IMPLEMENTATION PLAN FOR THE NEW MECHANISTIC-EMPIRICAL PAVEMENT DESIGN GUIDE

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Submitted by

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16. Abstract

This report presents the research effort to develop an implementation plan for the NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide (MEPDG). This research encompasses both flexible and rigid pavements in new and rehabilitation projects. The project includes the study of current design practices followed by the NCDOT and the design practices followed by the MEPDG. The MEPDG is a sophisticated tool used to predict the performance of pavements and requires more rigorous inputs than any other earlier design procedures. Because the distress prediction models included in the MEPDG were calibrated using limited national databases, it is critical to calibrate the design methods and models using locally available input and performance data. The implementation plan developed during this project provides detailed recommendations for the steps necessary for the local calibration and validation of the MEPDG procedures. One important issue in the successful implementation of the MEPDG is the sensitivity analysis of the input data and the prediction using local databases. The Long-Term Pavement Performance (LTPP) database plays a significant role in this study. Sensitivity analysis has been performed on several representative pavement sections in North Carolina. For material sensitivity analysis, the pavements are divided according to their climatic region and structure, thus taking care of two major inputs (climate and structure). Traffic sensitivity analysis has been performed based on the functional classification of roadways. A series of tables are provided showing the sensitivity of each input for various distress predictions. Once the sensitive and insensitive inputs are identified, an input data collection strategy is provided showing the most efficient ways of collecting those data. A main framework for a local training program is developed during this project. Finally, MEPDG implementation guidelines are developed based on all the findings from this project.

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1. INTRODUCTION

1.1 Research Needs and Significance

The 1993 AASHTO Guide for Design of Pavement Structures is a mere modification of the empirical methods found in its earlier versions that are based on regression equations relating simple material and traffic inputs. Although the various editions of the AASHTO design guide have served well for several decades, they contain too many limitations to be continued as the nation's primary pavement design procedures. Besides the empirical nature of the 1993 Guide, the performance equations that are its foundation are derived from the AASHO Road Test that took place during 1958-1961 in Ottawa, Illinois. Several limitations have been noted in the procedures from then on, including 1950's traffic loading, one climatic zone, one material type for each pavement layer, 1950's construction and drainage, to name a few.

One of the major concerns regarding the previous AASHTO methods was the inability to incorporate significant material properties into the design. For flexible pavements, for example, the only parameter considered was layer coefficient 'a,' which is empirical by nature. For rigid pavements, highly significant parameters such as the coefficient of thermal expansion and joint spacing were not considered at all. The mechanistic-empirical design procedure, on the other hand, provides the tools for evaluating the effect of variations in materials on pavement performance. It provides a rational relationship between the construction and material specifications and the design of the pavement structure. Because the mechanistic procedure better accounts for present day materials, aging, climate, and present day vehicle loadings, the variations in performance in relation to design life should be reduced.

Several benefits are associated with the implementation of the NCHRP 1-37A Mechanistic Empirical Pavement Design Guide (MEPDG). The design method in the MEPDG is mechanistic because it uses stresses and strains in a pavement system calculated from the pavement response model to predict the performance of the pavement. The empirical nature of the design method stems from the fact that the pavement performance predicted from laboratory-developed performance models is adjusted based on the observed performance from the field to reflect the differences between predicted and actual field performance. These models require user inputs for the following four modules: materials, traffic, environment and pavement structure. The MEPDG is hierarchical in nature in that the level of sophistication for different input requirements changes according to the importance of the project in question.

The performance models used in the MEPDG are calibrated using limited national databases and, thus, it is necessary to calibrate these models for implementation by taking into account local materials, traffic information, and environmental conditions. A crucial step in ensuring that the calibration is commensurate with local conditions is the sensitivity analysis; that is, the sensitivity of the final design outcome for various input parameters must consider the material, traffic and environmental conditions in North Carolina.

1.2 Research Objectives

The primary objective of the research project is to develop an implementation plan for the MEPDG. To accomplish this objective, the following tasks are performed in this study:

1. Develop a summary of design practices outlined in the MEPDG that differ from the current design practices used by the NCDOT;
2. Perform a sensitivity analysis on the design input parameters using realistic input ranges;
3. Develop a strategy for the required input data collection; and
4. Develop a local training program.

1.3 Report Organization

This report is composed of seven chapters. Chapter 1 presents the research needs and objectives. Chapter 2 summarizes the literature review of current design practices at the NCDOT, the design inputs required to use the MEPDG, and data extraction from the Long-term Pavement Performance (LTPP) database. Chapter 3 describes sensitivity analyses done by other researchers as well as the analysis performed in this project. Chapter 4 provides a discussion of the input data collection strategy that is derived from the results of the sensitivity runs. Chapter 5 develops a local training program to enable the NCDOT engineers to better understand the concepts behind the MEPDG. Chapter 6 presents the implementation recommendations that need to be followed by the NCDOT to allow a smooth transition to the new MEPDG design practices. Chapter 7 includes references cited in this report.

2. DATA COLLECTION

A review of the NCDOT'S current pavement design practices and existing input data constitutes the first task of the project; these practices and data include the material inputs, traffic inputs, climatic inputs, design reliability levels, performance criteria, and pavement structures. Information collected in this review includes: (1) types and formats of input data for current NCDOT design practices; (2) actual values and their variations for various input data; and (3) data collection methods.

It was determined at the beginning of the project that the most comprehensive and reliable data that can be used in the sensitivity analysis are the LTPP data. In this chapter, LTPP data extraction efforts made in this project are described.

2.1 Current Design Practices at the NCDOT

The first task of this project is to review the NCDOT's current pavement design practices and existing input data. Several engineers from key NCDOT units were interviewed for the purpose of understanding the current design practices at the NCDOT. These units include the Pavement Management Unit (PMU), Geotechnical Engineering Unit, Materials & Tests Unit (M&T Unit), Traffic Forecasting Unit, and Traffic Survey Unit (TSU).

The current design practices follow AASHTO design equations, as presented in the 1972 AASHTO Interim Guide for Design of Pavement Structures, for the design of both flexible and rigid pavements. For flexible pavement designs, the inputs required are regional factors and soil support values, as determined from laboratory CBR tests. For rigid pavement designs, the input required is the modulus of the subgrade reaction.

The findings from the review and interviews are summarized below.

2.1.1 Pavement Management Unit

Pavement designs are created by the PMU and follow the NCDOT's Interim Pavement Design Procedure (IPDP) dated April 1, 2000. The IPDP is based on the 1972 AASHTO Interim Pavement Design Guide with some modifications. In the following, the procedures in the IPDP are summarized, along with the findings from the interviews with the PMU engineers.

2.1.1.1 Design Life

The design life for new flexible and rigid pavements is 20 and 30 years, respectively.

2.1.1.2 Traffic Inputs

The algorithm used in the current NCDOT procedure for calculating the 18 kip (80 kN) equivalent single axle loads (ESALs) for pavement design requires the following traffic inputs: initial year average daily traffic (ADT), projected year ADT, percentage of Duals, percentage of TTST, and directional distribution percentages. The term *Dual* represents single-unit trucks, whereas *TTST* represents multiple unit trucks including both single and twin trailer combinations.

The current NCDOT procedure is based on the following traffic growth law:

$$Total\ \ ESALs = \sum_{i=0}^{DL} IESAL \times (1 + \frac{GR}{100})^{i} \ \ , \qquad (1)$$

where DL = design period in years;

$IESAL$ = first year ESALs; and

GR = growth rate, percent.

Eq. (1) can be further refined using various traffic factors, as shown below:

$$Total\ \ ESALs = AE + IADT \times \left\{ \left(1 + \frac{GR}{100 * 365.25} \right)^{365.25 \times DL} - 1 \right\} \times \left(1 + \frac{GR}{365.25 \times 100} \right)^{(CY - IY) \times 365.25}$$

$$\times \left(\frac{PTT}{100} \times FTT + \frac{PD}{100} \times FD \right) \times \frac{DDP}{100} \times \frac{LD}{\ln\left(1 + \frac{GR}{100 \times 365.25} \right)} \ \ , \qquad (2)$$

where

AE = additional ESALs, such as military loadings;

GR = growth rate, percent;

DL = design life, year (flexible pavement = 20 and rigid pavement = 30);

IADT = initial year ADT;

CY = construction year;

IY = initial year;

PTT = TTST, percent;

FTT = truck factor for TTST (Table 2-2);

PD = Duals, percent;

FD = truck factor for Duals (Table 2-2);

DDP = directional distribution, percent;

LD = lane distribution factor determined from Table 2-1; and

LN = natural logarithm.

The projected year ADT is normally for a 20-year period. The 20-year growth rate should be used to project traffic counts to the 30-year mark, unless the Traffic Forecast Unit provides 30-year projections. Loadings from automobiles are considered to be negligible. The lane distribution factors and the truck factors are tabulated in Table 2-1 and Table 2-2, respectively. A lane distribution factor of 0.5 will be used for the design of the inside (median) lane widening of existing facilities that have 2 or more lanes per direction.

Table 2-1 Lane Distribution Factor

Lane Distribution Factor	**No. of Lanes in One Direction**
1.0	1
0.9	2
0.8	3 or more

Table 2-2 Truck Loading Factors

	Truck Loading Factors			
	Flexible Pavement		**Rigid Pavement**	
Road Type	**Duals (*FD*)**	**TTST (*FTT*)**	**Duals (*RD*)**	**TTST (*RTT*)**
Rural Freeway	0.30	1.15	0.30	1.60
Rural Other	0.30	0.95	0.35	1.30
Urban Freeway	0.30	0.85	0.35	1.20
Urban Other	0.25	0.80	0.25	1.10

The following list summarizes the characteristics of traffic inputs for pavement designs at the PMU:

- ADT, %TTST, and %Dual are obtained for the construction year and for the design life based on the projection from the Traffic Forecasting Unit.

- When the project is composed of multiple segments, the highest traffic data are used for the entire project.
- Class 4 and Class 9 trucks are the major vehicle types in North Carolina.
- Eq. (2) is used to determine the ESALs.
- Truck factors are developed from weigh station data.
- Fifty percent is normally used to convert two-way traffic to one direction for pavement design.
- Based on the PMU's mid-day vehicle and truck counts and visual observation at project sites, it has been noticed that traffic forecast truck percentages are lower than truck percentages based on these observations.

2.1.1.3 Soil Support Value (SSV)

The SSV is determined from the following equation:

$$SSV = 5.32 \times \log(CBR) - 1.49\ . \tag{3}$$

The pavement design engineer will determine the final SSV value based on the laboratory CBR test results, deflection data (if any), and information from the Geotechnical Engineering Unit, including the soil classification and Dynamic Cone Penetrometer (DCP) results.

2.1.1.4 Terminal Serviceability Index

The following table shows the terminal serviceability index values used in different cases.

Table 2-3 Terminal Serviceability Index

Traffic Level	Terminal Serviceability Index
20-year traffic projection exceeds 50,000 ADT with a high heavy truck volume	2.75
20-year traffic projection exceeds 80,000 ADT with a high heavy truck volume	3.0
All other roadways	2.5

2.1.1.5 Regional Factors

The minimum values for the regional factors for different counties in North Carolina are given on page 4 of the IPDP. These values are used unless higher values are provided by the Geotechnical Engineering Unit.

2.1.1.6 Layer Coefficients

Layer coefficients for different materials are given on page 4 of the IPDP. It is noted that one structural coefficient value is used for all the surface and binder hot-mix asphalt (HMA) mixes.

2.1.1.7 Drainage

For rigid pavements, a permeable asphalt drainage layer (PADL) over a stabilized subgrade is typically used under the concrete slab to provide uniform support and positive drainage. In the past, NCDOT had specific mix types that consisted of coarse aggregate and asphalt cement only, and were not dense-graded. These mix types were identified as PADL/PADC. A separating layer of S9.5A (30 mm thick) or S9.5B (40 mm thick) is placed between the PADL and the stabilized subgrade.

Shoulder drains are always used when PADLs are used. Shoulder drains are considered for projects with an ADT greater than 15,000 and a heavy truck percentage greater than 5%. For projects with an ADT greater than 50,000 and a heavy truck percentage greater than 15%, shoulder drains are highly recommended. For flexible pavements, shoulder drains are recommended for locations that have a slope of less than 1% and poor draining soils.

2.1.1.8 Cost Analysis

According to the IPDP, the unit costs for pavement pay items are obtained from the Project Services Unit, and the request for unit costs should include the project location and description and a complete listing and total quantities of the pay items.

2.1.1.9 Asphalt Overlay on Flexible Pavements

The falling weight deflectometer (FWD) data are used to determine the overlay thicknesses. The detailed mathematical procedure is given on pages 10 and 11 of the IPDP. Traffic estimates for smaller overlay jobs and widening projects are provided by the PMU.

The modulus of an AC overlay is assumed to be 500,000 psi. Coring is often undertaken to determine layer thicknesses.

2.1.1.10 Asphalt Overlay on Rigid Pavements

The design of asphalt overlay on rigid pavements is mainly experience-based.

2.1.1.11 Concrete Overlay on Rigid Pavements

Currently, there is no design procedure for a concrete overlay on rigid pavements. Bonded overlay is not very common in North Carolina. The continuously reinforced concrete pavement (CRCP) construction is undertaken mostly in widening projects, and such projects use the design method for new pavements. Therefore, the thickness of the concrete overlay on the existing pavement is governed by the thickness of the pavement in the new lane. For CRCP pavements that are not in good condition, patching will be done to restore them. It is the most preferred treatment which is done with concrete using mechanical couplers and is then overlaid with 5 inches of HMA.

The unbonded overlay requires a substantially thicker overlay than the bonded overlay but much lower risk. The additional thickness of an unbonded overlay often becomes a problem because of geometric constraints. Bridge clearances are the main constraint.

2.1.1.12 Rubblization

The layer coefficient for rubblized concrete is given on page 5 of the IPDP. The SSV values are obtained from the Geotechnical Engineering Unit. Rubblization projects are treated as new flexible pavement design projects.

2.1.2 Traffic Survey and Traffic Forecasting Units

2.1.2.1 Data type

The TSU has six types of traffic data products that may be used in the development of traffic forecasts. These are:

1. **Annual Average Daily Traffic (AADT)**

   The unit operates a coverage count program to provide comprehensive monitoring of traffic volume on all primary and on some secondary and local routes. Data are collected in daily counts on highway segments that are factored for axle correction and seasonal adjustment to generate AADT volume estimates. These data are used to generate base year AADT estimates and for trend analyses to develop future year estimates.

2. **Turning Movements (TMs)**

   Turning movements are manual volume counts collected at intersections to identify the number of turns and through movements. Truck classification data consistent with traffic forecast classification formats are collected for one leg of the intersection. Data are collected in two shifts, typically on two different days. Surveyed turning volumes and truck volumes are expanded from partial day to 24-hour estimates. These values are treated as average weekday volumes.

3. **Manual Classification (MC)**

   Manual classification is similar to turning movements, but data are collected on a segment where traffic is classified in both directions. Truck percentages are generated for surveyed traffic only. These volumes are not expanded to 24-hour estimates. Surveyed truck percentages are considered representative of average weekday truck percentages. The manual classification is typically used when conditions do not allow collection of an electronic vehicle classification count.

4. **Daily Volume Counts**

   Daily volume counts are the same type of count as collected for AADT. Data are provided as requested for small-scale projects, but are unfactored. Data are factored for large-scale urban transportation modeling projects (validation counts). These counts are typically collected on weekdays. Factoring means converting Short duration counts to represent the average traffic condition, which is usually done using the continuous counter data from other locations.

5. **Hourly Volume Counts**

   Hourly volume counts are the same type of count as daily counts except data are collected in an hourly format. These counts are sometimes collected by direction. The hourly counts are never factored. Daily totals are sometimes factored as daily counts. These counts are typically collected on weekdays.

6. **Hourly Vehicle Classification Counts**

   Hourly vehicle classification counts are electronic counts collected in the FHWA 13 vehicle classification scheme in hourly totals. These counts are collected and reported by lane. Data must be aggregated by the user for two-way totals and then aggregated by class to generate the NCDOT truck percentages. The correlation between the schemes is Duals = Class 4-7 and TTST = Class 8-13. Daily totals are sometimes factored as daily counts. These counts are typically collected on weekdays.

2.2.2.2 Data Collection Methods

In estimating the traffic volume for new roads, computer programs are used to predict the future traffic once the new road is opened to traffic. The PMU uses the default truck loading factors from Table 2-2 to determine percentage of Duals and percentage of TTSTs for different road categories. Currently, axle load information is not generated from the TSU.

2.2.2.3 Equipment

The TSU uses the following equipment to collect various traffic data:

- Daily counter – TT6 (pneumatic tube) – manual data transfer
- Vehicle classifier - PEEK ADR-1000 – hourly volume and vehicle classification – requires programming for operation
- Manual counter – Jamar's DB400
- Continuous volume monitoring site – PEEK ADR-3000 with inductance loops
- Continuous WIM – PEEK ADR-3000 with inductance loops and piezoelectric sensors

2.2.2.4 Forecasting

Currently, traffic forecasting is made once a year. Base year data, historic data for extrapolation, and land use information are used to predict the future AADTs and truck percentages. It is noted that ESALs are calculated by the PMU using Eq. (2).

2.2.2.6 Existing Data and Research Needs

Weigh-In-Motion (WIM) sites are classified into two types:

- TMG: These sites are compliant with the recommendations of the Traffic Monitoring Guide (TMG) where vehicle classification and truck weight data are collected in all lanes in both directions continuously. This procedure meets the requirements for generating class and load spectra.
- LTPP: Data are collected only in the lanes with test sections.

There are 55 sites in North Carolina that are equipped with a permanent piezoelectric-type WIM. Most of these sites meet the TMG standard. These sites include all 24 LTPP sites, but a few of them still have sensors in the test section lanes only, thus not meeting the TMG standard. The NCDOT has 1- to 10-year-long data from the 55 sites. A research project is needed to use these data to develop default values and tables for the traffic inputs in the MEPDG as well as to develop a process to regularly update class and load spectra. This research will ensure that the NCDOT stays current with how trucks are traveling, the distribution of truck types, and how they are loaded.

For the LTPP sections, regardless of whether a site has sensors in all lanes or just in the test lanes, only data from the test lanes are reported. Additionally, most LTPP sites require the reporting of continuous vehicle class data, but only 1 week of truck weight data per quarter. Therefore, the LTPP database (maintained by the FHWA) has limited utility in developing class and load spectra for North Carolina. It is noted that the TSU collects truck weight data continuously and these data are suitable for developing load spectra. Hence, in order to use the LTPP data in the MEPDG, the traffic data in the LTPP database need to be augmented with the continuous truck weight data collected by the TSU.

2.1.3 Materials & Tests Unit

2.1.3.1 Design of New Pavements

It is common that specific information about layer materials is not known during the pavement design stage and, therefore, participation by the M&T Unit in the design of new pavements is mostly limited to the characterization of existing subgrade soils. Since the NCDOT is currently using the 1972 AASHTO Design Guide, the primary parameter that represents the strength of the subgrade soil is the Soil Support Value (SSV). This value is determined from the soil classification and/or CBR values of soils sampled from the project site.

The M&T Unit performs unconfined compressive strength tests on cement-treated base and stabilized soils to determine the amount of cement or lime in the layers. The minimum thicknesses of lime- and cement-stabilized layers are 8 and 7 in., respectively. A 6" thick cement stabilized layer can also be used, if road mixed. Currently, no testing is being conducted on HMA mixtures for the design of new pavements.

For the design of new concrete pavements, no testing is being conducted on any layer materials.

For the design of overlay, no testing is being performed on the overlay materials regardless of the material type (i.e., asphalt or concrete overlay). Cores are taken from existing concrete and asphalt pavements to determine compressive strength, layer thickness, and/or layer condition, such as honeycombing and stripping. Cores have always been part of the overlay construction QC/QA check.

2.2.3.2 Data Collection Methods

The following equipment items are available at the M&T Unit:

For HMA Mixtures:

- 2 Troxler gyratory compactors
- Asphalt Pavement Analyzer
- Pine Marshall Press for TSR testing

For Aggregate Base and Subgrade:

- 2 Humboldt HM3000s for CBR testing
- 1 Instron closed-loop servo-hydraulic machine for M_R testing of soil, aggregate, and stabilized materials. Acquired in 2004. Computer controlled. Uses pre-programmed software to run tests.

For Concrete:

- Reinhart loading machine for flexural strength testing
- UTM (Hydraulic) for compressive strength determination

2.1.4 Geotechnical Engineering Unit

2.1.4.1 Design of New Pavements

The following information is generated in the Geotechnical Engineering Unit for new pavement design regardless of the pavement type (i.e., flexible vs. rigid):

- Subsurface plan, including information on slopes, embankments, soil type, etc.
- County soil maps
- CBR values of soils and the SSV estimated from the CBR values
- Chemical stabilization
- Shelby tube samples for M_R determination by the M&T Unit

2.1.4.2 Overlay on Flexible Pavement

The following tasks are performed for existing pavements:

- Visual survey of pavement cores and conditions
- Determination of SSV values from:

- ✓ Dynamic Cone Penetrometer values, obtained through the aggregate base course (ABC) and 18 in. into subgrade
- ✓ Augering, to determine the depth of the ABC and to obtain soil samples
- ✓ Soil classification and the moisture content of soil samples
- ✓ CBR values

- Determination of regional factors, based on the water table, frost susceptibility, and soil type (typically 1.5 for the mountain region, 1 for the piedmont, and 0.5 for the coastal region)

2.1.4.3 Overlay on Rigid Pavement

No work is required to support the design of this pavement type.

2.1.4.4 Rubblization

The following tasks are performed for rubblization projects:

- Coring
- DCP testing
- Determining moisture content
- Augering to determine the depth of water table
- Visual condition survey

Testing with DCPs is done extensively in order to reduce the effect of excessive undercut.

2.2 Inputs Required by the MEPDG

In an effort to identify the types of input parameters for the MEPDG, the MEPDG report and software program were studied. In the following, all the required input parameters that are needed to perform analyses using the MEPDG software are summarized.

