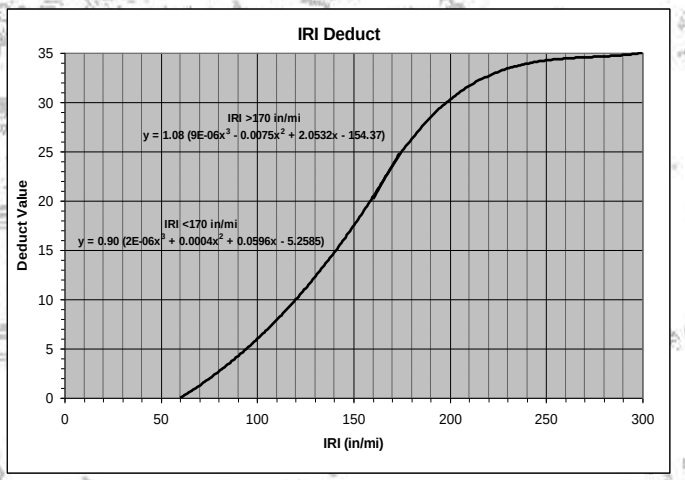
NYSDOT Network Level

Pavement Condition Assessment

V2.0w

- Surface Distress Rating
- Ride Quality (IRI)
- Pavement Condition Index



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NEW YORK STATE DEPARTMENT OF TRANSPORTATION
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New York State Department of Transportation

Network Level Pavement Condition Assessment

Preface

This document describes the procedures used by the New York State Department of Transportation (NYSDOT) to assess and quantify network-level pavement condition. There are four general facets of pavement condition: surface distress, ride quality, structural capacity and friction. Because the data collection tools currently available to measure structural capacity and friction are not efficient for network-level data collection, the NYSDOT condition assessment procedures are limited to certain surface distresses and to ride quality. Network-level data for these condition factors is readily available through ongoing data collection programs.

Information about pavement condition and performance is critical to the decision making that occurs to successfully manage highway pavements. Accurate and timely data is used to assess system performance and deterioration, identify maintenance and reconstruction needs, and determine financing requirements. The annual assessment and reporting of pavement conditions is required by the New York State Highway Law (§ 2 Section 10).

NYSDOT has assessed pavement surface distress information annually on 100% of the state highway system using a visual windshield rating system since 1981. The original paper-based collection procedure was replaced in 2004 with the E-Score electronic recording system. The rating procedure and E-Score operating details are described in detail in this manual.

Beginning in 2003, the Department has collected ride quality data (IRI) and measurements of rut depth and fault height through the high speed profiler program. Profiler data is collected annually on the Interstates and about every two years on the remainder of the system. This additional information and the Pavement Surface Distress Rating are used individually to assess various aspects of pavement performance, and are used collectively in the Pavement Condition Index (PCI) to obtain a comprehensive measure of pavement condition. Profiler data (IRI, rut and fault) and PCI are also described later in this document.

Pavement data collection activities are managed by the Pavement Data Services Section of the Highway Data Services Bureau, Office of Technical Services. Questions regarding the Surface Distress and High Speed Profiler Surveys and results can be directed to the Pavement Data Services staff.

Pavement Data Services
New York State Department of Transportation
50 Wolf Road, POD 32
Albany, New York 12232
518-457-1965

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Network Level Pavement Condition Assessment

Introduction

The New York State Department of Transportation, in cooperation with the Federal Highway Administration (FHWA), collects a variety of information used to assess the condition of highway pavements. This includes an assessment of surface distress, ride quality, Rutting and Faulting. The data is collected to provide generalized information about the distresses observed on the surface of a pavement and the performance of the pavement with respect to ride quality. This information is the primary input to network level condition assessments, performance trend analyses, needs assessments and program level decision making.

Two separate surveys are used to collect pavement condition data. First, a windshield survey is used to collect the severity and extent of surface cracking and other specific types of distress in the pavement. The windshield survey is also used to update roadway characteristics and inventory information, such as pavement type, number of lanes, type and width of shoulder, etc. The windshield survey is conducted annually by teams of raters from each regional office on 100% of the Touring Routes and Reference Routes. The New York State Thruway also provides a rating team to survey the Thruway. Surface Ratings are assessed for the travel lanes only (not the shoulders) in both directions, except on divided highways where the ratings apply to the primary direction (northbound and eastbound).

The second survey is conducted using high speed profilers operated by Department staff and supplemented with contractual services. The high speed profiler survey measures ride quality using the International Roughness Index (IRI), rut depth and fault height. In addition, the profiler collects forward and side view digital images of the road and right of way, and has the capability to measure radius of curve, cross-slope and grade. Profiler data is collected annually in both directions on the Interstates, including the Thruway, and about every two years on the balance of the system.

Once candidate projects are identified from the network-level data, a more detailed project-level assessment is conducted to determine the specific pavement treatment. The project-level assessment and development of the Pavement Evaluation and

Treatment Selection Report (PETSR) is beyond the scope of this document, but is thoroughly described in Chapter 2 of the Comprehensive Pavement Design Manual.

This document provides details of the Surface Distress Rating Survey and the profiler data used to describe pavement condition. First addressed is background information about the linear referencing system and data file organization. The survey procedure is described in detail, and specific instructions to raters for conducting the survey with E-Score are presented. Instructions for interpreting and using profiler data (IRI, etc.), and calculation and use of the Pavement Condition Index (PCI) follow.

The Appendices contain additional information for assigning ratings, data file code descriptions, operating details for E-Score and an expanded picture rating scale.

The Pavement Surface Rating Survey

General Surface Rating Procedures

The network level Pavement Surface Rating Survey is conducted by region-based crews consisting of a driver and a rater. While traveling at the posted speed limit, the rater will make two assessments of each pavement segment: (1) assign a condition rating from “1” (impassable) to “10” (new) based on the distresses appearing on the pavement surface, and (2) identify the presence of specific types of distresses called Dominant Distresses.

The Pavement Surface Rating is based on the severity and extent of cracking on the surface of the pavement. The rater will assign a rating based on a comparison of what is seen on the pavement to photographs of pavements at each rating point. The rating of the photograph most closely representing the average condition of the rating segment is assigned. Only integer scale values are used; partial or half-values are not allowed. The Surface Ratings are categorized as follows:

Rating	Condition/Description
9-10	Excellent - No surface distress.
7-8	Good – Surface distress beginning to show.
6	Fair – Surface distress is clearly visible.
1-5	Poor – Distress is frequent and severe.
U	Under Construction – not rated due to ongoing work

Appendix E contains a table with additional descriptions of the severity and extent of cracking for each rating, and key criteria that occur at each rating. Appendix F contains an expanded picture scale with several examples across the range of each pavement rating to assist rating pavements near the boundaries of rating values.

The E-Score electronic recording system is used to record the field data. The raters enter updates to pavement ratings and inventory characteristics by a touch-screen on a tablet computer. The system uses a distance measuring instrument (DMI) and GPS to link actual field location with the related record in the pavement information database and displays values from each rating segment as the system moves along the road. Built-in business rules improve data quality by preventing mismatched data types or unexpected values. The electronic collection and manipulation of the incoming data greatly improves the quality and efficiency of the survey.

The Pavement Surface Rating Survey is conducted within a “snapshot” time window of about 4-6 weeks in May and June of each year. The results are compiled and analyzed through the summer, and a summary pavement report is issued usually in the fall. The survey results represent the condition of the pavement system in June, so work completed after the highways are surveyed will be accounted for in the following year’s survey.

It is important to reiterate that the Surface Rating is based only on the severity and extent of cracking on the pavement surface. The Surface Rating does not reflect type of crack nor its location or orientation, nor does it include other types of distress such as flushing, shoving, raveling, rutting or faulting. The Surface Rating also is not influenced by ride quality; ride quality is measured separately by the high speed profiler program.

Identifying Dominant Distress

The second component of the Surface Rating Survey is to identify if any Dominant Distresses are present. The Dominant Distresses considered in the NYSDOT Rating Procedure are Alligator Cracking, Faulting, Spalling and Widening Dropoff. These specific distresses in the pavement make it necessary for a more significant treatment to be applied to properly rehab the pavement than if the Dominant Distress was not present. Note that the Surface Rating should not be downgraded because of the presence of a Dominant Distress.

The mechanisms that cause structural or performance failures in the pavement (the “Dominant Distresses”) are specific to the type of pavement. For example, it is not logical or possible for Faulting to develop on an asphalt pavement. Therefore Faulting and Spalling occur only to rigid (concrete) pavement, Alligator Cracking to flexible and overlaid pavement, and Widening Dropoff only to overlaid pavement.

When in the field, it may be difficult to differentiate between flexible and overlaid pavements. The E-Score program interface will display the pavement type as it is recorded in the database for the segment being rated. E-Score also has built-in business rules that prevent a mismatch of Dominant Distress and pavement type. E-Score will gray-out the buttons for the Dominant Distresses that do not apply to the pavement type of the rating segment.

When an existing concrete pavement is overlaid, it is important to update the codes in the master database file for pavement type and pavement layer type. If the pavement type is not updated, the E-Score business rules will prevent entering the proper Dominant Distress because the system will think there is a pavement type – distress type mismatch. Refer to Appendix A for more detail of the code definitions and their relationship.

Photographs of the Dominant Distresses are provided in Appendix G. More detailed descriptions of the Dominant Distresses are provided below.

Faulting

Faulting is the vertical displacement of abutting slabs at transverse joints or mid-slab cracks. The displacement across the joints or cracks first begins by making a clicking noise on the tires, and likely will progress to a noticeable bump. When the bump becomes noticeable as the vehicle crosses the fault (about 0.2 in. height differential), Faulting should be noted on the rating segment.

Faulting is reported simply as “present” when it is observed on a pavement. Actual fault height is measured as part of the high speed profiler program and will eventually replace the need to record Faulting as a Dominant Distress in the Surface Rating Survey.

Spalling

There are two types of Spalling that can occur on a PCC pavement: joint spalling and mid-slab spalling.

Joint spalling occurs when the joint between concrete slabs becomes filled with incompressible material (sand, etc.). The joint is then unable to move enough to absorb the expansion of the slabs in the summer heat, and very high compressive forces cause the concrete to break. The loose concrete eventually is dislodged by the traffic and deep holes are left in the pavement.

Mid-slab spalling occurs usually as a result of the steel mesh reinforcement in the concrete being placed too close to the surface during construction. Chlorides leach into the concrete and over time the steel reinforcement expands due to corrosion and pops out the concrete on the surface. This leaves fairly shallow, randomly occurring holes on the pavement surface.

When Spalling is present, it is identified as being “isolated” (Si) if it occurs on less than 20% of the length of the segment, or “general” (Sg) if it occurs on more than 20% of the length.

Alligator Cracking

Alligator Cracking is defined as interconnected cracks in the wheelpath forming a series of small polygons resembling an alligator's hide. Alligator Cracking is a fatigue-related distress that

occurs only on areas of the pavement subject to traffic loads. Raters take care to distinguish this fatigue cracking from other advanced cracking that may look like Alligator Cracking but is not load related, such as deteriorated longitudinal paving joints. Therefore, Alligator Cracking is identified as a Dominant Distress only if it is in the wheelpath.

Alligator Cracking may first appear as a single [reflective] crack along the wheelpath. Even though the interconnected cracks typical of the distress have not yet developed, the crack still should be called Alligator Cracking because it is in the wheelpath and therefore assumed to be load related. The severity of the Alligator Cracking can be inferred from the Surface Rating.

Alligator Cracking is identified as “isolated” (Ai) if it occurs on less than 20% of the length of the segment, or “general” (Ag) if it occurs on more than 20% of the length.

Widening Drop-Off

Widening Drop-off occurs when old concrete slabs are overlaid and widened with asphalt. The asphalt frequently cracks and settles at the underlying concrete slab edge and a vertical displacement forms. This displacement usually develops secondary surface cracking along the edge of the underlying concrete slab.

Widening Drop-off is noted as present and low severity (Wl) when the cracks are clearly visible along the underlying slab edge. The Widening Drop-off is noted as high severity (Wh) when the vertical displacement is great enough to be noticeable when crossed by the vehicle tire.

Quality Assurance Measures

Several measures are taken each year in the design of the survey procedures and the review of data to ensure the information collected is high quality.

All rating teams attend a training and review session in the spring prior to the start of the field survey. The raters are taken through various office and field exercises to ensure consistency with the procedures and the rating scale. Raters are evaluated and

provided guidance on how to “calibrate” themselves if their ratings consistently differ from the generally accepted ratings.

The E-Score program contains many real-time edit checks to ensure the data at the time of collection is consistent and compatible with various business rules. Rigorous review and data checking procedures are performed on the collected data to identify any problems or bias in the data.

Cases of one-point rating increases when no work is done (attributable to rater variability) are carefully reviewed and adjusted when the increase is inconsistent with the rating trend for the segment.

Approximately 10% of each region’s highways are re-rated by main office staff in a shadow rating survey. The shadow ratings are compared to the region’s ratings to identify any bias in a region’s ratings.

Special Considerations for Assessing Surface Rating

There are certain field conditions that may be encountered that require special consideration when assessing pavement surface condition. The following section provides information on the most commonly occurring special conditions.

Pavement Patching and Repairs

Permanent pavement patches (such as pothole or joint patches) are rated as if they are part of the surrounding pavement and are rated as distress only if the patches are showing distress. A patch can be considered a permanent repair if the edges of the patch are sawcut in straight or clean lines, the assumption being that if the repair crew took the time to sawcut the edges, they probably made a high quality repair that will perform as if it were part of the original pavement. Patches with ragged edges and rounded shapes are considered unimproved pavement with distress.

When maintenance “skip” patching or full-lane patches are encountered, the patched section is rated the same as the adjacent “unimproved” portions. If it can be determined that the skip patch is a full depth pavement repair, the patch is considered as if it were original pavement.

Crack Seal

Cracks in the pavement surface often become substantially more visible after they have been sealed. This sometimes causes a rater to rate the pavement lower. To prevent a sudden drop in rating after a crack seal application, the pavement is rated the same rating as the prior year. The segment is continued at the same rating until additional cracking develops, at which time consideration of all the cracking is resumed when assessing the rating.

Thin Overlays

For thin overlays using specialty products such as microsurfacing, slurry seal, chip seal and paver-placed surface treatment (Novachip), the distress in the pavement is rated as it appears at the time of the survey.

Delamination

Delamination occurs when the bond fails between the top layer of pavement and the underlying layers. Pieces of the pavement may peel off or pop out, creating shallow holes that can become quite large in area. Delamination can occur on an asphalt pavement or an overlaid pavement. When rating a pavement with delamination, the rating is assigned as if the delamination was severe cracking.

Bridge Decks

Bridge decks are ignored when rating a pavement. The condition of bridge decks is covered by the Bridge Inspection System. Sometimes an entire rating segment consists of bridge deck. In these special cases, the deck is rated as if it were pavement in order to maintain continuity of the roadway in the data file.

Highways, Referencing System and Roadway Segmentation

Highway Systems in New York

The highway system in New York State is comprised of the Touring Route system, which consists of numbered highways that are owned by the State, and certain roads not owned by the State but signed as Touring Route highways for continuity in driving, and the Reference Route system (commonly called “900 Routes” because of their numbering convention), which is comprised of roads usually owned by the State but are not part of the Touring Route system. The 900 Routes are typically parkways, service roads, roads no longer part of the Touring Route due to realignment, and various other highways under State ownership.

Also part of the New York State highway system, but managed separately, is the New York State Thruway. The Thruway system includes the mainline and the spurs, such as the Garden State Parkway Connector, the Berkshire Spur, and portions of I-95, I-287 and I-190. These highways are included in the Surface Rating and profiler data collection surveys. The county and local level roadway systems in New York are not under the jurisdiction of the Department and generally are not included in the data collection surveys.

Location Referencing System

The Department uses a location referencing system called the “Route-Milepoint System of Control” to uniquely identify any point on a State Highway. This system uses the route number, milepoint from the beginning of the route or the nearest county boundary, and a county order designation.

The referencing system begins with milepoint 0.00 at the beginning of a route. The milepoint increases along the route in the northbound or eastbound direction (Primary direction) until the route crosses a county boundary, at which time the milepoint will re-zero and the county order designation will increment from “01” to “02.” The measuring system continues in this manner, with the county order increasing by one each time a county boundary is crossed and the milepoint is re-zeroed, to the end of the route.

The field Reference Marker system is based on the county order measures. However, Reference Marker measures also re-zero at

city and municipal boundaries. These secondary re-zero points are used to define “Control Segments.” Even though Control Segment breaks are no longer used in the Department’s official highway data inventory system, the field Reference Markers will remain and are not expected to be replaced for the foreseeable future.

The oldest inventory and survey data is in County Order – Control Segment format, with re-zeroing at county and municipal boundaries. The inventory database and Surface Rating Survey changed to County Order format in 2006. From 2003 to 2006, high speed profiler data was collected in continuous milepoint format, with no re-zeros at county boundaries. Beginning in 2007, all data is collected in County Order format.

Rating Segments

Each route is divided into many smaller segments for rating. The segment limits are defined by lengths of the roadway that have similar characteristics, such as pavement type, pavement width, number of lanes, maintenance history and general pavement condition. When one characteristic changes, a new segment is created to preserve the homogeneous nature of the segment. Segments are identified by route number, county order and ending milepoint. The E-Score software is designed to display and update the road characteristics and record pavement ratings according to these predefined segments.

Lengths of rating segments vary from a few hundredths of a mile to several miles. In general, a segment length of about 0.50 to 1.0 mile is optimal. However on highways with long lengths of homogeneous characteristics, particularly interstates, longer segments are acceptable. It becomes more difficult to determine overall pavement condition as segment lengths exceed a couple miles, so raters must pay special attention on very long segments that conditions are in fact uniform across the segment.

It is undesirable to have very short lengths (less than 0.05 mile) because they pass quickly which makes them difficult to rate and document. In addition, the rating on a very short length will have no impact on the overall ratings, and it would be unlikely that a maintenance or rehab project would be initiated for a very short length of pavement. Over time and when possible, very short lengths should be combined with an adjacent segment.

Exceptions to the segment rules are common. If questions arise on how an exception is handled, consult with the Pavement Data Services Section.

Changes to Rating Segment Limits

Most segment limits have evolved over time and generally do not change unless there is an obvious change in a road characteristic or pavement condition.

If construction or realignment has changed the milepoints of several segments since the previous rating, there will likely be too many revisions to milepoints and road characteristics for the changes to be made within the E-Score Program. Consult with Pavement Data Services for details about the method to make revisions directly in the data file.

When possible, construction and realignment changes can be made prior to the survey so that the new route information is included in the E-Score Program's input file. Pre-survey changes are submitted to Pavement Data Services by January 15 to be included in the coming year's survey file. Familiarity with the Region's construction and maintenance programs and knowledge of the routes to be inventoried are useful to identify these types of changes.

Header Records

Header Records are descriptions of key landmarks along a route which help to identify the locations of rating segments. Header records usually identify the intersection with state routes, county roads, county and municipal boundaries and key geographic features.

Many older header records state "Access to…" and refer to the on-ramp of an intersecting route. Current convention specifies that these headers should refer to the center of the overpass or underpass of the intersecting route (if the routes are so configured). Over time the older descriptions and corresponding milepoints should be updated to the current convention.

Route Overlaps

It is common for two or more signed state highways to overlap for short distances or up to several miles. All mileage which is common to two or more routes must have the same number of rating segments and the same segment change-points on all the routes involved. This requires that each route junction be a segment change-point on each route of the overlap. The overlapping segment limits on each route will have a milepoint specific to the individual route, but the length of the overlap must be the same for each route. The synchronization of all the data elements and milepoints is done automatically by RIS.

Conducting the Survey Using E-Score

The following section contains instructions for the Pavement Surface Rating Survey, as well as specific information about using E-Score to conduct the Survey. More detailed information for performing some of the E-Score functions are identified by a superscript number ([1]) which corresponds to notes in Appendix C.

Equipment and Staff Requirements

The Pavement Surface Rating Survey is performed using the E-Score hardware and software system. Specific instructions on operating the E-Score system are given during the annual training session and are not intended to be covered completely by this publication.

Pavement Data Services provides the necessary components of the E-Score system, which includes a tablet computer, in-vehicle mounting tray, GPS antenna, distance measuring instrument (DMI), wiring harness and cables, and other peripheral items, as well as software and data files.

Each region is responsible to provide a suitable vehicle equipped with the wiring harness for the DMI. The vehicle should have sufficient space for the mounting tray and tablet computer, and should be air conditioned to protect the electronics from excessive heat.

The rating survey and inventory update should be performed by a team of at least two people: a lead rater/E-Score operator, and a driver. The lead rater should be thoroughly experienced in condition survey procedures and possess sound knowledge of construction and maintenance of highways. The team should be familiar with the complete highway system in the region, since they will be responsible for scheduling each day's work. It is beneficial for the driver also to be experienced in condition surveys and construction procedures to enhance assistance to and collaboration with the lead rater on assigning ratings.

Annual Input Files

Each survey year, a new data input file will be generated by Pavement Data Services. The annual data input file contains the most recent inventory information. This information is displayed on the E-Score interface. Specific instructions on loading and setting up the file will be provided each year.

System Setup

The E-Score system hardware and software is provided by Pavement Data Services. Instructions for setting up and operating E-Score are provided at the annual training session. It is important that rating crews test and calibrate the DMI (Distance Measuring Instrument) prior to the training session each year to be sure it is working properly.

Route Planning

The Pavement Surface Rating Survey can be conducted only when the pavement is dry. A wet pavement will obscure cracks, and a damp pavement will cause cracks to be highlighted which can cause a downward bias in the rating. To have the most representative and repeatable results, survey only when the pavement is dry. Care should also be taken when traveling directly into the sun when it is low on the horizon so that details of the pavement surface are not obscured.

Daily travel schedules should be planned so that the survey is performed efficiently with a minimum of deadhead travel. The sequence of the routes to be surveyed is not important other than that the sequence leads efficiently from one route to the next. Two-lane roads can be surveyed in the reverse direction to improve travel efficiency. However, any divided highway where both directions cannot be seen clearly must be surveyed in the primary direction.

Entering Ratings

Travel to the start location for the route to be surveyed. Select the appropriate region, county, route and direction on the E-Score display. The “Previous Landmark” box should display the description for the start location. The E-Score system must be started at one of the Landmarks appearing in the “Previous Landmark” drop-down list.

