONS

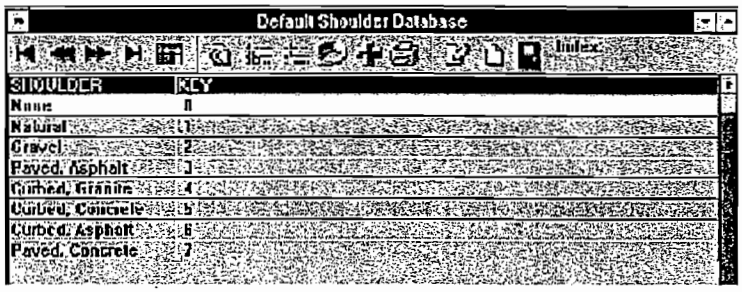
Customizing RSMS

Changing the Default Options

To change the options such as Surface Types that show up in "drop-down" boxes, select Update Options from the Utilities menu.

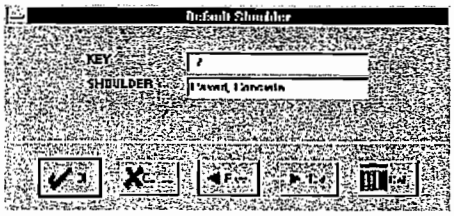
It is best to make changes BEFORE you enter your roads inventory - never delete an option after you have used it in an inventory.

To add a Shoulder Type, for example, select Shoulder from the Update Options menu:



You will bring up a browse screen that shows the current types of Shoulder and their "Key" value.

To add a new type, click on the **New Record** button.



Type in a Key value that follows the same pattern as the other "Keys", then type in the description in the "Shoulder" field.

Click Save to keep this shoulder type and add it to the list of defaults available.

6.9.2. INDEX AND PACK FILES

Keeping RSMS Healthy

Index and Pack Files

A database index is similar to the index in a book. It contains pointers to information in your database that allow the program to quickly locate information.

Periodically, especially if you notice a slowdown in your program, it is a good idea to reindex your databases and refresh your database index.

When you delete a lot of road sections, surveys, or other records, it leaves spaces in the information stored on your hard disk. This tends to slow the program down. Packing helps speed up the computer.

To Reindex and Pack, select Utilities from the Main Menu, then Pack and Index Files.

6.9.3. INPUT DATA FROM A LAPTOP OUTPUT

This menu item allows input from a laptop condition survey to be downloaded onto another computer from a floppy. Please call the Cornell Local Roads Program for more information.

6.9.4. DATA DICTIONARY

This menu item changes the mask which changes the way information is presented in various fields. Please call the Cornell Local Roads Program for more information.

6.9.5. PRINT SETUP

Similar to the standard Windows Print setup. Used to tell the computer which printer to use.

6.9.6. DATABASE VIEWER

Allows the user to view and print (But NOT edit) the databases used in RSMS.

6.10. WINDOW & HELP

These two main Menu items are standard Windows feature. The Help screen has the New Hampshire Technology Transfer Center version of this manual and many screens to help the user. Please use the online help before calling the Cornell Local Roads Program.

APPENDIX A - SAMPLE FORMS

Pavement Inventory Survey

Asphalt Pavement Condition Survey

Surface Treated Pavement Condition Survey

Unpaved Road Condition Survey

RSMS Repair Alternatives

RSMS2003 Cornell Local Roads Program Repair Defaults

- Asphalt Pavement
- Surface Treated Pavement
- Unpaved Road

RSMS Decision Trees (Blank)

RSMS Decision Trees (Asphalt)

RSMS Decision Trees (Surface Treated)

RSMS Decision Trees (Unpaved)

Maintenance Summary Priority Report

Sample Budget Worksheet

Blank Budget Worksheet

RSMS Report Information Listing

RSMS Pavement Inventory Survey Name:_____Date:_____

Road Name: _____ Inventory #: _____

Section Description From: To:	Road Sec. : Maintenance Div.: Jurisdiction :
# Lanes : Width : Surface : Shoulder: Shoulder Width: 1-Other 3-Gravel 4-Surf. Treat. 5-Asphalt 6-Concrete	Fed.Class : Traffic : 1 - 5 Importance: 1 - 5 US/METRIC : US/ ME
Distance - Start: End: Length:	Speed Limit : Inventory Yr:
Comments: _____	

IMPORTANCE (*DEFIMP.DBF*)

KEY	IMPORTANCE
1	Very Low
2	Low
3	Medium
4	High
5	Very High

TRAFFIC (*DEFVOL.DBF*)

KEY	TRAFFIC
1	Very Low
2	Low
3	Medium
4	High
5	Very High

JURISDICTION (*DEFJURIS.DBF*)

KEY	JURISDICT
I	City
N	Not Maintained
O	County
P	Private
S	State
T	Town
V	Village

SURFACE TYPE (*DEFSURF.DBF*)

KEY	SURFACE TYPE
1	Other
3	Unpaved
4	Surface Treated
5	Asphalt
6	Concrete
7	Brick / Block

SHOULDERS (DEFSHO.DBF)

KEY	SHOULDER
0	None
1	Paved, Asphalt
2	Gravel
3	Earth
4	Curb
5	None
6	Curbed, Asphalt
7	Curbed, Concrete
8	Curbed, Granite
9	Paved, Concrete

MEASUREMENT UNITS (DEFUNITS.DBF)

KEY	UNIT
LF	Linear Feet
SF	Square Feet
SY	Square Yards

or

LM	Linear Meter
SM	Square Meter

RSMS 2003 — Flexible Pavement Condition Survey

Street: _____	Distance: _____	Name: _____
Section #: _____	Start : _____	Date: _____
Start: _____	End : _____	Weather: _____
End: _____	Length: _____	Temp (F°/C°): _____

LONGITUDINAL/ TRANSVERSE CRACKING

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

ALLIGATOR CRACKING

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

EDGE CRACKING

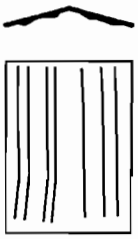
SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