2.2.1 General Information

1. Design life (years)
2. Existing pavement construction month (month, year)
3. Pavement overlay construction month (month, year)
4. Traffic open month (month, year)
5. Type of design
    a. Flexible pavement
    b. Jointed plain concrete pavement (JPCP)
    c. Continuously reinforced concrete pavement (CRCP)
6. Restoration
    a. JPCP
7. Overlay
    a. Asphalt concrete (AC)
    b. Portland cement concrete (PCC)

2.2.2 Site/Project Identification

1. Location

2. Project ID
3. Date
4. Section ID
5. Station/Milepost format (ft/miles/latitude, longitude)
6. Station/Milepost begin
7. Station/Milepost end
8. Traffic direction (E/W/N/S)

2.2.3 Analysis Parameters

1. IRI
2. Performance criteria

Table 2-4 Analysis Parameters for Rigid and Flexible Pavements

Rigid Pavement (Limit, Reliability)	Flexible Pavement (Limit, Reliability)
JPCP:	1. Terminal IRI (in./miles)
1. Terminal IRI (in./miles)	2. AC Surface-Down Cracking (ft/miles) (Longitudinal Cracking)
2. Transverse Cracking (% Slabs Cracked)	3. AC Bottom-Up Cracking (Alligator Cracking) (%)
3. Mean Joint Faulting (in.)	4. AC Thermal Fracture (ft/miles)
CRCP:	5. Chemically Stabilized Layer- Fatigue Fracture (%)
1. Terminal IRI (in./miles)	6. Permanent Deformation- Total Pavement (in.)
2. CRCP Punchouts (per mile)	7. Permanent Deformation- AC only (in.)

2.2.4 Structure Inputs

Table 2-5 Layer Inputs

Layers	Drainage and Surface Properties	Structural Design Features
I. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted) 1. Material type 2. Thickness (in.) **Strength Properties** 3. Input level (1, 2 or 3) 4. Analysis type 5. Poisson's ratio 6. Coefficient of lateral pressure 7. Modulus **ICM inputs** 8. Plasticity Index 9. Gradation a. Passing #200 sieve b. Passing #4 sieve c. D60 (mm) 10. Derived parameters from gradation a. Specific gravity b. Saturated hydraulic conductivity c. Maximum dry unit weight d. Dry thermal conductivity (default) e. Heat capacity (default) f. Optimum gravimetric water content g. Degree of saturation h. Equivalent gravimetric water content (n/a for new pavement) 11. Soil water characteristic curve regression parameters (a, b, c, Hr.)	N/A	N/A

II. AC Layer 1. Material type 2. Thickness (in.) 3. Input level **General Properties** 4. Reference temperature 5. Effective binder content (%) 6. Air voids (%) 7. Total unit weight (pcf) 8. Poisson's ratio **Thermal Properties** 9. Thermal conductivity asphalt (BTU/hr-ft-°F) 10. Heat capacity (BTU/lb-°F) **Asphalt Mix** 11. Cumulative % retained on 3/4 in. sieve 12. Cumulative % retained on 3/8 in. sieve 13. Cumulative % retained on #4 14. % passing #200 **Asphalt Binder** 15. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade 16. Corresponding A & VTS values	1. Surface shortwave absorptivity 2. Infiltration 3. Drainage path length (ft) 4. Pavement cross slope (%)	N/A
III. CRCP/JPCP Layer 1. Material type 2. Layer thickness (in.) 3. Unit weight (pcf) 4. Poisson's ratio **Thermal Properties** 5. Coefficient of thermal expansion (/°F* 10^{-6}) 6. Thermal conductivity (BTU/hr-ft-°F) 7. Heat capacity (BTU/lb-°F) **Mix Properties** 8. Cement type (I or II or III) 9. Cementitious material content (lb/yd3) 10. Water/Cement ratio 11. Aggregate type 12. PCC zero-stress temperature (°F)	1. Surface shortwave absorptivity 2. Infiltration 3. Drainage path length (ft) 4. Pavement cross slope (%)	**I. CRCP** 1. Slab thickness 2. Shoulder type 3. Permanent curl/warp effective temperature difference **Steel Reinforcement** 4. Steel (%) 5. Bar diameter (in.) 6. Steel depth (in.) **Base Properties** 7. Base type 8. Erodibility index 9. Base/slab friction coefficient **Crack Spacing** 10. Cracking model

13. Ultimate shrinkage at 40% R.H. (microstrain) 14. Reversible shrinkage (% of ultimate shrinkage) 15. Time to develop ultimate shrinkage (days) 16. Curing method **Strength Properties** 17. Input level		(Enter mean crack spacing (in.) or generate cracking model) **II. JPCP** 1. Slab thickness 2. Permanent curl/warp effective temperature difference **Joint Design** 3. Joint spacing (ft) 4. Sealant type 5. Random joint spacing 6. Doweled transverse joints 7. Dowel diameter (ft) 8. Dowel bar spacing (ft) **Edge Support** 9. Long-term LTE (%) 10. Slab width (ft) **Base Properties** 11. Base type 12. Erodibility index 13. Base/slab friction coefficient 14. PCC-base interface 15. Loss of bond age (months)
IV. Chemically Stabilized Materials (Note: In case of overlays, existing JPCP/CRCP act as CSM.) 1. Material type 2. Layer thickness (in.) 3. Unit weight (pcf) 4. Poisson's ratio 5. Elastic resilient modulus 6. Thermal conductivity asphalt (BTU/hr-ft-°F) 7. Heat capacity (BTU/lb-°F)	N/A	N/A

2.2.5 Flexible Rehabilitation

1. Rehabilitation level
2. Milled thickness (in.)
3. Geotextile present on existing surface (Y/N)
4. Pavement rating
5. Total rutting (in.)

2.2.6 Thermal Cracking (in case of all overlays)

1. Input level
2. Average tensile strength at 14°F (psi)
3. Creep test duration (sec)
4. Compute mix coefficient of thermal contraction
   a. Mix VMA (%)
   b. Aggregate coefficient of thermal contraction
   c. Mix coefficient of thermal contraction (in./in./°F)

2.2.7 Climate Inputs

1. Latitude (degrees.minutes)
2. Longitude (degrees.minutes)
3. Elevation (ft)
4. Depth of water table (ft)

2.2.8 Traffic Inputs

1. General
   - (a) Initial two-way AADTT
   - (b) Number of lanes in design direction
   - (c) Trucks in design direction (%)
   - (d) Trucks in design lane (%)
   - (e) Operational speed
2. Traffic volume adjustment factors
   1. Monthly adjustment factors
      - i) Input level
   2. Vehicle class distribution
      - i) Input level
      - ii) AADTT distribution by vehicle class
   3. Hourly distribution
      - i) Hourly truck distribution by period beginning
   4. Traffic growth factors
3. Axle load distributions
   1. Input level
   2. View (cumulative distribution or distribution)
   3. Axle types
4. General traffic inputs
   1. Lateral traffic wander
      - i) Mean wheel location (inches from the lane marking)

   ii) Traffic wander standard deviation (in.)

   iii) Design lane width (ft)

2. Number of axles/truck

3. Axle configuration

   i) Average axle width (edge-edge, outside dimension (ft))

   ii) Dual tire spacing (in.)

   iii) Tire pressure (psi) (single/double tire)

   iv) Tire spacing (tandem/tridem/quad)

4. Wheel spacing

   i) Average axle spacing (ft)

   ii) Trucks (%)

5. Traffic Growth (%)

2.2.9 Distress Potential Inputs

1. Block cracking (L/M/H) (% of total lane area)
2. Sealed longitudinal cracks outside of wheel path (M/H) (ft/miles)
3. Patches (H) (% of total lane)
4. Potholes (H) (% of total lane)

Note: L = low; M = mean; H = high

2.2.10 Rehabilitation Inputs

(In case of overlays, over JPCP/CRCP)

2.2.10.1 Rigid Rehabilitation

1. Existing distress
    a. Before restoration: percentage of slabs with transverse cracks plus percentage of previously repaired/replaced slabs
    b. After restoration: total percentage of slabs repaired/replaced
    c. CRCP Punchouts (per mi)
2. Foundation support
    a. Dynamic modulus of subgrade reaction (psi/in.)
    b. Monthly modulus of subgrade reaction

2.3 Input Level Hierarchy in MEPDG

The philosophy behind the hierarchical approach is that the level of engineering effort exerted in the design process should be consistent with the relative importance, size and cost of the project design. Three levels of input systems are available in the MEPDG. The Level 1 input system involves comprehensive laboratory testing or field tests. Level 2 inputs are estimated through the correlations between the material properties and the laboratory measured values. Level 3 allows the designer to estimate the most appropriate design value of the material property based on experience with little or no testing involved. There are several advantages with this hierarchical approach, including greater flexibility in selecting the appropriate engineering effort and cost-effective design.

2.4 LTPP Database

The LTPP program includes two types of studies: General Pavement Studies (GPS) and Specific Pavement Studies (SPS). The GPS include nearly 800 in-service pavement test sections selected mainly from existing highways whereas the SPS are specially designed and constructed pavements aimed at more intensive studies.

Table 2-6 List of GPS Experiments

Experiment	Experiment Title
GPS-1	AC Pavement on Granular Base
GPS-2	AC Pavement on Bound Base
GPS-3	Jointed Plain Concrete Pavement (JPCP)
GPS-4	Jointed Reinforced Concrete Pavement (JRCP)
GPS-5	Continuously Reinforced Concrete Pavement (CRCP)
GPS-6A	Existing AC Overlay of AC Pavement (existing at the start of the program)
GPS-6B	AC Overlay Using Conventional Asphalt of AC Pavement–No Milling
GPS-6C	AC Overlay Using Modified Asphalt of AC Pavement–No Milling
GPS-6D	AC Overlay on Previously Overlaid AC Pavement Using Conventional Asphalt
GPS-6S	AC Overlay of Milled AC Pavement Using Conventional or Modified Asphalt
GPS-7A	Existing AC Overlay on PCC Pavement
GPS-7B	AC Overlay Using Conventional Asphalt on PCC Pavement
GPS-7C	AC Overlay Using Modified Asphalt on PCC Pavement
GPS-7D	AC Overlay on Previously Overlaid PCC Pavement Using Conventional Asphalt
GPS-7F	AC Overlay Using Conventional or Modified Asphalt on Fractured PCC Pavement
GPS-7R	Concrete Pavement Restoration Treatments With No Overlay
GPS-7S	Second AC Overlay, Which Includes Milling or Geotextile Application, on PCC Pavement With Previous AC Overlay
GPS-9	Unbonded PCC Overlay on PCC Pavement

Table 2-7 List of SPS Experiments

Category	Experiment	Title
Pavement Structural Factors	SPS-1	Strategic Study of Structural Factors for Flexible Pavements
	SPS-2	Strategic Study of Structural Factors for Rigid Pavements
Pavement Maintenance	SPS-3	Preventive Maintenance Effectiveness of Flexible Pavements
	SPS-4	Preventive Maintenance Effectiveness of Rigid Pavements
Pavement Rehabilitation	SPS-5	Rehabilitation of AC Pavements
	SPS-6	Rehabilitation of Jointed Portland Cement Concrete (JPCC) Pavements
	SPS-7	Bonded PCC Overlays of Concrete Pavements
Environmental Effects	SPS-8	Study of Environmental Effects in the Absence of Heavy Loads
Asphalt Aggregate Mixture Specifications	SPS-9P	Validation and Refinements of Superpave Asphalt Specifications and Mix Design Process
	SPS-9A	Superpave Asphalt Binder Study

As a part of the data collection process, the LTPP database has been examined in order to extract data relevant to North Carolina. The LTPP database called the Information Management System (IMS) contains the performance data that have been collected since 1989 on approximately 2500 test sections located across North America. Currently, the LTPP IMS consists of 16 general data modules with 430 tables containing more than 8,000 unique data elements. The database is divided into modules containing similar sets of tables.

1) Administration (ADM)

This module contains tables that describe the structure of the database and the master test section control table.

2) Automated Weather Station (AWS)

Data collected by these weather stations include air temperature, relative humidity, wind speed and direction, solar radiation, and precipitation. These short-interval data are accumulated into hourly, daily and monthly statistics.

3) Climatic Data

At least five weather stations have been identified for each of the GPS/SPS pavements. The obtained daily values are summarized to monthly and annual statistics, including the mean, standard deviation, minimum and maximum.

4) Inventory Data

These data are necessary to: 1) identify the test section, 2) describe the geometric details and material properties of its original construction, and 3) identify construction costs of maintenance and repair performed prior to the long-term monitoring effort.

5) Maintenance

Maintenance includes construction activities such as seal coats, crack sealing, patching, joint sealing, grinding, milling less than 25 mm deep, and grooving. The collected maintenance data provide information such as when the activity was performed and the construction practices used.

6) Monitoring Data

The monitoring data include deflection measurements, surface friction measurements, surface distress evaluations, and longitudinal profile measurements. These data are used in developing relationships between distress, performance, traffic and axle loads, age, and maintenance.

7) Rehabilitation Data

These data pertain to any rehabilitation activity that has occurred after monitoring for the test section has been initiated, such as recycling or overlay, under-sealing, reworking shoulders, and placement of edge drains.

8) Seasonal Monitoring Program (SMP)

The SMP is used to understand the magnitude and impact of temporal variations in pavement response and material properties due to the separate and combined effects of temperature, moisture, frost/thaw variations, prevailing weather conditions, depth of frost penetration, temperature gradient, soil moisture, rainfall, and surface elevation measurements.

9) Specific Pavement Studies (SPS)

The SPS incorporate multiple test sections at a specific location. Because these sites are at the same location, they are expected to experience the same traffic and climate conditions, thus allowing for direct comparisons between the different pavement structures.

10) Traffic

Traffic data are collected only for the outside lane in one direction and include distribution of traffic by vehicle classes, days that the data are collected, and the distribution of the axle loads for single, tandem, and tridem axles by vehicle class.

11) Dynamic Load Response

This module contains dynamic load response instrumentation data from SPS test sections.

12) Laboratory Testing Data

This module contains the following categories of materials data: field materials sampling and testing data, general laboratory data, AC test data, treated base/sub-base test data, unbound base/sub-base test data, and PCC test data.

2.5 Extracting North Carolina Data from the LTPP Database

There are 27 LTPP sections located in North Carolina with 24 GPS and 3 SPS test sections. Each test section can be identified in the LTPP database by a state code and the SHRP ID assigned to it. The state code is a two-digit code used to identify the state where a test section is located. The state code assigned in the LTPP database for North Carolina is 37. The SHRP ID is a four-digit code for the test section. For GPS test sections, the number has no significance other than being unique when combined with the state code. For SPS sections, the second character represents the experiment number, shown in Table 2-8, and the third and fourth characters identify the sections at the project. Every section that enters the LTPP program is first assigned a construction number of 1. The construction number is incremented by 1 whenever maintenance or rehabilitation activity takes place, regardless of its impact on the pavement.

For example, 37-0201-1 (State code – SHRP ID – construction number) represents Section No. 01 of the SPS-2 pavement in North Carolina that has not had any maintenance or rehabilitation activity since it entered the LTPP program.

Table 2-8 List of LTPP Test Sections in North Carolina According to Pavement Type

Pavement Type	[SHRP ID]-[Construction Number]
JPCP over Unbound Base	0201-1, 0202-1, 0203-1, 0204-1, 3044-1
JPCP Over Non-Bituminous Treated Base	0205-1, 0206-1, 0207-1, 0208-1, 0260-1, 3008-2, 3807-1, 3816-1
JPCP Over Bituminous Treated Base	0209-1, 0210-1, 0211-1, 0212-1, 0259-1, 3011-2
AC with Granular Base	0801-1, 0802-1, 0859-1, 1006-3, 1024-2, 1028-2, 1030-1, 1040-2, 1352-3, 1801-2, 1802-2, 1803-3, 1814-2, 1817-5, 1992-2
AC with Bituminous Treated Base	0901-1, 0902-1, 0903-1
AC Overlay on AC Pavement	0960-2, 0961-2, 0962-2, 0963-2, 0964-2, 0965-2
AC with Non-Bituminous Treated Base	1645-2, 2819-3, 2824-3, 2825-1
CRCP - Over Unbound Base	5037-1, 5826-2, 5827-4

Extracting the LTPP data has been difficult as the LTPP data are currently released under the title, *Standard Data Release*, which does not have a graphical user interface. Considering the 27 LTPP sections in North Carolina and 430 tables for each LTPP section, the job is cumbersome.

All the data relevant to the MEPDG have been extracted for all the GPS/SPS sections in North Carolina. The data available for North Carolina in the LTPP database are not comprehensive in the sense that much of the data are still missing, such as thermal conductivity, heat capacity, unit weight, PCC zero-stress temperature, ultimate shrinkage at 40% relative humidity, reversible shrinkage, time to develop ultimate shrinkage, drainage and surface properties, permanent curl/warp effective temperature difference, erodibility index, base/slab friction coefficient, cracking model, long-term load transfer efficiency, PCC-base interface, loss of bond age, depth of water table, etc.

Because the data are not available for these parameters, MEPDG recommendations are followed. Parameters such as the erodibility index, base/slab friction coefficient, PCC-base interface, and drainage and surface properties are considered to be less sensitive and, hence, their default values are considered. Some of the default values that must be considered in case the values are not available in the database are provided below.

For Asphalt:

Thermal conductivity for asphalt = 0.44-0.81 (0.67) Btu/(ft)(hr)(^{o}F)

Heat capacity = 0.22-0.40 (0.23) Btu/(lb)(^{o}F)

Reference temperature = 70 ^{o}F

For PCC:

Unit weight = 140-160 lb/ft^3

PCC coefficient of thermal expansion = 3 x 10^{-6} / ^{o}F -8 x 10^{-6} / ^{o}F

Thermal conductivity = 1.25 Btu/(ft)(hr)(^{o}F)

Heat capacity = 0.28 Btu/(lb)(^{o}F)

Surface shortwave absorptivity = 0.85

Time to develop ultimate shrinkage = 35 days

Reversible shrinkage = 50%

Permanent curl/warp effective temperature difference = -10 ^{o}F

Loss of bond age = 60 months

PCC-base interface = bonded

Curing method = curing compound

For Chemically Stabilized Materials:

Thermal conductivity = 1.25 Btu/(ft)(hr)(^{o}F)

Heat capacity = 0.28 Btu/(lb)(^{o}F)

Table 2-9 Base/Slab Friction Coefficient

Sub-base/Base type	**Friction Coefficient (low/mean/high)**
Fine-grained soil	0.5/1.1/2
ATB	2.5/7.5/15
CTB	3.5/8.9/13
Sand	0.5/0.8/1
Aggregate	0.5/2.5/4
Lime-stabilized clay	3/4.1/5.3

3. SENSITIVITY ANALYSIS

3.1 Literature Review

The MEPDG has been developed to be relevant to climatic and material conditions for the whole nation and, therefore, includes variables that may or may not be pertinent to North Carolina. Hence, a sensitivity analysis has been conducted in order to determine which variables are appropriate for North Carolina. Based on this analysis, an importance ranking can be assigned to each input; such a ranking significantly helps to reduce the effort and cost in obtaining the inputs that are less sensitive to the pavement performance. This study also provides a better understanding of the design parameters that affect certain pavement performances the most, thus stressing the importance of careful consideration for these parameters before the design process even begins.

Several papers have been presented at the Transportation Research Board (TRB) 2006 annual meeting regarding the MEPDG's sensitivity analysis of various input parameters for both flexible and rigid pavements. A brief summary of these papers is provided below.

3.1.1 Rigid Pavements

A recent study by Ceylan and Coree (2006) employs a total of 30 input parameters. In the study, one input at a time is varied within its recommended range to study its effect on the predicted performance, while all the other inputs are assigned base case values. The study found a set of parameters that has a significant impact on various distresses. The sensitivity level of each input is categorized into one of five groups (Extremely Sensitive, Very Sensitive, Sensitive, Moderately Sensitive, Not Sensitive) based on a visual inspection of the sensitivity plots. The numerical criteria used to differentiate the sensitivity levels are not presented in the paper. In general, the curl/warp effective temperature difference, the coefficient of thermal expansion, and the thermal conductivity exhibit the greatest impacts on the distresses.

In another study by Hall and Beam (2005), 29 inputs were evaluated one at a time. This study reports that three models (cracking, faulting, and roughness) are sensitive for only 6 out of 29 inputs and insensitive to 17 out of 29 inputs, resulting in combinations of only one or two of the distress models sensitive to 6 out of 29 inputs. However, changing only one variable at a time results in little information regarding the interaction among the variables. That is, it is not known whether the distress prediction may show sensitivity to a particular variable for all the values of the remaining variables. The sensitivity criteria used in this study for faulting the model are the differences in total faulting after 20 years exceeding 0.1 in., and were judged significant. For the cracking model, differences in the percentage of slabs cracked after 20 years exceeding 25% were judged significant. For the smoothness model, differences after 20 years exceeding 30 in./mile were judged significant. It is also mentioned that the specific numerical criteria used in this study were chosen arbitrarily, based primarily on the author's experience.

Similarly, a study by Kannekanti and Harvey (2006) looks at the sensitivity of the models to the coefficient of thermal expansion and illustrates the sensitivity of the MEPDG faulting model to dowel diameter, slab width and edge support, built-in-temperature gradient, erodibility index of the base, and joint spacing. These researchers performed about 10,000 runs, thus enabling a study of the variable interactions as well as the single effects for the full range of projects.

3.1.2 Flexible Pavements

A study by Ceylan and Coree (2006) evaluates 20 input parameters, varying them one at a time, by using 50% reliability. As part of their study, a limited study on 2-way interactions among the inputs was also carried out by varying two inputs at a time, but no input parameter was found to be sensitive to all the performance measures. The same criteria used to determine the sensitivity level of the input parameters in rigid pavements (Section 3.1.1) was applied to flexible pavement input parameters.

Graves and Mahboub (2006) have performed a global sensitivity analysis using a random sampling based technique over the entire input parameter range. A total of 100 design sections were randomly sampled using the Monte Carlo sampling routine from these input parameters, and the resulting predicted performances were analyzed using the Pearson and Spearman correlation coefficients. The results indicate that this type of sensitivity analysis may be used to identify important input parameters across the entire parameter space, utilizing a sampling-based technique where the entire input parameter space of selected input variables is sampled. These samples are then used to create a matrix of design scenarios which are then run through the MEPDG software which, in turn, predicts the various performance parameters of each design scenario. These performance outputs and the corresponding input parameters are then analyzed to evaluate the sensitivity of each input parameter with respect to each predicted distress. Several problems have been identified with the global sensitivity analysis approach and the use of the Monte Carlo simulation technique to sample the design sections.