It is good procedure before starting the E-Score system to look at the beginning of the segment to be rated and enter a preliminary rating. This will ensure that a rating will be entered in the file should the first segment be very short and pass quickly. The “Short Segment Warning” may not trigger on the first segment.

The displayed rating can easily be changed before the end of the next longer segment is reached.

Start the E-Score system and assess the pavement surface condition for each segment while traveling at the posted speed limit. Collaboration between the E-Score operator and driver is encouraged. The rating assigned to the segment should be a weighted average of the entire segment of all travel lanes in both directions. Do not include shoulders, ramps, turning lanes or acceleration/deceleration lanes.

The “End of Segment” warning will sound when the end of the segment is approaching and a rating and/or Dominant Distress should be entered. The timing of the “End of Segment” warning can be adjusted in the Utilities menu to provide more or less time, depending on the speed being traveled and the preference of the rater.[1] Progress bars are also visible to track progress through the segment and for the entire route being surveyed. The speed of the progress bars is dependant on the length of the segment and route. The shorter the segment or route, the faster the progress bars will move.

The E-Score display provides input buttons for Surface Ratings ranging from 3 through 10. Surface Ratings lower than 3 on the State highway system are extremely rare. However, should a segment be encountered that is rated less than 3, enter a 3 and make a note of the location (route, milepoint, date and time of day). Then once back at the office, manually edit the output file to the desired rating. Other ratings for the last 10 rating segments can be edited in the field using the “Edit Recent” button.

Divided Highways and Couplets

The surface rating assigned to each segment should include an assessment of both directions of the road. However it may be difficult to see the opposite direction when the road is divided by a wide median or a barrier. In these cases, including all Interstates and other full controlled access highways, rate only the Primary direction. Rater judgment should be used in other situations, with the more important factor being to rate the section the same way each year.

RIS handles couplets (routes where each direction is on a separate street, usually occurring in cities) as two separate, undivided roads. Couplets should be rated and assigned roadway

characteristics as they apply to each direction. Separate data records for the Reverse direction of the couplet are or will be added to the inventory. If the Reverse direction of the couplet is not yet added to the inventory, rate only the Primary direction until the Reverse direction records are added to the file.

Overlaps and Overlaps with Reverse Primary Directions

When overlapping routes are encountered, only one of the routes in the overlap needs to be rated. The hierarchy of the route surveyed does not matter. RIS automatically will assign the same values to the other overlapping routes. If an overlap is rated more than once, only the ratings from the highest hierarchy route will be retained.

There are many overlaps where the Primary direction of one route is in the Reverse direction of an overlapped route. If only one of the routes in the overlap is rated, RIS will apply the ratings to the other(s) and automatically align the ratings to the proper milepoints and direction. If both opposing routes are rated individually, RIS will retain only the ratings from the highest hierarchy route.

Note that the above procedure applies to the Surface Rating only. When updating the inventory information, *the changes must be made to the highest hierarchy route.* The inventory data of a higher hierarchy route will overwrite the lower hierarchy route when loaded to RIS.

Construction

When encountering a construction zone during the survey, make a determination if the surface of the pavement is being worked on. If the construction project does not involve the pavement, ignore the construction zone and rate the pavement normally.

If the pavement surface has been worked on and appears to be complete (or with reasonable certainty will be completed by the end of the season) enter “10” for a rating. If, with reasonable certainty, it can be determined that the construction project will extend into the next year before it will be complete, enter the prior year rating. Use “U” for “Under Construction” in cases where the pavement has been removed and only a gravel or dirt surface exists at the time of the survey.

Sometimes it may be apparent what type of work is under way or has been done on the pavement. In these cases, update the Inventory “Last Work” type and year while in the field (or the “Year Last Crack Seal” as appropriate). When the work type done cannot be determined, make a note and investigate when back at the office. The work type and year completed are very important information for those managing pavements and is well worth the extra effort to collect and update.

Changes in Condition

Occasionally during the survey, a significant change in the condition or characteristics of the pavement may occur part-way through a rating segment. The change could be the result of a paving project ending in the middle of a segment, or capital construction work has changed the characteristics of the road, such as adding a lane.

If in the opinion of the rater the change warrants the creation of a new segment, use the “Condition Change” button to break the segment. The milepoint of the segment break is set when the Condition Change button is pressed. The rating value from this point on to the end of the segment will be applied as a new value to the new segment. Both rating and roadway characteristics can be changed by creating a new segment, but only the rating can be changed in the new segment during active collection. To change inventory values, use the Edit Recent - Score table while in pause mode[2] (note that not all data elements are available for update in E-Score), or when in the office go back to the record in the output file and change the values.

E-Score has a business rule that prevents the creation of segments less than 0.10 mile long. This is to prevent creating undesirably small segments. The Condition Change button will be inactive 0.10 mile from the beginning of a segment and again 0.10 mile from the end of the segment.

When extensive reconstruction or realignment occurs on a route, it may be necessary to address these changes outside of the E-Score Program. If large-scale changes are necessary, contact Pavement Data Services and a method to update the route electronically can be discussed

Updating the Roadway Characteristics (Inventory)

The Roadway Characteristics describing the physical features of the road can be updated in the field while the pavement Surface Rating survey is in progress. When it is necessary to update a value, press the “Inventory Update” button; drop-down tags will appear on each data box. Click (or tap) the tag of the appropriate box and select the desired new value from the drop-down list. Press the “Accept” button to complete the update.

It is important to note that the inventory change must be made and the “Accept” button pressed before the end of the segment is reached for the change to take effect. If “Accept” is not pressed and the end of the segment passes, the values will return to the previously saved value.

If the segments are passing too quickly to complete the change, either temporarily slow down or safely pull to the side of the road and stop. Use the “Edit Recent” feature to make the changes in the “Score” table (this table contains the newly entered ratings and the original roadway characteristics data for each rating segment) or the “Inventory Updates” table (this table contains only segments with changes completed using “Inventory Update” and “Accepted” by the end of the segment). Changes extending through multiple segments must be made in each segment.

Many, but not all of the inventory characteristics of the rating segment are shown on the E-Score display. Updates to features not included in the E-Score display must be made manually in the output file.

Defect Flag

The Defect Flag is active when E-Score is in “Collect” mode. This feature can be used to mark the locations of less common pavement distresses or other problems that may need maintenance attention. The list of defects appearing in the drop-down list can be customized in the Utilities menu.[3] Problems such as large potholes, flushing, slope instability, damaged signs, and many other deficiencies can be noted.

The location of the defect is tagged at the moment the Defect Flag button is pressed. Select the type of defect from the drop-down list. A table is created in the output file which can be

exported in spreadsheet format and provided to Maintenance or others for correction.[4]

Saving and Backing Up Survey Data

E-Score saves the data collected during the survey to various tables in an Access database file. A record (the data associated with a rating segment) is saved every time the end of a segment is reached. If a problem occurs while surveying and a segment is not completed, the uncompleted segment will not be saved.

It is good procedure to backup the database file frequently to preserve your work. If the file becomes corrupt, or if the Tablet PC is damaged or lost, all the survey work to that point could be lost unless the data file has been saved outside the Tablet PC.

At the end of each day of surveying, a backup should be performed using the E-Score backup feature. Insert the USB flash drive into any USB port on the Tablet PC. Press the "floppy disk" icon on the lower left of the E-Score screen. The file paths in the description boxes should be:

"Select a file to be backed up." The path should default to:
[XXXXXXXSERVER DIRECTORY PATH REMOVEDXXXXXXXX]
\RegionXX.mdb

"Select the backup destination." Select "Browse" and left-click the "Save in" drop down arrow. Look for the drive letter assigned to the Removable Disk; it is usually F:\, but it could be another letter. The following path (or alternate drive letter) should appear in the destination box: F:\escore_backup_ [system generated date].zip

Select "Run" and a backup file will be saved to the USB flash drive, or to another location if specified in the path.

At least weekly, a file should be saved to the server. Bring the Tablet PC to the office and connect to the network. Using "Explore" (right-click "Start"):

Copy: "[XXXXXSERVER DIRECTORY PATH REMOVEDXXXXX]
\RegionXX.mdb"

Paste to: [XXXXSERVER DIRECTORY PATH REMOVEDXXXX]
PvtData"*Year*"\"*Year*" Field Files\Region"*?*"

It is a good idea to rename the file once it is copied to the server with a date extension to preserve earlier copies in case it is necessary to restore to a prior file.[5]

The E-Score Output Files

The E-Score output files are generated by the E-Score Program in a specific format to facilitate office processing. Tables for each of the data elements collected during the survey are contained in the output summary file labeled “RegionXX.mdb.” The output file contains all the information from the previous survey effort plus the current condition information (Surface Rating and Dominant Distress) and any current highway characteristics changes. Samples of these output files are shown in Appendix B.

The High Speed Profiler Survey

The second survey used by NYSDOT to collect important pavement condition and performance data is the High Speed Profiler Survey. The profilers collect data for ride quality, Rutting and Faulting generally from April through November, weather permitting. The profilers travel at the posted speed limit, so there is no disruption to traffic during collection activities.

Profiler data is collected annually in both directions on the Interstates, including the Thruway, and approximately every two years on the remainder of the NYS Touring Routes and major Reference Routes. By convention, data is collected in the right hand travel lane, except in Region 11 (NYC) on roadways with three or more lanes, where data is collected in the second lane in an attempt to minimize interference with high volumes of entering and exiting traffic.

Ride quality, Rutting and Faulting data are summarized on 0.10 mile intervals by the equipment. The Department’s Roadway Inventory System uses specific business rules to convert the 0.10 mile summary data to the predetermined rating segments for reporting. Additional detail for the profiler data is provided below.

Ride Quality (International Roughness Index - IRI)

The International Roughness Index (IRI) is used to measure pavement ride quality. IRI is calculated by measuring the longitudinal profile of the pavement in each wheelpath and applying that profile to a computer algorithm to simulate the response of the suspension of a typical sedan traveling at 50 mph. The resulting accumulated vertical bounce of the vehicle is the IRI, reported as inches per mile. The higher the number, the rougher the ride quality. IRI values may be categorized as follows:

IRI Scale (in/mi)	***Description***
≤ 60	Very Smooth
61 – 120	Smooth
121 – 170	Fair
171 – 220	Rough
≥ 220	Very Rough

The Department follows AASHTO Protocols for the collection of IRI data. Specific technical details are as follows:

- Quarter Car Model is used (IRI is calculated for each wheel path and the resulting IRI values are averaged).
- High Pass filter of 300 feet and Low Pass filter of 6 inches are used.
- Wheelpath laser spacing is 72 inches.
- Longitudinal Profile is sampled at 1 inch intervals and averaged each 4 inches.
- IRI value is summarized and reported for each 0.10 mile.
- The Department's Roadway Inventory System (RIS) calculates and reports the weighted average IRI for each rating segment.
- IRI on bridges and railroad crossings are left in the data set, but are marked so the user can remove these features from the data if needed.
- Data corrupted by slow collection speed or construction events affecting the pavement surface are replaced with '0.'

Figure 1 below displays the IRI ranges used by FHWA and the ranges used by the Department.

Please contact the Pavement Management Unit for more information on the International Roughness Index and its uses.

Rut Depth

Rut depths are measured using an automated five-point rut measurement system on the high speed profiler. The collection procedure substantially follows AASHTO Protocol PP38 but differs from R 48-09 in the sample interval and minimum rut length. The transverse profile is sampled every 0.01 mile (5.28 feet) and the maximum value measured within each 0.10 mile for either the right or left wheel path is reported. RIS determines the largest value occurring in each rating segment and uses that value for reporting.

Due to limitations of the system and vehicle wander, it is possible in some locations that the actual rut depth is greater than the reported rut depth. To help account for potentially varying measures, RIS will update the rut depth value only when the new value is larger than the existing file value. Rut depths are reported in 0.1 inch increments.

Average Bump Height, Number of Bumps

Automated profiling equipment is used to measure the average fault height and accumulated number of faults for each 0.10 mile. The fault measurement system samples the longitudinal profile using the wheelpath lasers and searches for a height differential of at least 0.2 inch between any two successive one-inch measures. Each occurrence exceeding the detection threshold is counted as a fault, and the height of each fault is averaged and reported for each 0.10 mile. Fault heights are reported in 0.1 inch increments. The procedure used complies with AASHTO PP39.

Since the measurement system does not differentiate pavement type, the system will report “faults” on asphalt pavements as well as concrete. To take advantage of this idiosyncrasy, the height changes are referred to as “bumps.” A positive bump value is a drop down in the direction of travel, such as a faulted joint on a concrete pavement. A negative bump value is a step up in the direction of travel, such as a raised patch on the pavement. The bump data, whether up or down, is useful supplemental information when considering ride quality.

Figure 1: Comparison of Ride Quality Ratings using IRI Ranges Defined by FHWA Highway Statistics Publications

60 80 100 120 140 160 180 200 220

IRI (in/mi)	<60	60-94	95-119	120-144	145-170	171-194	195-220	>220
FHWA Interstates	V.Good	Good	Fair	Mediocre		Poor		
FHWA Other	V.Good	Good	Fair			Mediocre		Poor
NYSDOT	V.Smooth	Smooth		Fair		Rough		V.Rough

60 80 100 120 140 160 180 200 220

Appendix A: Code Descriptions

The following are descriptions of the codes used in the E-Score system and the Roadway Inventory System (RIS). The order of the descriptions below generally follows the order of the columns in the E-Score output file (RegionXX.mdb, RegXX_Score Table).

Record Identification (ID, FID)

The ID and FID columns contain unique record identifiers used in database manipulation and management. These are system generated values that have no relevance to pavement data.

Route Identification Code (DOT_Id)

The DOT_Id is a unique unintelligent (i.e., the characters and positions have no inherent meaning) identification number for each route or roadway. The DOT_Id is automatically generated in RIS and once assigned to a route, does not change.

Couplet Identification (Couplet_Id)

The Couplet_Id is a one digit to five digit numerical code that identifies segments that are part of a couplet.

GIS Identification Code (GIS_Id)

The GIS_Id is the DOT_Id plus County Order added as a suffix. This code is used in GIS and is automatically generated in RIS.

GIS Route Code (GIS_CODE)

GIS Route Code is a combined route designation used in GIS applications. The first four characters are the signed route designation (three numeric places and one alpha); the next two characters are the Region-County code, followed by two places for County Order. Pre-2006 data contains the Control Segment as the final character.

Begin Milepoint and End Milepoint (Beg_Mile, End_Mile)

The milepoint is the linear measurement along the route in miles. The Begin Milepoint is the measure at the beginning of the segment of interest, and the End Milepoint is the measure at the end of the segment.

RIS and E-Score use the county-order based milepoint measures, meaning that the milepoint is measured from the last county line crossed, and the number of times the milepoint re-zeros at county lines is counted by the County-Order.

Road Segment Length (Length)

The segment length is the length of the individual segment expressed in miles and hundredths of a mile. The length is computed by subtracting the Begin Milepoint from the End Milepoint.

Surface Distress Rating (Surf_Score)

This column contains the Surface Distress Rating for the current year survey. E-Score writes the new Surface Rating to this location.

Dominant Distress (Dom_Distr1, Dom_Distr2)

These two columns contain the Dominant Distresses for the current year survey. E-Score writes the Dominant Distresses to this location.

Code	Dominant Distress
Ai	Alligator Cracking – Isolated (<20%)
Ag	Alligator Cracking – General (>20%)
F	Faulting
Si	Spalling – Isolated (<20%)
Sg	Spalling – General (>20%)
Wl	Widening Dropoff – Low Severity
Wh	Widening Dropoff – High Severity

GPS Coordinates (GPSX, GPSY)

E-Score collects the GPS coordinates at the end milepoint of each rating segment. Shown are the UTM X-Y coordinates.

Date/Time Stamp (DTSTAMP)

The date and time the record was written (at the end milepoint).

Direction (DIR)

The direction in which the data was collected. “P” is for Primary (northbound or eastbound), and “R” is for Reverse.

Route Signing (Rte_Signing)

Route signing identifies the type of route classification of the highway.

Code	Route Signing
0	Not signed
1	Interstate
2	US
3	NY
4	Off-Interstate Business
5	County
6	Township
7	Municipal
8	Parkway or Forest Route Marker
9	None of the above

Touring Route Number and Letter Designation (Rte, Suffix)

The Touring Route Number is an alpha-numeric designation that identifies a signed route on the Touring Route. The Touring Route number contains from one to three numerals and, where required,

one alphabetic suffix. For example, Route 5A is designated as 5A and Interstate 787 is designated 787I.

Also included in the route number designations are the “900” series routes which are state-owned roads not part of the signed Touring Route. The first character of a 900 route is always “9.” The second character designates the region, and the third character (a numeric) and fourth character (an alpha) are the unique quasi-sequential identifiers of the specific road. A typical 900 route designation is “910B” which identifies Wolf Road in Albany, Region 1.

Route Signing Qualifier (Qualifier) (revised 3/16/10)

Most routes on the NYS Touring Route System have a unique route or route-suffix designation. However, in rare cases two separate but related routes may share the same route number, such as Route 62 and Route 62 – Business. In these cases the Route Qualifier provides the distinguishing notation.

Code	Route Signing Qualifier
1	No qualifier or Not Signed
2	Alternate
3	Business Route
4	Bypass Business
5	Spur
6	Loop
7	Proposed
8	Temporary
9	Truck Route
10	None of the above

Region and County Codes (Reg, Co)

The region/county numbers are the one-digit DOT region alpha-numeric code with the specific one-digit county numeric code which has been assigned to each county, in alphabetic order within that region. For example, Essex County is identified as 12

(second in an alphabetical list of counties in Region 1). It should be noted that since the region code is a one-digit code, Region 10 and Region 11 are designated as “0” and “N”, respectively.

As of April 1, 2007, Tioga County is reassigned to Region 9 from Region 6. The Region/County code for Tioga County is changed from “65” to “97”.

The Region/County Code Chart below lists the specific designations.

Region	**County Codes**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	ALB	ESX	GRN	REN	SAR	SCH	WAR	WSH
2	FUL	HAM	HRK	MAD	MTG	OND		
3	CAY	COR	ONO	OSW	SEN	TOM		
4	GEN	LIV	MNR	ONT	ORL	WYO	WYN	
5	CAT	CHA	ERI	NIA				
6	ALG	CHM	SHY	STU		YAT		
7	CLN	FRK	JEF	LEW	STL			
8	COL	DUT	ORG	PUT	ROC	ULS	WST	
9	BRM	CHN	DEL	OTS	SCO	SUL	TIO	
10 (0)			NAS				SUF	
11 (N)	BNX	KGS		NY	QNS	RCH		

County Order (Co_Order)

The County Order designation is a two-digit code that is part of the location identification system. The County Order code begins with “01” at the beginning of a route and will increment by 1 each time the route crosses a county boundary. The County Order code maintains the sequence of milepoints when they are re-zeroed at county lines.

Beginning Description (Beg_Desc)

This is a referenced location (landmark) that is associated with the begin mile point of a segment (ex. roadway intersections, Town/Village lines, R.R. tracks, etc.)

End Description (End_Desc)

This is a referenced location (landmark) that is associated with the end mile point of a segment (ex. roadway intersections, Town/Village lines, R.R. tracks, etc.)

Reference Marker (Ref_Marker)

Reference markers are small green signs positioned along the roadside used to mark a specific location along a highway. The markers display three rows of information containing up to four characters on each row. The first row lists the route number when the route was first designated (reference marker characters do not change even if the route number is changed). The second row contains the region/county numbers and the county order number. The third row contains the control segment number and the first three digits of the end milepoint, expressed in tenths of a mile, for that control segment.

The control segment is no longer used in the Department's linear reference system, but the control segment breaks (at city boundaries) remain part of the historical reference marker designation. The reference marker legends listed in this column represent the reference marker nearest to the end of the respective section. In situations where reference markers do not exist, this field is left blank.

State Highway Number (SH_No)

The state highway number is usually the contract number under which a section of highway was originally built, or the number assigned to a section of highway upon takeover by the Department from another political subdivision. The newest SH numbers are a sequential number by year (e.g., 2008-1). If the route is on a city or village street, county or town road, parkway or toll bridge, the following abbreviations are used:

Code	Description
CTYST	City Street
VILST	Village Street
CORD	County Road
TNRD	Town Road
PKWAY	Parkway
BRIDGE	Bridge

Residency Code (Residency)

The DOT Residency Codes indicate the residency to which the highway segment is assigned for maintenance responsibility. Often counties are split between two residencies, or residency boundaries are not coterminous with county lines due to local maintenance agreements.

Code	Description	Code	Description
014	Nassau North	534	Erie North
024	Nassau Central	544	Erie South
034	Suffolk East	554	Niagara
044	Suffolk Central	614	Allegany West
054	Suffolk West	624	Chemung – Steuben East
064	Nassau South		
114	Albany	634	Schuyler – Yates
124	Essex	644	Allegany East – Steuben West
134	Greene		
144	Rensselaer	714	Clinton
154	Saratoga	724	Franklin
164	Schenectady	734	Jefferson
174	Warren	744	Lewis
184	Washington	754	St. Lawrence
224	Hamilton	814	Columbia

Code	Description	Code	Description
234	Herkimer	824	Dutchess North
254	Fulton - Montgomery	834	Dutchess South
264	Oneida East	844	Orange East
274	Oneida West – Madison	854	Orange West
314	Cayuga – Seneca	864	Rockland
324	Cortland – Tompkins	874	Ulster
334	Onondaga East	884	Westchester North
344	Onondaga West	894	Westchester South
354	Oswego	914	Broome
414	Genesee – Orleans	924	Chenango
424	Livingston	944	Delaware South
434	Monroe East	954	Otsego
444	Monroe West	964	Schoharie – Delaware North
474	Wyoming		
484	Wayne – Ontario	974	Sullivan
514	Cattaraugus	984	Tioga
524	Chautauqua		

Roadway Configuration (Div)

Roadways are classified as either Undivided or Divided. A roadway is considered divided, and therefore two roadways, if it has a flush median wider than four feet, or another type of median or barrier (see Median Type). Couplets are considered two distinct roadways. Each direction of the couplet should be coded as an undivided roadway. Use the following codes for Roadway Configuration:

Code	Number of Roadways
1	Undivided roadway
2	Divided roadway

Number of Travel Lanes – Total (Total_Lanes)

Listed in this column is the number of travel lanes present on the roadway in both directions, not including turning lanes, acceleration / deceleration lanes or shoulders.