PATCHING / POTHOLES

NO Defects	EXTENT
	1 Low
	2 Medium
	3 High

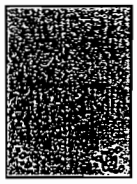
Do not include good patches

RUTTING



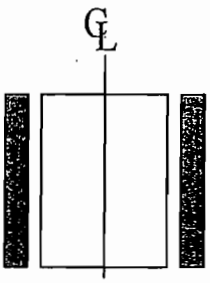
SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

BLEEDING



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

DRAINAGE



SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

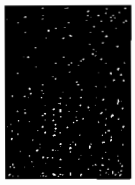
- uneven surface
- sags
- humps
- frost heaves

SEVERITY	CONDITION
1	Good
4	Fair
7	Poor

RSMS 2003 Surface Treated Condition Survey

Street: _____	Distance	Name: _____	
Section #: _____	Start : _____	Date: _____	
Start: _____	End : _____	Weather: _____	
End: _____	Length: _____	Temp (F°/C°): _____	

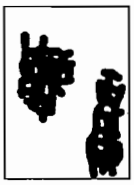
TREATMENT CONDITION



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

ALLIGATOR CRACKING



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

LONGITUDINAL/ TRANSVERSE CRACKING

NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

PATCHING / POTHOLES

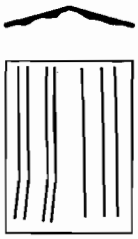
NO Defects

Do not include good patches

EXTENT

1	Low
2	Medium
3	High

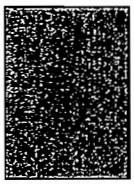
RUTTING



NO Defects

SEVERITY	EXTENT Low	Med	High
Low	1	2	3
Med	4	5	6
High	7	8	9

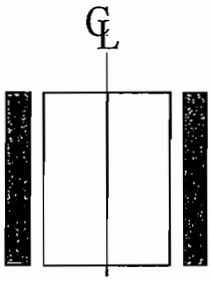
BLEEDING



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

DRAINAGE



CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- corrugations
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

RSMS 2003 Unpaved Condition Survey

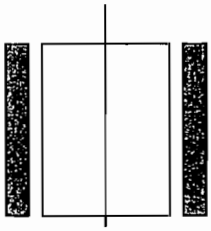
Street: _____	Distance	Name: _____	
Section #: _____	Start : _____	Date: _____	
Start: _____	End : _____	Weather: _____	
End: _____	Length: _____	Temp (F°/C°): _____	

IMPROPER X-SECTION

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

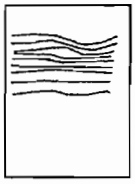
ROADSIDE DRAINAGE



CONDITION

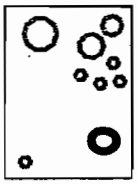
SEVERITY	
1	Good
4	Fair
7	Poor

CORRUGATIONS



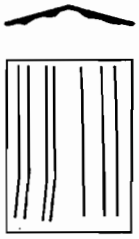
SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

POTHOLES



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

RUTTING



SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

LOOSE AGGREGATE

SEVERITY	NO Defects	EXTENT Low	EXTENT Med	EXTENT High
Low		1	2	3
Med		4	5	6
High		7	8	9

DUST

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

ROUGHNESS

Check road for presence of the following:

- uneven surface
- sags
- humps
- frost heaves

CONDITION

SEVERITY	
1	Good
4	Fair
7	Poor

RSMS Repair Alternatives Name: _____ Date: _____

Repair: _____ Inventory #: _____

Surface:
Category:
Strategy:

Units:
US/METRIC:

Life/Time (months):
PCI Improvement (%):
Cost: $
Year:

Comments: _____

REPAIR CATEGORIES (*DEFCAT.DBF*)

KEY	CATEGORY	VALUE
1	No work Needed	0
2	Defer Maintenance	1
3	Spot Dust Cont.-UNPAVED	2
4	Dust Control-UNPAVED	3
5	Spot Add Material - UNPAVED	3
6	Surface Reshape - UNPAVED	4
7	Regrade - UNPAVED	5
8	Regrade w/ new mater. -UNPA	6
13	Crack Repairs - ASPHALT	2
14	Patching - ASPHALT	3
15	Surface Treat - ASPHALT	4
16	Overlays - ASPHALT	5
17	Rehab - ASPHALT	6
23	Crack Repairs - ST	2
24	Spot Repairs - ST	3
25	Patching - ST	4
26	Surface Treat -ST	5
27	Asphalt Overlay - ST	6
40	Reconstruction	7
41	Drainage, Good	1
42	Drainage, Fair	4
43	Drainage, Poor	6
99	Reenter - Nonapplicable	0

REPAIR STRATEGIES (*DEFSTRAT.DBF*)

KEY	STRATEGY	VALUE
1	No Work Needed	0
2	Defer Maint.	3
3	Routine Maint.	5
4	Routine Maint.	5
5	Corrective Maint.	4
6	Routine Maint.	5
7	Corrective Maint.	4
8	Rehabilitation	2
13	Preventive Maint.	6
14	Routine Maint.	5
15	Routine Maint.	5
16	Corrective Maint.	4
17	Rehabilitation	2
23	Preventive Maint.	6
24	Preventive Maint.	6
25	Routine Maint.	5
26	Corrective Maint.	4
27	Rehabilitation	2
40	Reconstruction	1
41	Drainage Maint.	6
42	Drainage Rehabs	4
43	Drainage Reconstruct	1