3.1.3 Granular Base Sensitivity

A recent study by Masad and Little (2004) indicates that the base modulus and thickness have a significant influence on the IRI and longitudinal cracking. The influence of these properties on alligator cracking is approximately half of that on longitudinal cracking. The study also indicates that the granular base material properties do not seem to have an influence on the permanent deformation of the pavement. However, Graves and Mahboub (2006) state that this type of analysis does not reflect the influence of the variation of the other parameters in the model because the inputs are varied one at a time, thus keeping the other inputs constant. Further, if predicted alligator cracking changes from 2% to 3% due to the change in a given input variable, then such a change represents a significant finding since the cracking changes by 50 percent. However, in terms of evaluating a particular design, neither 2% nor 3% is significant in selecting a pavement structure.

3.1.4 Traffic Sensitivity

A study by Papagiannakis and Bracher (2006) evaluates the potential sensitivity of the various hierarchal levels and sampling schemes for the MEPDG traffic inputs. These hierarchal levels deal with the source of traffic data that are utilized in the design, site-specific WIM, classification, volume, etc., or regional and national average values. The study illustrates that the variability of traffic data may have a significant impact on the predicted performance of the pavement system. It also shows that regional WIM data generally provide designs that overestimate the base case (continuous site-specific data) by less than 20 percent.

3.1.5 Insensitive Input Parameters

A review of the publications on sensitivity analyses conducted by different states reveal that some inputs are insensitive in all the studies (different states, different climates, different traffic conditions, different structures of pavements). Hence, it is reasonable to assume that these inputs do not have significant effects for North Carolina. These inputs are described below.

3.1.5.1 Rigid Pavements

The following is a list of inputs which are found to be insensitive in all the referred studies.

Table 3-1 Insensitive Parameters, from Literature Review

Faulting	Cracking	Smoothness
1. Heat capacity-PCC	1. Cement content	1. Sealant type
2. Cement content	2. Cement type	2. Dowel spacing
3. Cement type	3. Water/Cement ratio	3. PCC-base interface
4. Water/Cement ratio	4. Aggregate type	4. Erodibility index
5. Aggregate type	5. PCC zero stress temperature	5. Infiltration
6. PCC zero stress temperature	6. Reversible shrinkage	6. Drainage path length
7. Reversible shrinkage	7. Time to develop 50% shrinkage	7. Pavement cross slope
8. Time to develop 50% shrinkage	8. Ultimate shrinkage	8. PCC zero stress temperature
9. Ultimate shrinkage	9. Sealant type	9. Heat capacity-PCC
10. Sealant type	10. Dowel spacing	10. Cement type
11. Dowel spacing	11. Dowel diameter	11. Aggregate type
12. Edge support	12. Infiltration	12. Reversible shrinkage
13. PCC-base interface	13. Drainage path length	13. Time to develop 50% shrinkage
14. Erodibility index	14. Pavement cross slope	14. Ultimate shrinkage
15. Curing method	15. Curing method	15. Curing method
16. Infiltration	16. PCC-base interface	16. Traffic wander
17. Drainage path length	17. Erodibility index	17. Design lane width
18. Pavement cross slope	18. Traffic wander	18. Coefficient of lateral pressure
19. Modulus of rupture (Level 1, 2, 3)	19. Coefficient of lateral pressure	

20. Compressive strength (Level 2, 3) 21. 20-year/28-day ratio (Level 1, 2) 22. Modulus of elasticity (Level 1) 23. Traffic wander 24. Design lane width 25. Coefficient of lateral pressure	20. Design lane width	

The inputs that are found to be common to all three distresses are cement type, aggregate type, PCC-zero stress temperature, reversible shrinkage, time to develop 50% shrinkage, ultimate shrinkage, curing method, sealant type, infiltration, drainage path length, pavement cross slope, dowel spacing, PCC-base interface, erodibility index, traffic wander, design lane width, and coefficient of lateral pressure.

3.1.5.2 Flexible Pavements

Five performance measures (alligator cracking, longitudinal cracking, rutting, transverse cracking, and IRI) are studied in all the sensitivity analyses for flexible pavements. The following parameters are found to be insensitive:

1. Aggregate thermal coefficient
2. Type of sub-base
3. Traffic wander

3.2 Proposed Plan for Sensitivity Analysis

Most sensitivity analyses reported in the literature change the values of the input parameters in a systematic fashion to evaluate the effect of that change on the pavement performance. Although this approach allows a systematic evaluation of various input parameters in a straightforward manner, it may not reflect a realistic change in the various input parameters. To illustrate this point further, assume that the sensitivity analysis evaluates the effect of a ±20% change in the input values. In some inputs, a ±20% change may not be possible, whereas some other inputs may experience a much greater change than 20% under normal conditions. In order to perform the sensitivity analysis in a more realistic manner, it was decided to use LTPP pavements and data. It was found that not all the data are available in the LTPP database. The unavailability of data in the LTPP database for certain inputs does not necessarily indicate that they are not important; rather, they may turn out to be very sensitive for the pavement performance. Hence, default values have been developed based on a typical range of values as specified by the MEPDG, best guesses and values that are typically used by the NCDOT.

3.2.1 Selection of Pavements

North Carolina is divided into three distinct geographical areas – the coastal plain in the east, the piedmont in the center, and the mountains in the west – and thus experiences a wide variety of climatic conditions. All the LTPP sections are categorized according to pavement type and climatic region, as shown in Table 3-2.

Table 3-2 Pavement Classification According to Climate and Structure

No.	Pavement Type	Climatic Regions		
		Mountains	**Piedmont**	**Coastal Plain**
1	AC with Granular Base	1801-2, 1803-3, 1040-2, 1814-2, 1024-2	1817-5, 1352-3, 1992-2, 1802-2, 1006-3	0801-1, 0802-1, 0859-1
2	AC with Bituminous Treated Base		0901-1, 0902-1, 0903-1	1030-1, 1028-2
3	AC with Non-Bituminous Treated Base		2819-3, 2824-3, 2825-1	1645-2
4	JPCP over Unbound base		0201-1, 0202-1, 0203-1, 0204-1, 3044-1	
5	JPCP over Bituminous Treated Base		0209-1, 0210-1, 0211-1, 0212-1, 0259-1	3011-2
6	JPCP over Non-Bituminous Treated Base		0205-1, 0206-1, 0207-1, 0208-1, 0260-1, 3008-2, 3807-1, 3816-1	
7	CRCP over Unbound Base	5037-1, 5826-2	5827-4	
8	AC Overlay on AC Pavement		0960-2, 0961-2, 0962-2, 0963-2, 0964-2, 0965-2	

For sensitivity analysis, pavements are selected from each cell of the above table so that the structure and climatic inputs are the same among the selected pavements. Therefore, the only two inputs that are left to be studied for the analysis are the traffic and material inputs.

3.2.1.1 Material Sensitivity Analysis

One LTPP section is selected from each cell in Table 3-2 above as a base case, and the variation of each material input parameter is studied for the remaining pavements in the same cell, resulting in minimum and maximum values for each input along with the base value (from the base case). Site-specific traffic data from the base pavement are used throughout the material sensitivity analysis.

For the HMA dynamic modulus, an analysis is performed to assess the use of different levels of input. Level 1 includes the input of dynamic modulus |E*| values for different temperatures and frequencies obtained from the NCDOT project completed by Kim, King and Momen (2004). It also includes the input of G* and phase angle data for different temperatures. Level 2 requires only the input of the mix gradation and G* values. Level 3 includes the input of the mix gradation and binder viscosity obtained from the same Kim et al. NCDOT project (2004). Here it is assumed that the |E*|, G*, and mix gradation values represent the site-specific material properties for the LTPP sections, so that the effect of using Level 1 inputs versus the Level 3 inputs can be identified.

3.2.1.2 Traffic Sensitivity Analysis

A traffic sensitivity analysis according to the plan presented in Table 3-3 requires the estimation of regional values. To estimate regional values for a particular LTPP section, the remaining sections located all over the state are considered (irrespective of the type of pavement). There are two methods to estimate the regional values from the remaining LTPP sections: 1) classification based on functional class and 2) clustering. The TMG 2001 has endorsed the clustering technique as the preferred method for the estimation of regional values. It is a mathematical approach used to establish similarities between two objects that are described by their attributes. The attributes here can be vehicle class distribution or axle load distribution. In order to identify the pattern, Euclidean distance is calculated between the attributes of the two objects (objects here refer to pavement sections). Once the Euclidean distance is calculated for the sections, clusters are identified by assuming a level of acceptable dissimilarity.

The clustering technique was applied for the 15 pavement sections falling in the piedmont region to identify the sections that exhibit similar traffic patterns as a preliminary study apart from the estimation based on functional classification. StatistiXL v 1.6, an add-on tool to Microsoft Excel was used to identify the clusters. Several clustering methods were available to determine the clusters. Here Euclidean distance was calculated using Wards Minimum Variance method. The set of clusters formed during the study are provided in the APPENDIX G: Clustering Technique Analysis.

Due to an insufficient number of sections (considering the different types of pavements) and the lack of daily summaries data, estimation based on functional class is preferred during the main study. The final selections of pavements are then averaged to obtain the regional values. The default values provided in the MEPDG are used as the national values for the LTPP sections.

All sections having the most site-specific data (WIM, AVC, and ATR data) with different pavement structures and falling in one of the three climatic regions (from Table 3-2) are considered.

Table 3-3 Traffic Sensitivity Analysis Plan

	Scenario	AADTT	Vehicle Class Distribution	MAF[b]	No. of Axles per Truck	Axle Load Distribution
WIM-SS[a] AVC-SS	1	SS	SS	SS	SS	SS
WIM-R[a] AVC-SS	2	SS	SS	SS	Regional	Regional
WIM-R AVC-R ATR-SS	3	SS	Regional	SS	Regional	Regional
WIM-N[a] AVC-R ATR-SS	4	SS	Regional	SS	National	National
WIM-N AVC-N ATR-SS	5	SS	National	SS	National	National

Note: [a]SS: Site-specific, R: Regional, N: National

[b]MAF: Monthly Adjustment Factor

Table 3-4 Pavement Classification According to Functional Class

Functional Class (FC)	FC Code	SHRP ID
Rural Principal Arterial - Interstate	1	3011, 3044, 5826
Rural Principal Arterial – Other	2	0200, 0900, 1028, 1030, 1040, 1352, 1645, 1803, 1814, 1817. 1992, 2819, 2824, 3807, 3816, 5827
Rural Minor Arterial	6	1024
Rural Major Collector	7	1802
Rural Minor Collector	8	-
Rural Local System	9	0800
Urban Principal Arterial - Interstate	11	1006, 1801, 5037
Urban Principal Arterial – Freeways or Expressways	12	-
Urban Principal Arterial – Other	14	3008
Urban Minor Collector	16	2825
Urban Collector	17	-
Urban Local System	19	-

3.3 Sensitivity Runs

A total of 400-plus runs were made, including both flexible and rigid input variations. A preliminary set of runs were made to verify the effect of reliability on the sensitivity of the inputs. From the study of Ceylan and Coree (2006), it is noted that the reliability factor incorporated in the software is questionable and is still under debate. It is also noted from the design reliability models presented in the MEPDG that the estimation of 90% reliability is just a simple reflection of 50% reliability results adjusted by a corresponding standardized normal deviate. Hence, to verify the observation, a set of runs using both 50% and 90% reliability were made. The preliminary analysis indicates that the sensitivity of the inputs has not changed at all by changing the reliability from 90% to 50%. Hence, it was decided that a 50% reliability (based on the mean inputs) will be used in all the sensitivity runs.

3.3.1 Variation in the Input Data

The degree to which variation should be considered in the sensitivity analysis is determined from the variation observed in each input among the sections belonging to the same cell (seen in Table 3-2), as this indicator provides a realistic picture of the actual variation. For each input, a set of low, base and high values are prepared. Inputs such as traffic direction and design life that do not have any impact on the pavement performance are kept constant. For those inputs that are unavailable in the database, either the NCDOT typical input range or the MEPDG default range is used. All the material input variation files used in the sensitivity analysis are provided in APPENDIX A: Material Input Variation, and the traffic input variation files are provided in APPENDIX B: Traffic Input Variation.

3.3.2 Determination of the Sensitivity of Input Parameters

The sensitivity of each input is then determined from the MEPDG performance measures observed from each variation. The distresses that are observed during this analysis are alligator cracking, longitudinal cracking, thermal cracking, rutting and smoothness for flexible pavements, and transverse cracking, punchouts, joint faulting and smoothness for rigid pavements. From the observed variations in the predicted distresses, each input can be categorized as *insensitive* or *sensitive* or *extremely sensitive*. Here, the change in distresses (due to the change in input from minimum to maximum) is measured with respect to the distress target, which remains constant throughout the analysis, giving rise to absolute sensitivity rather than relative sensitivity (which is measured with respect to the minimum distress predicted, i.e., (maximum-minimum)*100/minimum). The relative sensitivity keeps changing from case to case as both the minimum and maximum values change. For example, if the maximum alligator cracking predicted for a particular case is 3% and the minimum alligator cracking predicted is 2%, then the percentage change in distress turns out to be 50%. However, neither 2% nor 3% represent a significant amount of distresses. For the same prediction of distresses, according to absolute sensitivity, the percentage change in distresses turns out to be 4%, which is insensitive according to the classification given in Table 3-5. The percentage values defining the sensitivity levels in Table 3-5 are determined purely based on the visual inspection of the sensitivity tables and charts provided in APPENDIX C: Sensitivity Analysis Tables and APPENDIX D: Sensitivity Analysis Charts, respectively. It is to be understood that choosing a different numerical criteria gives rise to new sensitivity classifications.

Table 3-5 Sensitivity Classification

	Distress Target	Change in Predicted Distress with Respect to Distress Target				
		<20%	**20-40%**	**40-60%**	**60-80%**	**>80%**
Terminal IRI (in./mi)	172	*I*[a]	*LS*[a]	*S*[a]	*VS*[a]	*ES*[a]
AC Surface-Down Cracking (Long. Cracking) (ft/500)	1000	*I*	*LS*	*S*	*VS*	*ES*
AC Bottom-Up Cracking (Alligator Cracking) (%)	25	*I*	*LS*	*S*	*VS*	*ES*
Permanent Deformation (AC Only) (in.)	0.25	*I*	*LS*	*S*	*VS*	*ES*
Permanent Deformation (Total Pavement) (in.)	0.75	*I*	*LS*	*S*	*VS*	*ES*
Transverse Cracking (% slabs cracked)	15	*I*	*LS*	*S*	*VS*	*ES*
Mean Joint Faulting (in.)	25	*I*	*LS*	*S*	*VS*	*ES*
CRCP Punchouts (/mi)	10	*I*	*LS*	*S*	*VS*	*ES*

Note: [a]I: Insensitive, LS: Less Sensitive, S: Sensitive, VS: Very Sensitive, ES: Extremely Sensitive.

3.4 Analysis of the Sensitivity Runs

3.4.1 Material Sensitivity

According to the proposed plan for sensitivity analysis, each input is varied within the limits to observe the predicted distresses. The input variation files are provided in APPENDIX A: Material Input Variation for reference. The observed distresses are then analyzed in accordance with the sensitivity classification provided in Table 3-5. The reliability levels and distresses predicted for each input variation from minimum to maximum along with the base cases are provided in APPENDIX C: Sensitivity Analysis Tables. These tables also provide the sensitivity classification for each input versus the distress predicted. The preliminary set of runs to check the sensitivity of reliability level (i.e., 50% vs. 90%) is provided in APPENDIX E: Reliability 50% Vs 90%.

A discussion regarding the sensitivity of inputs and the steps necessary to make changes to the data collection strategy is provided in Chapter 4.

3.4.2 Traffic Sensitivity

Traffic inputs are varied in accordance with the input variation method proposed in Table 3-3. Each scenario is then compared with the rest of the scenarios to differentiate the amount of effort needed along with the sensitivity. These tables are provided in APPENDIX C: Sensitivity Analysis Tables. A discussion regarding the sensitivity of traffic scenarios along with the data collection strategy are provided in Chapter 4.

3.5 Determination of Sensitive Inputs

3.5.1 Material Sensitivity

The following tables consolidate the sensitivity analysis from the tables presented in APPENDIX C: Sensitivity Analysis Tables. These tables provide the sensitivity of each input with respect to the five major flexible pavement distresses.

3.5.1.1 1817 – Piedmont Region – AC with Granular Base

Table 3-6 1817 – Piedmont Region – AC with Granular Base – Input Sensitivity

		IRI (in./miles)	**Longitudinal Cracking (ft/miles)**	**Alligator Cracking (% Area)**	**AC Rut Depth (in.)**	**Total Rut Depth (in.)**
Asphalt Concrete Layer -1	Air Voids	*I*	*I*	*I*	*I*	*I*
	Heat Capacity	*I*	*I*	*I*	*I*	*I*
	Thermal Conductivity	*I*	*I*	*I*	*I*	*I*
	|E*| S9.5BC, S9.5B0	*I*	*I*	*I*	*ES*	*LS*
	|E*| S9.5B1	*I*	*I*	*I*	*I*	*I*
Asphalt Concrete Layer -2	Air Voids	*I*	*I*	*LS/S*	*I*	*I*
	Heat Capacity	*I*	*I*	*I*	*I*	*I*
	Thermal Conductivity	*I*	*I*	*I*	*I*	*I*
	|E*| B25BC	*I*	*I/LS*	*I*	*S*	*I/LS*
Creep Compliance		*I*	*I*	*I*	*I*	*I*
GB Modulus		*I*	*I*	*I*	*I*	*I*
SG Modulus		*I*	*I*	*I*	*I*	*I*
Surface Shortwave Absorptivity		*I*	*I*	*I*	*S*	*I/LS*
Pavement Construction Month	Season – 1	*I*	*I*	*I*	*I*	*I*
	Season – 2	*I*	*I*	*I*	*I*	*I*
	Season – 3	*I*	*I*	*I*	*I*	*I*
Truck Growth Factor		*I*	*I*	*I*	*I*	*I*

3.5.1.2 1814 – Mountain Region – AC with Granular Base

Table 3-7 1814 – Mountain Region – AC with Granular Base – Input Sensitivity

		IRI (in./miles)	**Longitudinal Cracking (ft/miles)**	**Alligator Cracking (% Area)**	**AC Rut Depth (in.)**	**Total Rut Depth (in.)**
Asphalt Concrete Layer -1	Air Voids	*I*	*ES*	*I*	*I*	*I*
	Heat Capacity	*I*	*I*	*I*	*I*	*I*
	Thermal Conductivity	*I*	*I*	*I*	*I*	*I*
	|E*| S9.5BC	*I*	*ES*	*S/VS*	*ES*	*I*
Asphalt Concrete Layer -2	Air Voids	*I*	*I*	*S/VS*	*I*	*I*
	Heat Capacity	*I*	*I*	*I*	*I*	*I*
	Thermal Conductivity	*I*	*I*	*I*	*I*	*I*
Creep Compliance		*I*	*ES*	*S*	*I*	*I*
GB Modulus		*I*	*I*	*I*	*I*	*I*
SG Modulus		*I*	*I*	*I*	*I*	*I*
Surface Shortwave Absorptivity		*I*	*LS*	*LS*	*LS*	*I*
Pavement Construction Month	Season – 1	*I*	*I*	*I*	*I*	*I*
	Season – 2	*I*	*I*	*I*	*I*	*I*
	Season – 3	*I*	*I*	*I*	*I*	*I*
Truck Growth Factor		*I*	*I*	*I*	*I*	*I*

3.5.1.3 0901 – Piedmont Region – AC with Bituminous Treated Base

Table 3-8 0901 – Piedmont Region – AC with Bituminous Treated Base – Input Sensitivity

		IRI (in./miles)	**Longitudinal Cracking (ft/miles)**	**Alligator Cracking (% Area)**	**AC Rut Depth (in.)**	**Total Rut Depth (in.)**
Asphalt Concrete Layer -1	Air Voids	*I*	*ES*	*I*	*I/LS*	*I*
	Heat Capacity	*I*	*I*	*I*	*I*	*I*
	Thermal Conductivity	*I*	*I/LS*	*I*	*I*	*I*
	|E*| S9.5BC	*I*	*ES*	*I/LS*	*ES*	*S*
Asphalt Concrete Layer -2	Air Voids	*I*	*I*	*LS/S*	*I*	*I*
	Heat Capacity	*I*	*I*	*I*	*I*	*I*
	Thermal Conductivity	*I*	*I*	*I*	*I*	*I*
	|E*| I19BC	*I*	*LS/S*	*I*	*LS*	*I*
Asphalt Concrete Layer -3 – Treated Base	Air Voids	*I*	*ES*	*ES*	*I*	*I*
	Heat Capacity	*I*	*I*	*I*	*I*	*I*
	Thermal Conductivity	*I*	*I*	*I*	*I*	*I*
	|E*| B25BC	*I*	*ES*	*I*	*I*	*I*
Creep Compliance		*I*	*I*	*I*	*I*	*I*
GB Modulus		*I*	*LS/S*	*I*	*I*	*I*
SG Modulus		*I*	*ES*	*I*	*I*	*I*
Surface Shortwave Absorptivity		*I*	*ES*	*I*	*LS*	*I*
Pavement Construction Month	Season – 1	*I*	*I*	*I*	*I*	*I*
	Season – 2	*I*	*I*	*I*	*I*	*I*
	Season – 3	*I*	*I*	*I*	*I*	*I*
Truck Growth Factor		*I*	*LS*	*I*	*I*	*I*

3.5.1.4 1028 – Coastal Region – AC with Bituminous Treated Base

Table 3-9 1028 – Coastal Region – AC with Bituminous Treated Base – Input Sensitivity

		IRI (in./miles)	**Longitudinal Cracking (ft/miles)**	**Alligator Cracking (% Area)**	**AC Rut Depth (in.)**	**Total Rut Depth (in.)**
Asphalt Concrete Layer -1	Air Voids	*I*	*S*	*I*	*I*	*I*
	Heat Capacity	*I*	*I*	*I*	*I*	*I*
	Thermal Conductivity	*I*	*I*	*I*	*I*	*I*
	|E*| - S9.5C, S9.5C0	*I*	*I*	*I*	*LS*	*I*
	|E*| - S9.5C1	*I*	*ES*	*I/LS*	*ES*	*S*
	|E*| - S9.5C2	*I*	*I*	*I*	*I*	*I*
	|E*| - S12.5C	*I*	*ES*	*I*	*S*	*I*
Asphalt Concrete Layer -2	Air Voids	*I*	*LS*	*I*	*I/LS*	*I*
	Heat Capacity	*I*	*I*	*I*	*I*	*I*
	Thermal Conductivity	*I*	*I*	*I*	*I*	*I*
	|E*| B25C	*I*	*ES*	*ES*	*ES*	*ES*
Creep Compliance		*I*	*I*	*I*	*I*	*I*
SG Modulus		*I*	*LS*	*I*	*I*	*I*
Surface Shortwave Absorptivity		*I*	*I/LS*	*I*	*S*	*I*
Pavement Construction Month	Season – 1	*I*	*I*	*I*	*I*	*I*
	Season – 2	*I*	*I*	*I*	*I*	*I*
	Season – 3	*I*	*I*	*I*	*I*	*I*
Truck Growth Factor		*I*	*I*	*I*	*I*	*I*