Number of Travel Lanes – Primary (Primary_Lanes)

This is the number of travel lanes in the Primary direction (northbound or eastbound). Not included are turning lanes, acceleration/deceleration lanes or shoulders. Enter the number of lanes; if there are 9 or more lanes, enter 9.

Pavement Width - Total (Total_Pvt_Width)

The Pavement Width is the sum of the width in feet of all travel lanes in both directions, and the width of all turning lanes and acceleration/deceleration lanes. Not included are the Paved Shoulder Width and/or Median Width.

Pavement Width - Primary (Primary_Pvt_Width)

The Primary Pavement Width is the sum of the width in feet of all travel lanes in the primary direction, and the width of all turning lanes and acceleration/deceleration lanes. Not included are the Paved Shoulder Width and/or Median Width.

Pavement Type (Pvt_Type)

The Pavement Type code describes the type of pavement structure for the segment. An unpaved road has a dirt, gravel or other type of stabilized surface other than asphalt or concrete.

An Asphalt or Flexible pavement is comprised of layers of hot mix asphalt (HMA). If an asphalt pavement has been treated with a preventive maintenance treatment such as microsurfacing or chip seal, it is still considered an Asphalt (Flexible) pavement.

A Portland Cement Concrete (PCC) pavement or Rigid pavement is comprised entirely of concrete, and an Overlay pavement is one or more layers of asphalt over a pavement that was originally concrete. The specialty treatment known as “Whitetopping” is considered a rigid pavement.

Use the following codes for pavement type:

Code	Pavement Type
A	Asphalt (Flexible)
B	Brick or Block
C	Concrete (Rigid)
O	Overlay (Asphalt over Concrete)
U	Unpaved

Logic dictates that only certain combinations of Pavement Type, Pavement Layer Type, Base Type and Work Type can occur. Care must be taken to make sure that the codes are consistent, especially in cases where a PCC pavement is rehabilitated and becomes an Overlay pavement.

Pavement Layer Type (Pvt_Layer)

The Pavement Layer Type describes the general construct of the pavement structure. It is important when construction changes the Pavement Type (such as when a PCC pavement is overlaid with asphalt) that the new Pavement Layer Type is kept consistent with the Pavement Type, Base Type, Subbase Type and Work Type codes. Use the following codes for Pavement Layer Type:

Code	Pavement Layer Type (revised 3/16/10)
1	Gravel, Stone, Slag, etc.
2	Asphalt on top of 8” or less PCC
3	Asphalt on top of greater than 8” PCC
4	Asphalt – 6” or less
5	Asphalt – greater than 6”
6	Portland cement concrete - 8" or less
7	Portland cement concrete – greater than 8"
8	Asphalt on top of Brick or Block
9	Brick or block

Code	Pavement Layer Type (revised 3/16/10)
10	PCC on top of 6” or less of Asphalt
11	PCC on top of greater than 6” of Asphalt

Pavement Layer Thickness (Pvt_Layer_Thickness)

The thickness of the total pavement layer above the subbase layer, in inches.

Last Overlay Thickness (Last_Overlay)

Shown in this column is the thickness in inches of the last overlay. The values are used primarily for HPMS reporting and are populated by the system using an algorithm based on the latest Work Type code. Layer thickness values should not be changed unless local knowledge can provide a more accurate measure.

PG Binder Type (PG_Binder)

PG Binder data is provided primarily for use in HPMS reporting. The performance graded binder type shown is the assumed PG binder used in the asphalt mix. The data field is populated based on the general directions of EB 08-008 as follows: PG 70-22 Downstate (generally south of Poughkeepsie); PG 58-34 Adirondack Region; PG 64-22 all other counties. Specific locations may have used a different PG binder based on local conditions. Therefore, the data reported should be used with due caution.

Code	PG Binder Type
1	PG 58-34
2	PG 64-22
3	PG 64-28
4	PG 70-22
5	PG 76-22
6	PG 82-22

Base Layer (Base)

At times during construction of highways, an additional material is used between the pavement layer and the subbase. The following codes identify this material when it is known from construction records or local knowledge.

Code	Base Layer
0	None
1	Asphalt treated permeable base
2	Portland Cement treated permeable base
3	Cement Stabilized Base
4	Other treated base material or unknown

Subbase Type (Subbase)

Subbase Type codes describe the underlying structure of the pavement. Because it is normally not possible to observe the underlying layers of the pavement, these codes should not be changed unless there has been new construction or resurfacing, or the code shown is known to be wrong. Use the following codes:

Code	Subbase Type
1	Natural soil, unimproved
2	Natural soil, graded and drained
3	Selected soils (not gravel or rock) 12"or less
4	Selected soils (not gravel or rock) over 12"
5	Gravel, stone, etc. (12" or less)
6	Gravel, stone, etc. (over 12")
7	Other (bridges, culverts, etc.)

Roadside Type (Roadside_Type)

The Roadside Type describes the type of surface immediately outside the edge of the paved shoulder. A roadside type not requiring mowing is one that is not intended to support vegetation,

such as a sidewalk, brick paver or other treated surface. If the shoulder material supports the growth of vegetation, it is designated as “mowing.”

A stabilized roadside has been treated by some type of man-made intervention (treated gravel/sand mixtures, etc.), whereas an unstabilized roadside is predominantly loose or naturally placed materials.

Code	Roadside Type
0	Curbed, mowing
1	Curbed, no mowing
2	Gutter, mowing
3	Gutter, no mowing
4	Stabilized, mowing
5	Stabilized, no mowing
6	Unstabilized, mowing
7	Unstabilized, no mowing

Paved Shoulder Width (Paved_Shldr_Width)

The paved shoulder width is the width of the paved area immediately outside (to the right) of the white fog line on the pavement. Paved areas of one foot or less are considered to be a paved shoulder width of zero. The area outside the paved area is described by the Roadside Type code above.

Median Type (Med) (revised 3/16/10)

The Type of Median is a description of the device or area that separates the travel directions. Use the following codes for Type of Median:

Code	Median Type
1	None; the opposing travel lanes are separated by less than four feet with no barrier.

Code	Median Type
2	Unprotected; the opposing travel lanes are separated by an unpaved area four feet wide or more with no barrier. The grassy area in the center of controlled access highways is a typical unprotected median.
3	Curbed; the median edge is defined by a raised curb with a minimum original height of 4 inches or more; can be vertical or mountable.
4	Positive Barrier – unspecified; any device placed between opposing travel lanes intended to keep directional traffic separated. Use Code 5, 6 or 7 when the barrier type is known.
5	Positive Barrier – flexible; guiderail that allows considerable deflection on impact, such as cable
6	Positive Barrier – semi-rigid; guiderail that allows some deflection on impact, such as box beam and corrugated W beam.
7	Positive Barrier – rigid; concrete Jersey or single slope barrier that does not deflect on impact.
8	Continuous Center Turn Lane; an uninterrupted bi-directional center lane that provides refuge for vehicles waiting to turn left. Do not include marked left turn lanes that serve only one direction.
9	Flush Paved; the opposing travel lanes are separated by a paved area four feet wide or more with no barrier.

Median Width (Med_Width)

The median is the separation between the travel directions of the roadway. Provided in the report is the actual median width in feet as observed in the field. A flush, paved area less than 4 feet in width between the travel directions is not considered a median.

Terrain Type (Terrain)

The Terrain code describes the topographical nature of the surrounding landforms and their affect on the road profile. Soon these codes will be replaced by actual grade values as measured by the high speed profiler. For now, the following codes are used:

Code	Terrain Type
1	Flat (highway profile approx. 0-3%)
2	Rolling (highway profile approx. 4-6%)
3	Hilly (highway profile approx. 7-9%)

Area Type (Area) (revised 3/16/10)

The Area Type code describes the extent of land development in the area through which the roadway passes.

Code	Area Type
1	Rural
2	Unincorporated Community
3	Village less than 5,000 population
4	Suburban
5	City
6	Village over 5,000 population

Culture Type (Cult)

The Culture code represents the type of community in which the highway passes.

Code	Culture
1	Controlled Access
2	Residential
3	Resort

4	Industry
5	Business
6	Agriculture, Open Land, etc.

Passing Sight Distance (Passing)

The actual passing sight distance, in feet from 0 to 99, as determined by pavement markings in the direction traveled.

Percent (%) Parking (Pkg)

The availability of parking along the roadway. Use the following codes:

Code	Parking
Blank	Unknown
0	No Parking
1	50% Parking
2	100% Parking

National Highway System (NHS)

Established by ISTEA in 1991 and approved by Congress in 1995, the National Highway System (NHS) is an interconnected system of high priority routes serving major population centers, interstate and interregional travel, border crossings, intermodal facilities and national defense needs. The following list identifies the record type codes, including those which are not NHS or federal-aid eligible:

Code	NHS Type
Blank	Not on NHS
1	NHS
2	NHS Intermodal Connector – Airport
3	NHS Intermodal Connector – Port

4	NHS Intermodal Connector – AMTRAK Station
5	NHS Intermodal Connector – Rail/Truck Terminal
6	NHS Intermodal Connector – Intercity Bus Terminal
7	NHS Intermodal Conn – Public Transit/Multi Modal
8	NHS Intermodal Connector – Pipeline Terminal
9	NHS Intermodal Connector – Ferry Terminal

Access Control (Acc) (revised 3/16/10)

The Access code describes the type of entrance control on the highway. "No Control of Access" means access to the highway may be made by public roads and private driveways. "Partial Control of Access" means access to the highway is provided by interchanges and some at grade intersections, but no direct private driveway connections. "Full Control of Access" means access to the highway is provided by interchange only. Use the following codes:

Code	Highway Access
1	Full Control of Access
2	Partial Control of Access
Blank	No Control of Access

Functional Classification (FC)

The Functional Classification describes the functional characteristics of the highway. Highways eligible for federal aid include all Functional Classes except 08, 09 and 19. HPMS Functional Class codes as of September 2008 are 1-7 with no distinction between urban and rural. The former expanded codes are retained in RIS as shown below.

Code	Functional class - Rural
01	Rural Principal Arterial Interstate
02	Rural Principal Arterial Other
06	Rural Minor Arterial
07	Rural Major Collector
08	Rural Minor Collector
09	Rural Local

Code	Functional Class - Urban
11	Urban Principal Arterial Interstate
12	Urban Principal Arterial - Freeway or Expressway
14	Urban Principal Arterial Other
16	Urban Minor Arterial
17	Urban Collector
19	Urban Local

Owning Jurisdiction (Jur-Owning), Maintenance Jurisdiction (Jur2)

Maintenance responsibility for a roadway is not always correlated with the owner of the road. Cooperative agreements are often made between agencies when it is more efficient for another agency to maintain the roadway due to geographics, availability of resources or other factors.

The Jurisdiction Codes below are used twice: once to indicate the ownership of the highway (Jur-Owning) and then again to designate the maintenance responsibility (Jur2).

Code	Jurisdiction
01	NYSDOT
02	County Highway Department
03	Town Highway Department
04	City or Village Highway Department

Code	Jurisdiction
11	State Park, Forest, or Reservation Agency
12	Local Park, Forest, or Reservation Agency
21	Other State Agencies
25	Other Local Agencies
26	Private (other than railroad).
27	Railroad
31	State Toll Authority (Thruway)
32	Local Toll Authority
50	Indian Tribal Government
60	Other Federal Agencies (not listed below)
62	Bureau of Indian Affairs
63	Bureau of Fish and Wildlife
64	U.S. Forest Service
66	National Park service
70	Corps of Engineers (Civil)
72	Air Force
73	Navy / Marines
74	Army

Overlap Number (Olap_No)

The Overlap Number is a numeric designation assigned to segments that are part of an overlap with another route(s). Each overlap location receives a unique Overlap Number, and all segments participating in the overlap at that location are assigned the same number. This makes it possible to find and link all of the segments that overlap in a specific location. The code is controlled by the database system.

Occasionally an overlap occurs where the Primary direction of one route is the Reverse direction of the overlapping route. Overlap Numbers for these locations are marked with an “R” prefix to indicate the route has another route or local road overlapping and the Primary directions of the overlapping routes

are in opposing directions. For example, northbound Route 9 overlaps eastbound Route 20 in the westbound direction. Each segment of Route 9 and Route 20 falling within the overlapping boundaries is assigned the Overlap Number “R 654.”

Route Overlap Status (Olap)

The Route Overlap Status code identifies the segments of lower hierarchy (secondary) routes that overlap with a higher level route. The code is controlled by the database system. A “Y” indicates the segment is the lower priority member of an overlap and would count as duplicate mileage within the data.

There are three categories of highways: Interstates, US routes and State routes. Interstates have higher priority in the hierarchy than US routes, which have higher priority than the State routes. Within each category of highway type, the lower route numbers have higher priority in the hierarchy. In the case where overlapping routes have the same number but different letter designations, the route with the lower letter (or no letter) has priority.

Year Rated (Yr_Scored)

The Year Scored is the present year in which the Pavement Surface Distress Rating Survey is being conducted. The year is entered automatically by E-Score.

Year of Last Crack Seal (Crack_Seal_Yr)

Shown in this column is the year in which the latest pavement crack seal work was performed on the highway section, either by contract or Department forces. Enter the four digit year the work was completed. It is extremely important that year of last work be updated as part of each year's rating effort.

Year of Last Work (Work_Yr)

Shown in this column is the year in which the latest pavement work was performed on the highway section, either by contract or Department forces. Do not include demand-type maintenance activities such as pothole patching or crack sealing. Enter the four digit year the work was completed.

It is extremely important that year of last work be updated as part of each year's rating effort. If a highway section is under construction at the time of the survey and it is expected that the construction will be complete before the end of the season, enter the current year.

Work Type (Work_Type)

Work type codes are used to describe the type of work done on a pavement. The codes are intended to be detailed enough to allow the pavement management system to track the performance of each treatment type over time. New codes can and should be added when new work types are identified. The following codes are used to describe the type of work:

Code	Work Type
1	Single course hot mix asphalt overlay, 1" - 1½".
2	Two course hot mix asphalt overlay, 2" - 3".
3	Three course hot mix asphalt overlay, 4" - 6". Note that the thicknesses given for single, two and three course overlays are to be used as a guide only. For example, if a two course overlay was placed a total of 4” thick, then it would be coded as a 2, not a 3.
4	Mill and Fill, where the top course is removed and replaced with essentially no change in final thickness.
5	Mill and Fill, where the top course is removed and replaced and an additional overlay is added.
6	Cold-In-Place Recycling with single course overlay. - CIPR is a process in which a portion of an existing bituminous pavement is milled, the reclaimed material is mixed with new binder and, in some instances, virgin aggregates. The resultant blend is used as a base for a subsequent overlay.
7	Cold-In-Place Recycling with multiple course overlay.
8	Crack and Seat Pavement Rehabilitation; the slabs of an existing concrete pavement are broken into smaller pieces (but not to rubble) and the pavement is overlaid with one or more courses of hot mix asphalt.

Code	Work Type
9	Pavement Reconstruction by Rubblizing; an existing concrete pavement is reduced to rubble and a new pavement structure, either HMA or PCC, is constructed on top.
10	Pavement Construction and Reconstruction; new pavement on new alignment, or the existing pavement is completely removed and a new pavement structure is built.
11	Blank
12	Permanent Pavement Repairs on asphalt pavement, or on concrete pavement without diamond grinding; includes partial depth replacement, occasional full depth replacement, permanent spall/pothole repair, joint repair; does not include temporary “throw and go” pothole patching.
13	Concrete Pavement Restoration: permanent pavement repairs with diamond grinding, including partial and full depth replacement, dowel bar retrofit, cross stitching and other permanent joint and spall repairs.
14	Surface Treatment, Chip Seal / Oil and Stone – A thin treatment where a pavement surface is sprayed with asphalt and then immediately covered with aggregate and rolled.
15	Slurry Seal – a mixture of slow setting emulsified asphalt, well graded fine aggregate, mineral filler and water.
16	Microsurfacing – a mixture of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water and other additives, mixed and spread with a paver.
17	Paver Placed Surface Treatment (Nova Chip) – usually placed at very high temperatures, and includes admixtures such as rubber and other chemicals.
18	6.3 mm Overlay – hot mix asphalt with small aggregate that is placed 1” thick or less.
19	Blank
20	Multi-course saw and seal – Two or more courses of hot mix asphalt are placed on an existing pavement;

Code	Work Type
	saw cuts are made on the pavement surface over the locations of underlying joints or transverse cracks and then sealed with crack sealant.
24	Hot-in-Place Recycling – A recycling process that softens the existing asphalt with heat, remixes the asphalt with new material as needed and replaces the asphalt on the pavement.
25	White Topping – A relatively thin (4”-6”) layer of PCC is placed on top of existing asphalt pavement.
26	Unbonded Concrete Overlay – a new concrete overlay placed directly on top of an existing concrete pavement.
27	Bonded Concrete Overlay – a new concrete pavement constructed over an existing concrete pavement, with a flexible (asphalt) interlayer.
28	Grinding Only – Usually performed on PCC, but can be used on asphalt pavement as well to improve ride quality.
99	Other Treatments not fitting into another Work Type. This could include anything from shim courses, rut filling without overlay, etc.

One Year Prior Surface Score (SS-1)

This column contains the Surface Rating for last year’s survey.

Two Years Prior Surface Score (SS-2)

This column contains the Surface Rating from two years ago.

Segment Type (Seg_Type)

Segment Type identifies the type of segment. This administrative code is used mostly to identify filler segments (dummy segments) that connect discontinuous route segments. All records with Segment Type codes normally should be removed by the time the file is released for production use.

Code	Segment Type
Blank	Data record
D	Dummy record
T	Temporary record
P	Placeholder record

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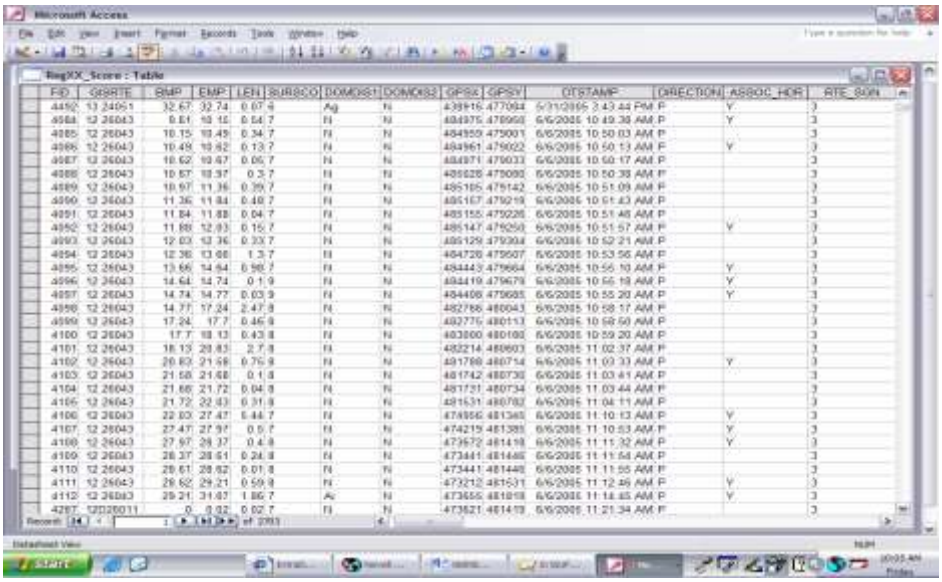
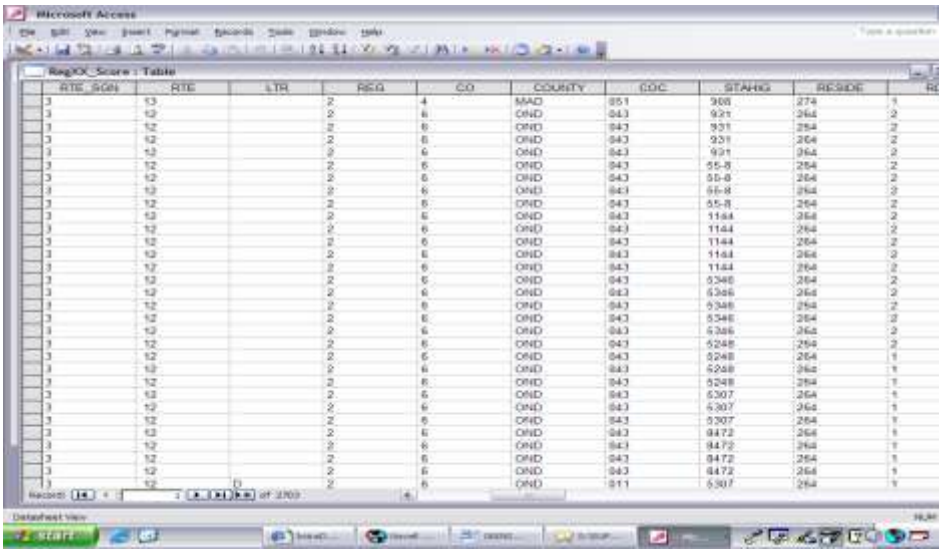
Appendix B: Sample E-Score Output Files

Shown below are sample output files generated by E-Score as part of the Pavement Surface Rating Survey. Descriptions of the fields and abbreviations are provided in Appendix C.