RSMS2003 Cornell Local Roads Program Repair Defaults

SURFACE	REPAIR	CATEGORY	COST ($)	UNITS	LIFE IMPROVEMENT (Months)	PCI IMPROVEMENT (%)
UNPAVED ROADS	4" NEW GRAVEL, GRADE	7	0.97	SY	42	85
	ADD SOME GRAVEL / REGRADE	7	0.23	SY	24	75
	CHIP SEAL OVER GOOD	40	0.91	SY	36	75
	CUT SHOULDERS	42	0.92	LF	24	40
	DEFER WORK	2	0	SY	0	0
	DEMAND PATCHING	5	0.11	SY	12	15
	DITCHING	42	1.64	LF	48	35
	DRAGGING SURFACE	6	0.05	SY	12	60
	DUST CONTROL (SPOT)	3	0.27	SY	12	15
	DUST CONTROL W/ LIQUID	4	1	SY	12	25
	INSTALL UNDERDRAIN	42	2.59	LF	120	35
	PREP BASE AND CHIP SEAL	40	3.43	SY	72	90
	REGRADE (NO NEW MATERIAL)	7	0.14	SY	12	70
	RESET CROWN	6	0.07	SY	18	60
	SPOT REGRAVEL	5	0.08	SY	12	20
	SPOT REGRAVEL(W/ DUST)	5	0.35	SY	18	25
	STABIL.BASE, 6" NEW	40	3	SY	60	90
	STABIL.SURFACE/ GRADE	40	2.15	SY	48	90
SURFACE TREATED ROADS	2.5" OVERLAY	27	4.33	SY	96	85
	ALL NEW 5" ASPHALT,	40	16.01	SY	216	95
	BOX OUT 25% (NO BASE)	24	2.77	SY	48	65
	BOX OUT 25% (W/ BASE)	24	4.4	SY	120	90
	CHIP SEAL (SINGLE)	26	0.81	SY	36	65
	CLEAN GUTTERS	42	0.24	LF	24	10
	CRACK REPAIRS	23	0.99	LF	24	35
	CUT SHOULDERS	42	0.92	LF	24	25
	DEFER WORK	2	0	SY	0	0
	DITCHING	42	1.64	LF	60	20
	INSTALL UNDERDRAIN	42	2.59	LF	120	35
	MICROPAVING (1/2" RUTS)	26	1.33	SY	60	75
	PATCHING	25	0.45	SY	12	20
	REMOVE INSTALL SHOULDERS	43	2.39	LF	60	45
	REPAIR SHOULDERS	43	1.5	LF	36	35
	STABIL.BASE & ASP, S.T.	40	5.62	SY	180	95
	THIN OVERLAY (1")	27	1.84	SY	48	80
ASPHALT ROADS	3" COLD MIX OVERLAY	16	4.25	SY	96	85
	ALL NEW 5" ASPHALT,	40	25	SY	216	90
	BOX OUT 25% (W/ BASE)	17	4.4	SY	120	80
	CLEAN GUTTERS	42	0.24	LF	24	25
	DEFER WORK	2	0	SY	0	0
	DITCHING	42	1.64	LF	60	20
	INSTALL UNDERDRAIN	42	2.59	LF	120	35
	MICROPAVING (1/2" RUTS)	15	1.33	SY	60	75
	REMOVE INSTALL SHOULDERS	43	2.39	LF	60	45
	REPAIR CUBS/CATCH BASINS	43	1.61	LF	60	35
	REPAIR SHOULDERS	43	1.5	LF	36	35
	REPLACE CURBS	43	3.7	LF	120	30
	SEMI-PERMENANT PATCH	14	2.1	SY	36	30
	SLURRY SEAL (TYPE 1)	15	0.96	SY	35	65
	STABIL.BASE & ASP, 2" TOP	17	6.59	SY	180	85
	T & L / 1" OVERLAY	16	2.15	SY	84	80
	THIN OVERLAY (1")	15	1.84	SY	48	65

RSMS Decision Trees (Blank)

RSMS2003 Decision Trees

Repair Cat. ____
pci deduct ____

Decision Trees
Surface ____ Distress ____

SEVERE	EXTENT: LOW	EXTENT: MOD	EXTENT: HIGH
LOW			
MOD			
HIGH			

Decision Trees
Surface ____ Distress ____

SEVERE	EXTENT: LOW	EXTENT: MOD	EXTENT: HIGH
LOW			
MOD			
HIGH			

Decision Trees
Surface ____ Distress ____

SEVERE	EXTENT: LOW	EXTENT: MOD	EXTENT: HIGH
LOW			
MOD			
HIGH			

Decision Trees
Surface ____ Distress ____

SEVERE	EXTENT: LOW	EXTENT: MOD	EXTENT: HIGH
LOW			
MOD			
HIGH			

Decision Trees
Surface ____ Distress ____

SEVERE	EXTENT: LOW	EXTENT: MOD	EXTENT: HIGH
LOW			
MOD			
HIGH			

Decision Trees
Surface ____ Distress ____

SEVERE	EXTENT: LOW	EXTENT: MOD	EXTENT: HIGH
LOW			
MOD			
HIGH			

Decision Trees
Surface ____ Distress ____

SEVERE	EXTENT: LOW	EXTENT: MOD	EXTENT: HIGH
LOW			
MOD			
HIGH			

Decision Trees
Surface ____ Distress ____

SEVERE	EXTENT: LOW	EXTENT: MOD	EXTENT: HIGH
LOW			
MOD			
HIGH			

Decision Trees
Surface ____ Distress ____

SEVERE	EXTENT: LOW	EXTENT: MOD	EXTENT: HIGH
LOW			
MOD			
HIGH			

RSMS Decision Trees (Asphalt)

Decision Trees

Surface 5 Asphalt — Distress 11 Long/Trans Cracks (0-9)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**13**	**13**	**15**
	2	4	6
MOD	**13**	**15**	**15**
	6	8	10
HIGH	**14**	**16**	**17**
	10	12	14

Decision Trees

Surface 5 Asphalt — Distress 12 Alligator Cracks(0-9)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**	**15**	**15**
	2	4	6
MOD	**14**	**14**	**16**
	5	7	9
HIGH	**14**	**17**	**40**
	10	12	15

Decision Trees

Surface 5 Asphalt — Distress 13 Edge Cracking (0-9)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**13**	**13**	**15**
	2	4	6
MOD	**13**	**14**	**15**
	5	6	7
HIGH	**14**	**16**	**17**
	8	10	11

Decision Trees

Surface 5 Asphalt — Distress 14 Patching/Potholes (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**14**	**17**	**17**
	3	**5**	**9**
MOD			
HIGH			

Decision Trees

Surface 5 Asphalt — Distress 15 Rutting (0-9)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**	**16**	**16**
	2	4	6
MOD	**14**	**16**	**17**
	6	7	9
HIGH	**14**	**17**	**40**
	9	11	13

Decision Trees

Surface 5 Asphalt — Distress 16 Bleeding (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**		
	2		
MOD	**16**		
	5		
HIGH	**17**		
	10		