3.5.1.5 0201 – Piedmont Region – JPCP over Unbound Base

Table 3-10 0201 – Piedmont Region – JPCP Over Unbound Base – Input Sensitivity

		Terminal IRI (in./mile)	**Transverse Cracking (% Slabs Cracked)**	**Mean Joint Faulting (in.)**
JPCP	Coefficient of Thermal Expansion	*VS/ES*	*ES*	*ES*
	Heat Capacity	*I*	*ES*	*I*
	Thermal Conductivity	*LS*	*ES*	*LS*
	Unit Weight	*I*	*I*	*I*
Chemically Stabilized Material	Heat Capacity	*I*	*I*	*I*
	Thermal Conductivity	*I*	*LS*	*I*
	Unit Weight	*I*	*I*	*I*
GB Modulus		*I*	*I*	*I*
SG Modulus		*I*	*I*	*I*
Load Transfer Efficiency		*I*	*VS*	*I*
Joint Spacing		*LS*	*ES*	*I/LS*
Dowel Diameter		*S*	*I*	*ES*
Surface Shortwave Absorptivity		*I*	*ES*	*I*
Pavement Construction Month	Season – 1	*I*	*I*	*I*
	Season – 2	*I*	*I*	*I*
	Season - 3	*I*	*I*	*I*

3.5.1.6 0209 - Piedmont Region – JPCP over Bituminous Treated Base

Table 3-11 0209 – Piedmont Region – JPCP Over Bituminous Treated Base – Input Sensitivity

		Terminal IRI (in./mile)	**Transverse Cracking (% Slabs Cracked)**	**Mean Joint Faulting (in.)**
JPCP	Coefficient of Thermal Expansion	*S*	*ES*	*LS*
	Heat Capacity	*I*	*S*	*I*
	Thermal Conductivity	*LS*	*ES*	*I*
Chemically Stabilized Material	Heat Capacity	*I*	*I*	*I*
	Thermal Conductivity	*I*	*LS*	*I*
Asphalt Treated Base	Air Voids	*I*	*I*	*I*
	Heat Capacity	*I*	*LS*	*I*
	Thermal Conductivity	*I*	*I*	*I*
GB Modulus		*I*	*I*	*I*
SG Modulus		*I*	*I*	*I*
Load Transfer Efficiency		*I*	*S*	*I*
Joint Spacing		*I*	*ES*	*I*
Dowel Diameter		*LS*	*I*	*ES*
Surface Shortwave Absorptivity		*I*	*S/VS*	*I*
Pavement Construction Month	Season – 1	*I*	*I*	*I*
	Season – 2	*I*	*I*	*I*
	Season - 3	*I*	*I*	*I*
NCDOT W/C Vs Base		*I*	*I*	*I*

3.5.1.7 3011 – Coastal Region – JPCP over Bituminous Treated Base

Table 3-12 3011 – Coastal Region – JPCP Over Bituminous Treated Base – Input Sensitivity

		Terminal IRI (in./mile)	**Transverse Cracking (% Slabs Cracked)**	**Mean Joint Faulting (in.)**
JPCP	Coefficient of Thermal Expansion	*S*	*LS*	*ES*
	Heat Capacity	*I*	*I*	*I*
	Thermal Conductivity	*I*	*S*	*I/LS*
ATB	Air Voids	*I*	*I*	*I*
	Heat Capacity	*I*	*I*	*I*
	Thermal Conductivity	*I*	*I*	*I*
SG Modulus		*I*	*I*	*I*
Load Transfer Efficiency		*I*	*I*	*I*
Joint Spacing		*I*	*I*	*LS*
Dowel Diameter		*I/LS*	*I*	*S*
Surface Shortwave Absorptivity		*I*	*I*	*I*
Pavement Construction Month	Season – 1	*I*	*I*	*I*
	Season – 2	*I*	*I*	*I*
	Season - 3	*I*	*I*	*I*
Truck Growth Factor		*I*	*I*	*I*

3.5.1.8 3816 – Piedmont Region – JPCP over Non-Bituminous Treated Base

Table 3-13 3816 – Piedmont Region – JPCP Over Non-Bituminous Treated Base – Input Sensitivity

		Terminal IRI (in./mile)	**Transverse Cracking (% Slabs Cracked)**	**Mean Joint Faulting (in.)**
JPCP	Coefficient of Thermal Expansion	*I*	*I*	*S*
JPCP	Heat Capacity	*I*	*I*	*I*
JPCP	Thermal Conductivity	*I*	*I*	*I*
Chemically Stabilized Material	Heat Capacity	*I*	*I*	*I*
Chemically Stabilized Material	Thermal Conductivity	*I*	*I*	*I*
Chemically Stabilized Material	Unit Weight	*I*	*I*	*I*
SG Modulus		*I*	*I*	*I*
Load Transfer Efficiency		*I*	*I*	*I*
Joint Spacing		*I*	*I*	*I*
Dowel Diameter		*I*	*I*	*I*
Surface Shortwave Absorptivity		*I*	*I*	*I*
Pavement Construction Month	Season – 1	*I*	*I*	*I*
Pavement Construction Month	Season – 2	*I*	*I*	*I*
Pavement Construction Month	Season - 3	*I*	*I*	*I*
Truck Growth Factor		*I*	*I*	*I*

3.5.1.9 5827 – Piedmont Region - CRCP over Unbound Base

Table 3-14 1814 – Piedmont Region – CRCP Over Unbound Base – Input Sensitivity

		Terminal IRI (in./mile)	**CRCP Punchouts (per mile)**
CRCP	Coefficient of Thermal Expansion	*I*	*ES*
	Heat Capacity	*I*	*I*
	Thermal Conductivity	*I*	*LS*
GB Modulus		*I*	*I*
SG Modulus		*I*	*I*
Surface Shortwave Absorptivity		*I*	*I*
Percentage of Steel		*LS*	*ES*
Steel Depth		*I*	*I*
Bar Diameter		*I/LS*	*ES*
Shoulder Type	Asphalt	*I*	*I*
	Gravel	*I*	*I*
Pavement Construction Month	Season – 1	*I*	*I*
	Season – 2	*I*	*I*
	Season - 3	*I*	*I*
Truck Growth Factor		*I*	*I*

3.5.1.10 5037 – Mountain Region - CRCP over Unbound Base

Table 3-15 1814 – Mountain Region – CRCP Over Unbound Base – Input Sensitivity

		Terminal IRI (in./mile)	**CRCP Punch outs (per mile)**
CRCP	Coefficient of Thermal Expansion	*I*	*VS*
	Heat Capacity	*I*	*I*
	Thermal Conductivity	*I*	*I*
GB Modulus		*I*	*I*
SG Modulus		*I*	*I*
Surface Shortwave Absorptivity		*I*	*I*
Percentage of Steel		*LS*	*I*
Steel Depth		*I*	*I*
Bar Diameter		*I/LS*	*I*
Shoulder Type	Asphalt	*I*	*I*
	Gravel	*I*	*I*
Pavement Construction Month	Season – 1	*I*	*I*
	Season – 2	*I*	*I*
	Season - 3	*I*	*I*
Truck Growth Factor		*I*	*I*

3.5.2 Traffic Sensitivity

The following tables are consolidated versions of a series of tables presented in APPENDIX C: Sensitivity Analysis Tables. The sensitivity of each scenario (presented in Table 3-3) is then compared with the rest of the scenarios and classified accordingly. Here, each comparison differentiates the level of effort needed. The column headings in the table, for example, 1-2 and 1-3 represent comparison of scenario 1 with scenario 2 and scenario 3 respectively.

Table 3-16 Functional Classification – 1 - 3011 – Coastal Region – JPCP Over Bituminous Treated Base – Sensitivity

Performance Criteria	**Comparison of Scenarios**									
	1-2	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Transverse Cracking (% slabs cracked)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Mean Joint Faulting (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

Table 3-17 Functional Classification – 1 – 5826 – Mountain Region – CRCP Over Unbound Base – Sensitivity

Performance Criteria	**Comparison of Scenarios**									
	1-2	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
CRCP Punchouts (per mi)	*I/LS*	*I/LS*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

Table 3-18 Functional Classification – 2 – 0201 – Piedmont Region – JPCP Over Unbound Base Sensitivity

Performance Criteria	Comparison of Scenarios									
	1-2	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Transverse Cracking (% slabs cracked)	*I/LS*	*LS*	*LS*	*LS*	*I*	*I*	*I*	*I*	*I*	*I*
Mean Joint Faulting (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

Table 3-19 Functional Classification – 2 – 1028 – Coastal Region – AC with Bituminous Treated Base – Sensitivity

Performance Criteria	Comparison of Scenarios									
	1-2	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
AC Surface-Down Cracking (Long. Cracking) (ft/500)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
AC Bottom-Up Cracking (Alligator Cracking) (%)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
AC Thermal Fracture (Transverse Cracking) (ft/mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Chemically Stabilized Layer (Fatigue Fracture)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (AC Only) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (Total Pavement) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

Table 3-20 Functional Classification – 2 – 1814 – Mountain Region – AC with Granular Base – Sensitivity

Performance Criteria	Comparison of Scenarios									
	1-2	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

AC Surface-Down Cracking (Long. Cracking) (ft/500)	*LS/S*	*ES*	*VS*	*ES*	*S*	*LS*	*VS/ES*	*LS*	*LS*	*LS*
AC Bottom-Up Cracking (Alligator Cracking) (%)	*I/LS*	*S*	*LS*	*S*	*LS*	*I*	*LS*	*I*	*I*	*I/LS*
AC Thermal Fracture (Transverse Cracking) (ft/mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Chemically Stabilized Layer (Fatigue Fracture)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (AC Only) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (Total Pavement) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

Table 3-21 Functional Classification – 2 – 1817 – Piedmont Region – AC with Granular Base – Sensitivity

Performance Criteria	**Comparison of Scenarios**									
	1-2	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
AC Surface-Down Cracking (Long. Cracking) (ft/500)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
AC Bottom-Up Cracking (Alligator Cracking) (%)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
AC Thermal Fracture (Transverse Cracking) (ft/mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Chemically Stabilized Layer (Fatigue Fracture)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (AC Only) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (Total Pavement) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

Table 3-22 Functional Classification – 2 – 3816 – Piedmont Region – JPCP with Non-Bituminous Treated Base – Sensitivity

Performance Criteria	Comparison of Scenarios									
	1-2	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Transverse Cracking (% slabs cracked)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Mean Joint Faulting (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

Table 3-23 Functional Classification – 2 – 5827 – Piedmont Region – CRCP Over Unbound Base – Sensitivity

Performance Criteria	Comparison of Scenarios									
	1-2	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
CRCP Punchouts (per mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

Table 3-24 Functional Classification – 11 – 1006 – Piedmont Region – AC with Granular Base – Sensitivity

Performance Criteria	Comparison of Scenarios									
	1-2	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
AC Surface-Down Cracking (Long. Cracking) (ft/500)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
AC Bottom-Up Cracking (Alligator Cracking) (%)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
AC Thermal Fracture	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

(Transverse Cracking) (ft/mi)										
Chemically Stabilized Layer (Fatigue Fracture)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (AC Only) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (Total Pavement) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

Table 3-25 Functional Classification – 11 – 1801 –Mountain Region – AC with Granular Base – Sensitivity

Performance Criteria	**Comparison of Scenarios**									
	1-2	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
AC Surface-Down Cracking (Long. Cracking) (ft/500)	*I*	*LS*	*ES*	*LS*	*LS*	*ES*	*LS*	*VS*	*I*	*VS*
AC Bottom-Up Cracking (Alligator Cracking) (%)	*I*	*I*	*LS*	*I*	*I*	*LS*	*I*	*I*	*I*	*I*
AC Thermal Fracture (Transverse Cracking) (ft/mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Chemically Stabilized Layer (Fatigue Fracture)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (AC Only) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (Total Pavement) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

Table 3-26 Functional Classification – 11 – 5037 – Mountain Region – CRCP Over Unbound Base – Sensitivity

Performance Criteria	**Comparison of Scenarios**									
	1-2	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
CRCP Punchouts (per mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

3.5.3 Ground Water Table Sensitivity

Table 3-27 Ground Water Table - Flexible Pavement - 1814

Performance Criteria	**Change (%) with respect to 5ft (Base Case)**								
	10 ft	**15 ft**	**20 ft**	**25 ft**	**30 ft**	**35 ft**	**40 ft**	**45 ft**	**50 ft**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
AC Surface-Down Cracking (Long. Cracking) (ft/500)	*LS*	*LS*	*I*	*I*	*I*	*I*	*I*	*LS*	*S*
AC Bottom-Up Cracking (Alligator Cracking) (%)	*I*	*I*	*I*	*I*	*LS*	*LS*	*LS*	*LS*	*LS*
AC Thermal Fracture (Transverse Cracking) (ft/mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Chemically Stabilized Layer (Fatigue Fracture)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (AC Only) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Permanent Deformation (Total Pavement) (in.)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

Table 3-28 Ground Water Table - Rigid Pavement - 5037

Performance Criteria	**Change (%) with respect to 10ft (Base Case)**								
	5 ft	**15 ft**	**20 ft**	**25 ft**	**30 ft**	**35 ft**	**40 ft**	**45 ft**	**50 ft**
Terminal IRI (in./mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*
CRCP Punchouts (per mi)	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*	*I*

3.5.4 Summary

3.5.4.1 Flexible Pavements

International Roughness Index

Neither the inputs from flexible pavements nor the traffic inputs are found to be sensitive towards IRI. In rigid pavements, especially JPCP, the coefficient of thermal expansion, thermal conductivity, joint spacing and dowel diameter are found to be sensitive to IRI, whereas in CRCP the percentage of steel and the bar diameter have a significant influence on IRI.

Alligator Cracking

In general, air voids and the |E*| of asphalt concrete are the only two inputs that are found to be sensitive to alligator cracking. In particular, this distress is found to be sensitive to the percentage of air voids in base AC layers. The increase in alligator cracking can be explained by the wide range of percentage of air voids used (6-11%). Volumetric properties play an important role in governing the fatigue damage. The greater the effective volume of bitumen and the lower the air void percentage, the higher the fatigue life.

Longitudinal Cracking

Air voids, the |E*| and surface shortwave absorptivity have a significant influence on longitudinal cracking. The same explanation provided in the above section regarding the use of a wide range of air voids percentages holds here. The influence of the |E*| can be explained by the fact that the use of lower stiffness wearing course material increases the surface tensile strains, thus increasing the top-down cracking, or the use of thick or stiff layers in the upper portion of the structure of the pavement likewise increases the surface tensile strains.

AC Rut Depth

The AC rut depth is influenced by the |E*| of the AC (all layers – surface, intermediate and base) and also by surface shortwave absorptivity. The use of low stiffness layers increases the rut depth in the asphalt layer. As the surface shortwave absorptivity increases, the temperature in the top layers of the pavement structure increases, which in turn affects the stiffness of the layer. As a result, the rut depth in the asphalt layer increases.

Total Rut Depth

The total rut depth is influenced mainly by the |E*| of asphalt concrete. The use of low stiffness asphalt layers decreases the relative stiffness of the structure and, thus, increases the total rutting.

3.5.4.2 Rigid Pavements

Transverse Cracking

The inputs that are found to be sensitive to transverse cracking are the coefficient of thermal expansion, heat capacity, thermal conductivity, load transfer efficiency, and joint spacing. These inputs have significant impact within the MEPDG default range. An increase in transverse cracking can be expected by the increase in the coefficient of thermal expansion or the increase in joint spacing or decrease in load transfer efficiency.

Mean Joint Faulting

The coefficient of thermal expansion, load transfer efficiency, and dowel diameter has a significant influence on mean joint faulting, whereas thermal conductivity and joint spacing have a relatively low impact. The dowel diameter and dowel spacing are the critical design inputs and are very sensitive to mean joint faulting. An increase in dowel diameter decreases the stress that concrete has to bear and the joint faulting. Load transfer efficiency across the transverse joints is the most critical factor controlling JPCP joint faulting, which in turn affects smoothness.

Punchouts

The coefficient of thermal expansion, thermal conductivity, percentage of steel, and bar diameter is sensitive to punchouts. An increase in the percentage of steel results in fewer punchouts.

In summary, the following tables list the inputs that are sensitive in accordance with the type of distresses.

Table 3-29 Flexible Pavements – Sensitive Inputs

Terminal IRI	Longitudinal Cracking	Alligator Cracking	AC Rut Depth	Total Rut Depth
None	• Air voids • Dynamic modulus • Surface shortwave absorptivity • Subgrade modulus	• Air voids of base AC layers • Dynamic modulus	• Dynamic modulus • Surface shortwave absorptivity	• Dynamic modulus

Table 3-30 Rigid Pavements – JPCP – Sensitive Inputs

Terminal IRI	Transverse Slab Cracking	Mean Joint Faulting
• Coefficient of thermal expansion • Thermal conductivity • Joint spacing • Dowel diameter	• Coefficient of thermal expansion • Joint spacing • Heat capacity • Thermal conductivity • Load transfer efficiency	• Coefficient of thermal expansion • Dowel diameter • Thermal conductivity • Load transfer efficiency • Joint spacing

Table 3-31 Rigid Pavements – CRCP – Sensitive Inputs

Terminal IRI	CRCP Punchouts
• Percentage of steel • Bar diameter	• Coefficient of thermal expansion • Thermal conductivity • Percentage of steel • Bar diameter

3.5.5 Problems Encountered

The following problems are identified from the current version 0.800 of the MEPDG during this project:

1) The MEPDG at present has a default limit of a 20-year design life for flexible pavements. The main drawback of this limitation is that the pavement life cannot be estimated because the distresses were predicted only up to 20 years.
2) The MEPDG does not have the batch mode option enabled in the current version, thus requiring a human presence to change the input after each run.
3) In the current study, a default value of 1 is used as the MAF (Monthly Adjustment Factor) due to a lack of sufficient data. This use of a default value does not capture the seasonal variation in the traffic data.

4) Two-way interaction of the input variables is not studied as part of this project. This kind of study significantly increases the number of sensitivity runs, which could not be performed within the available time limit.

5) It is to be noted that the MEPDG is still in its draft form, and many changes are expected in its final version.

6) It is recommended by the MEPDG that treated sub-base should not be analyzed using the current version as the model is not yet calibrated.

7) The case with the use of Level 1 inputs in unbound layers is similar. The finite element method analysis (Level 1) is not yet calibrated in the current version of the MEPDG.

8) The computational time of each run takes at least 30-40 minutes for one analysis to finish, even on a highly configured PC.

9) The MEPDG, unlike the previous AASHTO methods, requires 100-plus inputs and concepts which were previously unknown to most of the pavement design engineers. Hence, a training program is required that summarizes the concepts used in the MEPDG.

10) Increasing the layer thickness to reduce distresses, as opposed to earlier design practices, is not the only solution for improving pavement performance. Many inputs are interrelated or interact with each other to predict the pavement performance.

11) It should be noted that even though a sensitivity analysis was carried out using the MEPDG that was nationally calibrated, the locally calibrated MEPDG may not result in the same sensitivity analysis results.

4. DEVELOPMENT OF INPUT DATA COLLECTION STRATEGY

4.1 General

The MEPDG requires 100-plus inputs to model traffic, climate and materials to predict the performance over the design life of pavement. This procedure differs widely from the current design practice at the NCDOT. Hence, to implement the MEPDG, the current input data collection strategy requires many changes, including equipment that allows for a smooth transition.

As aforementioned, the MEPDG requires four major input data, i.e., traffic, climate, material, and structure. A set of recommendations is provided below for each of these inputs, according to the results and analysis found in Chapter 3.

4.2 Input Data Collection

4.2.1 Traffic

The axle load distribution data available in the LTPP database are given on a yearly basis, which differs from the input data format required by the MEPDG (month by month data) and, therefore, is distributed equally among the months (i.e., a MAF of 1). This type of distribution may not capture the seasonal variation in the traffic data.

Also, the data are available in Microsoft Access format in the LTPP database, which must be converted to .alf format before inputting in the MEPDG, which is time-consuming. If the axle load distribution data collected by the NCDOT in the future are tuned to the format directly readable by the MEPDG, a significant amount of time can be saved.

Two research projects are currently being conducted at North Carolina State University and will help generate the traffic inputs for the MEPDG. One project is a truck study, recently completed by Professor John Stone, in which a methodology is developed to forecast the truck traffic growth separately from the total traffic growth. The other project, directed by Professor William Rasdorf, is developing a design for a database for the linear referencing system for traffic volume and vehicle class data and seasonal groupings for volume, vehicle class, and truck weights. The database will support the seasonal adjustment of short-term traffic counts, reporting of volume and vehicle class data, development of statewide and regional systems analysis, and provide a link to class and load spectra for pavement design.

A study by Papagiannakis and Bracher (2006) involving 176 GPS sites and 17 different scenarios to optimize the traffic data collection observes that continuous coverage, site-specific AVC data are capable of predicting pavement life with fewer errors for varying confidence intervals. This study also supports the observation made earlier that partial WIM data do not yield site-specific MAFs, which are necessary for accurately modeling seasonal damage in the MEPDG.

From the traffic sensitivity tables provided in Chapter 3, it can be observed that all the sections are insensitive to the pavement distresses, irrespective of the different levels of input data availability (site-specific, regional and national) except few anomalies. These anomalies include the two sections (1814 and 1801) that are found to be sensitive to longitudinal cracking and alligator cracking; their sensitivity level depends on the level of input data available. For example, if the Minkowski distance between the site-specific data and regional data for the vehicle class distribution is low (i.e., Scenario 2 vs. Scenario 3), then the change in distresses between the two scenarios will be low, thus leading to low sensitivity or insensitivity. For a point (x_1, x_2, ...,x_n) and a point (y_1, y_2, ...,y_n), the Minkowski distance of order p (p-norm distance) is defined as

$$p\text{-norm distance} = \left(\sum_{i=1}^{n} | x_i - y_i |^p \right)^{1/p} \tag{4}$$

From Table C-174 of APPENDIX C: Sensitivity Analysis Tables, it can be seen that as the vehicle class distribution varies from site-specific to regional (comparison case 2-3) and keeping the other inputs constant, the sensitivity increases as compared to the variation from regional to national (case 4-5). This phenomenon can be explained by comparing the Minkowski distance of order 3 between the regional – site-specific data (11.1 units) and national – regional data (24.1 units); i.e., as one moves from site-specific data to national data, the distance increases and, hence, the distresses. Similarly, for site 1801 the Minkowski distance between R-SS is -6.4 units and between N – SS is 11.4; i.e., the order is R-SS-N. If one moves from SS data to R data, then the distresses are expected to decrease, and if one moves from R data to N data then the distresses are expected to increase, which is exactly the case presented in Table C – 179, APPENDIX C: Sensitivity Analysis Tables.