Score Output Table



FID	GSRTE	BMP	EMP	LEN	SURFCO	DOMDIR1	DOMDIR2	GPSX	GPSY	DTSTAMP	DIRECTION	ASSOC_HDR	RTE_SGN
4492	13 24061	32.67	32.74	0.07	9	Ag	N	439916	477064	6/3/2005 3:43:44 PM	P	Y	3
4494	12 26043	9.61	10.15	0.54	7	N	N	484975	479968	6/6/2005 10:49:38 AM	P	Y	3
4495	12 26043	10.15	10.49	0.34	7	N	N	484959	479001	6/6/2005 10:50:03 AM	P		3
4496	12 26043	10.49	10.62	0.13	7	N	N	484961	479022	6/6/2005 10:50:13 AM	P	Y	3
4497	12 26043	10.62	10.67	0.05	7	N	N	484971	479033	6/6/2005 10:50:17 AM	P		3
4498	12 26043	10.67	10.97	0.3	7	N	N	485028	479090	6/6/2005 10:50:38 AM	P		3
4499	12 26043	10.97	11.36	0.39	7	N	N	485105	479142	6/6/2005 10:51:09 AM	P		3
4500	12 26043	11.36	11.84	0.48	7	N	N	485167	479219	6/6/2005 10:51:43 AM	P		3
4501	12 26043	11.84	11.88	0.04	7	N	N	485155	479226	6/6/2005 10:51:46 AM	P		3
4502	12 26043	11.88	12.03	0.15	7	N	N	485147	479250	6/6/2005 10:51:57 AM	P	Y	3
4503	12 26043	12.03	12.36	0.33	7	N	N	485129	479304	6/6/2005 10:52:21 AM	P		3
4504	12 26043	12.36	13.66	1.3	7	N	N	484726	479507	6/6/2005 10:53:56 AM	P		3
4505	12 26043	13.66	14.64	0.98	7	N	N	484443	479664	6/6/2005 10:55:10 AM	P	Y	3
4506	12 26043	14.64	14.74	0.1	9	N	N	484419	479679	6/6/2005 10:55:19 AM	P	Y	3
4507	12 26043	14.74	14.77	0.03	9	N	N	484406	479685	6/6/2005 10:55:20 AM	P	Y	3
4508	12 26043	14.77	17.24	2.47	8	N	N	482786	480043	6/6/2005 10:58:17 AM	P		3
4509	12 26043	17.24	17.7	0.46	9	N	N	482775	480113	6/6/2005 10:58:50 AM	P		3
4100	12 26043	17.7	18.13	0.43	8	N	N	482560	480180	6/6/2005 10:59:20 AM	P		3
4101	12 26043	18.13	20.83	2.7	8	N	N	482214	480603	6/6/2005 11:02:37 AM	P		3
4102	12 26043	20.83	21.58	0.75	8	N	N	481788	480714	6/6/2005 11:03:33 AM	P	Y	3
4103	12 26043	21.58	21.68	0.1	8	N	N	481742	480730	6/6/2005 11:03:41 AM	P		3
4104	12 26043	21.68	21.72	0.04	8	N	N	481731	480734	6/6/2005 11:03:44 AM	P		3
4105	12 26043	21.72	22.03	0.31	8	N	N	481631	480782	6/6/2005 11:04:11 AM	P		3
4106	12 26043	22.03	27.47	5.44	7	N	N	474956	481365	6/6/2005 11:10:13 AM	P	Y	3
4107	12 26043	27.47	27.97	0.5	7	N	N	474219	481385	6/6/2005 11:10:53 AM	P	Y	3
4108	12 26043	27.97	28.37	0.4	8	N	N	473672	481418	6/6/2005 11:11:32 AM	P	Y	3
4109	12 26043	28.37	28.61	0.24	8	N	N	473441	481446	6/6/2005 11:11:54 AM	P		3
4110	12 26043	28.61	28.62	0.01	8	N	N	473441	481448	6/6/2005 11:11:55 AM	P		3
4111	12 26043	28.62	29.21	0.59	8	N	N	473212	481531	6/6/2005 11:12:46 AM	P	Y	3
4112	12 26043	29.21	31.07	1.86	7	Ac	N	473655	481918	6/6/2005 11:16:45 AM	P	Y	3
4287	12026011	0	0.02	0.02	7	N	N	473621	481419	6/6/2005 11:21:34 AM	P		3



RTE_SGN	RTE	LTR	REG	CO	COUNTY	COC	STAHIG	RESIDE	R
3	13		2	4	MAD	851	968	274	1
3	12		2	6	OND	943	931	264	2
3	12		2	6	OND	943	931	264	2
3	12		2	6	OND	943	931	264	2
3	12		2	6	OND	943	931	264	2
3	12		2	6	OND	943	55-8	264	2
3	12		2	6	OND	943	55-8	264	2
3	12		2	6	OND	943	55-8	264	2
3	12		2	6	OND	943	55-8	264	2
3	12		2	6	OND	943	1144	264	2
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3	12		2	6	OND	943	1144	264	2
3	12		2	6	OND	943	1144	264	2
3	12		2	6	OND	943	1144	264	2
3	12		2	6	OND	943	5346	264	2
3	12		2	6	OND	943	5346	264	2
3	12		2	6	OND	943	5346	264	2
3	12		2	6	OND	943	5346	264	2
3	12		2	6	OND	943	5346	264	2
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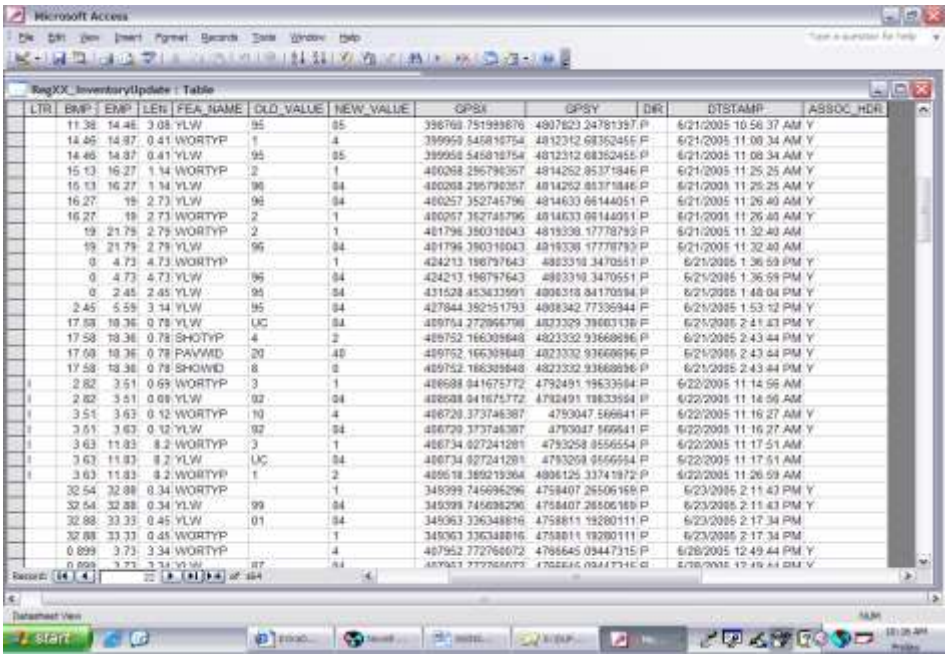
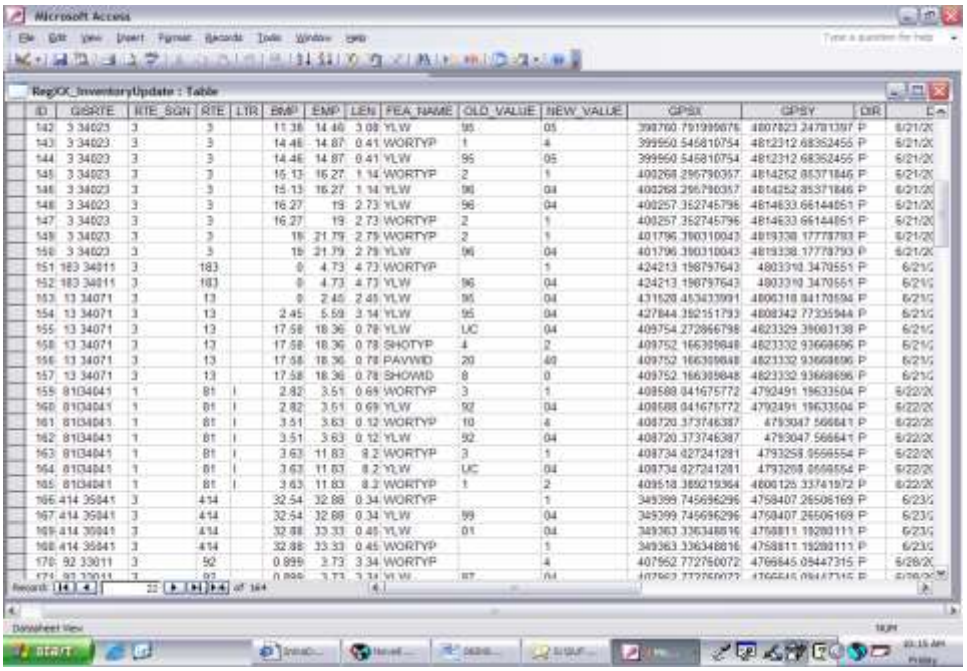
3	12		2	6	OND	943	5248	264	1
3	12		2	6	OND	943	5307	264	1
3	12		2	6	OND	943	5307	264	1
3	12		2	6	OND	943	5307	264	1
3	12		2	6	OND	943	5307	264	1
3	12		2	6	OND	943	8472	264	1
3	12		2	6	OND	943	8472	264	1
3	12		2	6	OND	943	8472	264	1
3	12		2	6	OND	943	8472	264	1
3	12		2	6	OND	911	5307	264	1

Inventory Update Output Table



LTR	BMP	EMP	LEN	FEA_NAME	OLD_VALUE	NEW_VALUE	GPSX	GPSY	DIR	DTSTAMP	ASSOC_HDR
	11.38	14.46	3.08	YLW	95	05	398760.751999876	4807823.24781397	P	6/21/2005 10:56:37 AM	Y
	14.46	14.87	0.41	WORTYP	1	4	399950.545810754	4812312.68362455	P	6/21/2005 11:08:34 AM	Y
	14.46	14.87	0.41	YLW	95	05	399950.545810754	4812312.68362455	P	6/21/2005 11:08:34 AM	Y
	15.13	16.27	1.14	WORTYP	2	1	400268.296790357	4814252.85371846	P	6/21/2005 11:25:25 AM	Y
	15.13	16.27	1.14	YLW	96	04	400268.296790357	4814252.85371846	P	6/21/2005 11:25:25 AM	Y
	16.27	19	2.73	YLW	96	04	400257.352745796	4814633.66144051	P	6/21/2005 11:26:40 AM	Y
	16.27	19	2.73	WORTYP	2	1	400257.352745796	4814633.66144051	P	6/21/2005 11:26:40 AM	Y
	19	21.79	2.79	WORTYP	2	1	401796.390310043	4819338.17778793	P	6/21/2005 11:32:40 AM	
	19	21.79	2.79	YLW	96	04	401796.390310043	4819338.17778793	P	6/21/2005 11:32:40 AM	
	0	4.73	4.73	WORTYP		1	424213.198797643	4803310.3470551	P	6/21/2005 1:36:59 PM	Y
	0	4.73	4.73	YLW	96	04	424213.198797643	4803310.3470551	P	6/21/2005 1:36:59 PM	Y
	0	2.45	2.45	YLW	95	04	431528.453433991	4806318.84170594	P	6/21/2005 1:48:04 PM	Y
	2.45	5.59	3.14	YLW	95	04	427844.392151793	4808342.77336944	P	6/21/2005 1:53:12 PM	Y
	17.58	18.36	0.78	YLW	UC	04	409754.272866798	4823329.39083138	P	6/21/2005 2:41:43 PM	Y
	17.58	18.36	0.78	SHOTYP	4	2	409752.166309848	4823332.93668696	P	6/21/2005 2:43:44 PM	Y
	17.58	18.36	0.78	PAVWID	20	40	409752.166309848	4823332.93668696	P	6/21/2005 2:43:44 PM	Y
	17.58	18.36	0.78	SHOWID	8	0	409752.166309848	4823332.93668696	P	6/21/2005 2:43:44 PM	Y
	2.82	3.51	0.69	WORTYP	3	1	408588.041675772	4792491.19633504	P	6/22/2005 11:14:56 AM	
	2.82	3.51	0.69	YLW	92	04	408588.041675772	4792491.19633504	P	6/22/2005 11:14:56 AM	
	3.51	3.63	0.12	WORTYP	10	4	408720.373746387	4793047.566641	P	6/22/2005 11:16:27 AM	Y
	3.51	3.63	0.12	YLW	92	04	408720.373746387	4793047.566641	P	6/22/2005 11:16:27 AM	Y
	3.63	11.83	8.2	WORTYP	3	1	408734.027241281	4793258.0556554	P	6/22/2005 11:17:51 AM	
	3.63	11.83	8.2	YLW	UC	04	408734.027241281	4793258.0556554	P	6/22/2005 11:17:51 AM	
	3.63	11.83	8.2	WORTYP	1	2	409518.389219364	4806125.33741972	P	6/22/2005 11:26:59 AM	
	32.54	32.88	0.34	WORTYP		1	349399.745696296	4758407.26506169	P	6/23/2005 2:11:43 PM	Y
	32.54	32.88	0.34	YLW	99	04	349399.745696296	4758407.26506169	P	6/23/2005 2:11:43 PM	Y
	32.88	33.33	0.45	YLW	01	04	349363.336348816	4758811.19280111	P	6/23/2005 2:17:34 PM	
	32.88	33.33	0.45	WORTYP		1	349363.336348816	4758811.19280111	P	6/23/2005 2:17:34 PM	
	0.899	3.73	3.34	WORTYP		4	407952.772766072	4766645.09447315	P	6/28/2005 12:49:44 PM	Y



ID	GISRTE	RTE_SGN	RTE	LTR	BMP	EMP	LEN	FEA_NAME	OLD_VALUE	NEW_VALUE	GPSX	GPSY	DIR	D
142	3 34023	3	3		11.38	14.46	3.08	YLW	95	05	398760.751999876	4807823.24781397	P	6/21/2
143	3 34023	3	3		14.46	14.87	0.41	WORTYP	1	4	399950.545810754	4812312.68362455	P	6/21/2
144	3 34023	3	3		14.46	14.87	0.41	YLW	95	05	399950.545810754	4812312.68362455	P	6/21/2
145	3 34023	3	3		15.13	16.27	1.14	WORTYP	2	1	400268.296790357	4814252.85371846	P	6/21/2
146	3 34023	3	3		15.13	16.27	1.14	YLW	96	04	400268.296790357	4814252.85371846	P	6/21/2
148	3 34023	3	3		16.27	19	2.73	YLW	96	04	400257.352745796	4814633.66144051	P	6/21/2
147	3 34023	3	3		16.27	19	2.73	WORTYP	2	1	400257.352745796	4814633.66144051	P	6/21/2
149	3 34023	3	3		19	21.79	2.79	WORTYP	2	1	401796.390310043	4819338.17778793	P	6/21/2
150	3 34023	3	3		19	21.79	2.79	YLW	96	04	401796.390310043	4819338.17778793	P	6/21/2
151	183 34011	3	183		0	4.73	4.73	WORTYP		1	424213.198797643	4803310.3470551	P	6/21/2
152	183 34011	3	183		0	4.73	4.73	YLW	96	04	424213.198797643	4803310.3470551	P	6/21/2
153	13 34071	3	13		0	2.45	2.45	YLW	95	04	431528.453433991	4806318.84170594	P	6/21/2
154	13 34071	3	13		2.45	5.59	3.14	YLW	95	04	427844.392151793	4808342.77336944	P	6/21/2
155	13 34071	3	13		17.58	18.36	0.78	YLW	UC	04	409754.272866798	4823329.39083138	P	6/21/2
158	13 34071	3	13		17.58	18.36	0.78	SHOTYP	4	2	409752.166309848	4823332.93668696	P	6/21/2
156	13 34071	3	13		17.58	18.36	0.78	PAVWID	20	40	409752.166309848	4823332.93668696	P	6/21/2
157	13 34071	3	13		17.58	18.36	0.78	SHOWID	8	0	409752.166309848	4823332.93668696	P	6/21/2
159	81 34041	1	81	I	2.82	3.51	0.69	WORTYP	3	1	408588.041675772	4792491.19633504	P	6/22/2
160	81 34041	1	81	I	2.82	3.51	0.69	YLW	92	04	408588.041675772	4792491.19633504	P	6/22/2
161	81 34041	1	81	I	3.51	3.63	0.12	WORTYP	10	4	408720.373746387	4793047.566641	P	6/22/2
162	81 34041	1	81	I	3.51	3.63	0.12	YLW	92	04	408720.373746387	4793047.566641	P	6/22/2
163	81 34041	1	81	I	3.63	11.83	8.2	WORTYP	3	1	408734.027241281	4793258.0556554	P	6/22/2
164	81 34041	1	81	I	3.63	11.83	8.2	YLW	UC	04	408734.027241281	4793258.0556554	P	6/22/2
165	81 34041	1	81	I	3.63	11.83	8.2	WORTYP	1	2	409518.389219364	4806125.33741972	P	6/22/2
166	414 35041	3	414		32.54	32.88	0.34	WORTYP		1	349399.745696296	4758407.26506169	P	6/23/
167	414 35041	3	414		32.54	32.88	0.34	YLW	99	04	349399.745696296	4758407.26506169	P	6/23/
169	414 35041	3	414		32.88	33.33	0.45	YLW	01	04	349363.336348816	4758811.19280111	P	6/23/
168	414 35041	3	414		32.88	33.33	0.45	WORTYP		1	349363.336348816	4758811.19280111	P	6/23/
170	92 33011	3	92		0.899	3.73	3.34	WORTYP		4	407952.772766072	4766645.09447315	P	6/28/2

Appendix C: Details for Selected Functions

Listed below are additional detailed directions on how to perform selected actions described in the main text. The numbers correspond to the superscripted numbers in the text of the section "Conducting the Survey Using E-Score" beginning on Page 12.

1 - Adjusting the "End of Segment" Warning

To adjust the timing of when the "End of Segment" warning occurs:

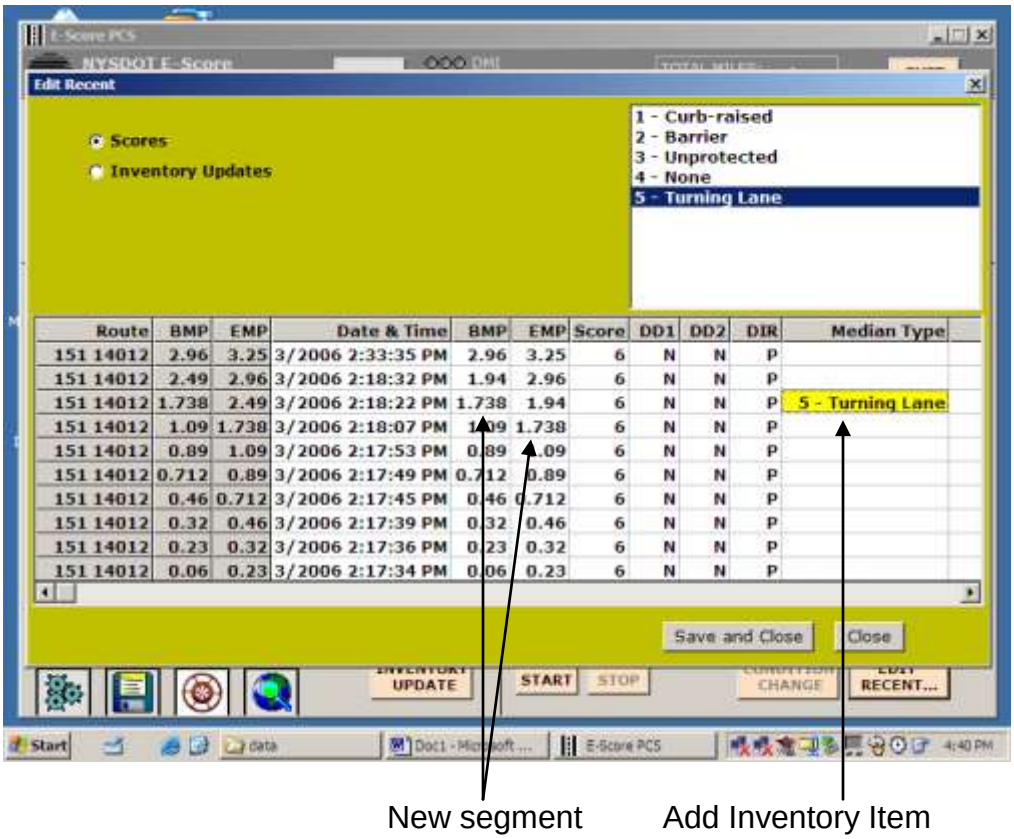
1. Select the "Utilities" icon on the E-Score main display.
2. Select the "Tolerances" tab.
3. Place the cursor in the box for "Distance from end of segment at which warning occurs.'"
4. Using the keyboard, change the number value (in tenths of a mile) according to your preference. A larger number will give more time before the end of the segment, and a smaller number will give less time.

2 - Changing Inventory Values Using the "Edit Recent" Table

To make changes to Inventory values when a new segment is created:

1. Make sure E-Score is in the paused/stop mode (press "Stop").
2. Press the "Edit Recent" button; the "Scores" table will be displayed.
3. The inserted milepoint creating the new end milepoint of the existing segment and the begin milepoint of the new segment is identified by the values with three decimal places.
4. Click on a milepoint box; a +/- key will appear to allow editing of the milepoints if necessary.
5. Click on a box in a feature column to edit the value; a context-sensitive editing box will appear.
6. Use the scroll bar at the bottom of the window to view additional data columns in the table.

Figure C1: Edit Recent – Scores Table

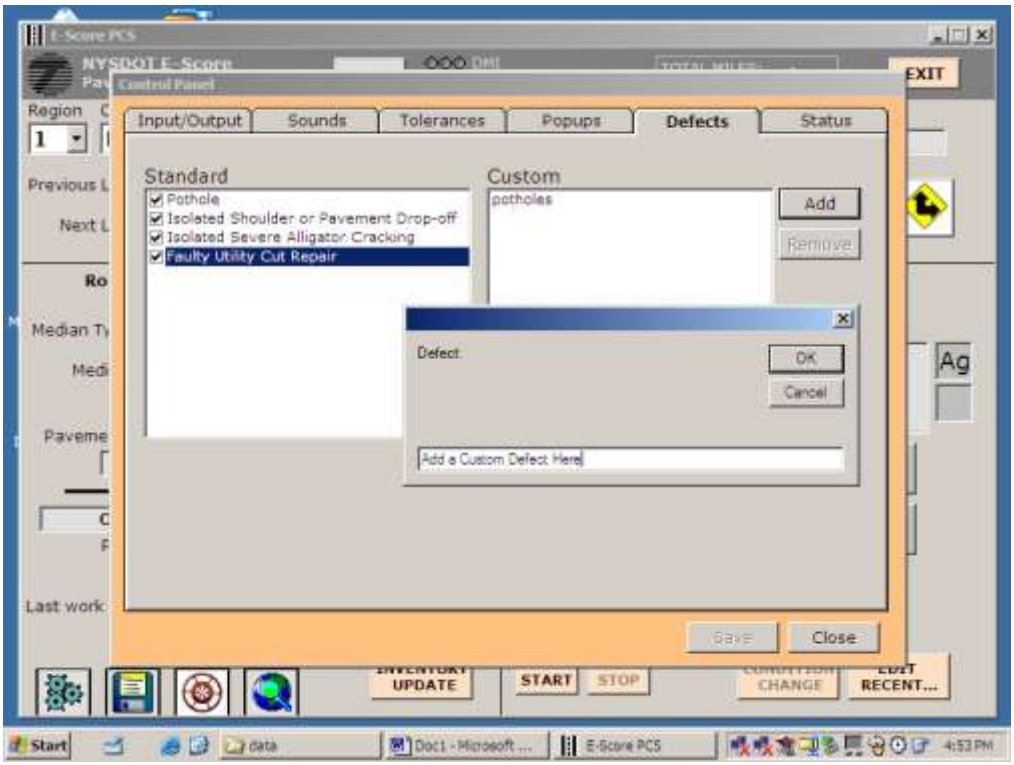


3 – Adding Custom Defects

To add custom Defects or other notations for the Flag feature:

1. Select the “Utilities” icon on the E-Score main display.
2. Select the “Defects” tab.
3. Press the “Add” button. Type a short description of the item to add to the Defects list and press “OK.” The item will now appear in the drop down select list when the Flag icon is pressed.
4. To remove an item from the list, simply highlight the item on the Utilities – Defect tab and press “Remove.”