Decision Trees

Surface 5 Asphalt — Distress 17 Drainage (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**41**		
	2		
MOD	**42**		
	5		
HIGH	**43**		
	9		

Decision Trees

Surface 5 Asphalt — Distress 18 Roughness (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**		
	2		
MOD	**16**		
	7		
HIGH	**17**		
	11		

RSMS Decision Trees (Surface Treated)

Decision Trees

Surface 4 Distress 21

S.T. Treatment Condition (0-9)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**	**24**	**26**
	2	4	5
MOD	**24**	**24**	**26**
	4	5	7
HIGH	**25**	**26**	**40**
	9	11	15

Decision Trees

Surface 4 Distress 22

S.T. Alligator Cracks(0-9)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**	**24**	**26**
	2	4	5
MOD	**24**	**25**	**40**
	5	6	7
HIGH	**25**	**25**	**40**
	8	9	11

Decision Trees

Surface 4 Distress 23

S.T. Long/Trans Cracking

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**	**23**	**26**
	2	3	5
MOD	**23**	**23**	**26**
	5	6	7
HIGH	**25**	**25**	**27**
	9	11	13

Decision Trees

Surface 4 Distress 24

S.T. Patching/Potholes (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**25**	**25**	**40**
	2	6	10
MOD			
HIGH			

Decision Trees

Surface 4 Distress 25

S.T. Rutting (0-9)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**	**24**	**27**
	2	4	5
MOD	**25**	**25**	**27**
	5	6	8
HIGH	**25**	**27**	**40**
	9	10	12

Decision Trees

Surface 4 Distress 26

S.T. Bleeding (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**		
	2		
MOD	**27**		
	5		
HIGH	**27**		
	9		

Decision Trees

Surface 4 Distress 27

S.T. Drainage (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**41**		
	2		
MOD	**42**		
	5		
HIGH	**43**		
	10		

Decision Trees

Surface 4 Distress 28

S.T. Roughness (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**		
	2		
MOD	**27**		
	7		
HIGH	**40**		
	12		

RSMS Decision Trees (Unpaved)

Decision Trees

Surface 3 Unpaved — Distress 1 Cross section (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**		
	2		
MOD	**6**		
	10		
HIGH	**7**		
	15		

Decision Trees

Surface 3 Unpaved — Distress 2 Drainage (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**41**		
	2		
MOD	**42**		
	5		
HIGH	**43**		
	15		

Decision Trees

Surface 3 Unpaved — Distress 3 Corrugations (0-9)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**6**	**6**	**6**
	2	5	6
MOD	**6**	**7**	**7**
	7	8	10
HIGH	**7**	**7**	**40**
	10	11	15

Decision Trees

Surface 3 Unpaved — Distress 4 Potholes (0-9)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**5**	**5**	**7**
	2	5	8
MOD	**5**	**7**	**7**
	7	8	9
HIGH	**7**	**7**	**40**
	10	11	14

Decision Trees

Surface 3 Unpaved — Distress 5 Rutting (0-9)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**5**	**6**	**6**
	2	4	7
MOD	**6**	**7**	**7**
	6	8	10
HIGH	**7**	**7**	**40**
	11	13	14

Decision Trees

Surface 3 Unpaved — Distress 6 Loose aggregate (0-9)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**	**6**	**6**
	2	3	4
MOD	**6**	**6**	**6**
	4	5	7
HIGH	**6**	**7**	**7**
	7	8	9

Decision Trees

Surface 3 Unpaved — Distress 7 Dust (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**2**		
	2		
MOD	**3**		
	4		
HIGH	**4**		
	7		

Decision Trees

Surface 3 Unpaved — Distress 8 Roughness (1,4,7)

SEVERITY	EXTENT LOW	EXTENT MOD	EXTENT HIGH
LOW	**6**		
	2		
MOD	**6**		
	6		
HIGH	**7**		
	10		

Maintenance Summary Name:_____ Date:_____

Road Type:

ALL: ☐
Other: ☐
Upaved: ☐
Surface Treated: ☐
Asphalt: ☐
Concrete: ☐
Brick/Block: ☐

Date From: _____
Date To: _____

Priority Factors (Total = 100%)

Importance: 20 - 75% ☐
Roughness: 0 - 66% ☐
Condition: 0 - 33% ☐
Traffic: 20 -75% ☐

Comments: _____

5 YEAR ROAD IMPROVEMENT PLAN Example

Enter the task in priority order from the RSMS prioritized list. Use the annual budget columns to record the cost in a given year. Cumulative cost should be as close to the annual budget amount without going over.

Section Name	Repair Alternative	Cost	Annual Budget $ 100,000				
			Cumulative Cost				
			Year 1	Year 2	Year 3	Year 4	Year 5
Orange Rd	Micropave	$35,000	$35,000				
Watson Rd	Crack Fill	$5,200	$40,200				
Four Rd - 1	Overlay - Thin	$8,000	$48,200				
Four Rd - 4	Overlay - Thin	$15,000	$63,200				
Four Rd - 3	Overlay - Thin	$20,000	$83,200				
Moriarity St	Reconstruct	$95,000		$95,000			
Four Rd - 4	Overlay - Thin	$8,000			$8,000		
Holmes Dr - 2	New Sidewalks	$9,000			$17,000		
League St	Slurry Seal / Drainage	$8,500			$25,500		
Red Rd	Overlay - Thick	$17,000			$42,500		
Alder Blvd	Mill, Rebuild	$20,000			$62,500		
Holmes Dr - 1	Crack Filling	$3,000	$86,200				
Lastrade Ln - 1	Drainage 2 - Overlay	$52,000				$52,000	
London Rd	Curb Replace - Thin Ol	$18,000			$80,500		

5 YEAR ROAD IMPROVEMENT PLAN

Enter the task in priority order from the RSMS prioritized list. Use the annual budget columns to record the cost in a given year. Cumulative cost should be as close to the annual budget amount without going over.