In other words, sensitivity here depends on how close the site-specific values are to the regional, or regional to national, or site-specific to national values, which can be calculated using the Minkowski distance.

4.2.1.1 Truck Growth Factor

A separate set of runs were made to learn the effect of using an actual traffic growth factor versus the MEPDG default growth factor (4% compound). On average, the actual growth factor for all the LTPP sections is found to be 1.1%. After analyzing the results, none of the distresses were found to be sensitive towards the truck growth factor.

4.2.2 Climate

The Enhanced Integration Climatic Model (EICM) incorporated in the MEPDG software reads the climatic data directly from the weather stations located all over the nation. During the design process, the designer needs to choose the weather station nearest the pavement construction site. If none of the existing weather stations are within a reasonable distance from the pavement site, then a set of weather stations are chosen so that the software can interpolate the climatic data. In such a case, the ground water table depth values are input manually. For this study, there are 23 weather stations present in North Carolina that are read directly by the MEPDG; however, only one climatic station is located in the mountain region.

The MEPDG recommends that the ground water table depth values must be as accurate as possible because they constitute one of the most important parameters that affect the performance prediction of the pavement. The depth to the water table controls the moisture content regime and the modulus of the layer above it. Also, the distance or radius of influence depends on the material type. The infiltration from the surface and the granular base or sub-base materials controls the moisture regime of the upper subgrade.

A study has been conducted to check the sensitivity of the ground water table depth value to the distresses. In this study, a pavement section is selected such that the climatic data must be interpolated from the nearby stations and the ground water table depth value is manually input. In each case, the ground water table depth value is varied from 5 ft to 50 ft at intervals of 5 ft. The resulting performance data are studied to understand the effect of ground water table depth values on the pavement distresses.

From the tables presented in Chapter 3, it can be observed that ground water table depth values do not influence the rigid pavement distresses whereas they have a significant impact on flexible pavement distresses, such as longitudinal cracking and alligator cracking. Alligator cracking decreases steadily with an increase in the ground water table depth value. For longitudinal cracking, 10 ft is found to be the critical value because a sudden rise in distress value occurs at 10 ft and then decreases thereafter. In general, water table depth values closer to the surface, i.e., 5 ft to15 ft, result in an appreciable reduction of the moduli of the base and subgrade. The tables and charts are provided near the end of APPENDIX C: Sensitivity Analysis Tables and APPENDIX D: Sensitivity Analysis Charts, respectively.

4.2.3 Material

4.2.3.1 Flexible Pavement Layers

Asphalt Layer

Air voids in the asphalt layers (surface, intermediate and base) have turned out to be the most sensitive parameter for longitudinal cracking and alligator cracking for the input variation practiced by the NCDOT (6-11%) and, hence, needs careful consideration in achieving the proper air void content during the actual field pavement construction.

For the |E*| of the asphalt layer, Level 1 data are compared to Level 3 data to determine the sensitivity level along with Level 2 data in some cases. It can be observed from the tables presented in Chapter 3 that changing the input data from Level 1 to Level 3 is very sensitive to asphalt layer rut depth and longitudinal cracking. Kim, King and Momen (2004) have already developed typical |E*| values for 42 various asphalt mixes in North Carolina as a part of their study. These values can be used as Level 2 inputs for future designs without any additional testing.

Heat capacity and thermal conductivity are found to be insignificant for asphalt layers. In order to use input Level 1, it is recommended by the MEPDG to develop values by direct measurement using the ASTM E1952 Procedure for Thermal Conductivity and the ASTM D2766 Procedure for Heat Capacity.

For creep compliance, in general, the use of Level 1 values has no significant effect compared to Level 3 values (the MEDPG default values), except in one case where there are significant differences in the predicted longitudinal cracking and alligator cracking.

Granular Base and Subgrade Layers

Level 1 analysis for granular base layers and subgrade layers is not recommended in the MEPDG until further notice because the FEM analysis model in the current version is not yet calibrated. For the present study, the MEPDG default ranges of values are used. It is recommended to develop a database of resilient modulus values for all types of bases and subgrade layers available in North Carolina.

Surface shortwave absorptivity is found to be sensitive for three of the distresses. It is recommended that this parameter be estimated through laboratory testing. Although there are procedures in existence to measure shortwave absorptivity, no current AASHTO certified standards for paving materials exist. Hence, it will suffice to use the default values provided by the MEPDG until further notice.

During one of the progress meetings, the Steering and Implementation Committee decided that the pavement construction month must be evaluated based on the four seasons presented in Table 4-1. Therefore, a set of sensitivity runs were made to test the sensitivity nature of the construction month of different layers. It was found to be insensitive for all the pavement structures within the design life irrespective of the construction month.

Table 4-1 Pavement Construction Month Seasons

Season		**Month Duration**
1	Spring	March – May
2	Summer	June – August
3	Fall	September – November
4	Winter	December - February

4.2.3.2 Rigid Pavement Layers

JPCP

The coefficient of thermal expansion, heat capacity and thermal conductivity are found to be very sensitive parameters in the case of JPCP. These values were never part of the design practice followed by the NCDOT and, hence, are recommended to establish realistic input values for NCDOT materials. Level 1 input values can be developed for thermal conductivity and heat capacity following the ASTM standards E1952 and D2766, respectively.

Joint spacing is very sensitive within the MEPDG default range. However, it is fixed at 15 ft according to NCDOT design procedure and, therefore, no further consideration is needed. The dowel diameter is very sensitive within the NCDOT design range and, hence, requires more attention during the design process.

Granular Base and Subgrade Layers

Granular base and subgrade resilient moduli are found to be insensitive in all the rigid pavement cases and, therefore, the default values suggested by the MEPDG are recommended.

Load transfer efficiency can be very sensitive to the transverse cracking of slabs and, hence, there is a need to develop a more realistic value for this input.

Surface shortwave absorptivity is found to be sensitive to transverse cracking. It is recommended that this parameter be estimated through laboratory testing. Although procedures exist to measure shortwave absorptivity, there are no current AASHTO certified standards for paving materials. Therefore, it will suffice to use the default value provided by the MEPDG until further notice.

CRCP

The coefficient of thermal expansion is extremely sensitive to punchouts. The CRCP construction method is not currently available in the NCDOT design practice and, hence, it is recommended that realistic values for these inputs be developed. Typical ranges of values for these inputs for various CRCP materials are provided in the MEPDG for reference.

Percentage of steel and bar diameter is also found to be sensitive for CRCP layers.

5. LOCAL TRAINING PROGRAM

Engineers in state highway agencies are not necessarily familiar with the complex principles and concepts incorporated in the MEPDG. Therefore, the implementation plan should include not only an evaluation of the technical issues, but also should include an implementation training program. In this project, a main framework of a local training program is developed that can be used to train NCDOT engineers at different levels. This training program is designed to provide a more gradual, stepped instruction process for the MEPDG that is based on North Carolina-specific conditions and that is different from workshops that are available at the national level.

The PI offered a distance learning graduate course on highway pavement design (CE 755) at North Carolina State University in the fall of 2005. The course materials focused mainly on the concepts and principles used in the new MEPDG. Prior to this course, the PI obtained the slides used in different workshops offered by the FHWA Design Guide Implementation Team (DGIT). These slides have been reviewed to identify those that can be effectively used in the local training program. Additional slides were developed using the course materials for the CE 755 class to complement the DGIT slides in order to strengthen the local training program. In the end, a total of 831 slides were developed. These slides and other supporting documents were grouped into 25 different topics. The materials developed in this process constitute an excellent foundation for the local training program, but will need refinements and modifications when the actual format and audience of the training is known.

6. DEVELOPMENT OF IMPLEMENTATION PLAN

6.1 General

The important issue in the implementation of the MEPDG in the NCDOT operation is that local conditions need to be taken into account for the calibration. Because the calibration of the models in the MEPDG was performed during the NCHRP 1-37A project using limited national databases, it is critical to calibrate the design methods and models using the locally available input and performance data.

6.2 Recommended Implementation Guidelines

6.2.1 General Recommendations

1. Immediate implementation of the MEPDG as the only approach to pavement design is not feasible and, hence, the NCDOT should allow itself at least three to five years for general implementation to adjust to the new input data collection strategy. Meanwhile, the local calibration effort should take place.
2. Implementation would be unsuccessful if the MEPDG is not calibrated, verified and validated for the local conditions in North Carolina. The LTPP database will be used extensively for the verification and calibration processes. The recommended approach to the verification and calibration of the MEPDG is described in the next section.
3. It is now recognized, and is recommended as the preferred approach by the MEPDG, to use axle load spectra, because these can accurately characterize the axle loads better than the earlier procedures based on ESALs and AADT.

4. A local training program for the NCDOT engineers should be included as a necessary part of the implementation process to teach basic principles of the MEPDG and to provide NCDOT engineers with hands-on experience. It is estimated that four days are needed to conduct an effective local training workshop. The workshop can be given in four consecutive days or can be divided into four separate sessions with a few days to one week apart.
5. Due to an ongoing debate as to how the reliability model works, it is recommended that 50% reliability criteria are used until further notice. In the present study, both 50% and 90% reliability cases are run in order to check their sensitivity to the pavement distresses. It is found that none of the distresses are sensitive to the reliability.
6. As a general design approach, increasing the layer thickness to reduce the amount of pavement distresses is not the only solution to improve the performance in the MEPDG because many inputs are interconnected or multiple interactions exist between the inputs that provide the predicted performance measures.

6.2.2 Specific Recommendations

1. Develop a pavement design manual similar to the existing IPDG used by the NCDOT to summarize the new concepts and procedures suggested by the MEPDG.
2. A set of acceptable pavement performance criteria for both flexible and rigid pavements needs to be developed. Due to the lack of availability of performance criteria from the NCDOT, MEPDG default criteria are used in the present sensitivity study.

3. Develop the traffic database to provide accurate load spectra, project-specific truck volumes, and growth, which are critical elements to the design process due to the sensitivity of the models to these inputs.
4. Develop a set of MAFs that capture the actual seasonal variation in the traffic. The use of site-specific MAFs may have a significant effect on the distresses predicted. The MEPDG suggests that MAFs can turn out to be a significant parameter.
5. Establish realistic input values for material properties such as heat capacity, thermal conductivity etc., for HMA, PCC and CSM materials. Because these properties are very important with regard to sensitivity, it will be helpful to develop these values to be as accurate as possible. ASTM procedures have been suggested by the MEPDG to determine these values in the laboratory.
6. During design iterations, variation of sensitive inputs results in wide variation in the prediction of pavement distresses. Hence, develop a system which helps pavement design engineers identify them, in order to keep the predicted pavement distresses within the allowable range.

6.3 Verification and Calibration of the MEPDG Models

There are two NCHRP research projects that are closely related to the objectives of this research. They are the NCHRP 9-30(001) and NCHRP 1-40B projects. Under the NCHRP 9-30(001) project, pre-implementation studies involving verification and recalibration have been conducted in order to quantify the bias and residual error of the flexible pavement distress models included in the MEPDG. Based on the findings from the NCHRP 9-30(001) study, the NCHRP 1-40B project focuses on the calibration refinement study of the existing load-related distress prediction models for flexible pavements and HMA overlays. The approaches taken in these two studies are reviewed and form the basis for the recommendations given in the following subsections regarding the verification and calibration of the MEPDG models.

6.3.1 Verification

For the verification study, a completely independent data set with different input levels from the sections or sites that have at least three distress surveys (in order to avoid potential error and variability in measuring surface distress) should be used to predict the distresses for both new and rehabilitated flexible and rigid pavements. These pavements should not have been included in the NCHRP 1-37A (MEPDG prediction models) calibration process.

These data are used to create the input data files for MEPDG software for each verification section and then reviewed for reasonableness and consistency. A database is then created to store the predicted and measured distresses once the software is executed for the input data file. The accuracy of the prediction models is assessed by comparing the bias and residual error between the original calibration process (NCHRP 1-37A) and the verification runs for different distress prediction models and then determining whether the residual error and bias are locally dependent and significantly different from the global calibration errors.

The test sections include only the newly constructed sites, thus excluding the rehabilitated test sections due to the finding that errors exist in the rehabilitation part of the software version submitted to the NCHRP in 2004 (i.e., errors related to the cumulative cracking predicted in HMA overlays and the rutting calculations in HMA overlays for Level 2 inputs).

The calibration error constitutes most of the distress measurement error and the materials input error, of which the distress measurement error is the most difficult to reduce because it is independent of the predictive capability of the model. The material input error, however, can be reduced by using the laboratory repeated load resilient modulus values for unbound materials and soils in the calibration process, including the use of a supplemental HMA mixture characterization test. The calibration coefficients of the rut depth prediction model for each layer should be revised based on the rutting measured from the trench cuts and other destructive techniques. Global and local calibration procedures should consider estimating permanent deformation and fracture characteristics from other physical properties of the HMA mixtures, such as the effect of mixture type on the local calibration coefficients for rutting and fatigue cracking.

6.3.2 Calibration Refinement

Calibration refinement of the MEPDG distress prediction models for flexible pavements and HMA overlays can be achieved in two ways. One method is to use the mixture properties that are currently available within the LTPP database with no additional testing. The other method is to use additional mixture tests such as repeated load permanent deformation and indirect tensile strength tests to improve upon the calibration process.

Irrespective of the calibration process, the final calibrated models will have errors associated with them. Such errors are called the standard error of the estimate and can be used to establish confidence intervals for the predictive equation. This error explains the scattering of data across the 1:1 line between the predicted and measured distresses and is composed of four major components that include measurement (distress) error, input (testing) error, model lack-of-fit error and pure error (error due to replication).

Many of the test sections used for the recalibration effort include the sections that are used for verification studies. The selection of these independent pavement sections is similar to their selection for the original calibration effort (NCHRP 1-37A); data from at least three distress surveys can be easily extracted from the existing databases. The test sections should have input Levels 1 and 2 data available for most of the input parameters.

7. REFERENCES

Ceylan, H. and B. Coree. 2006. A Strategic Plan for Implementing the Mechanistic-Empirical Pavement Design Guide in Iowa. TRB Annual Meeting.

Graves, R. C. and K. C. Mahboub. 2005. A Pilot Study in Sampling Based Sensitivity Analysis of the NCHRP 1-37A Design Guide for Flexible Pavements. TRB Annual Meeting.

Hall, K. D. and S. Beam. 2005. Estimation of the Sensitivity of Design Input Variables For Rigid Pavement Analysis Using the Mechanistic-Empirical Design Guide. TRB Annual Meeting.

Interim Pavement Design Procedure. 2000. Pavement Management Unit, N. C. Department of Transportation. April.

Kannekanti, V. and J. Harvey. 2006. Sensitivity Analysis of 2002 Design Guide JPCP Distress Prediction Models. TRB Annual Meeting.

Kim, Y. R., M. King, M. Momen. 2004. "Typical Dynamic Moduli for North Carolina Asphalt Concrete Mixtures." Draft Final Report. North Carolina Department of Transportation. Raleigh. December.

Long-Term Pavement Performance Program. 2004. Federal Highway Administration, Information Management System: Pavement Performance Database. User Reference Guide. McLean, VA. July.

Masad, S. and D. N. Little. 2004. Sensitivity Analysis of Flexible Pavement Response and AASHTO 2002 Design Guide for Properties of Unbound Layers. Thesis. Texas A&M University. May.

National Cooperative Highway Research Program. 2004. “2002 Design Guide: Design of New and Rehabilitated Pavement Structures.” Draft Final Report. NCHRP Study 1-37A. Washington D.C. July.

National Cooperative Highway Research Program. 2005. “Local Calibration Guide: Design of New and Rehabilitated Pavement Structures.” Preliminary Draft Final Report. NCHRP Study 1-40B. Illinois. November.

Papajiannakis, A. T. and M. Bracher. 2006. Sensitivity of the NCHRP 1-37A Pavement Design to Traffic Input. TRB Annual Meeting.

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APPENDIX A: MATERIAL INPUT VARIATION

1. Flexible Pavements

Table A - 1 1817 Piedmont Region – AC with Granular Base

	Base (1817)	Min	Max
General Information			
1. Design life (years)	20	-	-
2. Existing pavement construction month (month, year)	***Dec 83***	***Mar***	***Jun, Sep***
3. Pavement overlay construction month (month, year)			
4. ***Traffic open month (month, year)***	***Jan 84***	***Apr***	***Jul , Oct***
5. Type of design			
a. Flexible pavement	Flexible	-	-
b. JPCP			
c. CRCP			
6. Restoration			
a. JPCP			
7. Overlay			
a. AC			
b. PCC			
Site/Project Identification			
1. Location	3950 ft from SR 2698 (Ridgewood Rd) to Winston-Salem, NC.	-	-
2. Project ID	-	-	-
3. Section ID	1817	-	-
4. Station/milepost format (ft/miles/latitude, longitude)	Miles	Miles	Miles
5. Station/milepost begin	0	-	-
6. Station/milepost end	0.75		
7. Traffic direction (E/W/N/S)	South		
Analysis Parameters			
1. Initial IRI (in./miles)	63	63	63
2. Performance criteria			
Flexible Pavement (Limit,			

Reliability):			
1. Terminal IRI (in./miles)	172, 50	172, 50	172, 50
2. AC surface down cracking (ft/miles) (longitudinal cracking)	1000, 50	1000, 50	1000, 50
3. AC bottom up cracking (alligator cracking) (%)	25, 50	25, 50	25, 50
4. AC thermal fracture	1000, 50	1000, 50	1000, 50
5. Chemically stabilized layer-fatigue fracture (%)	25, 50	25, 50	25, 50
6. Permanent deformation-total pavement (in.)	0.75, 50	0.75, 50	0.75, 50
7. Permanent deformation-AC only (in.)	0.25, 50	0.25, 50	0.25, 50
Structure			
I. AC Layer			
1. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
2. Thickness (in.)	2.1	2.1	2.1
3. Input level	3	3	3
General properties			
4. Reference temperature	70°F	70°F	70°F
5. Effective binder content (%)	6	6	6
6. Air voids (%)	***8.5***	***6***	***11***
7. Total unit weight (pcf)	145.49	145.49	145.49
8. Poisson's ratio	0.30	0.30	0.30
Thermal properties			
9. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
10. Heat capacity (BTU/lb- °F)	***0.23***	***0.22***	***0.40***
Asphalt Mix			
11. Cumulative % retained on 3/4 in. sieve	0	0	0
12. Cumulative % retained on 3/8 in. sieve	7	7	7
13. Cumulative % retained on #4	34	34	34
14. % passing #200	6.7	6.7	6.7
Asphalt Binder			
15. Superpave binder grading (or) Conventional viscosity grade (or)	AC-20	AC-20	AC-20

Conventional penetration grade. Corresponding A & VTS values			
II. AC Layer			
16. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
17. Thickness (in.)	2.2	2.2	2.2
18. Input level	3	3	3
General properties			
19. Reference temperature	70°F	70°F	70°F
20. Effective binder content (%)	5.5	5.5	5.5
21. Air voids (%)	***8.5***	***6***	***11***
22. Total unit weight (pcf)	149.42	149.42	149.42
23. Poisson's ratio	0.30	0.30	0.30
Thermal properties			
24. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
25. ***Heat capacity (BTU/lb-°F)***	***0.23***	***0.22***	***0.40***
Asphalt Mix			
26. Cumulative % retained on 3/4 in. sieve	2	2	2
27. Cumulative % retained on 3/8 in. sieve	30	30	30
28. Cumulative % retained on #4	54	54	54
29. % passing #200	4.2	4.2	4.2
Asphalt Binder			
30. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A & VTS values	AC-20	AC-20	AC-20
III. Granular Base Inputs (Unbound Compacted/Uncompacted)			
31. Material type	Crushed gravel	Crushed gravel	Crushed gravel
32. Thickness (in.)	12	12	12
Strength Properties			
33. Input level (1 - 3)	3	3	3

34. Analysis type 35. Poisson's ratio 36. Coefficient of lateral pressure ***37. Modulus (MPa)*** ICM inputs 38. Plasticity Index 39. Gradation a. Passing #200 sieve b. Passing #4 sieve c. D60 (mm)		ICM inputs 0.35 0.5 ***40000*** 0 11.1 46 9.3	ICM inputs 0.35 0.5 ***38500*** 0 11.1 46 9.3	ICM inputs 0.35 0.5 ***42000*** 0 11.1 46 9.3
I. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted) 40. Material type 41. Thickness (in.) Strength properties 42. Input level (1 - 3) 43. Analysis type 44. Poisson's ratio 45. Coefficient of lateral pressure ***46. Modulus*** ICM inputs 47. Plasticity Index 48. Gradation d. Passing #200 sieve e. Passing #4 sieve f. D60 (mm)		A-3 Sand - 3 ICM inputs 0.35 0.5 ***29000*** 0 41 94 0.21	 Sand - 3 ICM inputs 0.35 0.5 ***24500*** 0 41 94 0.21	 Sand - 3 ICM inputs 0.35 0.5 ***35500*** 0 41 94 0.21
Traffic:				
Initial two-way AADTT		190	190	190
Number of lanes in design direction		2	2	2
Percent trucks in design direction (%)		40	40	40
Percent trucks in design lane (%)		90	90	90
Operational speed (mph)		60	60	60
Monthly adjustment factors		1	1	1
Vehicle class distribution	Class 4	0.5%	0.5%	0.5%
	Class 5	18.0%	18.0%	18.0%
	Class 6	30.1%	30.1%	30.1%
	Class 7	2.3%	2.3%	2.3%
	Class 8	14.7%	14.7%	14.7%
	Class 9	31.2%	31.2%	31.2%
	Class 10	1.1%	1.1%	1.1%