Figure C2: Utilities – Defects Tab



4 – Exporting the Defect Table to Excel

To create an Excel spreadsheet file listing the Defects identified during the Survey:

1. Close E-Score.
2. Browse to the location of the latest output data file (RegionXX.mdb).
3. Double-click on the RegionXX.mdb file to open in Access.
4. In the “Tables” window (select “Tables” from the list of items under “Objects), click on “RegXX_Defect.”
5. Click “File” from the menu bar at the top of the main window, and select “Export.”
6. From the “Save as type” drop-down box, select “Microsoft Excel 97-2002.”
7. The “File name” box will fill with the default name “RegXX_Defect.” Change the name if desired.
8. From the “Save in:” drop-down box, select the location to save the file. In the example box below, the file is saved to the Removable Disk (F:), which in this case is the Memory Stick.
9. Click “Export” and an Excel spreadsheet file will be created and saved to the target directory.

Figure C3: Exporting the Defect Table

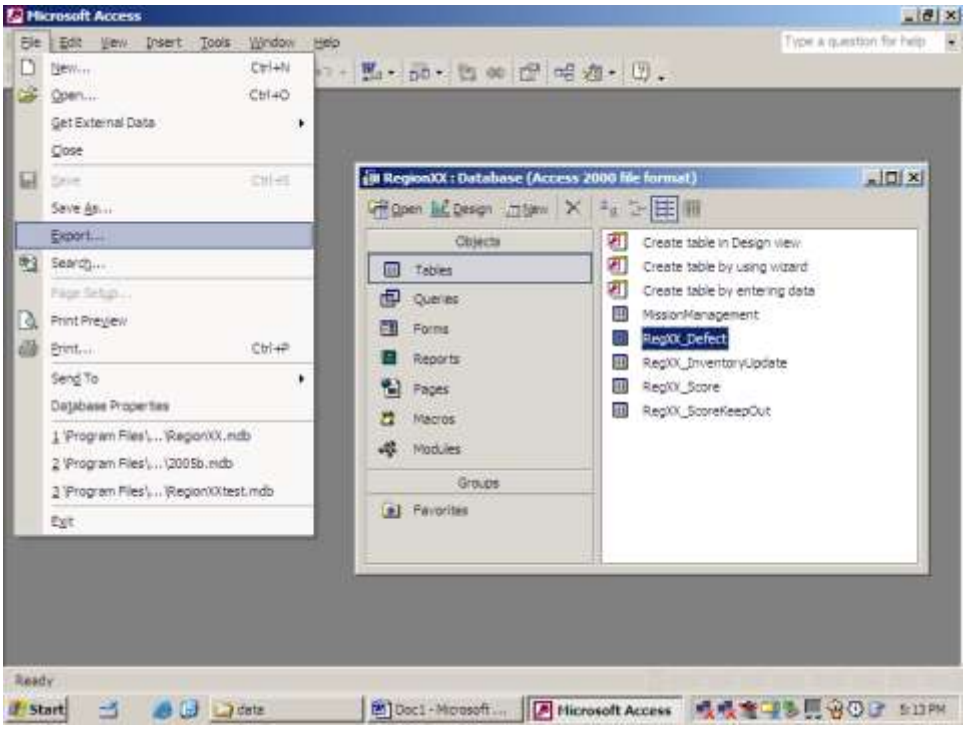
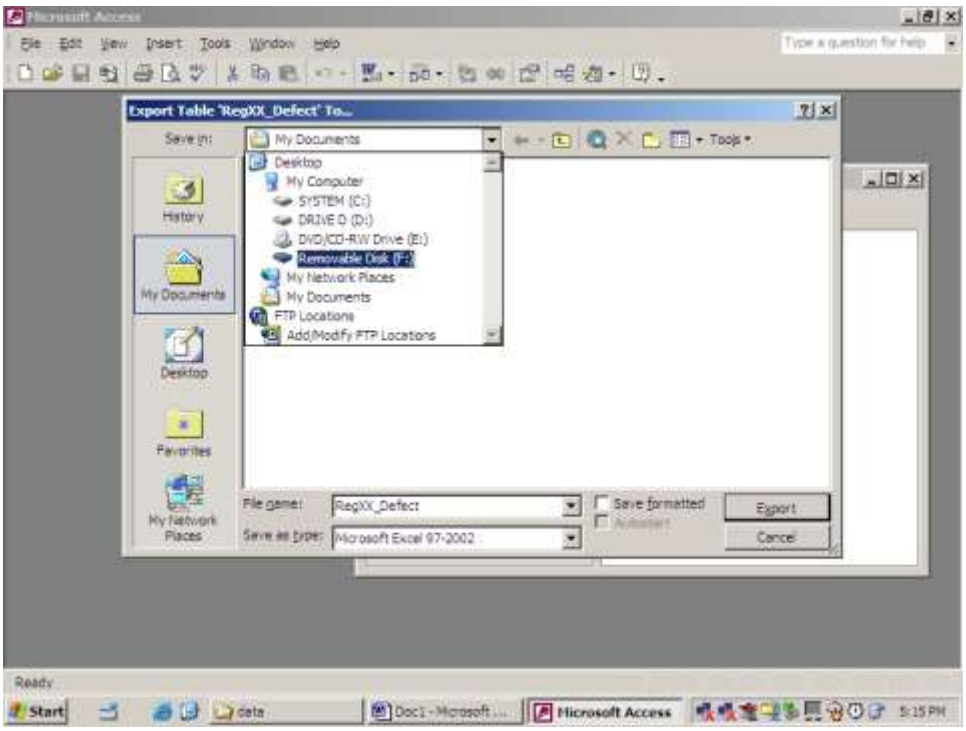


Figure C4: Saving the Defect Table as an Excel Spreadsheet



5 – Renaming a File on the Server

Files created by the E-Score backup feature will have a date extension that will uniquely identify each file. It is not necessary to rename these files. However, if the E-Score base output file is copied directly from the Tablet PC to the server (RegionXX.mdb), it is advisable to rename the Access output file on the server to a format that identifies the Region and the date of the file so as to preserve prior files should the survey data need to be reestablished. To rename a file:

1. Browse to the folder holding the file by right-clicking on “Start” and select “Explore.”

2. Select: [XXXXSERVER DIRECTORY PATH REMOVEDXXX] \ PvtData ”Year” \ “Year” Field Files \ Region”?”

3. Right-click on the file to rename and select “Rename” from the list.

4. Type the new name for the file. Be sure to include the extension “.mdb” at the end of the name so the computer will recognize the file as an Access file.

5. An example of a good filename is: Region01_6-18-05.mdb which represents a Region 1 file containing data up to 6/18/05 (Note that “/” and “\” are not valid characters for file names).

Utilities Menu – Standard Settings

The figures below display the default settings in the Utilities menu:

Figure C5: Input/Output Tab Default Settings

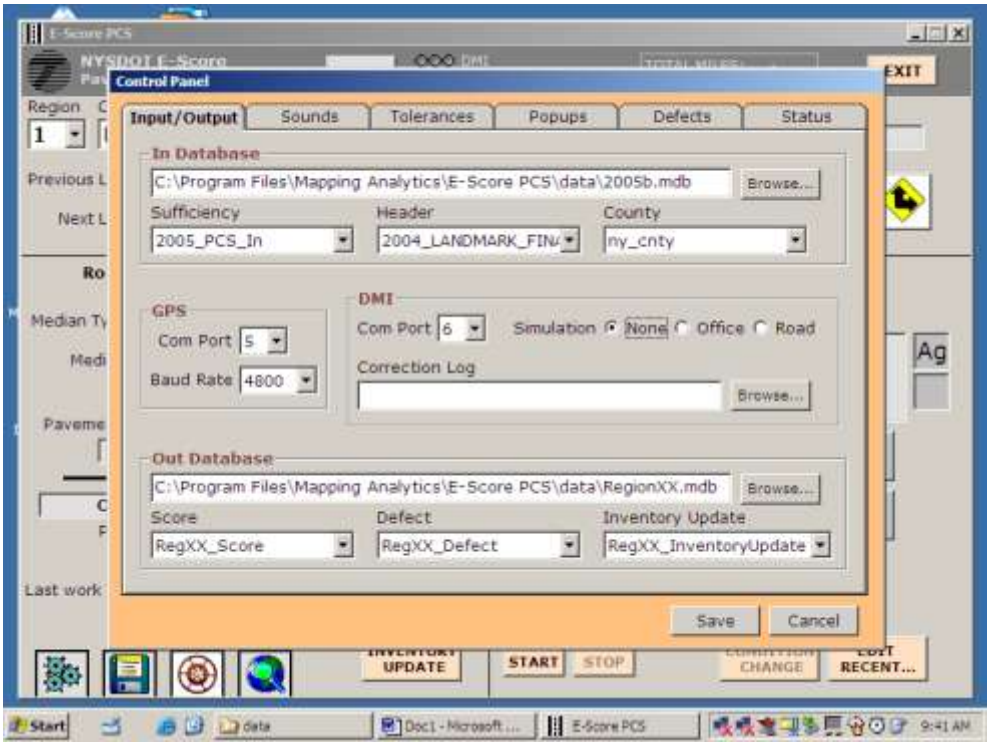


Figure C6: Sounds Default Settings

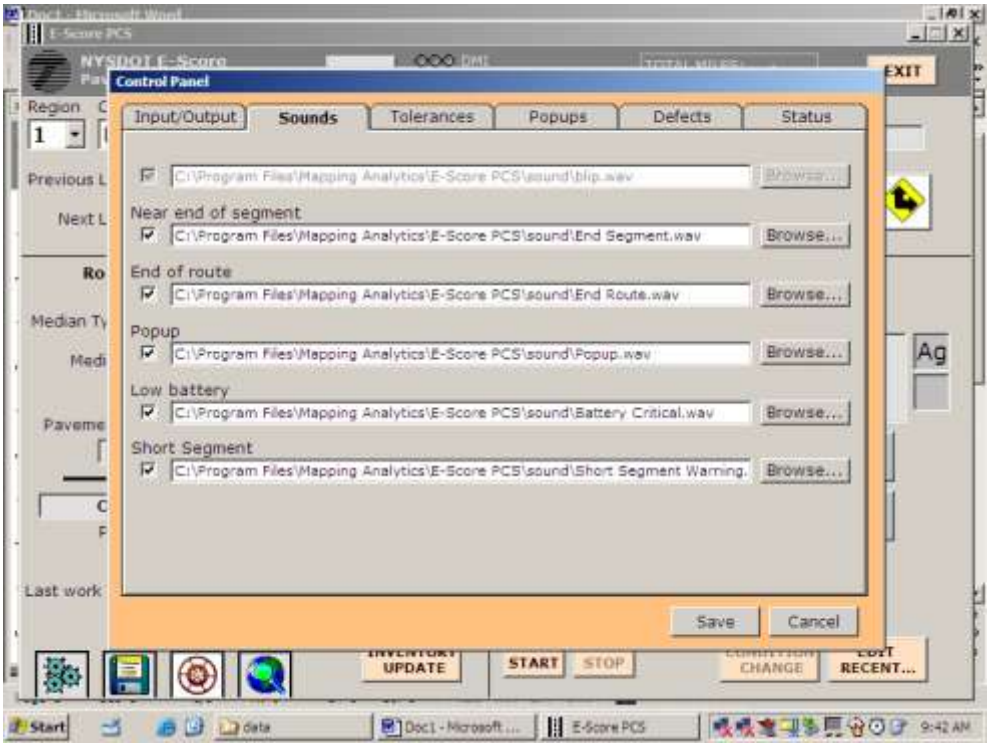
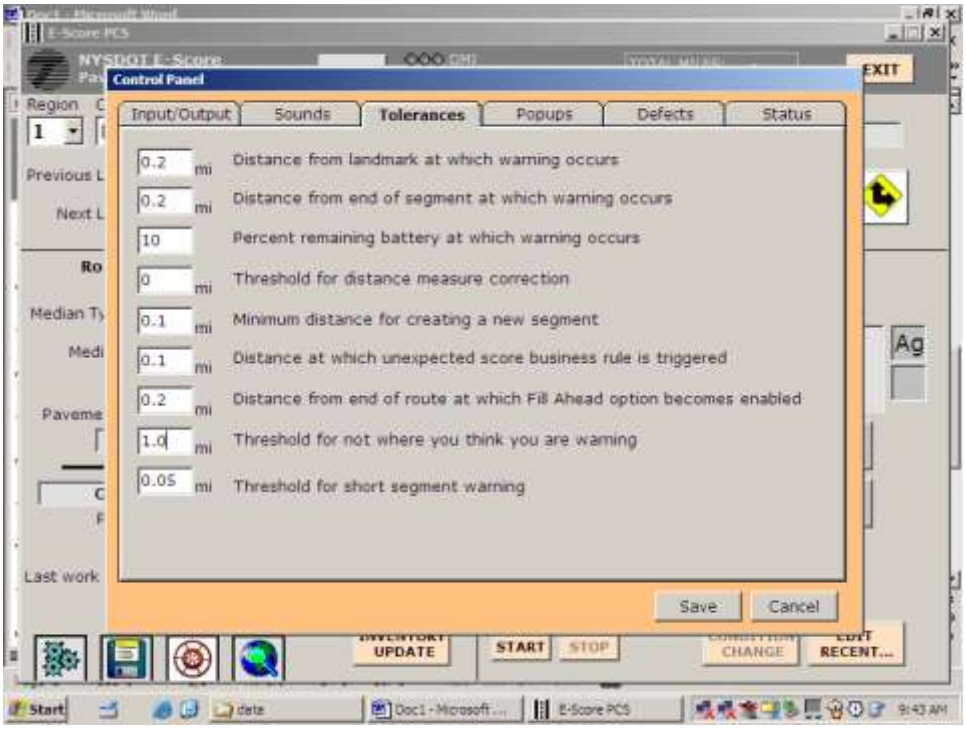
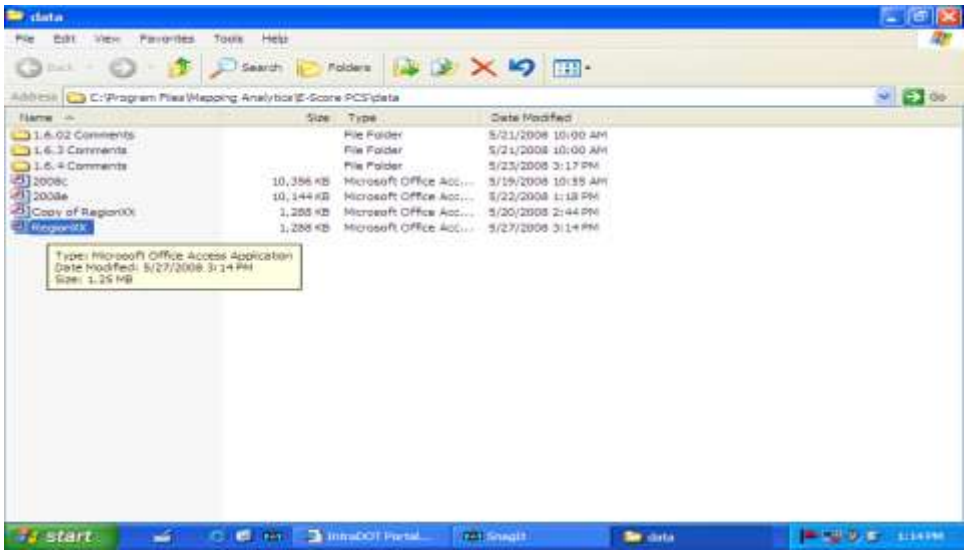


Figure C7: Tolerances Default Settings

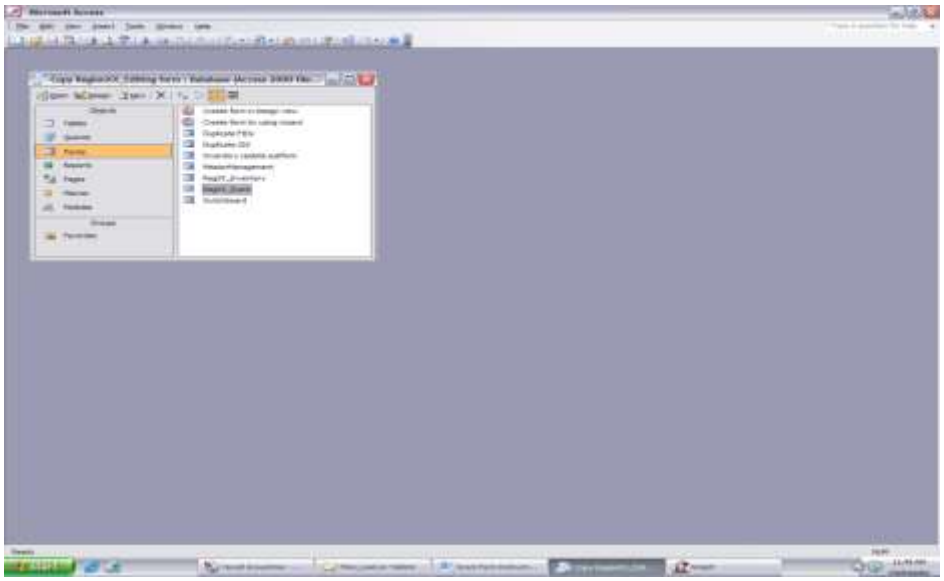


6 – Using the RegXX_Score form to edit the Pavement Surface Score Survey Collected Data

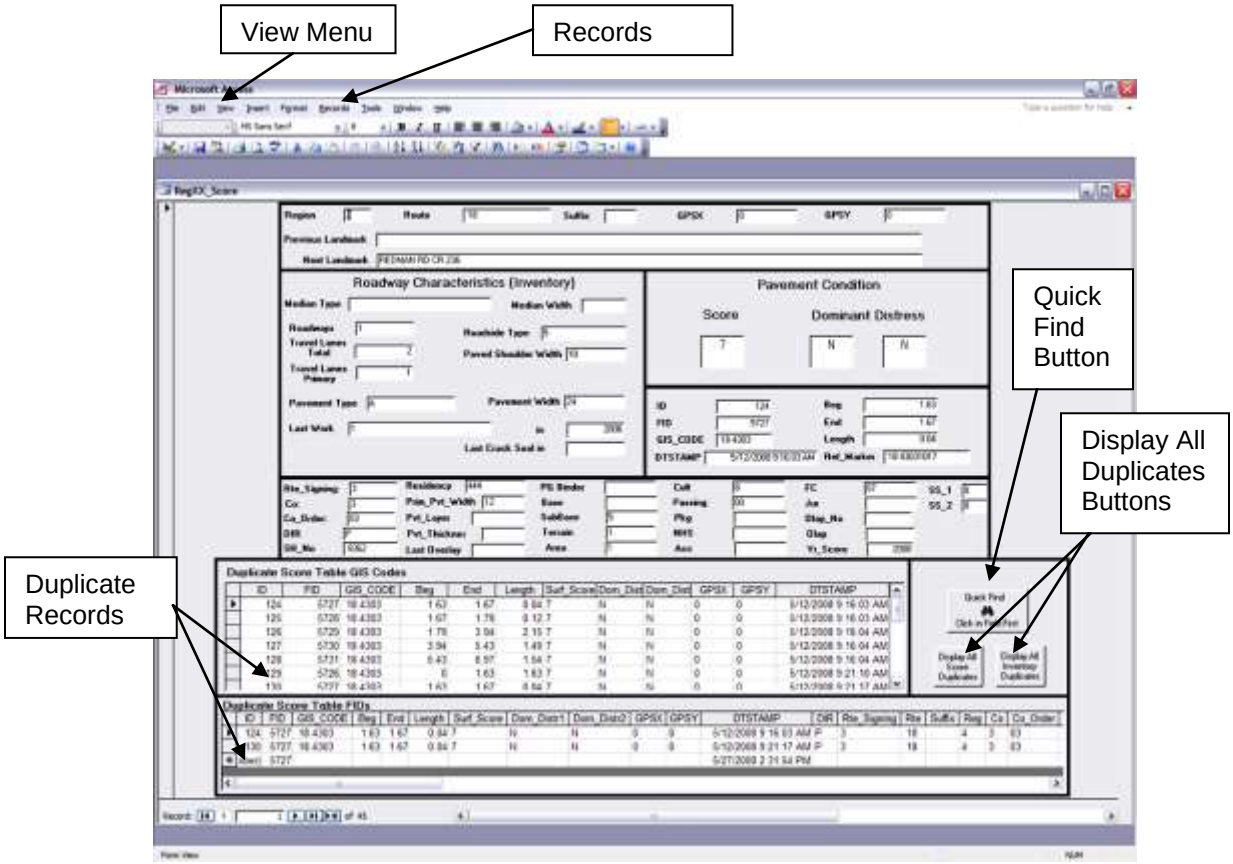
1. Browse to the directory where the RegionXX.mdb that will be updated is stored and open it.