Section Name	Repair Alternative	Cost	Annual Budget $				
			Cumulative Cost				
			Year 1	Year 2	Year 3	Year 4	Year 5

RSMS Report Information Listing

RSMS Reports should include the following:

1. Cover letter (target audience is the elected board)
2. Table of contents
3. Executive summary (1 to 2 page introduction and summary)
4. Detailed description of the project parameters used
5. Map of roadway sections
6. Inventory data
7. Condition data
8. Sample condition survey sheet with an explanation
9. Repair alternatives
10. Decision trees
11. 5-year capital plan
12. Appendix of detailed reports not included in the main report
13. Anything else needed to make the report complete

APPENDIX B - RATING OF ROAD SURFACE DISTRESSES

The RSMS program involves identifying types of road surface distress characteristics, measuring or estimating the SEVERITY of distress, and assessing the EXTENT of the severity within a section of road. The distresses are identified visually and the affected area is estimated as a percentage of the road surface. A brief explanation of how the severity and extent is determined for each distress type is provided in section B.1 through B.3.

Both the SEVERITY and the EXTENT of road surface distresses are rated on a pre-established scale. The term "SEVERITY" applies to the degree of deterioration of the various types of distress that are described; the term "EXTENT" refers to the frequency of occurrence, or amount of road surface subjected to a particular distress.

Types of distress for flexible pavements addressed in this appendix are:

- Longitudinal/Transverse Cracking
- Alligator Cracking
- Patching/Potholes
- Edge Cracking
- Drainage
- Roughness
- Rutting
- Bleeding

Types of distress for surface-treated pavements addressed in this appendix are:

- Treatment Condition
- Longitudinal/Transverse Cracking
- Alligator Cracking
- Patching/Potholes
- Rutting
- Bleeding
- Drainage
- Roughness

Types of distresses for unpaved roads addressed in this appendix are:

- Cross Section
- Roadside Drainage
- Corrugations
- Dust
- Potholes
- Ruts
- Loose Aggregate
- Roughness

Note: Users are not limited to the distresses listed above. Distresses may be added or deleted in the DEFDIS.DBF file

Longitudinal/Transverse Cracking

Longitudinal cracks are cracks that run parallel to the roadway centerline. Longitudinal cracks are usually found at construction joints and between lanes. Transverse cracks run perpendicular to the roadway centerline. Transverse cracks are generally spaced at regular intervals and caused by expansion and contraction of the road surface material.

Both types of cracks can also be reflective, appearing above joints and cracks in underlying pavements.

NO DEFECT:		The road section has no visible signs of longitudinal/transverse cracking.
SEVERITY:	LOW	Hairline cracks with little or no spalling (width of pencil tip).
	MODERATE	Crack widths up to 1/4" in width with some spalling evident (width of pencil).
	HIGH	Well-defined cracks filled with foreign material (sand, stones, etc.). Extensive spalling and breakage. (See note 3.)
EXTENT:	LOW < 10%	The overall length of longitudinal cracking is less than 10% of the section length and/or transverse cracks are 50' apart.
	MOD. 10-30%	The overall length of longitudinal cracking is between 10% and 30% of the total section length and/or transverse cracks are between 25' and 50' apart.
	HIGH > 30%	The overall length of longitudinal cracking is over 30% of the total section length and/or transverse cracks are less than 25' apart.

NOTES:

1. Spalling refers to the physical relocation and/or displacement of pieces of original pavement.
2. Transverse cracks must extend across at least one full lane width to be counted as transverse. Cracks limited to wheel paths, typically alligator cracks, are not included in this category.
3. Multiple (parallel) cracks within 8" of a primary crack are considered as part of the primary crack

Alligator Cracking

Alligator cracking refers to interconnected crack patterns that resemble alligator skin or chicken wire. Pavement pieces range in size from one to six inches on a side.

NO DEFECT:		The road section has no visible signs of alligator cracking or the total area exhibiting cracking comprises less than 1% of the entire section
SEVERITY:	LOW	Crack pattern is just beginning to appear. Cracks have no measurable width and no actual pavement separation is found.
	MODERATE	Easily discernible cracking with measurable crack widths up to 1/8" and some breakup. Pavement pieces, while loose, are still interconnected.
	HIGH	Wide cracking (1/8") has resulted in major pavement breakup with loose pieces actually displaced.
EXTENT:	LOW < 10%	The total area exhibiting alligator cracking encompasses more than 1% and less than 10% of the roadway section.
	MOD. 10-30%	The total area exhibiting alligator cracking encompasses between 10% and 30% of the roadway section.
	HIGH > 30%	The total area exhibiting alligator cracking encompasses greater that 30% of the roadway section.

NOTES:

1. When alligator cracking is the primary distress, it is generally related to traffic loading. As such, alligator cracking will be found primarily in wheel paths.

2. It is important that surveyors be aware of the distinction between alligator cracking and the other primary distresses of edge cracking, longitudinal/transverse cracking, and rutting. This is critical to the program for selecting viable repair strategies.

Patching/Potholes

Patching refers to areas where the original pavement has been removed and subsequently replaced but is showing deterioration. Potholes are areas where portions of the road pavement have broken and loss of pavement has resulted in a bowl-shaped depression.

NO DEFECT:		No patched or potholes detected in the rated section.
EXTENT:	LOW < 10%	The total area of patching is less than 10% of the total section area and/or there are fewer that 5 potholes per 100' of section length.
	MOD. 10-30%	The total area of patching is between 10% and 30% of the total section area and/or there are between 5 and 10 potholes per 100' of section length.
	HIGH > 30%	The total area of patching is greater that 30% of the total section area and/or there are more than 10 potholes per 100' of section length.

NOTES:

1. Edge cracks, spalling of longitudinal/transverse cracks, and displacement of alligator cracks are not counted as potholes.

2. Only patches that show deterioration should be evaluated. Good patches should be ignored. Frost heaves, including culverts that are protruding and rocks that are coming up through the surface, should be included. Surface area, rather than depth of deterioration, should be used to assess extent.

Edge Cracking

Edge cracking refers to cracks adjacent and parallel to the edge of the pavement. While generally confined to the outer one to two feet of pavement, edge cracking can progress into the travel lane.

NO DEFECT:		The roadway does not exhibit edge cracking.
SEVERITY:	LOW	Cracking evident; however, no breakup. Crack widths < 1/8" and confined to 12" from the edge pavement.
	MODERATE	Multiple cracking occurring with some breakup or raveling. Cracks extend up to 24" into pavement.
	HIGH	Extensive cracking beyond 24" into roadway; breakup. This condition closely resembles alligator cracking.
EXTENT:	LOW < 10%	The total section length effected by cracking is less than 10% of the section length.
	MOD. 10-30%	The total section length effected by cracking is between 10% and 30% of the section length.
	HIGH > 30%	The total section length effected by cracking is more than 30% of the section length.