	Class 11	0.4%				0.4%				0.4%			
	Class 12	0.2%				0.2%				0.2%			
	Class 13	1.5%				1.5%				1.5%			
Hourly traffic distribution	12 am-6 am	2.3				2.3				2.3			
	6 am-10 am	5.0				5.0				5.0			
	10 am-4 pm	5.9				5.9				5.9			
	4 pm-8 pm	4.6				4.6				4.6			
	8 pm-12 am	3.1				3.1				3.1			
Traffic growth factor		4% Compound				4% Compound				4% Compound			
General Traffic Inputs:													
Mean wheel location (in.)		18				18				18			
Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.36	1.18	0.00	0.00	1.36	1.18	0.00	0.00	1.36	1.18	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00
	7	1.30	0.35	0.80	0.00	1.30	0.35	0.80	0.00	1.30	0.35	0.80	0.00
	8	2.21	0.80	0.00	0.00	2.21	0.80	0.00	0.00	2.21	0.80	0.00	0.00
	9	1.12	1.94	0.00	0.00	1.12	1.94	0.00	0.00	1.12	1.94	0.00	0.00
	10	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
	11	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
	12	3.98	0.98	0.00	0.00	3.98	0.98	0.00	0.00	3.98	0.98	0.00	0.00
	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Axle load distribution		1817.alf file				1817.alf file				1817.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			
Tridem axle (psi)		49.2				49.2				49.2			
Quad axle (psi)		49.2				49.2				49.2			
Climate		1817.icm file				1817.icm file				1817.icm file			
Latitude (degrees.minutes)		36.08				36.08				36.08			
Longitude (degrees.minutes)		-80.13				-80.13				-80.13			
Elevation (ft)		993				993				993			
Ground water table depth (ft)		5				5				5			

Table A - 2 1814 Mountainous Region – AC with Granular Base

	Base (1814)	Min	Max
General Information 1. Design life (years) ***2. Existing pavement construction month (month, year)*** 3. Pavement overlay construction month (month, year) ***4. Traffic open month (month, year)*** 5. Type of design a. Flexible pavement b. JPCP c. CRCP 6. Restoration a. JPCP 7. Overlay a. AC b. PCC	20 ***Aug, 70*** ***Sep, 70*** Flexible	- ***Feb 1st*** ***Mar 1st*** -	- ***May 1st, Nov 1st*** ***June 1st, Dec 1st*** -
Site/Project Identification 1. Location 2. Project ID 3. Section ID 4. Station/milepost format (ft/miles/latitude, longitude) 5. Station/milepost begin 6. Station/milepost end 7. Traffic direction (E/W/N/S)	0.75 miles East of NC 54, Raleigh , NC - 1814 Miles 0 0.75 South	- - - Miles -	- - - Miles -
Analysis Parameters 1. Initial IRI (in./miles) 2. Performance criteria	63	63	63
Flexible Pavement (Limit, Reliability):			
1. Terminal IRI (in./miles)	172, 50	172, 50	172, 50
2. AC surface down	1000, 50	1000, 50	1000, 50

cracking (ft/miles) (longitudinal cracking)			
3. AC bottom up cracking (alligator cracking) (%)	25, 50	25, 50	25, 50
4. AC thermal fracture	1000, 50	1000, 50	1000, 50
5. Chemically stabilized layer-fatigue fracture (%)	25, 50	25, 50	25, 50
6. Permanent deformation-total pavement (in.)	0.75, 50	0.75, 50	0.75, 50
7. Permanent deformation-AC only (in.)	0.25, 50	0.25, 50	0.25, 50
Structure			
I. AC Layer			
1. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
2. Thickness (in.)	2.4	2.4	2.4
3. Input level	1	1	1
General properties			
4. Reference temperature	70°F	70°F	70°F
5. Effective binder content (%)	5	5	5
6. Air voids (%)	***6.5***	***6,8.5***	***11***
7. Total unit weight (pcf)	150	150	150
8. Poisson's ratio	0.35	0.35	0.35
Thermal properties			
9. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
10. Heat capacity (BTU/lb- °F)	***0.23***	***0.22***	***0.40***
Asphalt Mix			
11. Cumulative % retained on 3/4 in. sieve	0	0	0
12. Cumulative % retained on 3/8 in. sieve	1	1	1
13. Cumulative % retained on #4	25	25	25
14. % passing #200	10	10	10
Asphalt Binder			
15. Superpave binder grading (or) Conventional viscosity grade (or)	AC-20	AC-20	AC-20

Conventional penetration grade. Corresponding A & VTS values			
II. AC Layer			
16. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
17. Thickness (in.)	2.7	2.7	2.7
18. Input level	3		
General properties			
19. Reference temperature	70°F	70°F	70°F
20. Effective binder content (%)	4	4	4
21. Air voids (%)	***8.5***	***6***	***11***
22. Total unit weight (pcf)	148	148	148
23. Poisson's ratio	0.35	0.35	0.35
Thermal properties			
24. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
25. ***Heat capacity (BTU/lb-°F)***	***0.23***	***0.22***	***0.40***
Asphalt Mix			
26. Cumulative % retained on 3/4 in. sieve	5	5	5
27. Cumulative % retained on 3/8 in. sieve	38	38	38
28. Cumulative % retained on #4	57	57	57
29. % passing #200	4.7	4.7	4.7
Asphalt Binder			
30. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A & VTS values	AC-20	AC-20	AC-20
III. Granular Base Inputs (Unbound Compacted/Uncompacted)			
31. Material type	Crushed gravel	Crushed gravel	Crushed gravel

32. Thickness (in.)		13.5	13.5	13.5
Strength Properties				
33. Input level (1 - 3)		3	3	3
34. Analysis type		ICM inputs	ICM inputs	ICM inputs
35. Poisson's ratio		0.35	0.35	0.35
36. Coefficient of lateral pressure		0.5	0.5	0.5
37. Modulus (MPa)		***40000***	***38500***	***42000***
ICM inputs				
38. Plasticity Index		0	0	0
Gradation				
39. Passing #200 sieve		11	11	11
40. Passing #4 sieve		47	47	47
41. D60 (mm)		9.88	9.88	9.88
I. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted)				
42. Material type		Sand	Sand	Sand
43. Thickness (in.)		-	-	-
Strength properties				
44. Input level (1 - 3)		3	3	3
45. Analysis type		ICM inputs	ICM inputs	ICM inputs
46. Poisson's ratio		0.35	0.35	0.35
47. Coefficient of lateral pressure		0.5	0.5	0.5
48. Modulus		***24000***	***21500***	***29000***
ICM inputs				
49. Plasticity Index		17	17	17
Gradation				
50. Passing #200 sieve		40.6	40.6	40.6
51. Passing #4 sieve		85	85	85
52. D60 (mm)		0.05	0.05	0.05
Traffic:				
Initial two-way AADTT		420	420	420
Number of lanes in design direction		2	2	2
Percent trucks in design direction (%)		40	40	40
Percent trucks in design lane (%)		90	90	90
Operational speed (mph)		60	60	60
Monthly adjustment factors		1	1	1
Vehicle class distribution	Class 4	3.3	3.3	3.3
	Class 5	35.6	35.6	35.6
	Class 6	14.5	14.5	14.5
	Class 7	0.9	0.9	0.9

	Class 8	12.5				12.5				12.5			
	Class 9	31.4				31.4				31.4			
	Class 10	1.6				1.6				1.6			
	Class 11	0.1				0.1				0.1			
	Class 12	0.0				0.0				0.0			
	Class 13	0.1				0.1				0.1			
Hourly traffic distribution	12 am-6 am	2.3				2.3				2.3			
	6 am-10 am	5.0				5.0				5.0			
	10 am-4 pm	5.9				5.9				5.9			
	4 pm-8 pm	4.6				4.6				4.6			
	8 pm-12 am	3.1				3.1				3.1			
Traffic growth factor		4% Compound				4% Compound				4% Compound			
General Traffic Inputs:													
Mean wheel location (in.)		18				18				18			
Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Ta.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.82	0.18	0.00	0.00	1.82	0.18	0.00	0.00	1.82	0.18	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.07	0.95	0.01	0.00	1.07	0.95	0.01	0.00	1.07	0.95	0.01	0.00
	7	1.10	0.34	0.64	0.02	1.10	0.34	0.64	0.02	1.10	0.34	0.64	0.02
	8	2.80	0.26	0.00	0.00	2.80	0.26	0.00	0.00	2.80	0.26	0.00	0.00
	9	1.18	1.88	0.00	0.00	1.18	1.88	0.00	0.00	1.18	1.88	0.00	0.00
	10	1.20	1.33	0.33	0.18	1.20	1.33	0.33	0.18	1.20	1.33	0.33	0.18
	11	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
	12	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00
	13	1.40	0.60	1.19	0.00	1.40	0.60	1.19	0.00	1.40	0.60	1.19	0.00
Axle load distribution		1814.alf file				1814.alf file				1814.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			
Tridem axle (psi)		49.2				49.2				49.2			
Quad axle (psi)		49.2				49.2				49.2			
Climate		1814.icm file				1814.icm file				1814.icm file			
Latitude (degrees.minutes)		35.17				35.17				35.17			
Longitude (degrees.minutes)		-83.37				-83.37				-83.37			

Elevation (ft)	2060	2060	2060
Ground water table depth (ft)	5	5	5

Table A - 3 0901 – Piedmont Region – AC with Bituminous Treated Base

	Base (0901)	Min	Max
General Information			
1. Design life (years)	20	-	-
2. Existing pavement construction month (month, year)	***Aug, 75***	***Feb 1st***	***May 1st, Nov 1st***
3. Pavement overlay construction month (month, year)			
4. ***Traffic open month (month, year)***	***Sep, 75***	***Mar 1st***	***Jun 1st, Dec 1st***
5. Type of design			
a. Flexible pavement	Flexible	-	-
b. JPCP			
c. CRCP			
6. Restoration			
a. JPCP			
7. Overlay			
a. AC			
b. PCC			
Site/Project Identification			
1. Location	1.94 miles South of SR 1415, Colon Rd, Sanford, NC.	-	-
2. Project ID		-	-
3. Section ID	0901	-	-
4. Station/milepost format (ft/miles/latitude, longitude)	Miles	Miles	Miles
5. Station/milepost begin	0	-	-
6. Station/milepost end	1.94		
7. Traffic direction (E/W/N/S)	North		
Analysis Parameters			
1. Initial IRI (in./miles)	63	63	63
2. Performance criteria			
Flexible Pavement (Limit, Reliability):			
1. Terminal IRI (in./miles)	172, 50	172, 50	172, 50
2. AC surface down	1000, 50	1000, 50	1000, 50

cracking (ft/miles) (longitudinal cracking)			
3. AC bottom up cracking (alligator cracking) (%)	25, 50	25, 50	25, 50
4. AC thermal fracture	1000, 50	1000, 50	1000, 50
5. Chemically stabilized layer-fatigue fracture (%)	25, 50	25, 50	25, 50
6. Permanent deformation-total pavement (in.)	0.75, 50	0.75, 50	0.75, 50
7. Permanent deformation-AC only (in.)	0.25, 50	0.25, 50	0.25, 50
Structure			
I. AC Layer			
1. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
2. Thickness (in.)	2.6	2.6	2.6
3. Input level	1	1	1
General properties			
4. Reference temperature	70°F	70°F	70°F
5. Effective binder content (%)	6.4	6.4	6.4
6. Air voids (%)	***6(5)***	***8.5***	***11***
7. Total unit weight (pcf)	150	150	150
8. Poisson's ratio	0.35	0.35	0.35
Thermal properties			
9. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
10. Heat capacity (BTU/lb- °F)	***0.23***	***0.22***	***0.40***
Asphalt Mix			
11. Cumulative % retained on 3/4 in. sieve	0	0	0
12. Cumulative % retained on 3/8 in. sieve	1	1	1
13. Cumulative % retained on #4	23	23	23
14. % passing #200	6.7	6.7	6.7
Asphalt Binder			
15. Superpave binder grading (or) Conventional viscosity grade (or)	AC-20	AC-20	AC-20

Conventional penetration grade. Corresponding A & VTS values			
II. AC Layer 16. Material type 17. Thickness (in.) 18. Input level General properties 19. Reference temperature 20. Effective binder content (%) ***21. Air voids (%)*** 22. Total unit weight (pcf) 23. Poisson's ratio Thermal properties ***24. Thermal conductivity (BTU/hr-ft-°F)*** 25. ***Heat capacity (BTU/lb-°F)*** Asphalt Mix 26. Cumulative % retained on 3/4 in. sieve 27. Cumulative % retained on 3/8 in. sieve 28. Cumulative % retained on #4 29. % passing #200 Asphalt Binder 30. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A & VTS values	Asphalt concrete 2.8 3 70°F 5 ***6(5)*** 148 0.35 ***0.67*** ***0.23*** 26 57 63 3 AC-20	Asphalt concrete 2.8 3 70°F 5 ***8.5*** 148 0.35 ***0.44*** ***0.22*** 26 57 63 3 AC-20	Asphalt concrete 2.8 3 70°F 5 ***11*** 148 0.35 ***0.81*** ***0.40*** 26 57 63 3 AC-20
III. Treated Base Layer 31. Material type 32. Thickness (in.) 33. Input level	Asphalt permeable base 3.4 3	Asphalt permeable base 3.4 3	Asphalt permeable base 3.4 3

General properties			
34. Reference temperature	70°F	70°F	70°F
35. Effective binder content (%)	4.7	4.7	4.7
36. Air voids (%)	***6***	***8.5***	***11***
37. Total unit weight (pcf)	148	148	148
38. Poisson's ratio	0.35	0.35	0.35
Thermal properties			
39. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
40. ***Heat capacity (BTU/lb-°F)***	***0.23***	***0.22***	***0.40***
Asphalt Mix			
41. Cumulative % retained on 3/4 in. sieve	14	14	14
42. Cumulative % retained on 3/8 in. sieve	52	52	52
43. Cumulative % retained on #4	63	63	63
44. % passing #200	3.1	3.1	3.1
Asphalt Binder			
45. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A & VTS values	AC-20	AC-20	AC-20
IV. Granular Base Inputs (Unbound Compacted/Uncompacted)			
46. Material type	A-7-5 – Soil Aggregate mixture-fine grained Clayey soils	A-7-5 – Soil Aggregate mixture-fine grained Clayey soils	A-7-5 – Soil Aggregate mixture-fine grained Clayey soils
47. Thickness (in.)	7	7	7
Strength Properties			
48. Input level (1 - 3)	3	3	3
49. Analysis type	ICM inputs	ICM inputs	ICM inputs
50. Poisson's ratio	0.35	0.35	0.35
51. Coefficient of lateral pressure	0.5	0.5	0.5
52. Modulus (MPa)	***12000***	***8000***	***17500***

ICM inputs 53. Plasticity Index Gradation 53. Passing #200 sieve 54. Passing #4 sieve 55. D60 (mm)		30 85 60 0.01	30 85 60 0.01	30 85 60 0.01
V. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted) 54. Material type 55. Thickness (in.) Strength properties 56. Input level (1 - 3) 57. Analysis type 58. Poisson's ratio 59. Coefficient of lateral pressure ***60. Modulus*** ICM inputs 61. Plasticity Index Gradation 56. Passing #200 sieve 57. Passing #4 sieve 58. D60 (mm)		A-6 Silty clay - 3 ICM inputs 0.35 0.5 ***17000*** 10 75 95 0.27	A-6 Silty clay - 3 ICM inputs 0.35 0.5 ***13500*** 10 75 95 0.27	A-6 Silty clay - 3 ICM inputs 0.35 0.5 ***24000*** 10 75 95 0.27
Traffic:				
Initial two-way AADTT		361	361	361
Number of lanes in design direction		2	2	2
Percent trucks in design direction (%)		49.8	49.8	49.8
Percent trucks in design lane (%)		90	90	90
Operational speed (mph)		60	60	60
Monthly adjustment factors		1	1	1
Vehicle class distribution	Class 4	3.5	3.5	3.5
	Class 5	15	15	15
	Class 6	8.3	8.3	8.3
	Class 7	0.5	0.5	0.5
	Class 8	14.1	14.1	14.1
	Class 9	53.9	53.9	53.9
	Class 10	2.8	2.8	2.8
	Class 11	0.5	0.5	0.5
	Class 12	0.0	0.0	0.0
	Class 13	1.3	1.3	1.3
Hourly traffic distribution	12 am-6 am	2.3	2.3	2.3

	6 am-10 am	5.0				5.0				5.0			
	10 am-4 pm	5.9				5.9				5.9			
	4 pm-8 pm	4.6				4.6				4.6			
	8 pm-12 am	3.1				3.1				3.1			
Traffic growth factor		4% Compound				4% Compound				4% Compound			
General Traffic Inputs:													
Mean wheel location (in.)		18				18				18			
Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Ta.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.88	0.12	0.00	0.00	1.88	0.12	0.00	0.00	1.88	0.12	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.04	0.97	0.00	0.00	1.04	0.97	0.00	0.00	1.04	0.97	0.00	0.00
	7	1.16	0.41	0.59	0.00	1.16	0.41	0.59	0.00	1.16	0.41	0.59	0.00
	8	2.83	0.16	0.00	0.00	2.83	0.16	0.00	0.00	2.83	0.16	0.00	0.00
	9	1.22	1.85	0.00	0.02	1.22	1.85	0.00	0.02	1.22	1.85	0.00	0.02
	10	1.10	0.96	0.16	0.51	1.10	0.96	0.16	0.51	1.10	0.96	0.16	0.51
	11	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
	12	4.01	1.00	0.00	0.00	4.01	1.00	0.00	0.00	4.01	1.00	0.00	0.00
	13	1.10	0.91	0.05	0.95	1.10	0.91	0.05	0.95	1.10	0.91	0.05	0.95
Axle load distribution		0900.alf file				0900.alf file				0900.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			
Tridem axle (psi)		49.2				49.2				49.2			
Quad axle (psi)		49.2				49.2				49.2			
Climate		0900.icm file				0900.icm file				0900.icm file			
Latitude (degrees.minutes)		35.54				35.54				35.54			
Longitude (degrees.minutes)		-79.17				-79.17				-79.17			
Elevation (ft)		295				295				295			
Ground water table depth (ft)		5				5				5			

Table A - 41028 – Coastal Region – AC with Bituminous Treated Base

	Base (1028)	Min	Max
General Information 1. Design life (years) ***2. Existing pavement construction month (month, year)*** 3. Pavement overlay construction month (month, year) 4. ***Traffic open month (month, year)*** 5. Type of design a. Flexible pavement b. JPCP c. CRCP 6. Restoration a. JPCP 7. Overlay a. AC b. PCC	20 ***Nov/1/82*** ***Dec/1/82*** Flexible	- ***Aug 1st*** ***Sep 1st*** -	- ***Feb 1st, May 1st*** ***Mar 1st, June 1st*** -
Site/Project Identification 1. Location 2. Project ID 3. Section ID 4. Station/milepost format (ft/miles/latitude, longitude) 5. Station/milepost begin 6. Station/milepost end 7. Traffic direction (E/W/N/S)	1.70 miles North of SR 1231, Elizabeth city, NC. 1028 Miles 0 8.45 North	- - - Miles -	- - - Miles -
Analysis Parameters 1. Initial IRI (in./miles) 2. Performance criteria	63	63	63
Flexible Pavement (Limit, Reliability):			
1. Terminal IRI (in./miles)	172, 50	172, 50	172, 50
2. AC surface down	1000, 50	1000, 50	1000, 50

cracking (ft/miles) (longitudinal cracking)			
3. AC bottom up cracking (alligator cracking) (%)	25, 50	25, 50	25, 50
4. AC thermal fracture	1000, 50	1000, 50	1000, 50
5. Chemically stabilized layer-fatigue fracture (%)	25, 50	25, 50	25, 50
6. Permanent deformation-total pavement (in.)	0.75, 50	0.75, 50	0.75, 50
7. Permanent deformation-AC only (in.)	0.25, 50	0.25, 50	0.25, 50
Structure			
I. AC Layer			
1. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
2. Thickness (in.)	1.6	1.6	1.6
3. Input level	3	3	3
General properties			
4. Reference temperature	70°F	70°F	70°F
5. Effective binder content (%)	6.9	6.9	6.9
6. Air voids (%)	***8.7***	***6***	***11***
7. Total unit weight (pcf)	150	150	150
8. Poisson's ratio	0.35	0.35	0.35
Thermal properties			
9. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
10. Heat capacity (BTU/lb- °F)	***0.23***	***0.22***	***0.40***
Asphalt Mix			
11. Cumulative % retained on 3/4 in. sieve	0	0	0
12. Cumulative % retained on 3/8 in. sieve	6	6	6
13. Cumulative % retained on #4	23	23	23
14. % passing #200	6.2	6.2	6.2
Asphalt Binder			
15. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A &	AC-20	AC-20	AC-20

VTS values			
II. TB			
16. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
17. Thickness (in.)	8.2	8.2	8.2
18. Input level	3	3	3
General properties			
19. Reference temperature	70°F	70°F	70°F
20. Effective binder content (%)	4.1	4.1	4.1
21. Air voids (%)	***8.7***	***6***	***11***
22. Total unit weight (pcf)	148	148	148
23. Poisson's ratio	0.35	0.35	0.35
Thermal properties			
24. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
25. ***Heat capacity (BTU/lb-°F)***	***0.23***	***0.22***	***0.40***
Asphalt Mix			
26. Cumulative % retained on 3/4 in. sieve	14	14	14
27. Cumulative % retained on 3/8 in. sieve	52	52	52
28. Cumulative % retained on #4	63	63	63
29. % passing #200	3.1	3.1	3.1
Asphalt Binder			
30. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A & VTS values	AC-20	AC-20	AC-20
III. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted)	A-3	A-3	A-3
31. Material type	Poorly graded sand	Poorly graded sand	Poorly graded sand
32. Thickness (in.)	-	-	-
Strength properties			
33. Input level (1 - 3)	3	3	3
34. Analysis type	ICM inputs	ICM inputs	ICM inputs
35. Poisson's ratio	0.35	0.35	0.35
36. Coefficient of lateral	0.5	0.5	0.5

pressure				
37. Modulus		***29000***	***24500***	***35500***
ICM inputs				
38. Plasticity Index		0	0	0
Gradation				
39. Passing #200 sieve		8.5	8.5	8.5
40. Passing #4 sieve		100	100	100
41. D60 (mm)		0.2	0.2	0.2
Traffic:				
Initial two-way AADTT		540	540	540
Number of lanes in design direction		2	2	2
Percent trucks in design direction (%)		40.6	40.6	40.6
Percent trucks in design lane (%)		90	90	90
Operational speed (mph)		60	60	60
Monthly adjustment factors		1	1	1
Vehicle class distribution	Class 4	5.3	5.3	5.3
	Class 5	22.0	22.0	22.0
	Class 6	4.6	4.6	4.6
	Class 7	0.1	0.1	0.1
	Class 8	9.3	9.3	9.3
	Class 9	57.6	57.6	57.6
	Class 10	0.6	0.6	0.6
	Class 11	0.4	0.4	0.4
	Class 12	0.1	0.1	0.1
	Class 13	0.0	0.0	0.0
Hourly traffic distribution	12 am-6 am	2.3	2.3	2.3
	6 am-10 am	5.0	5.0	5.0
	10 am-4 pm	5.9	5.9	5.9
	4 pm-8 pm	4.6	4.6	4.6
	8 pm-12 am	3.1	3.1	3.1
Traffic growth factor		4% Compound	4% Compound	4% Compound
General Traffic Inputs:				
Mean wheel location (in.)		18	18	18
Traffic wander std. dev. (in.)		10	10	10
Design lane width (ft)		12	12	12