2. Select “Forms” on the Objects window and open the RegXX_Score form from the list in the window on the right.

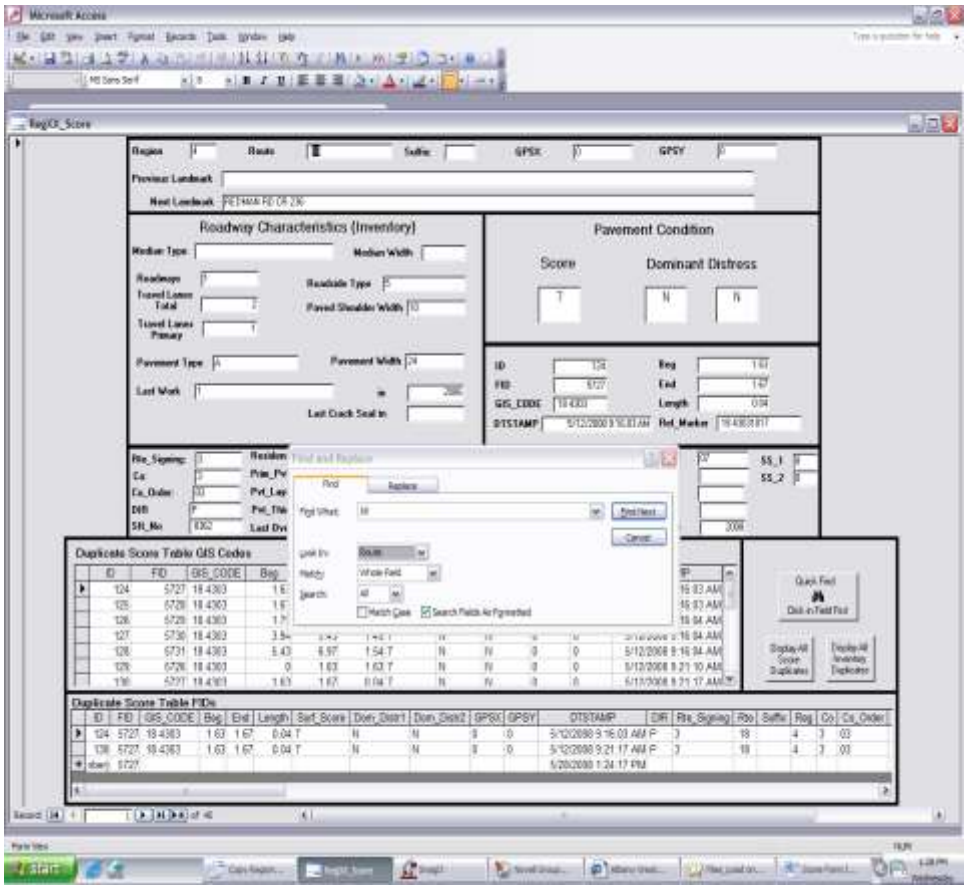


3. This form will help the rater with their editing of the data contained in the RegXX_Score table and the InventoryUpdates table. The following are some key features of the editing form:



4. To highlight any data element, use the tab key on your computer keyboard to scroll through the fields on the form to get to the data you want to or by using your mouse, left click directly in the desired field. Any data changes made in the form will automatically update the data in either data table that it represents.

5. To find a specific record, click the “Quick Find” button. This search tool will default to whatever field is currently selected. A screen will open where the search information is entered. Type the search criteria in the “Find what” field.



NOTE: When searching a Route field, enter the route number in the criteria field in double quote marks: “xxx” with spaces replacing the hundreds and tens places when the route number is one or two digits. For example, for Route 18, enter “ 18” and for Route 7 enter “ 7”]

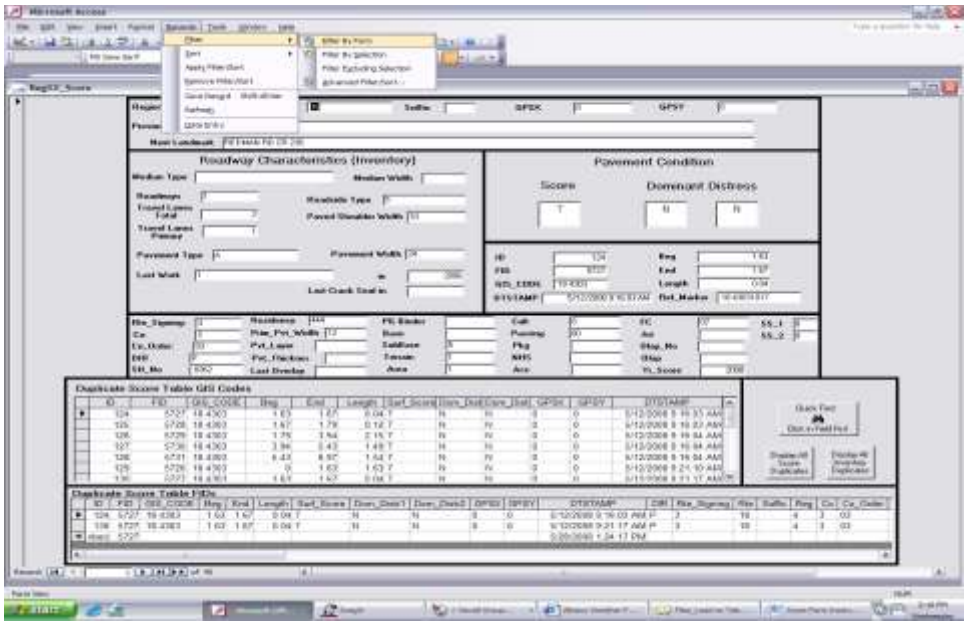
One Space

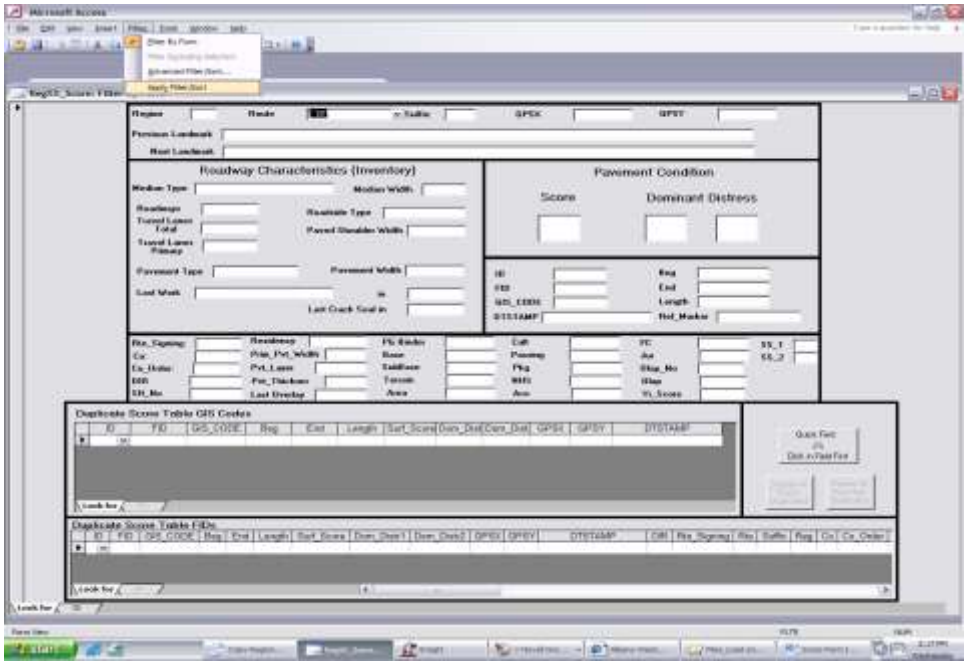
Two Spaces

Make sure that the “Look in” field is showing the desired search field. Click “Find Next.” The next record that matches the search criteria will be displayed as the current record. Click “Find Next”

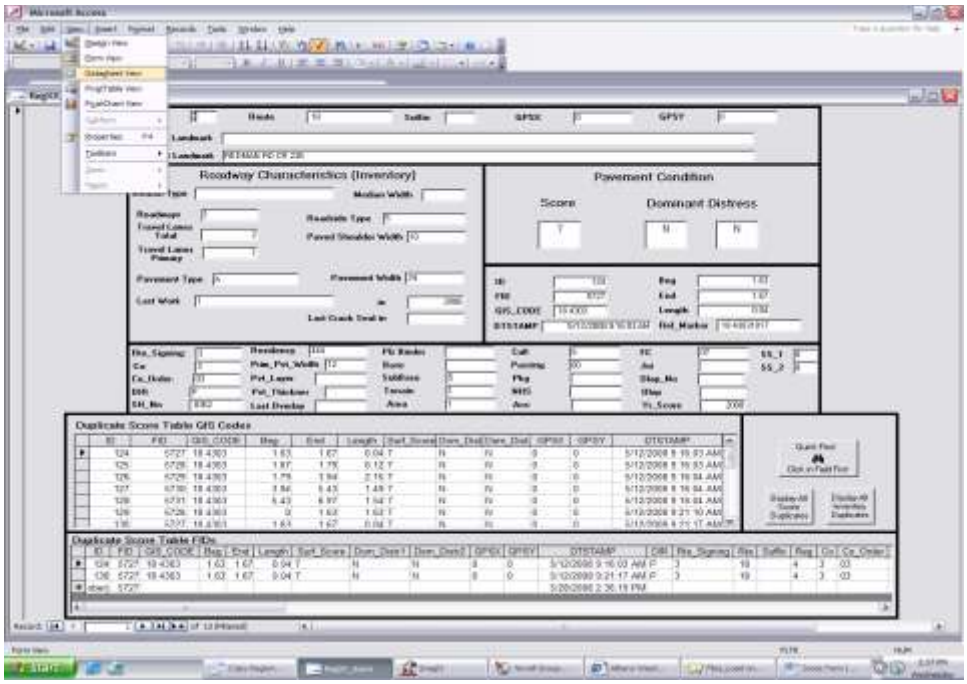
again and the next matching record will be displayed. Click “Find Next” until the desired record appears.

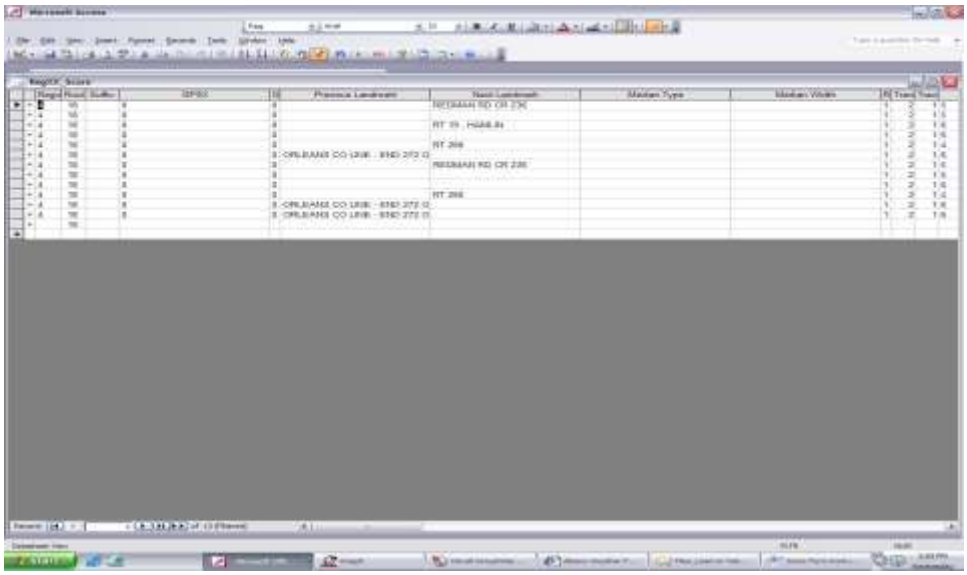
6. If data for a specific route is wanted, a filter can be used to get that data. To create a filter, click on “Records” on the main menu bar at the top of the screen and select “Filter” then “Filter by Form.” A blank form page will be displayed. Enter the search criteria in one or more of the fields. For this example, the Route number as described in Step No. 5 above is entered. Click on “Filters” on the main menu bar at the top of the screen and select “Apply Filter/Sort.”



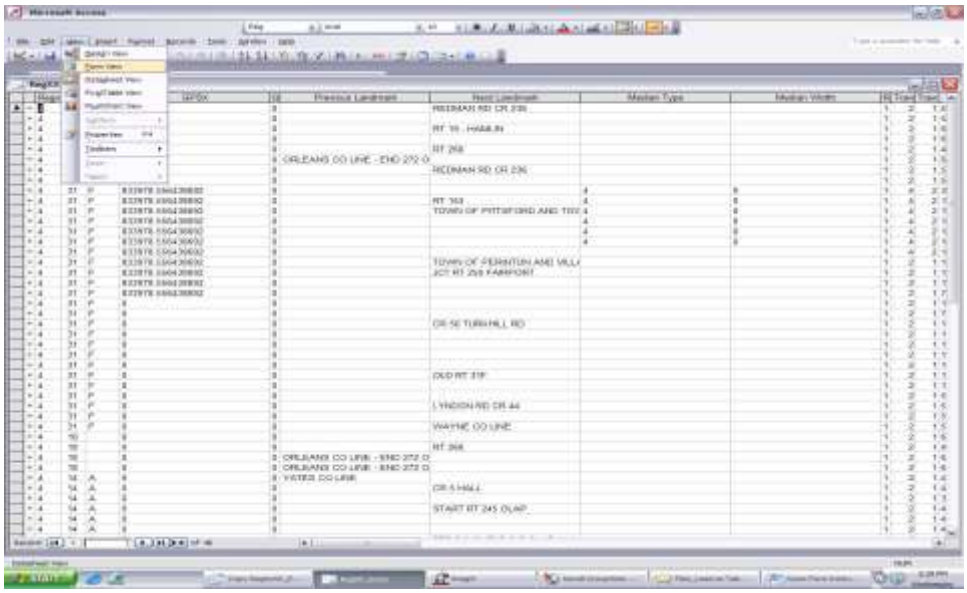


Scroll through the records that match the given criteria or display all matching records by clicking on “View” on the main menu bar at the top of the screen and selecting “Datasheet View.” Return to the Form version by clicking on “View” on the main menu bar at the top of the screen and selecting “Form View.”

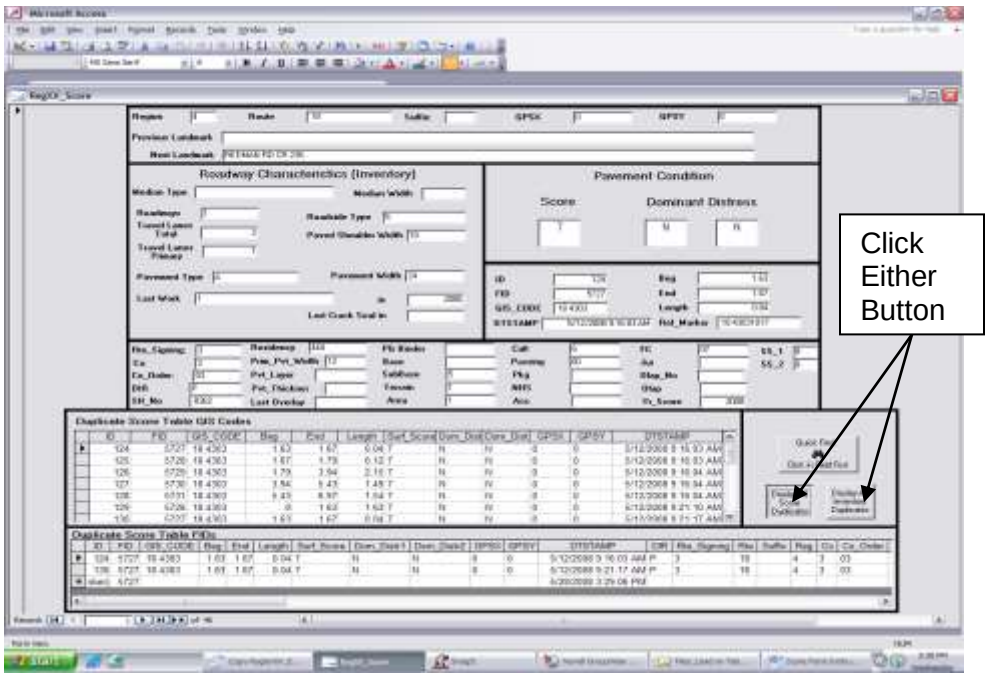




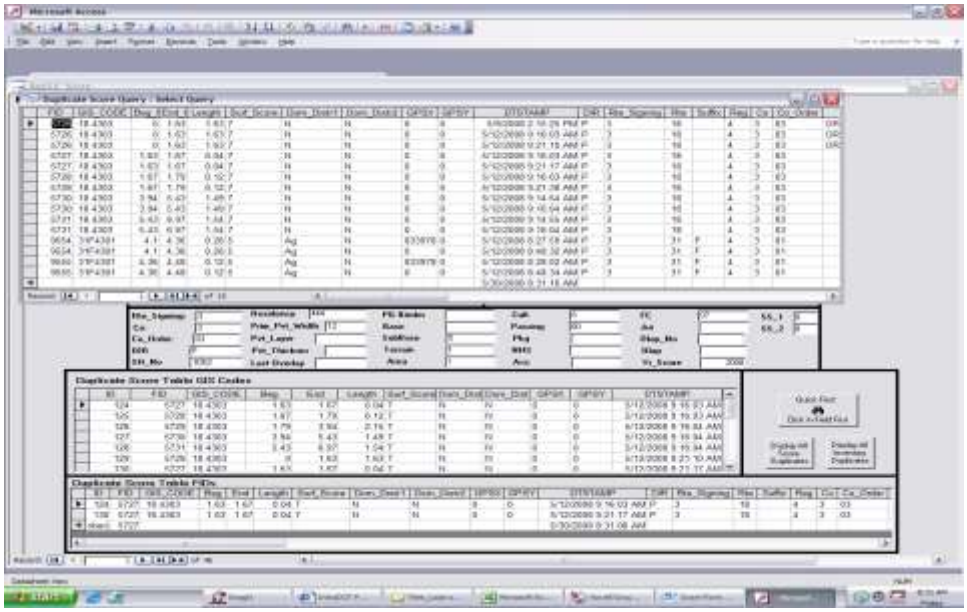
To remove filter, click on “Records” on the main menu bar at the top of the screen and select “Remove Filter/Sort.” To get back to the form view, click on the View option on the menu bar at top of page and select Form View.



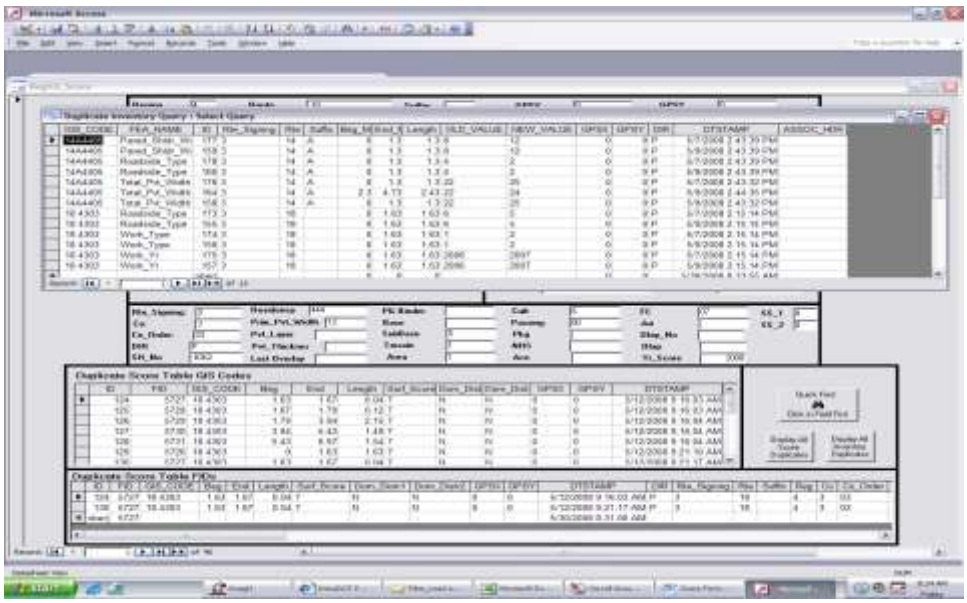
7. Duplicate GIS Codes and FID fields that match the current record will display in the lower half of the form. Changes can be made to these records from the form. To see all duplicates, not just necessarily those pertaining to the current record, click on the "Display All Duplicates" buttons.



The Display All *Score* Duplicates will display all records with matching FID and GIS code fields that are contained in the RegXX_Score data table.



The Display All *Inventory* Duplicates will display all records with matching GIS_Code, FEA_Name, Beg, and End fields that are contained in the RegXX_Inventory data table.



Appendix D: Pavement Condition Index (PCI)

The Pavement Surface Rating, Dominant Distress, and the data gathered through the High Speed Profiler program (IRI, bump and rut information) are combined in the Pavement Condition Index (PCI) to give a more comprehensive indicator of pavement condition. The following document describes the concept of PCI, and gives detailed information on how to compute and use PCI.

The PCI concept is in Working Draft form, so it has been placed in an Appendix rather than the main body of the document.

The NYSDOT Pavement Condition Index (PCI)

WORKING DRAFT

August 2007

Pavement Management Unit
Office of Technical Services
Engineering Division
New York State Department of Transportation

Executive Summary

The Department's measure of pavement condition has been the Surface Score and Dominant Distress as identified by an annual windshield survey. This measure describes the surface distress on a pavement, but in itself describes only one component of the total pavement condition. Other factors, such as ride quality, structural capacity and friction, as well as Rutting, a key pavement distress, are not addressed. The desire for a more comprehensive assessment of pavement performance, reinforced by the national emphasis on ride quality, has led to the development of the Pavement Condition Index, or PCI.

The PCI was developed by a committee of Department personnel having various roles in the pavement management decision-making process. The Committee decided that PCI should include surface distress, ride quality, Rutting, Faulting and Dominant Distresses since these factors each describe a particular facet of pavement performance and the data is readily available through existing data collection activities. The PCI is calculated by starting with a perfect score of 100 and subtracting deduction points for each distress based on the distress type and severity.

PCI has many advantages and uses. It allows pavement distress and ride quality to be considered together in condition assessments and decision making. Charts of PCI provide managers a quick and more complete overview of network condition and the distress types that are contributing to lower scores. And PCI charts at the project level allow users to see the distresses present in a pavement section and to track the development of those distresses over time.

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The NYSDOT Pavement Condition Index (PCI)

Introduction

One of the key components of an effective pavement management system is an accurate assessment of the condition of the existing pavement network. This assessment has historically been accomplished in the Department by an annual visual pavement condition survey. The surface cracking of a pavement is represented by a Surface Rating and Dominant Distress for each segment of the pavement network.