NOTE:

Raveling is the progressive loss of bituminous pavement materials from the road surface.

Drainage

Drainage severities are judged by the ability for run-off to flow from the paved area to a location that does not influence roadway conditions. Visual indicators of drainage problems include accumulation of debris and sand and high water marks. Evaluation during or just after a rainfall event can be extremely beneficial.

CONDITION:	GOOD	There is no evidence of water accumulation on the pavement surface. Roadway has good crown. Positive drainage can be visually confirmed. Ditches, gutters, and other drainage structures are clear, clean and functioning.
	FAIR	There is evidence of occasional water accumulation on the pavement surface. Road crown is minimal. Ditched, gutters and other drainage surfaces are functional though probably need maintenance.
	POOR	There is evidence of recurring and extensive ponding of water on the pavement surface. Roadway has no crown. Ditches, gutters, and other drainage structures are not functioning or non-existent.

NOTES:

Sure signs of poor drainage include:

1. Road shoulders above the edge of pavement.
2. Standing water.
3. Outwashes or accumulations of sand along the edge of the roadway.

Roughness

Pavement roughness is defined as irregularities in the roadway surface which adversely affects the comfort of the ride.

CONDITION:	GOOD	Road has even surface - ideal for smooth, undisturbed travel. New roads and recent resurfacing generally fall into this category. (There may be minor distortions not noticeable to the typical rider.)
	FAIR	Noticeable unevenness, but vehicle may continue safely at posted speeds. Sags, humps, and frost heaves have not yet become hazardous.
	POOR	Pavement surface is very uneven, causing a safety hazard for vehicles traveling at the posted speed limit.

NOTES:

1. Assessment of roughness should be determined while the survey vehicle is traveling at posted speeds.
2. This category is also a "catch-all" for conditions which are not included in other categories - i.e., corrugations, waves, frost heaves, settlement, etc.

Rutting

Rutting refers to channels in the wheel paths. Rutting causes water to drain along the road surface rather than drain to the edge of the road.

NO DEFECT:		No visible rutting in the rated section.
SEVERITY:	LOW	Depth of rut is less than 1/2".
	MODERATE	Ruts are between 1/2" and 1" deep.
	HIGH	Ruts are greater than 1" deep and water is held on roadway surface.
EXTENT:	LOW < 10%	Less than 10% of the total road surface is covered by rutting.
	MOD. 10 - 30%	Between 10% and 30% of the total road surface is covered by rutting.
	HIGH > 30%	More than 30% of the total road surface is covered by rutting.

NOTE:

Tire path wear caused by snow tires with chains is not the same as rutting, but should be recorded in the Roughness or Patching/Potholes Categories.

Bleeding

Bleeding refers to excess asphalt material on the surface of the roadway. Bleeding can be a safety problem due to decreased skid resistance.

CONDITIONS:	GOOD	No bleeding or only very isolated spots of bleeding are seen.
	FAIR	Road surface has bleeding over more than 5% of surface.
	POOR	Road surface has bleeding over more than 30% of the surface.

NOTE:

Severe bleeding which would cause an immediate safety problem should be fixed as soon as it is noted.

Longitudinal/Transverse Cracking

Longitudinal cracks are cracks that run parallel to the roadway centerline. Longitudinal cracks are usually found at construction joints and between lanes. Transverse cracks run perpendicular to the roadway centerline. Transverse cracks are generally spaced at regular intervals and caused by expansion and contraction of the road surface material.

Both types of cracks can also be reflective, appearing above joints and cracks in underlying pavements.

NO DEFECT:		The road section has no visible signs of longitudinal/transverse cracking.
SEVERITY:	LOW	Hairline cracks with little or no spalling (width of pencil tip).
	MODERATE	Crack widths up to 1/4" in width with some spalling evident (width of pencil).
	HIGH	Well-defined cracks filled with foreign material (sand, stones, etc.). Extensive spalling and breakage. (See note 3.)
EXTENT:	LOW < 10%	The overall length of longitudinal cracking is less than 10% of the section length and/or transverse cracks are 50' apart.
	MOD. 10-30%	The overall length of longitudinal cracking is between 10% and 30% of the total section length and/or transverse cracks are between 25' and 50' apart.
	HIGH > 30%	The overall length of longitudinal cracking is over 30% of the total section length and/or transverse cracks are less than 25' apart.

NOTES:

1. Spalling refers to the physical relocation and/or displacement of pieces of original pavement.
2. Transverse cracks must extend across at least one full lane width to be counted as transverse. Cracks limited to wheel paths, typically alligator cracks, are not included in this category.
3. Multiple (parallel) cracks within 8" of primary crack are considered as part of the primary crack.

Alligator Cracking

Alligator cracking refers to interconnected crack patterns that resemble alligator skin or chicken wire. Pavement pieces range in size from one to six inches on a side.

NO DEFECT:		The road section has no visible signs of alligator cracking or the total area exhibiting cracking comprises less than 1% of the entire section
SEVERITY:	LOW	Crack pattern is just beginning to appear. Cracks have no measurable width and no actual pavement separation is found.
	MODERATE	Easily discernible cracking with measurable crack widths up to 1/8" and some breakup. Pavement pieces, while loose, are still interconnected.
	HIGH	Wide cracking (1/8") has resulted in major pavement breakup with loose pieces actually displaced.
EXTENT:	LOW < 10%	The total area exhibiting alligator cracking encompasses more than 1% and less than 10% of the roadway section.
	MOD. 10-30%	The total area exhibiting alligator cracking encompasses between 10% and 30% of the roadway section.
	HIGH > 30%	The total area exhibiting alligator cracking encompasses greater that 30% of the roadway section.

NOTES:

1. When alligator cracking is the primary distress, it is generally related to traffic loading. As such, alligator cracking will be found primarily in wheel paths.