Number of	Axle type->	Si.	Ta.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.70	0.30	0.00	0.00	1.70	0.30	0.00	0.00	1.70	0.30	0.00	0.00

axles per truck	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.16	0.91	0.00	0.00	1.16	0.91	0.00	0.00	1.16	0.91	0.00	0.00
	7	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
	8	2.73	0.27	0.00	0.00	2.73	0.27	0.00	0.00	2.73	0.27	0.00	0.00
	9	1.17	1.91	0.00	0.00	1.17	1.91	0.00	0.00	1.17	1.91	0.00	0.00
	10	1.00	1.56	0.41	0.03	1.00	1.56	0.41	0.03	1.00	1.56	0.41	0.03
	11	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
	12	3.99	1.00	0.00	0.00	3.99	1.00	0.00	0.00	3.99	1.00	0.00	0.00
	13	1.00	0.75	1.00	0.25	1.00	0.75	1.00	0.25	1.00	0.75	1.00	0.25
Axle load distribution		1028.alf file				1028.alf file				1028.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			
Tridem axle (psi)		49.2				49.2				49.2			
Quad axle (psi)		49.2				49.2				49.2			
Climate		1028.icm file				1028.icm file				1028.icm file			
Latitude (degrees.minutes)		36.53				36.53				36.53			
Longitude (degrees.minutes)		-76.37				-76.37				-76.37			
Elevation (ft)		20				20				20			
Ground water table depth (ft)		5				5				5			

2. Rigid Pavements - JPCP

Table A - 5 0201 – Piedmont Region – JPCP with Unbound Base

	Base (0201)	Min	Max
General Information			
1. Design life (years)	20	-	-
2. Existing pavement construction month (month, year)	***July,92***	***Dec 1st***	***Mar 1st, Sep 1st***
3. Pavement overlay construction month (month, year)			
4. ***Traffic open month (month, year)***	***July,94***	***Jan 1st***	***Apr 1st, Oct 1st***
5. Type of design			
a. Flexible pavement	JPCP	-	-
b. JPCP			
c. CRCP			
6. Restoration			
a. JPCP			
7. Overlay			
b. AC			
a. PCC			
Site/Project Identification			
1. Location	Lexington by-pass, Lexington, NC.	-	-
2. Project ID	-	-	-
3. Section ID	0201	-	-
4. Station/milepost format (ft/miles/latitude, longitude)	Miles	Miles	Miles
5. Station/milepost begin	0	-	-
6. Station/milepost end	91.49		
7. Traffic direction (E/W/N/S)	South		
Analysis Parameters			
1. Initial IRI (in./miles)	82	82	82
2. Performance criteria			
Rigid Pavement (Limit, Reliability)			
1. Terminal IRI (in/miles)	172, 50	172, 50	172, 50

2. Transverse Cracking (% Slab Cracked)	15, 50	15, 50	15, 50
3. Mean Joint Faulting(in)	0.12, 50	0.12, 50	0.12, 50
Structure			
III. CRCP/JPCP Layer			
1. Material Type	JPCP		
2. Layer Thickness (in)	9		
3. Unit Weight (pcf)	145.5	*140*	*160*
4. Poisson's Ratio	0.15	*0.1*	*0.3*
Thermal Properties			
5. Coefficient of Thermal Expansion (/F°* 10^{-6})	5.5	*2*	*10*
6. Thermal conductivity (BTU/hr-ft-F°)	1.25	*0.2*	*2*
7. Heat Capacity (BTU/lb- F°)	0.28	*0.1*	*0.5*
Mix Properties			
8. Cement Type (I or II or III)	I		
9. Cementitious Material Content (lb/yd3)	421	*400*	*800*
10. Water/Cement Ratio	0.7	*0.3*	*0.7*
11. Aggregate Type	Granite		
12. PCC zero-stress temperature (F°)	*97*	*50*	*125*
13. Ultimate shrinkage at 40% R.H (Microstrain)	*752*	*300*	*1000*
14. Reversible Shrinkage (% of ultimate shrinkage)	*50*	*30*	*80*
15. Time to develop ultimate shrinkage (days)	*35*	*30*	*50*
16. Curing Method	Curing Compound		
Strength Properties			
17. Input Level			
18. 28-day PCC Modulus of rupture	824	*450*	*1200*
19. 28-day PCC Compressive strength	7170	*3000*	*8000*
20. 28-day PCC elastic modulus	4659000		
II. JPCP			

21. Slab thickness	-	-	-
22. Permanent curl/wrap effective temperature difference	*-10*	*-30*	*0*
Joint Design			
23. Joint spacing (ft)	15	*10*	*20*
24. Sealant type	LowModSilicone		
25. Random Joint Spacing	-	-	-
Dowelled Transverse Joints	-	-	-
26. Dowell diameter (in)	1.5	*1*	*1.75*
27. Dowell bar spacing (ft)	12	*10*	*14*
Edge Support			
28. Long term LTE (%)	*40*	*20*	*80*
29. Slab width (ft)	12	*12*	*14*
Base Properties			
Base type	-	-	-
30. Erodibility index	5		
31. PCC- base interface	Unbonded		
32. Loss of bond age (months)	-	*0*	*120*
III. Granular Base Inputs (Unbound Compacted/Uncompacted)			
33. Material type	Crushed Stone	Crushed Stone	Crushed Stone
34. Thickness (in.)	9.3	9.3	9.3
Strength Properties			
35. Input level (1 - 3)	3	3	3
36. Analysis type	ICM inputs	ICM inputs	ICM inputs
37. Poisson's ratio	0.35	0.35	0.35
38. Coefficient of lateral pressure	0.5	0.5	0.5
39. Modulus (MPa)	***40000***	***38500***	***42000***
ICM inputs			
40. Plasticity Index	1	1	1
Gradation			
41. Passing #200 sieve	8.8	8.8	8.8
42. Passing #4 sieve	51	51	51
43. D60 (mm)	7.1	7.1	7.1
IV. Chemically Stabilized Materials (CSM) (Note: In case of overlay's, existing JPCP/CRCP act as CSM)			
44. Material Type	Lime treated soil		
45. Layer thickness (in)	8	*3*	*24*

46. Unit Weight (pcf) 47. Poisson's ratio 48. Elastic Resilient Modulus 49. Thermal conductivity (BTU/hr-ft-F°) 50. Heat Capacity (BTU/lb- F°)	150 0.2 2000000 1.25 0.28	*50* *0.15* *50000* *0.1* *0*	*200* *0.45* *4000000* *4* *1*
I. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted) 51. Material type 52. Thickness (in.) Strength properties 53. Input level (1 - 3) 54. Analysis type 55. Poisson's ratio 56. Coefficient of lateral pressure ***57. Modulus*** ICM inputs 58. Plasticity Index Gradation 59. Passing #200 sieve 60. Passing #4 sieve 61. D60 (mm)	A-6 Silty Clay - 3 ICM inputs 0.35 0.5 ***17000*** 31 70.3 100 0.1	A-6 Silty Clay - 3 ICM inputs 0.35 0.5 ***13500*** 31 70.3 100 0.1	A-6 Silty Clay - 3 ICM inputs 0.35 0.5 ***24000*** 31 70.3 100 0.1
Traffic:			
Initial two-way AADTT	2130	2130	2130
Number of lanes in design direction	2	2	2
Percent trucks in design direction (%)	37.2	37.2	37.2
Percent trucks in design lane (%)	90	90	90
Operational speed (mph)	60	60	60
Monthly adjustment factors	1	1	1
Vehicle class distribution — Class 4	4.7	4.7	4.7
Class 5	15.0	15.0	15.0
Class 6	4.8	4.8	4.8
Class 7	0.1	0.1	0.1
Class 8	8.8	8.8	8.8
Class 9	60.7	60.7	60.7
Class 10	0.5	0.5	0.5
Class 11	3.7	3.7	3.7
Class 12	1.5	1.5	1.5
Class 13	0.2	0.2	0.2

Hourly traffic distribution	12 am-6 am	2.3				2.3				2.3			
	6 am-10 am	5.0				5.0				5.0			
	10 am-4 pm	5.9				5.9				5.9			
	4 pm-8 pm	4.6				4.6				4.6			
	8 pm-12 am	3.1				3.1				3.1			
Traffic growth factor		4% Compound				4% Compound				4% Compound			
General Traffic Inputs:													
Mean wheel location (in.)		18				18				18			
Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.80	0.20	0.00	0.00	1.80	0.20	0.00	0.00	1.80	0.20	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.13	0.93	0.01	0.00	1.13	0.93	0.01	0.00	1.13	0.93	0.01	0.00
	7	1.74	0.59	1.05	0.06	1.74	0.59	1.05	0.06	1.74	0.59	1.05	0.06
	8	2.55	0.45	0.00	0.00	2.55	0.45	0.00	0.00	2.55	0.45	0.00	0.00
	9	1.13	1.93	0.00	0.00	1.13	1.93	0.00	0.00	1.13	1.93	0.00	0.00
	10	1.20	1.37	0.57	0.15	1.20	1.37	0.57	0.15	1.20	1.37	0.57	0.15
	11	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
	12	4.02	1.00	0.00	0.00	4.02	1.00	0.00	0.00	4.02	1.00	0.00	0.00
	13	2.15	1.32	1.46	0.09	2.15	1.32	1.46	0.09	2.15	1.32	1.46	0.09
Axle load distribution		0201.alf file				0201.alf file				0201.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			
Tridem axle (psi)		49.2				49.2				49.2			
Quad axle (psi)		49.2				49.2				49.2			
Climate		0201.icm file				0201.icm file				0201.icm file			
Latitude (degrees.minutes)		35.87				35.87				35.87			
Longitude (degrees.minutes)		-80.27				-80.27				-80.27			
Elevation (ft)		741				741				741			
Ground water table depth (ft)		10				10				10			

Table A - 6 0209 Piedmont Region – JPCP Over Bituminous Treated Base

	Base (0209)	Min	Max
General Information			
1. Design life (years)	20	-	-
2. Existing pavement construction month (month, year)	***June, 94***	***Dec 1st***	***Mar 1st, Sep 1st***
3. Pavement overlay construction month (month, year)			
4. ***Traffic open month (month, year)***	***July, 94***	***Jan 1st***	***Apr 1st, Oct 1st***
5. Type of design			
a. Flexible pavement		-	-
b. JPCP	JPCP		
c. CRCP			
6. Restoration			
a. JPCP			
7. Overlay			
a. AC			
b. PCC			
Site/Project Identification			
8. Location	Lexington by-pass, Lexington, NC.	-	-
9. Project ID	-	-	-
10. Section ID	0209	-	-
11. Station/milepost format (ft/miles/latitude, longitude)	Miles	Miles	Miles
12. Station/milepost begin	0	-	-
13. Station/milepost end	91.49		
14. Traffic direction (E/W/N/S)	South		
Analysis Parameters			
15. Initial IRI (in./miles)	82	82	82
16. Performance criteria			
Rigid Pavement (Limit, Reliability)			
1. Terminal IRI (in/miles)	172, 50	172, 50	172, 50
2. Transverse Cracking (%	15, 50	15, 50	15, 50

Slab Cracked)			
3. Mean Joint Faulting(in)	0.12, 50	0.12, 50	0.12, 50
Structure			
I. CRCP/JPCP Layer			
1. Material Type	JPCP		
2. Layer Thickness (in)	8.6		
3. Unit Weight (pcf)	145.5	*140*	*160*
4. Poisson's Ratio	0.15	*0.1*	*0.3*
Thermal Properties			
5. Coefficient of Thermal Expansion (/F°* 10^{-6})	5.5	*2*	*10*
6. Thermal conductivity (BTU/hr-ft-F°)	1.25	*0.2*	*2*
7. Heat Capacity (BTU/lb- F°)	0.28	*0.1*	*0.5*
Mix Properties			
8. Cement Type (I or II or III)	I		
9. Cementitious Material Content (lb/yd3)	772	*400*	*800*
10. Water/Cement Ratio	0.45	*0.3*	*0.7*
11. Aggregate Type	Granite		
12. PCC zero-stress temperature (F°)	*97*	*50*	*125*
13. Ultimate shrinkage at 40% R.H (Microstrain)	*752*	*300*	*1000*
14. Reversible Shrinkage (% of ultimate shrinkage)	*50*	*30*	*80*
15. Time to develop ultimate shrinkage (days)	*35*	*30*	*50*
16. Curing Method	Curing compound		
Strength Properties			
17. Input Level	-		
18. 28-day PCC Modulus of rupture			
19. 28-day PCC Compressive strength	5110	*450*	*1200*
20. 28-day PCC elastic modulus	3420000	*3000*	*8000*
JPCP			
21. Slab thickness	-	-	-

22. Permanent curl/wrap effective temperature difference	*-10*	*-30*	*0*
Joint Design			
23. Joint spacing (ft)	15	*10*	*20*
24. Sealant type	Silicone		
25. Random Joint Spacing	-	-	-
Dowelled Transverse Joints	-	-	-
26. Dowell diameter (in)	1.5	*1*	*1.75*
27. Dowell bar spacing (ft)	12	*10*	*14*
Edge Support			
28. Long term LTE (%)	*40*	*20*	*80*
29. Slab width (ft)	12	*12*	*14*
Base Properties			
30. Base type	-	-	-
31. Erodibility index	1		
32. PCC- base interface	Unbonded		
33. Loss of bond age (months)	-	*0*	*120*
II. TB			
34. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
35. Thickness (in.)	5.6	5.6	5.6
36. Input level	3	3	3
General properties			
37. Reference temperature	70°F	70°F	70°F
38. Effective binder content (%)	2.4	2.4	2.4
39. Air voids (%)	***31.3***	***6***	***11***
40. Total unit weight (pcf)	148	148	148
41. Poisson's ratio			
Thermal properties	0.35	0.35	0.35
42. Thermal conductivity (BTU/hr-ft-°F)			
43. ***Heat capacity (BTU/lb-°F)***	***0.67***	***0.44***	***0.81***
Asphalt Mix	***0.23***	***0.22***	***0.40***
44. Cumulative % retained on 3/4 in. sieve	6	6	6
45. Cumulative % retained on 3/8 in. sieve	74	74	74
46. Cumulative % retained on #4	91	91	91
47. % passing #200	1.8	1.8	1.8

Asphalt Binder 48. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A & VTS values	AC-20	AC-20	AC-20
III. Granular Base Inputs (Unbound Compacted/Uncompacted)			
49. Material type	Crushed Stone	Crushed Stone	Crushed Stone
50. Thickness (in.)	5	5	5
Strength Properties			
51. Input level (1 - 3)	3	3	3
52. Analysis type	ICM inputs	ICM inputs	ICM inputs
53. Poisson's ratio	0.35	0.35	0.35
54. Coefficient of lateral pressure	0.5	0.5	0.5
55. Modulus (MPa)	***40000***	***38500***	***42000***
ICM inputs			
56. Plasticity Index	17	17	17
Gradation			
57. Passing #200 sieve	8.75	8.8	8.8
58. Passing #4 sieve	52	51	51
59. D60 (mm)	7.1	7.1	7.1
IV. Chemically Stabilized Materials (CSM) (Note: In case of overlay's, existing JPCP/CRCP act as CSM)			
60. Material Type	Lime treated soil		
61. Layer thickness (in)	5	*3*	*24*
62. Unit Weight (pcf)	150	*50*	*200*
63. Poisson's ratio	0.26	*0.15*	*0.45*
64. Elastic Resilient Modulus	2000000	*50000*	*4000000*
65. Thermal conductivity (BTU/hr-ft-F°)	1.25	*0.1*	*4*
66. Heat Capacity (BTU/lb- F°)	0.28	*0*	*1*
V. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted)	A-7-5		
67. Material type	Sandy Silty Clay	Sandy Silty Clay	Sandy Silty Clay

68. Thickness (in.)		-	-	-
Strength properties				
69. Input level (1 - 3)		3	3	3
70. Analysis type		ICM inputs	ICM inputs	ICM inputs
71. Poisson's ratio		0.35	0.35	0.35
72. Coefficient of lateral pressure		0.5	0.5	0.5
73. Modulus		***12000***	***8000***	***17500***
ICM inputs				
74. Plasticity Index		52.5	52.5	52.5
Gradation				
75. Passing #200 sieve		59.08	59.08	59.08
76. Passing #4 sieve		99.4	99.4	99.4
77. D60 (mm)		0.1	0.1	0.1
Traffic:				
Initial two-way AADTT		2130	2130	2130
Number of lanes in design direction		2	2	2
Percent trucks in design direction (%)		37.2	37.2	37.2
Percent trucks in design lane (%)		90	90	90
Operational speed (mph)		60	60	60
Monthly adjustment factors		1	1	1
Vehicle class distribution	Class 4	4.7	4.7	4.7
	Class 5	15.0	15.0	15.0
	Class 6	4.8	4.8	4.8
	Class 7	0.1	0.1	0.1
	Class 8	8.8	8.8	8.8
	Class 9	60.7	60.7	60.7
	Class 10	0.5	0.5	0.5
	Class 11	3.7	3.7	3.7
	Class 12	1.5	1.5	1.5
	Class 13	0.2	0.2	0.2
Hourly traffic distribution	12 am-6 am	2.3	2.3	2.3
	6 am-10 am	5.0	5.0	5.0
	10 am-4 pm	5.9	5.9	5.9
	4 pm-8 pm	4.6	4.6	4.6
	8 pm-12 am	3.1	3.1	3.1
Traffic growth factor		4% Compound	4% Compound	4% Compound
General Traffic Inputs:				

Mean wheel location (in.)		18				18				18			
Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.80	0.20	0.00	0.00	1.80	0.20	0.00	0.00	1.80	0.20	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.13	0.93	0.01	0.00	1.13	0.93	0.01	0.00	1.13	0.93	0.01	0.00
	7	1.74	0.59	1.05	0.06	1.74	0.59	1.05	0.06	1.74	0.59	1.05	0.06
	8	2.55	0.45	0.00	0.00	2.55	0.45	0.00	0.00	2.55	0.45	0.00	0.00
	9	1.13	1.93	0.00	0.00	1.13	1.93	0.00	0.00	1.13	1.93	0.00	0.00
	10	1.20	1.37	0.57	0.15	1.20	1.37	0.57	0.15	1.20	1.37	0.57	0.15
	11	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
	12	4.02	1.00	0.00	0.00	4.02	1.00	0.00	0.00	4.02	1.00	0.00	0.00
	13	2.15	1.32	1.46	0.09	2.15	1.32	1.46	0.09	2.15	1.32	1.46	0.09
Axle load distribution		0209.alf file				0209.alf file				0209.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			
Tridem axle (psi)		49.2				49.2				49.2			
Quad axle (psi)		49.2				49.2				49.2			
Climate		0209.icm file				0209.icm file				0209.icm file			
Latitude (degrees.minutes)		35.87				35.87				35.87			
Longitude (degrees.minutes)		-80.27				-80.27				-80.27			
Elevation (ft)		741				741				741			
Ground water table depth (ft)		10				10				10			

Table A - 7 3011 – Coastal Region – JPCP Over Bituminous Treated Base

	Base (3011)	Min	Max
General Information			
1. Design life (years)	20	-	-
2. Existing pavement construction month (month, year)	***Sep, 77***	***Jun 1st***	***Mar 1st, Dec 1st***
3. Pavement overlay construction month (month, year)			
4. Traffic open month (month, year)	***Oct, 77***	***July 1st***	***Apr 1st, Jan 1st***
5. Type of design a. Flexible pavement b. JPCP c. CRCP	J JPCP	-	-
6. Restoration a. JPCP			
7. Overlay a. AC b. PCC			
Site/Project Identification			
8. Location	1946 ft from SR 1745 to St 0+00. 4.2 miles from Wilson/Nash co. to St 0+00, Rocky Mount, NC.	-	-
9. Project ID	-	-	-
10. Section ID	3011	-	-
11. Station/milepost format (ft/miles/latitude, longitude)	Miles	Miles	Miles
12. Station/milepost begin	0	-	-
13. Station/milepost end	129		
14. Traffic direction (E/W/N/S)	South		
Analysis Parameters			
15. Initial IRI (in./miles)	63	63	63
16. Performance criteria			
Rigid Pavement (Limit, Reliability)			
1. Terminal IRI (in/miles)	172, 50	172, 50	172, 50

2. Transverse Cracking (% Slab Cracked)	15, 50	15, 50	15, 50
3. Mean Joint Faulting(in)	0.12, 50	0.12, 50	0.12, 50
4. CRCP Punchouts (miles)	10, 50	10, 50	10, 50
Structure			
I. CRCP/JPCP Layer			
17. Material Type	JPCP		
18. Layer Thickness (in)	10		
19. Unit Weight (pcf)	145	*140*	*160*
20. Poisson's Ratio	0.15	*0.1*	*0.3*
Thermal Properties			
21. Coefficient of Thermal Expansion (/F°* 10^{-6})	5.5	*2*	*10*
22. Thermal conductivity (BTU/hr-ft-F°)	1.25	*0.2*	*2*
23. Heat Capacity (BTU/lb- F°)	0.28	*0.1*	*0.5*
Mix Properties			
24. Cement Type (I or II or III)	I		
25. Cementitious Material Content (lb/yd3)	564	*400*	*800*
26. Water/Cement Ratio	0.48	*0.3*	*0.7*
27. Aggregate Type	Granite		
28. PCC zero-stress temperature (F°)		*50*	*125*
29. Ultimate shrinkage at 40% R.H (Microstrain)		*300*	*1000*
30. Reversible Shrinkage (% of ultimate shrinkage)	*50*	*30*	*80*
31. Time to develop ultimate shrinkage (days)	*35*	*30*	*50*
32. Curing Method	Curing compound		
Strength Properties			
33. Input Level			
34. 28-day PCC Modulus of rupture	-	*450*	*1200*
35. 28-day PCC Compressive strength	7330	*3000*	*8000*