However, the complete condition and performance of a pavement is broader than just an assessment of the surface distress. Other factors, such as ride quality, structural capacity and friction are also important components. Ride quality has emerged at the national level as a primary element of pavement performance and customer satisfaction. New technologies are now available to measure other important pavement distresses at the network level. Given these advancements, it is essential for the effective management of the pavement network to develop a more comprehensive metric of pavement condition, particularly a measure that provides the ability to include ride quality in condition assessment and decision making. New York's version of the Pavement Condition Index (PCI) has been established to meet these needs.

Development of the PCI

The Pavement Condition Index (PCI) was developed by a Department committee in 2003.[1] The 12 person committee was made up of a cross section of regional and main office staff at various levels of the pavement management decision-making process. The Committee decided that PCI should include surface distress, ride quality, Rutting, Faulting and Dominant Distresses since these factors each describe a particular facet of pavement performance and the data is readily available through existing data collection activities. The structural capacity and friction components are important to overall pavement condition, but the technology to efficiently collect this information at the network level does not yet exist. The Committee therefore decided not to include structural capacity and friction as part of the PCI at this time.

The Committee decided to use a deduct system for PCI, where points for each pavement defect are subtracted from a perfect rating of 100. The deduct approach was chosen because it is easy to understand, provides flexibility in the factors and weightings used, and is relatively easy to compute. The concept of a deduct system for PCI is not new, as a similar approach is described in ASTM D6433-03 "Standard Practice for Roads and Parking Lots Pavement Condition Index Survey" and other places. The NYSDOT approach to PCI is much simpler, but shares a similar philosophy of incorporating multiple weighted factors into a single rating.

[1] The delay in implementing PCI is due to the lack of a database system that can combine the sufficiency segment-based surface score with the 0.10 mile based IRI, rut and fault data. Recently, the Highway Data Management System (HDMS) reached a level of development to be able to produce at least a rudimentary combined file from which PCI could be calculated using actual data and evaluated for reasonableness.

Description of Deductions

The weighting of each factor in the PCI is controlled by the number of points available for deduction for the range of severity of the defect. The Committee used their expert judgment to assign the maximum deduct points for each factor, thereby determining their relative importance.

It should be noted that Alligator Cracking is considered only on asphalt (flexible) pavement and Widening Dropoff occurs only on overlaid pavement. While Rutting is not normally associated with PCC pavement, fairly deep ruts have been known to occur in concrete, caused by the abrasive action of traffic and by studded snow tires. Because the mechanism for rut formation on PCC pavement is mechanical, which is not as severe as Rutting in an asphalt pavement which could be a mix stability problem or a structural issue, the deduct value for Rutting on PCC is lower to reflect the lower severity.

After analyzing, testing and evaluating PCI calculations using production data, the maximum point deduction for each distress factor for asphalt/overlay and PCC pavements is established to be:

Asphalt/Overlay Pavements	
Surface Rating:	35 pts
IRI:	35 pts
Rutting:	15 pts
Alligator Crack:	15 pts
- or -	
Widening Drop:	15 pts

PCC Pavements	
Surface Rating:	35 pts
IRI:	35 pts
Rutting:	5 pts
Faulting:	15 pts
Spalling:	10 pts

Even though Surface Rating and IRI are both 35% of the total rating, the overall PCI is comprised of 65% deductions attributable to surface distress. This represents a reasonable balance between distress and ride quality in the condition assessment.

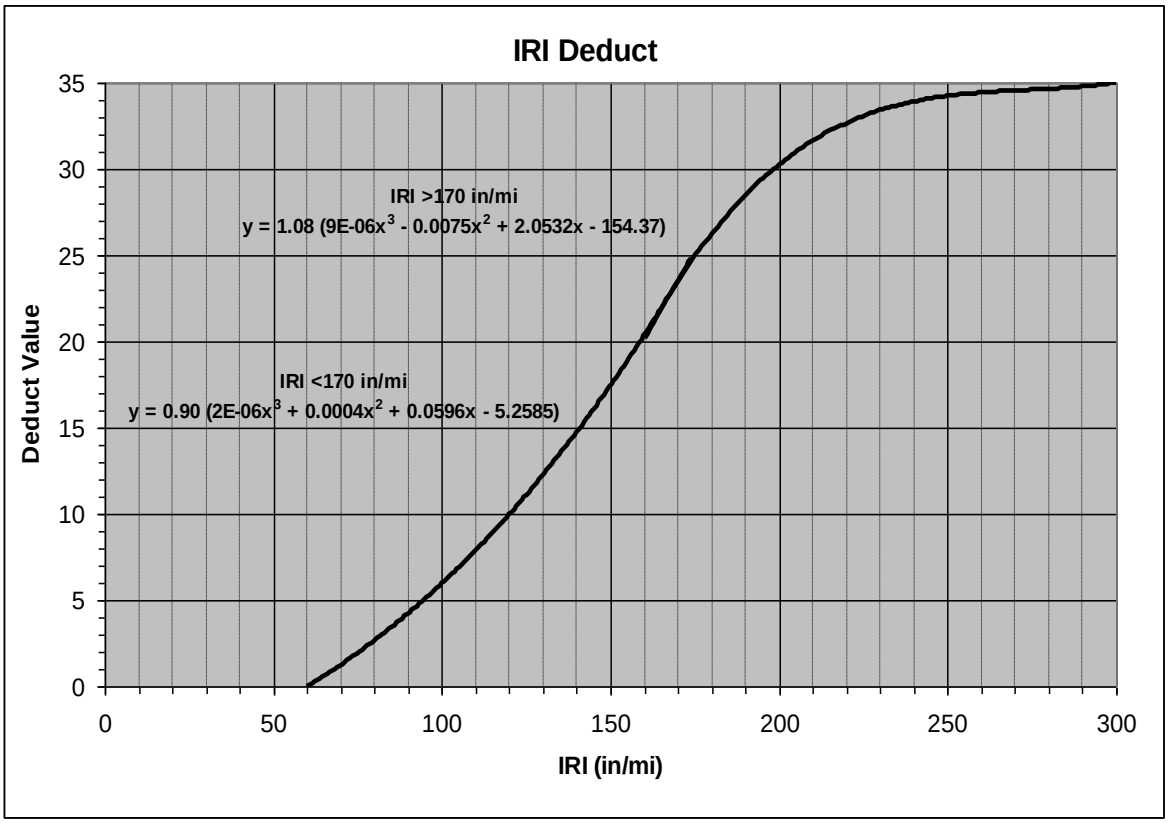
All of the data required to calculate PCI is collected by existing data collection activities: Surface Rating, Alligator Cracking, Spalling and Widening Dropoff from the annual pavement survey and IRI, rut depth and fault height from the high speed profiler.

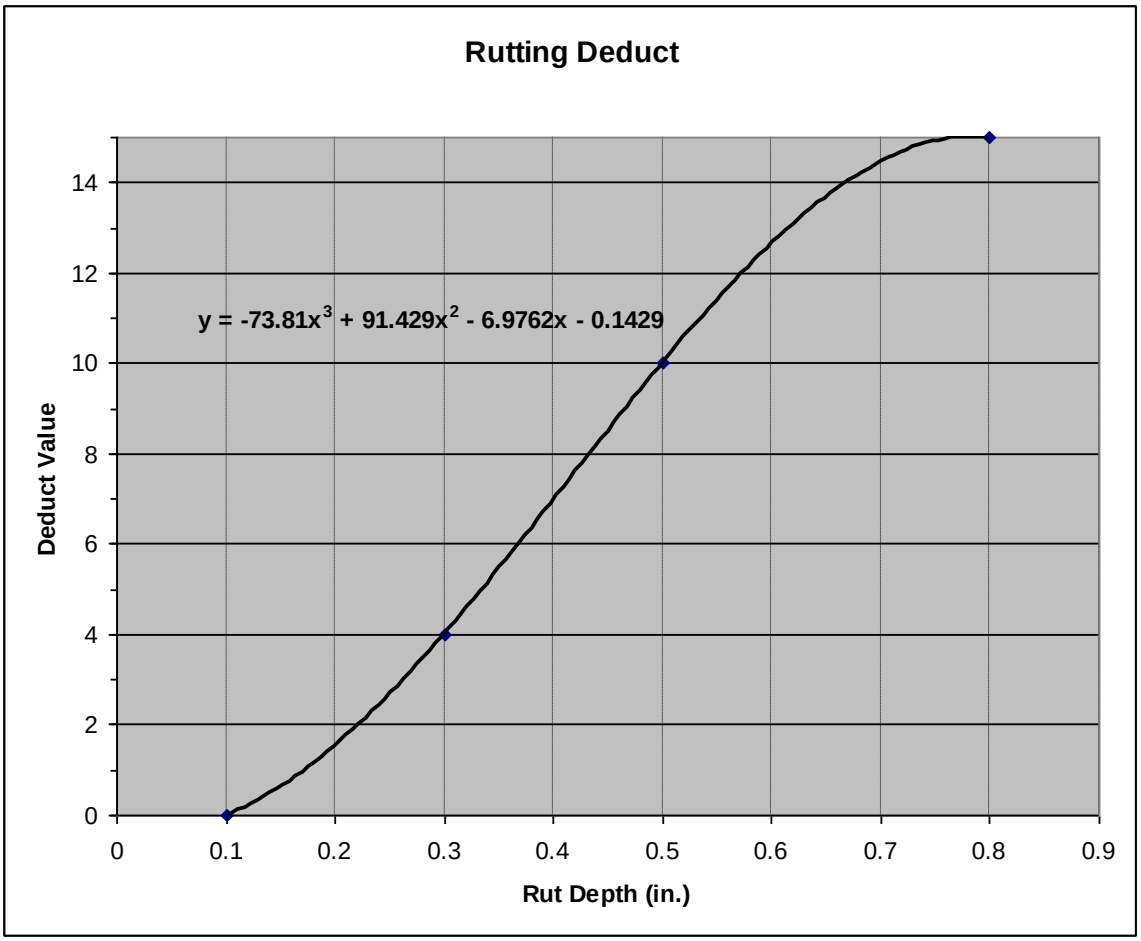
Determining the Deduct Values

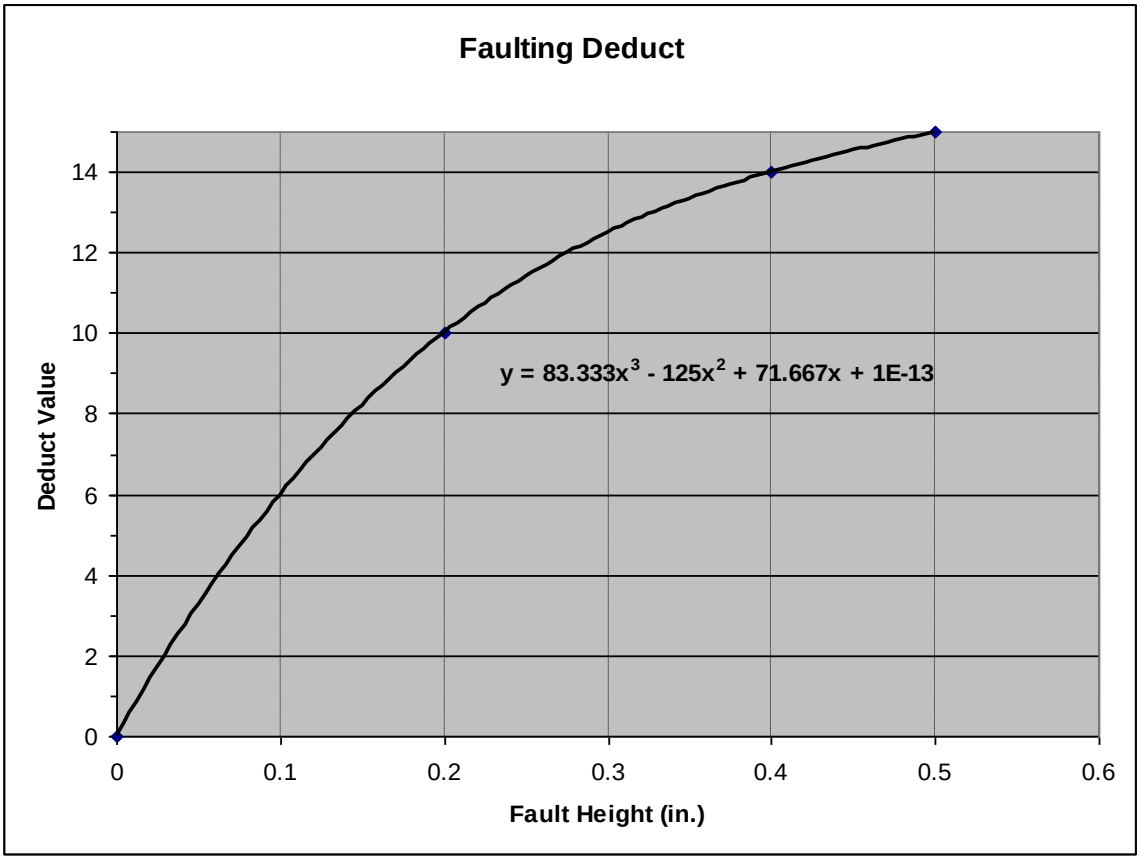
During the initial development of the PCI, the Committee created curves for deduct values for the range of ratings for each factor. The curves were designed to sensitize the deduct values to ranges of ratings that provide the most impact to pavement condition and performance. For example, the deduct for IRI values between 100 and 170 in/mi increases relatively rapidly for each increase in IRI, but the deduct increases more slowly for IRI values under 100 in/mi and over 200 in/mi where relative changes in roughness have less impact to highway users (similar to the Law of Diminishing Returns).

The deduct curves for each factor and the corresponding regression equations are shown below. Two equations are used for the IRI deduct because it was difficult to get a single equation to fit the curve well. To determine the rut depth deduct for PCC which is limited to 5 points, use the Rutting Deduct curve (with a maximum of 15 points) and divide the resulting deduct value by 3.

To determine the deduct values for Surface Rating, the Committee again used expert judgment and assigned deduct points for each Surface Rating value. However, because Surface Rating is always an integer, the resulting curve and its effect on the PCI rating caused a large step or sudden drop at the transition between each Surface Rating value.




Rutting Deduct
y = -73.81x3 + 91.429x2 - 6.9762x - 0.1429
Deduct Value
0
2
4
6
8
10
12
14
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Rut Depth (in.)


Faulting Deduct
y = 83.333x3 - 125x2 + 71.667x + 1E-13
Deduct Value
0
2
4
6
8
10
12
14
0
0.1
0.2
0.3
0.4
0.5
0.6
Fault Height (in.)

It is intuitive that Surface Rating deteriorates gradually even though the scoring system does not allow for intermediate ratings. To help reduce the appearance of a sudden drop in rating (and ultimately in PCI), the deduct amount in the first year of the rating is reduced by a few points. In most cases this helps to smooth the curve and reduces sudden drops in PCI. The same concept is applied to the deduct values for the Dominant Distresses.

Since there is no graduated rating for Widening Dropoff as there is for Alligator Cracking and Spalling (the "isolated" and "general" designations), the Surface Rating survey will be modified to include a "low severity" and "high severity" designation for Widening Dropoff to allow for a more gradual introduction of the distress.

The deduct values for Surface Rating and the Dominant Distresses are below:

Surface Rating	1st year Deduction	Full Deduction
10	0	0
9	1	2
8	3	5
7	8	10
6	17	20
5	27	30
4 or less	33	35

Dominant Distress	1st Year Deduction	Full Deduction
Ai	5	8
Ag	12	15
W_L	5	8
W_H	12	15
Si	3	5
Sg	8	10

A review of the deduct values for ride quality and Surface Rating shows that the deductions are balanced for similar levels of severity. The threshold of good for Surface Rating is a rating of 7, which is assigned a 10 point deduct. The threshold of good for ride quality is 120 in/mi, which is also a deduct of 10 points. Deductions of 20 points are made in what is considered to be the Fair category for both Surface Rating (6) and IRI (160 in/mi). Similarly, deductions of 30 points are made for both the Poor category of Surface Rating (5) and very rough category of IRI (200 in/mi).

Calculation of PCI

The calculation of PCI is straightforward and is best shown by example. The first step is to gather the necessary pavement data information.

Example #1

Pavement Type: PCC
Surface Rating: 5th year at 7
Dominant Distress: 1st year at Si
IRI: 138 in/mi
Rut Depth: 0.3 in.
Fault Height: 0.2 in.

The second step is to determine the deduct value for each factor, then sum the deduct values for all factors and subtract from 100.

	Surface Rating	Dominant Distress			IRI	Rut Depth	Fault Height	Total Deduct
		Allig	Wide Drop	Spalling				
Rating	7	-	-	Si	138	0.3	0.2	38
Deduct	10	-	-	3	14	1[2]	10	

PCI = 100 – 38 = 62 ◄

Example #2

Pavement Type: Asphalt (Flexible)
Surface Rating: 1st year at 6
Dominant Distress: 3rd year with Ai
IRI: 100 in/mi
Rut Depth: 0.4 in.
Fault Height: N/A

	Surface Rating	Dominant Distress			IRI	Rut Depth	Fault Height	Total Deduct
		Allig	Wide Drop	Spalling				
Rating	6	Ai	-	-	100	0.4	-	38
Deduct	17	8	-	-	6	7	-	

PCI = 100 – 38 = 62 ◄

Note that even though both examples above have the same PCI, the sample pavements have different types and extents of distress that would not be accounted for when using Surface Rating and Dominant Distress alone.

In most cases PCI will be calculated electronically for each pavement segment and reported alongside the supporting data in standard reports. A simple spreadsheet is also available to perform individual PCI calculations.

[2] The Rut Depth deduct for PCC is limited to a maximum of 5 points; use the Rutting Deduct curve (max of 15 points) and divide the deduct points by 3.

Data Integrity and Synchronization Issues

Like all information, quality PCI data is dependant on good quality input data. Sufficient quality assurance measures are in place for the Surface Rating Survey and the high speed profiler data collection process to ensure that the individual data elements are valid. Most of the challenge to producing a good PCI stems from the fact that Surface Rating and Dominant Distress are recorded on an annual basis, while IRI, Rutting, and Faulting currently are measured about every two years. This data synchronization issue could present difficulty when using data collected in different years because some of the data is not representing the same point in time. This is especially true when work performed on a pavement is captured in the next Surface Rating, but is not captured in the IRI, rut and fault data until the two year cycle of the high speed profiler remeasures that section in the following year.

Some assumptions can be made to mitigate the impact of data that is not synchronized in the same year of collection. It can be safely assumed that when overlay work is performed on a pavement, the rut depth or fault height after construction will be 0. Business rules in the PCI calculation routines have been established to revert the rut depth and fault height to 0 when appropriate based on the Work Type code. If no work has been done and new data is not available, the prior recorded values for rut and fault are used.

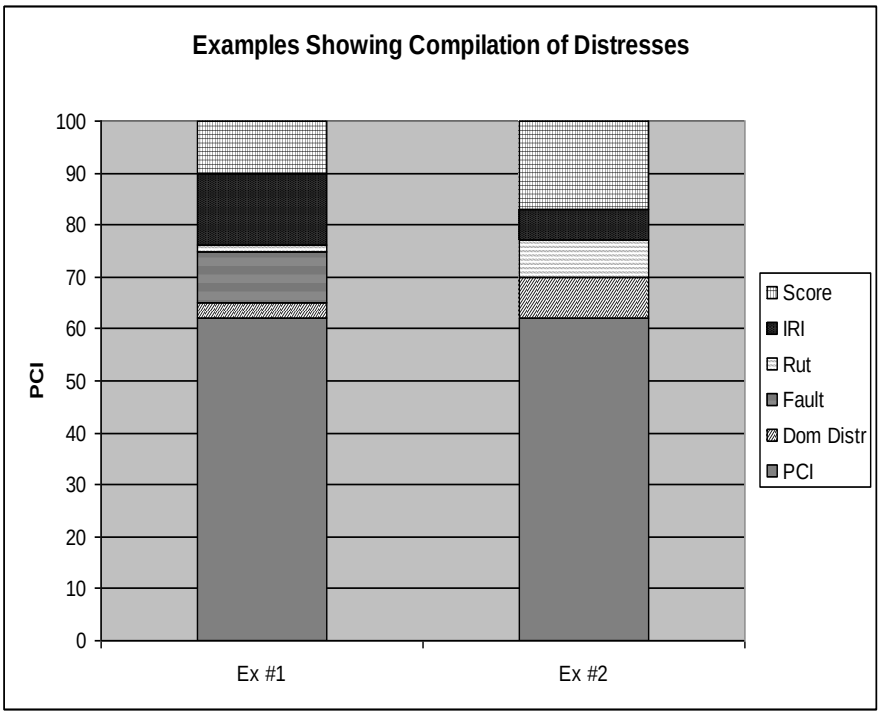
IRI is a little more difficult to estimate because post-construction IRI is affected by many factors. However, the effect of IRI on PCI is inconsequential up to about 100 in/mi. It is expected that interstates and other high volume roads for which ride quality is an important criteria would be constructed at IRI values well below 100 in/mi and the deduct would remain insignificant at least until ride quality is remeasured in the next collection cycle. Regardless, all pavements in this situation almost certainly would have PCI values above levels that would trigger any work. Therefore when work is done based on year of last work and work type codes, IRI will be defaulted to 60 in/mi until new data is available.

For years where new profiler data has not been collected and no work has been done, the previously reported IRI value is increased by 5% each year. This IRI progression rate is only an approximation to help smooth the curves, as opposed to reusing the same value and causing a stepped decline in the PCI. It is expected that refinements to these assumptions will be made as experience is gained with the data.