2. It is important that surveyors be aware of the distinction between alligator cracking and the other primary distresses of edge cracking, longitudinal/transverse cracking, and rutting. This is critical to the program for selecting viable repair strategies.

Patching/Potholes

Patching refers to areas where the original pavement has been removed and subsequently replaced but is showing deterioration. Potholes are areas where portions of the road pavement have broken and loss of pavement has resulted in a bowl-shaped depression.

NO DEFECT:		No patched or potholes detected in the rated section.
EXTENT:	LOW < 10%	The total area of patching is less than 10% of the total section area and/or there are fewer that 5 potholes per 100' of section length.
	MOD. 10-30%	The total area of patching is between 10% and 30% of the total section area and/or there are between 5 and 10 potholes per 100' of section length.
	HIGH > 30%	The total area of patching is greater that 30% of the total section area and/or there are more than 10 potholes per 100' of section length.

NOTES:

1. Edge cracks, spalling of longitudinal/transverse cracks, and displacement of alligator cracks are not counted as potholes.

2. Only patches that show deterioration should be evaluated. Good patches should be ignored. Frost heaves, including culverts that are protruding and rocks that are coming up through the surface, should be included. Surface area, rather than depth of deterioration, should be used to assess **EXTENT**.

Treatment Condition

Treatment Condition refers to the quality and condition of the surface treatment. Loose surface aggregate, and sections of missing surface treatments are signs of treatment failure.

NO DEFECT:		The surface treatment is in new or like new condition.
SEVERITY:	LOW	Some minor loss of stone from the surface.
	MODERATE	Loss of aggregate from the surface. Evidence of some breaking of the seal of the surface treatment.
	HIGH	Complete failure of the surface treatment. The base is completely exposed.
EXTENT:	LOW < 10%	Less than 5% of the surface has aggregate loss or treatment failure.
	MOD. 10-30%	Between 5% and 30% of the surface has aggregate loss or treatment failure.
	HIGH > 30%	More than 30% of the surface has aggregate loss or treatment failure.

NOTE:

Potholes formed in areas of missing treatments should be rated at potholes. Treatment condition refers to failure of the treatment, not potholes damaging the surface.

Drainage

Drainage severities are judged by the ability for run-off to flow from the paved area to a location that does not influence roadway conditions. Visual indicators of drainage problems include accumulation of debris and sand and high water marks. Evaluation during or just after a rainfall event can be extremely beneficial.

CONDITION:	GOOD	There is no evidence of water accumulation on the pavement surface. Roadway has good crown. Positive drainage can be visually confirmed. Ditches, gutters, and other drainage structures are clear, clean and functioning.
	FAIR	There is evidence of occasional water accumulation on the pavement surface. Road crown is minimal. Ditched, gutters and other drainage surfaces are functional though probably need maintenance.
	POOR	There is evidence of recurring and extensive ponding of water on the pavement surface. Roadway has no crown. Ditches, gutters, and other drainage structures are not functioning or non-existent.

NOTES:

Sure signs of poor drainage include:

1. Road shoulders above the edge of pavement.
2. Standing water.
3. Outwashes or accumulations of sand along the edge of the roadway.

Roughness

Pavement roughness is defined as irregularities in the roadway surface which adversely affects the comfort of the ride.

CONDITION:	GOOD	Road has even surface - ideal for smooth, undisturbed travel. New roads and recent resurfacing generally fall into this category. (There may be minor distortions not noticeable to the typical rider.)
	FAIR	Noticeable unevenness, but vehicle may continue safely at posted speeds. Sags, humps, and frost heaves have not yet become hazardous.
	POOR	Pavement surface is very uneven, causing a safety hazard for vehicles traveling at the posted speed limit.

NOTES:

1. Assessment of roughness should be determined while the survey vehicle is traveling at posted speeds.
2. This category is also a "catch-all" for conditions which are not included in other categories - i.e., corrugations, waves, frost heaves, settlement, etc.

Rutting

Rutting refers to channels in the wheel paths. Rutting causes water to drain along the road surface rather than drain to the edge of the road.

NO DEFECT:		No visible rutting in the rated section.
SEVERITY:	LOW	Depth of rut is less than 1/2".
	MODERATE	Ruts are between 1/2" and 1" deep.
	HIGH	Ruts are greater than 1" deep and water is held on roadway surface.
EXTENT:	LOW < 10%	Less than 10% of the total road surface is covered by rutting.
	MOD.10 - 30%	Between 10% and 30% of the total road surface is covered by rutting.
	HIGH > 30%	More than 30% of the total road surface is covered by rutting.

NOTE:

Tire path wear caused by snow tires with chains is not the same as rutting, but should be recorded in the Roughness or Patching/Potholes Categories.

Bleeding

Bleeding refers to excess asphalt material on the surface of the roadway. Bleeding can be a safety problem due to decreased skid resistance.

CONDITIONS:	GOOD	No bleeding or only very isolated spots of bleeding are seen.
	FAIR	Road surface has bleeding over more than 5% of surface.
	POOR	Road surface has bleeding over more than 30% of the surface.

NOTE:

Severe bleeding which would cause an immediate safety problem should be fixed as soon as it is noted.

Cross Section - Proper Crown

Cross section condition is judged by the ability for run-off to flow from the roadway to a location that does not influence roadway conditions. Visual indicators of drainage problems include accumulation of debris and sand and high water marks. Evaluation during or just after a rainfall event can be extremely beneficial.

CONDITION:	GOOD	There is little or no ponding water or evidence of ponding water. There is little or no evidence of water accumulation on the roadway surface. The roadway has good crown.
	FAIR	Moderate amounts of ponding water or evidence of ponding water on the road surface. There is evidence of occasional water accumulation on the road surface. Road crown is minimal or completely flat, i.e. no cross-slope.
	POOR	Large amounts of ponding water or evidence of ponding water on the road surface or severe depressions in the road surface. There is evidence of recurring and extensive ponding of water on the roadway surface. Roadway has no crown.

NOTES:

1. Improper cross section results when there is not sufficient slope to drain all water from the road surface.

2. Curves are often superelevated or banked in higher traffic volume locations. The use of super-elevation at curves may lead to potholes and road surface drainage problems at the transition between the normal crown section and the superelevated section. Superelevation may be avoided by increasing the radius of curvature of the road.