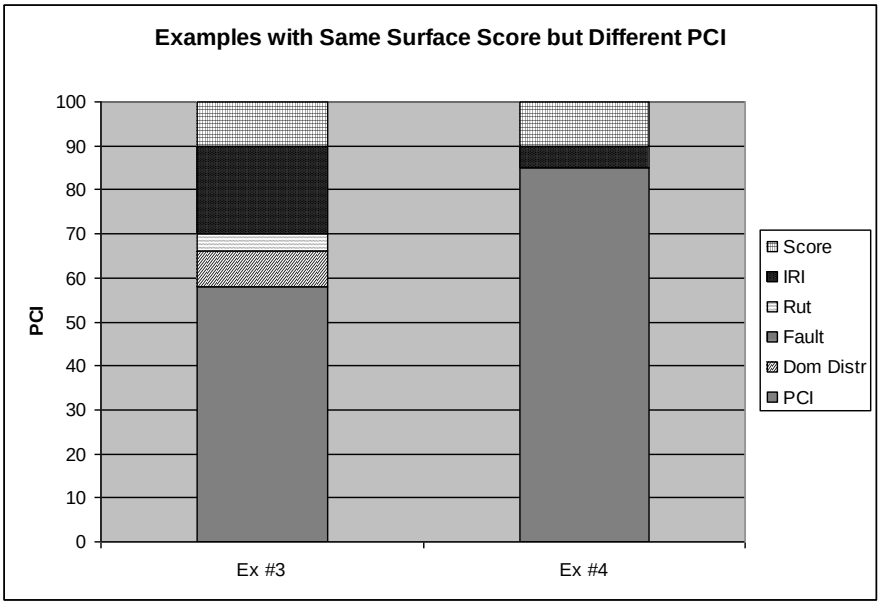
Using PCI

It is important to note that PCI is intended to be a network level indicator of pavement condition and performance. While it can be used to identify likely categories of pavement treatments (preventive maintenance, rehab, etc.) it is not intended for specific treatment selection. Project level decisions about treatment selection must still be based on the individual elements of the PCI (distress, ride quality, etc.) and a project inspection. Depending on the project type anticipated, a full Pavement Evaluation and Treatment Selection analysis may be required.

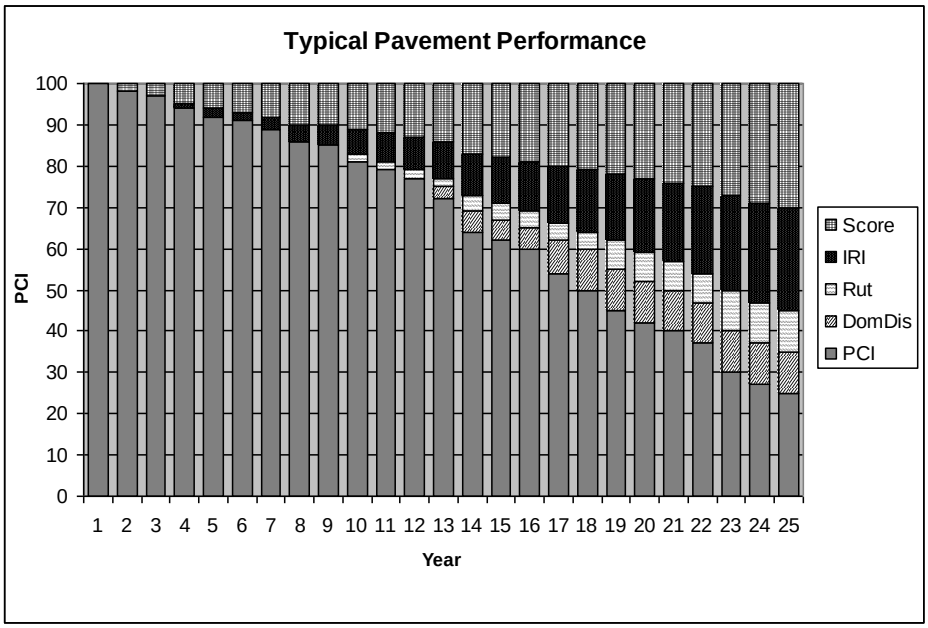
The value of the PCI is in the broader picture of what is happening in a pavement, and the ability to consider ride quality in a balanced and objective manner. In the sample PCI calculations discussed above, both examples have a PCI of 62. However, when the PCI is displayed in a cumulative bar chart as shown below, it becomes clear the distresses present in the pavement and their individual contribution to the overall condition of the pavement.

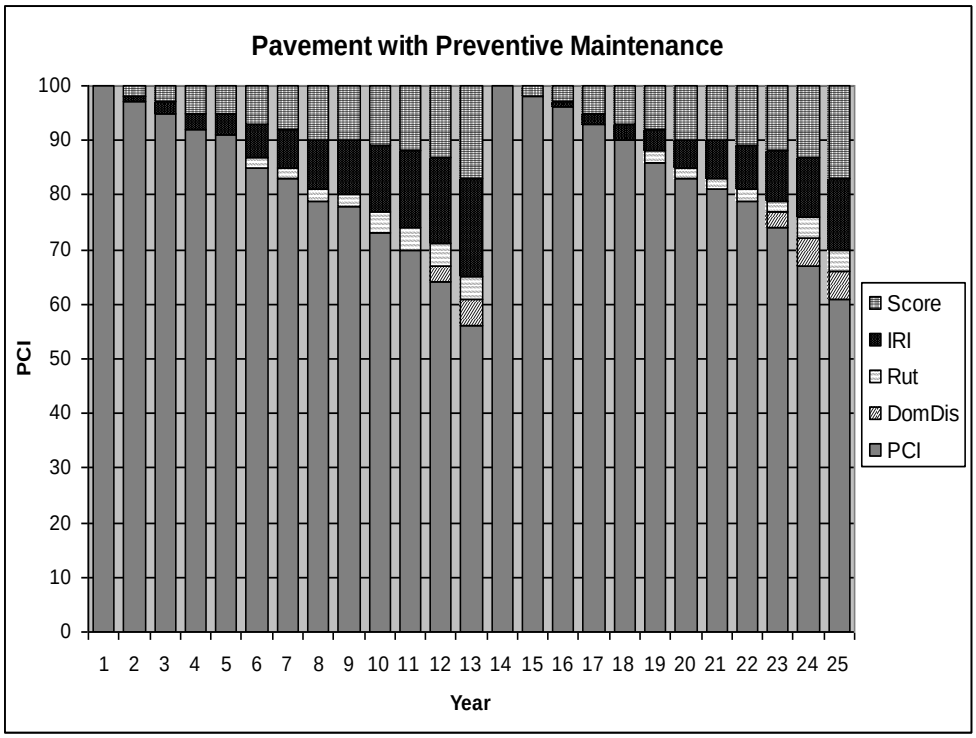


Conversely, under the former scoring system two pavements could have the same Surface Rating and would appear from the data to be in similar condition. However when using PCI, it is clear that there is a distinct difference in the overall condition of the pavement when all the factors are considered.



Charts can be developed for the performance of a pavement over time. In the chart at the right, the development of each individual distress can be observed as it progresses with time.

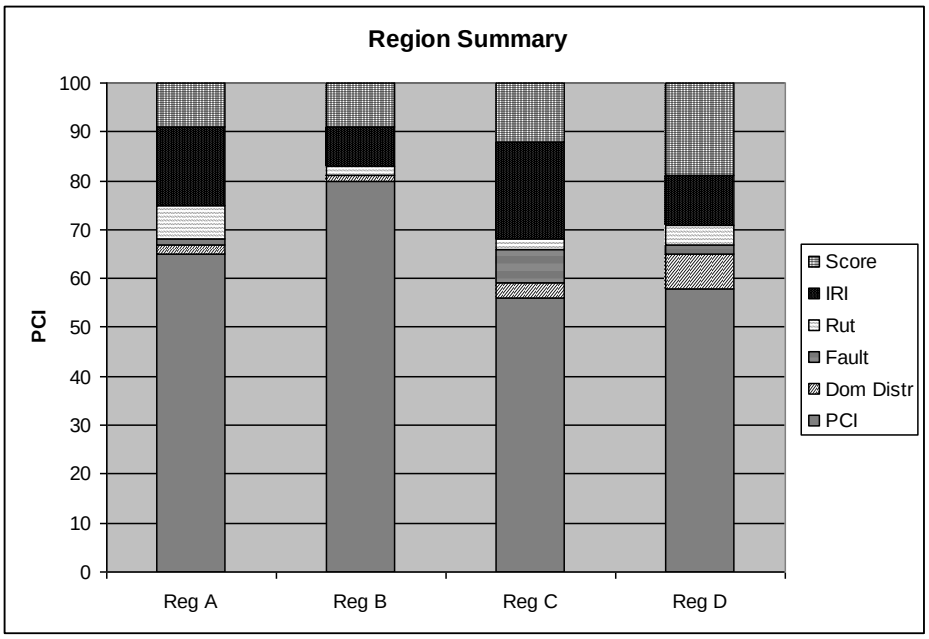




Charts of the life cycle of a pavement show the impact of performing work and the rate at which the distresses recur on the pavement.

With experienced gained through use, PCI trigger levels for categories of work can be established to aid with program planning.

Summaries by region provide a comprehensive overview of the pavement conditions and the type and level of distress occurring in the region.



PCI has many advantages and uses. It allows pavement distress and ride quality to be considered together in condition assessments and decision making. Charts of PCI provide managers a quick and more complete overview of network condition and the distress types that are contributing to lower ratings. And PCI charts at the project level allow users to see the distresses present in a pavement section and to track the development of those distresses over time. As managers and practitioners in the Department become familiar with the data, PCI will become a valuable tool to manage the pavement network. It is also expected that with experience will come refinements to the PCI process.

Appendix E: Pavement Rating Charts

The following tables provide additional descriptions of various levels of pavement distress to aid raters in deciding the rating to assign to a pavement segment. The first set of tables (*Pavement Distress Rating Warrants*) present a streamlined description of the frequency and severity of distress and the general appearance of the pavement at each rating.

The second table (*Pavement Surface Rating Based on Frequency and Severity Descriptions*) describes the rating scale expanded to include more of the possible combinations of frequency and severity of distresses. The Surface Rating determined by assessing the frequency and severity individually adds an element of objectiveness to the survey and ultimately improves the stability, consistency and repeatability of the ratings.

Pavement Distress Rating Warrants					
	Rating	**General Description**	**Warrants**		
			Frequency	**Severity**	**Appearance**
Flexible/Overlaid	10	No Distress Recently Constructed or Rehabilitated	No distress is present.		New pavement, dark black and neat. Typically one year old or less.
	9	No Significant Distress	All to nearly all of the pavement is free of distress; a single defect or crack per 0.10 mile is allowed.	The defect is superficial or the crack is tight.	Surface is typically oxidized to gray color. Typically one to three years old.
	8	Infrequent Distress, Slight Severity	Most of the pavement is free of cracking. Easy to count number of cracks at highway speed.	Cracks are tight and very widely spaced. No secondary cracking. No Dominant Distresses present.	Surface looks uniform and neat. May or may not be crack sealed.
	7	Infrequent to Occasional Distress with Minor Severity	Much of the pavement is free of cracking. More difficult to count number of cracks but still possible.	Cracks are mostly less than 1/8" wide. Cracks may have secondary cracking. No to very little connected cracking. May have isolated Dominant Distresses.	Looks fairly good but cracking is noticeable. Additional cracking has developed since last crack seal. Too many cracks to effectively crack seal- good candidate for single course overlay.

Pavement Distress Rating Warrants					
	Rating	**General Description**	**Warrants**		
			Frequency	**Severity**	**Appearance**
Flexible/Overlaid	6	Occasional to Frequent Distress with Moderate Severity	Much to most of the pavement is cracked. Cracks are spaced only a few feet apart or less.	Cracks vary in width from tight to greater than 1/8" wide. Most cracks have secondary cracking. Cracks extend to connect with adjacent cracks. Dominant Distresses may be common.	Condition looks “Fair.” Needs work, likely more than a single course overlay.
	5	Distress is Frequent and Moderate to Severe	Nearly all the pavement or wheel paths have multiple, well developed cracks.	Cracks are wide and/or well developed with secondary cracking. Many cracks are interconnected. Pieces of pavement are dislodged or have been patched.	Condition looks “Poor.” Needs major work.
	4	Distress is Frequent and Severe	Pavement is mostly cracked. Travel on the pavement is impaired.	Cracks are wide and connected. Potholes and/or patches are common. Patches on patches.	Beyond repair.

Pavement Distress Rating Warrants					
	Rating	**General Description**	**Warrants**		
			Frequency	**Severity**	**Appearance**
Rigid	10	No Distress Recently Constructed or Rehabilitated	No distress is present.		New pavement, white and neat. Typically one year old or less.
	9	No Significant Distress	All to nearly all of the pavement is free of distress; a single defect or crack per 0.10 mile is allowed.	The defect is superficial or the crack is tight.	Slight discoloration in wheel paths due to traffic. Typically one to three years old.
	8	Infrequent Distress, Slight Severity	A few slabs have minor popouts or corner breaks.	Popouts are shallow and few in number. Corner cracks, if present, are tight and not displaced. Joint distress is rare. No visible mid-slab cracking.	Slight weathered appearance on surface.
	7	Infrequent to Occasional Distress with Minor Severity	Popouts are more frequent and may be patched. Some joints show distress.	Joint spall cracks are tight and not displaced. Little or no secondary cracks. Some slabs may have a single mid-slab crack. Many slabs have mid-slab spalling and patching.	Distress is noticeable but not too severe.

Pavement Distress Rating Warrants					
	Rating	**General Description**	**Warrants**		
			Frequency	**Severity**	**Appearance**
Rigid	6	Occasional to Frequent Distress with Moderate Severity	Many slabs contain distress.	Advanced cracking at joints with some spalling and loose/displaced concrete. Mid-slab cracks are well defined. May have additional mid-slab cracks.	Distress is noticeable and needs repair.
	5	Distress is Frequent and Moderate to Severe	Most slabs contain distress. Distress covers a large portion of the slab.	Multiple cracks in the majority of slabs. Extensive cracking at joints with displaced concrete and/or patching.	Needs major work.
	4	Distress is Frequent and Severe	Most slabs are badly damaged. Extensive spalling and/or patching.	Cracks are wide. Broken concrete is common. Patches on patches.	Beyond repair.

Pavement Surface Rating Based on Frequency and Severity Descriptions

FREQUENCY		SEVERITY: None	Slight	Minor	Moderate	Moderate to Severe	Severe	Very Severe	Travel is Impaired	Impas-sible
No distress is present. A single random defect per 0.10 mile is allowed.	None	10 / 9	9	-	-	-	-	-	-	-
Most of the pavement is free of distress. One or two cracks or distresses are visible for the next 0.10 mile.	Infrequent	-	8	8	8	7	7	-	-	-
Much of the pavement is free of cracking. Large blocks of distress-free pavement are present.	Infrequent to Occasional	-	8	7	7	7	6	6	-	-
Much (<1/2) to most (>1/2) of the pavement is cracked. Uncracked or undistressed blocks of pavement range from 20-30 ft per lane to 12 ft per lane.	Occasional to Frequent	-	7	7	6	6	5	5	-	-
Nearly all the pavement is cracked. Uncracked or undistressed blocks of pavement are 12 ft square or less	Frequent	-	7	6	6	5	4	3	2	1
Mostly cracked. Cracks or distress are continuous and spaced only a few feet apart.	Very Frequent	-	6	6	5	5	4	3	2	1

Slight	Cracks are tight, single and only a few feet long. Tight, single longitudinal joint cracks, partial or continuous, are included.
Minor	Cracks are generally < 1/8 inch wide, some with minor secondary cracks, no or very few connected cracks. May have a few small spalls (< 1 ft square).
Moderate	Cracks are generally >1/8 inch wide; secondary cracking is common, some cracks connected; may have some minor popouts or small (1-2 ft) to medium (3-4 ft) patching.
Moderate to Severe	Distresses vary from "Moderate" to "Severe."
Severe	Cracks are wide and/or have extensive interconnnected secondary cracking; holes, loose material and/or patching are common, patches may have patches.
Very Severe	Cracks are very wide, holes and/or patching is extensive; patches extend across the full lane or extend several feet along the lane; patches on patches are common.
Travel is Impaired	Holes in pavement are large and/or pavement has so many layers of patches that the section can be traveled only at reduced speed.
Impassible	Travel by ordinary car would risk damage to the vehicle.

Notes: - Ratings in blue are the definitions from the original Pavement Rating Manual c.1981.
- "Very Slight" from the original Manual = "Slight" here.
- "Slight" from the original Manual = "Minor" here.

3/16/2010

Appendix F: Photographic Examples of Pavement Ratings

The following photographs establish the pavement Surface Rating scale used by the New York State Department of Transportation. Several photos are provided for each Surface Rating to present a better indication of the range of conditions that may be associated with each rating level. The photos include a description of the frequency and severity of distress, and the corresponding Surface Rating. The expanded photographic scale is used in conjunction with the chart on Page E-5.

The photographic scale used in the original Pavement Rating Manual remains unchanged and embedded in the expanded photographic scale presented on the following pages. The distress levels for each Surface Rating in the original Manual were used as control points around which the expanded scale was developed.

Photos of asphalt pavements are presented first, followed by concrete pavements. Photos of asphalt pavements include both full depth asphalt (flexible) and overlaid pavements to simplify the presentation.

10
Excellent

New
Pavement

No
Distress

9
Excellent

No
Distress

8
Good

Infrequent

Slight

8
Good

Infrequent

Minor

8
Good

Infrequent

Moderate

8
Good

Infrequent
to
Occasional

Slight

7
Good

Infrequent
to
Occasional

Minor

7
Good

Occasional
to
Frequent

Slight

7
Good

Infrequent

Moderate
to
Severe

7
Good

Infrequent

Severe

7
Good

Infrequent
to
Occasional

Moderate

7
Good

Infrequent
to
Occasional

Moderate
to
Severe

7
Good

Occasional
to
Frequent

Minor

7
Good

Occasional
to
Frequent

Minor

6
Fair

Frequent

Minor

6
Fair

Frequent

Minor

6
Fair

Frequent

Minor

6
Fair

Very Frequent

Slight

6
Fair

Very
Frequent

Minor

6
Fair

Occasional
to
Frequent

Moderate

6
Fair

Occasional
to
Frequent

Moderate
to
Severe

6
Fair

Infrequent
to
Occasional

Severe

6
Fair

Frequent

Moderate

6
Fair

Frequent

Moderate

6
Fair

Frequent

Moderate

6
Fair

Frequent

Moderate

5
Poor

Frequent

Moderate
to
Severe

5
Poor

Frequent

Moderate
to
Severe

5
Poor

Occasional
to
Frequent

Severe

5
Poor

Very
Frequent

Moderate

5
Poor

Very
Frequent

Moderate
to
Severe

4
Poor

Frequent

Severe

4
Poor

Very Frequent

Severe

3
Very Poor

Very Frequent

Very Severe

2
Very Poor

Very
Frequent

Impaired
Travel

1
Very Poor

Risk of
Damage
to Vehicle

10
Excellent

New
Pavement

No
Distress

9
Excellent

No
Distress

8
Good

Infrequent

Slight

8
Good

Infrequent

Slight

8
Good

Infrequent

Minor

8
Good

Infrequent

Moderate

7
Good

Infrequent

Severe

7
Good

Infrequent
to
Occasional

Minor

7
Good

Infrequent
to
Occasional

Minor

7
Good

Occasional
to
Frequent

Minor

7
Good

Infrequent
to
Occasional

Moderate

7
Good

Infrequent
to
Occasional

Moderate

7
Good

Infrequent
to
Occasional

Moderate

7
Good

Infrequent
to
Occasional

Moderate
to
Severe

6
Fair

Occasional
to
Frequent

Moderate

6
Fair

Occasional
to
Frequent

Moderate

6
Fair

Occasional
to
Frequent

Moderate
to
Severe

6
Fair

Occasional
to
Frequent

Moderate
to
Severe

6
Fair

Occasional
to
Frequent

Moderate
to
Severe

6
Fair

Very
Frequent

Minor

6
Fair

Frequent

Moderate

6
Fair

Frequent

Moderate

5
Poor

Frequent

Moderate
to
Severe

5
Poor

Frequent

Moderate
to
Severe

5
Poor

Frequent

Moderate
to
Severe

5
Poor

Very
Frequent

Moderate

5
Poor

Occasional
to
Frequent

Severe

5
Poor

Occasional
to
Frequent

Severe

4
Poor

Very
Frequent

Severe

3
Very Poor

Frequent

Very
Severe

2
Very Poor

Very
Frequent

Impaired
Travel

1
Very Poor

Risk of
Damage
to Vehicle

Appendix G: Photographs of Dominant Distresses and Other Special Cases

The following photographs display the various Dominant Distresses identified in the pavement Surface Rating survey.

Also included for reference are other distress types not included in the formal NYSDOT survey process, and guidance on how to account for these distresses and other special conditions when observed during the survey.

Alligator Cracking

Typical alligator cracking is composed of frequent inter-connected cracks. The distress is load-related, so it is identified only when present in the wheelpath of a full-depth asphalt pavement.

Alligator cracking is identified as “isolated” when it occurs over less than 20% of the length of the segment, and “general” when it occurs over more than 20% of the segment.

The longitudinal crack in this photo qualifies as alligator cracking even though it lacks the interconnected cracking. The crack is in the early stages of development, but still represents a load-related distress because it occurs in the wheelpath.

Spalling

Two types of spalling can occur on concrete pavement: mid-slab when the mesh reinforcement is close to the surface and corrosion causes popouts; and at the joints, when incompressible material prevents the joint from moving and the compressive stresses in the slab fracture the concrete.

Spalling is identified as “isolated” when it occurs on less then 20% of the slabs, and “general” when it occurs on more than 20% of the slabs.

Delamination

Delamination occurs when an overlaid pavement looses the bond to the underlying layers and becomes dislodged. This distress is not identified directly in the NYSDOT survey, so when it is observed, the delaminated areas should be considered the same as cracking distress.

Widening Dropoff

Widening dropoff occurs when an old concrete pavement is widened with an asphalt overlay. The dissimilar base materials settle relative to each other, causing a dropoff at the edge of the underlying slab.

The widening dropoff dominant distress is identified as “low” severity (photo at right) when the cracking at the drop becomes well developed.

The distress is identified as “high” severity (photo at right) when the effect of the height difference can be detected when driving across the drop, or has the potential to influence the track of a vehicle.

Permanent Patching

Patches with straight, saw-cut edges are assumed to be permanent repairs to the pavement and are expected to perform as original pavement. These areas are not counted as distress until the patch itself begins to show signs of distress.

Temporary Patching

Temporary patching, such as “throw and go” patches, do not repair the structural damage in the pavement and therefore are counted as distress. These patches can be identified by their rounded, random shapes.

Crack Seal

Crack seal is an effective preventive maintenance activity that helps keep water out of the pavement structure. When a pavement is crack sealed, the sealant tends to highlight the cracks, which could make the pavement look worse and cause a decrease in the rating. Roads that are crack sealed should be given the same rating as the prior year until the continued development of the cracking extends beyond the sealed areas.

Flushing

Flushing occurs when excess liquid asphalt material rises to the surface of the pavement. This distress is not identified directly in the NYSDOT survey, but should be reported separately to the Resident Engineer and/or the Regional Materials Engineer, as it may present an urgent safety condition.