Inadequate Roadside Drainage

Poor roadside drainage occurs when the ditches, culverts, or shoulders are not in good enough condition to direct and carry runoff water away from the road.

CONDITION:	GOOD	Small amounts of ponding water or evidence of ponding water along the sides of the roads, or small amounts of overgrowth or debris along the sides of the roads. Positive drainage can be confirmed visually. Ditches, gutters, and other drainage structures are clear, clean, and functioning.
	FAIR	Moderate amounts of ponding water or evidence of ponding water along the sides of the roads, or moderate amounts of overgrowth or debris along the sides of the roads, or some erosion of ditches into the shoulders or roadway. Ditches, gutters, and other drainage structures are functional, though probably need maintenance.
	POOR	Large amounts of ponding water or evidence of ponding water along the sides of the roads, water running across or down the road, large amounts of overgrowth or debris along the sides of the roads, or erosion of ditches into the shoulders or roadway. Ditches, gutters and other drainage structures are not functioning or non-existent.

NOTES:

1. Inadequate Roadside Drainage must not be confused with Improper Cross Section. Improper Cross Section relates to the drainage of the roadway itself, while Inadequate Roadside Drainage relates to the ability of the area adjacent the road to carry runoff away from the roadway.

2. Signs of poor drainage include standing water, outwashes, or accumulations of sand along the edge of the roadway.

Corrugations

Corrugations, or washboarding, are closely spaced ridges and valleys, spaced at fairly regular intervals. These ridges and valleys are perpendicular to the travel direction.

NO DEFECT:		No corrugations in the rated section.
SEVERITY:	LOW	Corrugations less than 1" deep.
	MODERATE	Corrugations between 1" and 3" deep.
	HIGH	Corrugations are deeper than 3" (width of baseball bat).
EXTENT:	LOW < 10%	Less than 10% of the total road surface is covered by corrugations.
	MOD. 10-30%	Between 10% and 30% of the total road surface is covered by corrugations.
	HIGH > 30%	More than 30% of the total road surface is covered by corrugations.

NOTES:

1. Corrugations are often caused by traffic and loose aggregate.
2. Corrugations usually form on hills, curves, acceleration or deceleration areas, or in areas where the road is soft or potholed.

Dust

Dust creates a hazard to trailing or passing vehicles and cause significant environmental problems. In addition, the loss of fine materials can result in the larger particles becoming unstable.

CONDITION:	LIGHT	Normal traffic produces a thin dust that does not obstruct visibility.
	MEDIUM	Normal traffic produces a moderately thick cloud that partially obstructs visibility and causes traffic to slow down.
	HEAVY	Normal traffic produces a very thick cloud that severely obstructs visibility and causes traffic to slow down significantly or stop.

NOTE:

Dust is measured at the posted speed.

Potholes

Potholes are areas where portions of the road surface have been worn away, and loss of material has resulted in a bowl-shaped depression.

NO DEFECT:		No potholes detected in the rated section.
SEVERITY:	LOW	Potholes are less than 1" deep and/or are less than one foot in diameter.
	MODERATE	Potholes are between 1" and 3" deep and/or are more than two feet in diameter.
	HIGH	Potholes are deeper than 3" and/or are more than two feet in diameter.
EXTENT:	LOW < 10%	The total area of potholes is less than 10% of the total road surface area and/or there are fewer than 5 potholes per 100' of section length.
	MOD>10 - 30%	The total area of potholes is between 10% and 30% of the total road surface area and/or there are between 5 and 10 potholes per 100' of section length.
	HIGH > 30%	The total area of potholes is greater than 30% of the total road surface area and/or there are more than 10 potholes per 100' of section length.

Rutting

Rutting refers to channels in the wheel paths. Rutting causes water to drain along the road surface rather than to drain to the edge of the road.

NO DEFECT:		No visible rutting in the rated section.
SEVERITY:	LOW	Depth of rut is less than 1".
	MODERATE	Ruts are between 1" and 3" deep.
	HIGH	Ruts are greater than 3" deep.
EXTENT:	LOW < 10%	Less than 10% of the total road surface is covered by rutting.
	MOD.10 - 30%	Between 10% and 30% of the total road surface is covered by rutting.
	HIGH > 30%	More than 30% of the total road surface is covered by rutting.

NOTE:

Ruts are caused by a permanent deformation in any of the road layers or subgrade. Ruts result from repeated vehicle passes when the road is soft. Significant rutting can destroy a road.

Loose Aggregate

Traffic loosens aggregate particles and moves these particles into berms along the shoulders or center of the roadway.

NO DEFECT:		No loose aggregate in the rated section.
SEVERITY:	LOW	Loose aggregate on the road surface, or berm of aggregate, less than 2" deep, on the shoulders or center of the roadway.
	MODERATE	Moderate aggregate berm, between 2" and 4" deep, on the shoulders or center of the roadway. A large number of fine soil particles may be found on the roadway surface.
	HIGH	Large aggregate berm, greater than 4" deep, on the shoulders or center of the roadway.
EXTENT:	LOW < 10%	Loose aggregate covers less than 10% of the road surface.
	MOD. 10 - 30%	Loose aggregate covers more than 10% and less than 30% of the total road surface.
	HIGH > 30%	Loose aggregate covers more than 30% of the total road surface.

Roughness

Pavement roughness is defined as irregularities in the roadway surface that adversely affect the comfort of the ride.

CONDITION:	GOOD	Road has even surface - ideal for smooth, undisturbed travel. New roads and recent resurfacing generally fall into this category. (There may be minor distortions not noticeable to the typical rider.)
	FAIR	Noticeable unevenness, but vehicle may continue safely at posted speeds. Sags, humps, and frost heaves have not yet become hazardous.
	POOR	Pavement surface is very uneven, causing a safety hazard for vehicles traveling at the posted speed limit.

NOTES:

1. Assessment of roughness should be determined while the survey vehicle is traveling at posted speeds.

2. This category is also a "catch-all" for conditions which are not included in other categories - i.e., waves, frost heaves, settlement, etc.

Appendix K

Software Disks

1. **RSMS Program Disk**
2. **Data Disk**
   - **RSMS Data Files**
   - **Cost Estimation Spreadsheet Files**