36. 28-day PCC elastic modulus	3850000		
JPCP			
37. Slab thickness	-	-	-
38. Permanent curl/wrap effective temperature difference	-10	*-30*	*0*
39.			
Joint Design			
40. Joint spacing (ft)	15	*10*	*20*
41. Sealant type	Silicone		
42. Random Joint Spacing	-	-	-
Dowelled Transverse Joints			
43. Dowell diameter (in)	1.25	*1*	*1.75*
44. Dowell bar spacing (ft)	12	*10*	*14*
Edge Support			
45. Long term LTE (%)	*40*	*20*	*80*
46. Slab width (ft)	12	*12*	*14*
Base Properties			
47. Base type	-	-	-
48. Erodibility index	3		
49. PCC- base interface	Unbonded		
50. Loss of bond age (months)	-	*0*	*120*
II. TB			
51. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
52. Thickness (in.)	4	4	4
53. Input level	3	3	3
General properties			
54. Reference temperature	70°F	70°F	70°F
55. Effective binder content (%)	4.7	4.7	4.7
56. Air voids (%)	***7.3***	***6***	***11***
57. Total unit weight (pcf)	148	148	148
58. Poisson's ratio	0.35	0.35	0.35
Thermal properties			
59. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
60. ***Heat capacity (BTU/lb-°F)***	***0.23***	***0.22***	***0.40***

Asphalt Mix 61. Cumulative % retained on 3/4 in. sieve 62. Cumulative % retained on 3/8 in. sieve 63. Cumulative % retained on #4 64. % passing #200 Asphalt Binder 65. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A & VTS values	 0 4.5 26 6.7 AC-20	 0 4.5 26 6.7 AC-20	 0 4.5 26 6.7 AC-20
III. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted) 66. Material type 67. Thickness (in.) Strength properties 68. Input level (1 - 3) 69. Analysis type 70. Poisson's ratio 71. Coefficient of lateral pressure ***72. Modulus*** ICM inputs 73. Plasticity Index Gradation 74. Passing #200 sieve 75. Passing #4 sieve 76. D60 (mm)	A-2-6 Clayey Sand - 3 ICM inputs 0.35 0.5 ***26000*** 13 31.8 98 0.3	 Clayey Sand - 3 ICM inputs 0.35 0.5 ***21500*** 13 31.8 98 0.3	 Clayey Sand - 3 ICM inputs 0.35 0.5 ***31000*** 13 31.8 98 0.3
Traffic:			
Initial two-way AADTT	2323	2323	2323
Number of lanes in design direction	2	2	2
Percent trucks in design direction (%)	40.5	40.5	40.5
Percent trucks in design lane (%)	90	90	90
Operational speed (mph)	70	70	70

Monthly adjustment factors		1				1				1			
Vehicle class distribution	Class 4	4.3				4.3				4.3			
	Class 5	8.3				8.3				8.3			
	Class 6	3.0				3.0				3.0			
	Class 7	0.1				0.1				0.1			
	Class 8	10.1				10.1				10.1			
	Class 9	72.4				72.4				72.4			
	Class 10	0.6				0.6				0.6			
	Class 11	0.7				0.7				0.7			
	Class 12	0.4				0.4				0.4			
	Class 13	0.1				0.1				0.1			
Hourly traffic distribution	12 am-6 am	2.3				2.3				2.3			
	6 am-10 am	5.0				5.0				5.0			
	10 am-4 pm	5.9				5.9				5.9			
	4 pm-8 pm	4.6				4.6				4.6			
	8 pm-12 am	3.1				3.1				3.1			
Traffic growth factor		4% Compound				4% Compound				4% Compound			
General Traffic Inputs:													
Mean wheel location (in.)		18				18				18			
Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.63	0.37	0.00	0.00	1.63	0.37	0.00	0.00	1.63	0.37	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.29	0.83	0.01	0.00	1.29	0.83	0.01	0.00	1.29	0.83	0.01	0.00
	7	1.87	0.87	0.11	0.00	1.87	0.87	0.11	0.00	1.87	0.87	0.11	0.00
	8	1.61	1.01	0.00	0.00	1.61	1.01	0.00	0.00	1.61	1.01	0.00	0.00
	9	1.25	1.87	0.00	0.00	1.25	1.87	0.00	0.00	1.25	1.87	0.00	0.00
	10	1.00	1.40	0.58	0.01	1.00	1.40	0.58	0.01	1.00	1.40	0.58	0.01
	11	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
	12	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00
	13	1.19	0.17	1.65	0.07	1.19	0.17	1.65	0.07	1.19	0.17	1.65	0.07
Axle load distribution		3011.alf file				3011.alf file				3011.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			
Tridem axle (psi)		49.2				49.2				49.2			

Quad axle (psi)	49.2	49.2	49.2
Climate	3011.icm file	3011.icm file	3011.icm file
Latitude (degrees.minutes)	35.87	35.87	35.87
Longitude (degrees.minutes)	-77.96	-77.96	-77.96
Elevation (ft)	165	165	165
Ground water table depth (ft)	5	5	5

Table A - 8 3816 – Piedmont Region – JPCP Over Non-Bituminous Treated Base

	Base (3816)	Min	Max
General Information			
1. Design life (years)	20	-	-
2. Existing pavement construction month (month, year)	***Apr, 73***	***Jan 1st***	***Oct 1st, July 1st***
3. Pavement overlay construction month (month, year)			
4. ***Traffic open month (month, year)***	***May, 73***	***Feb 1st***	***Nov 1st, Aug 1st***
5. Type of design a. Flexible pavement b. JPCP c. CRCP	JPCP	-	-
6. Restoration a. JPCP			
7. Overlay a. AC b. PCC			
Site/Project Identification			
8. Location	1.32 miles from Alexander Dr.(SR 2028) to St. 0+00, Chapel Hill, NC	-	-
9. Project ID	-	-	-
10. Section ID	3816	-	-
11. Station/milepost format (ft/miles/latitude, longitude)	Miles	Miles	Miles
12. Station/milepost begin	0	-	-
13. Station/milepost end	5.95		
14. Traffic direction (E/W/N/S)	North		
Analysis Parameters			
15. Initial IRI (in./miles)	63	63	63
16. Performance criteria			
Rigid Pavement (Limit, Reliability)			
1. Terminal IRI (in/miles)	172, 50	172, 50	172, 50

2. Transverse Cracking (% Slab Cracked)	15, 50	15, 50	15, 50
3. Mean Joint Faulting(in)	0.12, 50	0.12, 50	0.12, 50
Structure			
I. CRCP/JPCP Layer			
17. Material Type	JPCP		
18. Layer Thickness (in)	9.3		
19. Unit Weight (pcf)	145	*140*	*160*
20. Poisson's Ratio	0.15	*0.1*	*0.3*
Thermal Properties			
21. Coefficient of Thermal Expansion (/F°* 10^{-6})	5.5	*2*	*10*
22. Thermal conductivity (BTU/hr-ft-F°)	1.25	*0.2*	*2*
23. Heat Capacity (BTU/lb- F°)	0.28	*0.1*	*0.5*
Mix Properties			
24. Cement Type (I or II or III)	I		
25. Cementitious Material Content (lb/yd3)	564	*400*	*800*
26. Water/Cement Ratio	0.50	*0.3*	*0.7*
27. Aggregate Type	Granite		
28. PCC zero-stress temperature (F°)		*50*	*125*
29. Ultimate shrinkage at 40% R.H (Microstrain)		*300*	*1000*
30. Reversible Shrinkage (% of ultimate shrinkage)	*50*	*30*	*80*
31. Time to develop ultimate shrinkage (days)	*35*	*30*	*50*
32. Curing Method	Curing compound		
Strength Properties			
33. Input Level			
34. 28-day PCC Modulus of rupture	-	*450*	*1200*
35. 28-day PCC Compressive strength	7630	*3000*	*8000*
36. 28-day PCC elastic			

modulus	4100000		
JPCP			
37. Slab thickness	-	-	-
38. Permanent curl/wrap effective temperature difference	*-10*	*-30*	*0*
Joint Design			
39. Joint spacing (ft)	30	*10*	*20*
40. Sealant type	Silicone		
41. Random Joint Spacing	-	-	-
Dowelled Transverse Joints			
42. Dowell diameter (in)	1.12	*1*	*1.75*
43. Dowell bar spacing (ft)	12	*10*	*14*
Edge Support			
44. Long term LTE (%)	*40*	*20*	*80*
45. Slab width (ft)	12	*12*	*14*
Base Properties			
46. Base type	-	-	-
47. Erodibility index	3		
48. PCC- base interface	Unbonded		
49. Loss of bond age (months)	-	*0*	*120*
II. Chemically Stabilized Materials (CSM) (Note: In case of overlay's, existing JPCP/CRCP act as CSM)			
50. Material Type	Cement-Agg. Mixture		
51. Layer thickness (in)	4.2	*3*	*24*
52. Unit Weight (pcf)	150	*50*	*200*
53. Poisson's ratio	0.20	*0.15*	*0.45*
54. Elastic Resilient Modulus	400000	*50000*	*4000000*
55. Thermal conductivity (BTU/hr-ft-F°)	1.25	*0.1*	*4*
56. Heat Capacity (BTU/lb- F°)	0.28	*0*	*1*
III. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted)	A-4	A-4	A-4
49. Material type	Silt	Silt	Silt
50. Thickness (in.)	-		-

Strength properties 57. t level (1 - 3) 58. Analysis type 59. Poisson's ratio 60. Coefficient of lateral pressure ***61. Modulus*** ICM inputs 62. Plasticity Index Gradation 63. passing #200 sieve 64. Passing #4 sieve 65. D60 (mm)		 3 ICM inputs 0.35 0.5 ***24000*** 6.5 89.95 92.5 0.1	- 3 ICM inputs 0.35 0.5 ***21500*** 6.5 89.95 92.5 0.1	 3 ICM inputs 0.35 0.5 ***29000*** 6.5 89.95 92.5 0.1
Traffic:				
Initial two-way AADTT		780	780	780
Number of lanes in design direction		2	2	2
Percent trucks in design direction (%)		40	40	40
Percent trucks in design lane (%)		90	90	90
Operational speed (mph)		60	60	60
Monthly adjustment factors		1	1	1
Vehicle class distribution	Class 4	11.5	11.5	11.5
	Class 5	34.8	34.8	34.8
	Class 6	9.8	9.8	9.8
	Class 7	0.3	0.3	0.3
	Class 8	8.7	8.7	8.7
	Class 9	33.7	33.7	33.7
	Class 10	0.8	0.8	0.8
	Class 11	0.2	0.2	0.2
	Class 12	0.1	0.1	0.1
	Class 13	0.1	0.1	0.1
Hourly traffic distribution	12 am-6 am	2.3	2.3	2.3
	6 am-10 am	5.0	5.0	5.0
	10 am-4 pm	5.9	5.9	5.9
	4 pm-8 pm	4.6	4.6	4.6
	8 pm-12 am	3.1	3.1	3.1
Traffic growth factor		4% Compound	4% Compound	4% Compound
General Traffic Inputs:				
Mean wheel location (in.)		18	18	18

Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.79	0.21	0.00	0.00	1.79	0.21	0.00	0.00	1.79	0.21	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.12	0.93	0.00	0.00	1.12	0.93	0.00	0.00	1.12	0.93	0.00	0.00
	7	1.05	0.14	0.86	0.00	1.05	0.14	0.86	0.00	1.05	0.14	0.86	0.00
	8	2.61	0.39	0.00	0.00	2.61	0.39	0.00	0.00	2.61	0.39	0.00	0.00
	9	1.16	1.89	0.00	0.01	1.16	1.89	0.00	0.01	1.16	1.89	0.00	0.01
	10	1.10	1.26	0.36	0.21	1.10	1.26	0.36	0.21	1.10	1.26	0.36	0.21
	11	4.90	0.05	0.00	0.00	4.90	0.05	0.00	0.00	4.90	0.05	0.00	0.00
	12	4.01	1.00	0.00	0.00	4.01	1.00	0.00	0.00	4.01	1.00	0.00	0.00
	13	1.00	1.40	0.20	0.40	1.00	1.40	0.20	0.40	1.00	1.40	0.20	0.40
Axle load distribution		3816.alf file				3816.alf file				3816.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			
Tridem axle (psi)		49.2				49.2				49.2			
Quad axle (psi)		49.2				49.2				49.2			
Climate		3816.icm file				3816.icm file				3816.icm file			
Latitude (degrees.minutes)		35.94				35.94				35.94			
Longitude (degrees.minutes)		-78.86				-78.86				-78.86			
Elevation (ft)		350				350				350			
Ground water table depth (ft)		10				10				10			

3. Rigid Pavements - CRCP

Table A - 9 5827 – Piedmont Region – CRCP Over Unbound Base

	Base (5827)	Min	Max
General Information			
1. Design life (years)	20	-	-
2. Existing pavement construction month (month, year)	***Mar, 73***	***Dec 1st***	***Sep 1st, Jun 1st***
3. Pavement overlay construction month (month, year)			
4. ***Traffic open month (month, year)***	***Apr, 73***	***Jan 1st***	***Oct 1st, July 1st***
5. Type of design			
a. Flexible pavement		-	-
b. JPCP			
c. CRCP	CRCP		
6. Restoration			
a. JPCP			
7. Overlay			
a. AC			
b. PCC			
Site/Project Identification			
8. Location	1.96 miles from SR 2552 to St. 0+00, Reidsville, NC		-
9. Project ID	-		
10. Section ID	5827	-	-
		-	-
11. Station/milepost format (ft/miles/latitude, longitude)	Miles	Miles	Miles
12. Station/milepost begin	0	-	-
13. Station/milepost end	154.1		
14. Traffic direction (E/W/N/S)	North		
Analysis Parameters			
15. Initial IRI (in./miles)	63	63	63
16. Performance criteria			
Rigid Pavement (Limit, Reliability)			
1. Terminal IRI (in/miles)	172, 50	172, 50	172, 50

2. Transverse Cracking (% Slab Cracked)	15, 50	15, 50	15, 50
3. Mean Joint Faulting(in)	0.12, 50	0.12, 50	0.12, 50
4. CRCP Punchouts (miles)	10, 50	10, 50	10, 50
Structure			
I. CRCP/JPCP Layer			
17. Material Type	CRCP		
18. Layer Thickness (in)	8.1		
19. Unit Weight (pcf)	145	*140*	*160*
20. Poisson's Ratio	0.15	*0.1*	*0.3*
Thermal Properties			
21. Coefficient of Thermal Expansion (/F°* 10^{-6})	9.4	*2*	*5.5*
22. Thermal conductivity (BTU/hr-ft-F°)	1.25	*0.2*	*2*
23. Heat Capacity (BTU/lb- F°)	0.28	*0.1*	*0.5*
Mix Properties			
24. Cement Type (I or II or III)	I		
25. Cementitious Material Content (lb/yd3)	564	*400*	*800*
26. Water/Cement Ratio	0.46	*0.3*	*0.7*
27. Aggregate Type	Granite		
28. PCC zero-stress temperature (F°)		*50*	*125*
29. Ultimate shrinkage at 40% R.H (Microstrain)		*300*	*1000*
30. Reversible Shrinkage (% of ultimate shrinkage)	*50*	*30*	*80*
31. Time to develop ultimate shrinkage (days)	*35*	*30*	*50*
32. Curing Method	Curing compound		
Strength Properties			
33. Input Level			
34. 28-day PCC Modulus of rupture	-	*450*	*1200*
35. 28-day PCC Compressive strength	6810	*3000*	*8000*

36. 28-day PCC elastic modulus	3400000		
I. CRCP			
37. Slab Thickness			
38. Shoulder Type			
39. Permanent curl/wrap effective temperature difference.	*-10*	*-30*	*0*
Steel Reinforcement			
40. % Steel	*0.63*	*0.5*	*1*
41. Bar diameter (in)	*0.63*	*0.5*	*1*
42. Steel depth (in)	*3*	*3*	*6*
Base Properties			
43. Base type	*Granular*		
44. Erodibility index	*5*		
45. Base/Slab friction coefficient	*2.5*	*0*	*50*
46. Crack Spacing	-		
Cracking model			
47. Enter mean crack spacing (in)		*12*	*72*
48. Generate using model	*Generate using model*		
III. Granular Base Inputs (Unbound Compacted/Uncompacted)			
49. Material type	Crushed gravel	Crushed gravel	Crushed gravel
50. Thickness (in.)	4.4	4.4	4.4
Strength Properties			
51. Input level (1 - 3)	3	3	3
52. Analysis type	ICM inputs	ICM inputs	ICM inputs
53. Poisson's ratio	0.35	0.35	0.35
54. Coefficient of lateral pressure	0.5	0.5	0.5
55. Modulus (MPa)	***40000***	***38500***	***42000***
ICM inputs			
56. Plasticity Index	1	1	1
Gradation			
57. Passing #200 sieve	9.7	9.7	9.7
58. Passing #4 sieve	54	54	54
59. D60 (mm)	1.995	1.995	1.995
III. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted)	A-2-4	A-4	A-4

60. Material type		Silt	Silt	Silt
61. Thickness (in.)		-		-
Strength properties			-	
62. Input level (1 - 3)		3	3	3
63. Analysis type		ICM inputs	ICM inputs	ICM inputs
64. Poisson's ratio		0.35	0.35	0.35
65. Coefficient of lateral pressure		0.5	0.5	0.5
66. Modulus		***32000***	***28000***	***37500***
ICM inputs				
67. Plasticity Index		6.5	6.5	6.5
Gradation				
68. Passing #200 sieve		38.6	38.6	38.6
69. Passing #4 sieve		99	99	99
70. D60 (mm)		0.186	0.186	0.186
Traffic:				
Initial two-way AADTT		490	780	780
Number of lanes in design direction		2	2	2
Percent trucks in design direction (%)		40.6	40	40
Percent trucks in design lane (%)		90	90	90
Operational speed (mph)		60	60	60
Monthly adjustment factors		1	1	1
Vehicle class distribution	Class 4	4.2	4.2	4.2
	Class 5	10.9	10.9	10.9
	Class 6	3.1	3.1	3.1
	Class 7	0.2	0.2	0.2
	Class 8	8.8	8.8	8.8
	Class 9	66.7	66.7	66.7
	Class 10	0.4	0.4	0.4
	Class 11	5.0	5.0	5.0
	Class 12	0.7	0.7	0.7
	Class 13	0.0	0.0	0.0
Hourly traffic distribution	12 am-6 am	2.3	2.3	2.3
	6 am-10 am	5.0	5.0	5.0
	10 am-4 pm	5.9	5.9	5.9
	4 pm-8 pm	4.6	4.6	4.6
	8 pm-12 am	3.1	3.1	3.1
Traffic growth factor		4% Compound	4% Compound	4% Compound

General Traffic Inputs:													
Mean wheel location (in.)		18				18				18			
Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.76	0.24	0.00	0.00	1.76	0.24	0.00	0.00	1.76	0.24	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.08	0.95	0.00	0.00	1.08	0.95	0.00	0.00	1.08	0.95	0.00	0.00
	7	1.33	0.14	0.66	0.09	1.33	0.14	0.66	0.09	1.33	0.14	0.66	0.09
	8	2.60	0.40	0.00	0.00	2.60	0.40	0.00	0.00	2.60	0.40	0.00	0.00
	9	1.20	1.90	0.00	0.00	1.20	1.90	0.00	0.00	1.20	1.90	0.00	0.00
	10	1.07	1.45	0.54	0.00	1.07	1.45	0.54	0.00	1.07	1.45	0.54	0.00
	11	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
	12	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00
	13	1.00	0.88	1.13	0.13	1.00	0.88	1.13	0.13	1.00	0.88	1.13	0.13
Axle load distribution		5827.alf file				5827.alf file				5827.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			
Tridem axle (psi)		49.2				49.2				49.2			
Quad axle (psi)		49.2				49.2				49.2			
Climate		5827.icm file				5827.icm file				5827.icm file			
Latitude (degrees.minutes)		36.38				36.38				36.38			
Longitude (degrees.minutes)		-79.62				-79.62				-79.62			
Elevation (ft)		630				630				630			
Ground water table depth (ft)		10				10				10			

Table A - 10 5037 – Mountainous Region – CRCP Over Unbound Base

	Base (5037)	Min	Max
General Information			
1. Design life (years)	20	-	-
2. Existing pavement construction month (month, year)	***Oct, 72,***	***Apr 1st***	***Jan 1st, July 1st***
3. Pavement overlay construction month (month, year)			
4. Traffic open month (month, year)	***Nov, 72***	***May 1st***	***Feb 1st, Aug 1st***
5. Type of design a. Flexible pavement b. JPCP c. CRCP	CRCP	-	-
6. Restoration a. JPCP			
7. Overlay a. AC b. PCC			
Site/Project Identification			
8. Location	3624 ft from Exit 55, Oteen (SR 2838) to St 0+00, Ashville, NC		-
9. Project ID	-	-	-
10. Section ID	5037	-	-
11. Station/milepost format (ft/miles/latitude, longitude)	Miles	Miles	Miles
12. Station/milepost begin	0	-	-
13. Station/milepost end	54.52		
14. Traffic direction (E/W/N/S)	West		
Analysis Parameters			
15. Initial IRI (in./miles)	63	63	63
16. Performance criteria			
Rigid Pavement (Limit, Reliability)			
1. Terminal IRI (in/miles)	172, 50	172, 50	172, 50

2. Transverse Cracking (% Slab Cracked)	15, 50	15, 50	15, 50
3. Mean Joint Faulting(in)	0.12, 50	0.12, 50	0.12, 50
4. CRCP Punchouts (miles)	10, 50	10, 50	10, 50
Structure			
I. CRCP/JPCP Layer			
17. Material Type	CRCP		
18. Layer Thickness (in)	7.8		
19. Unit Weight (pcf)	145	*140*	*160*
20. Poisson's Ratio	0.15	*0.1*	*0.3*
Thermal Properties			
21. Coefficient of Thermal Expansion (/F°* 10^{-6})	5.5	*2*	*10*
22. Thermal conductivity (BTU/hr-ft-F°)	1.25	*0.2*	*2*
23. Heat Capacity (BTU/lb- F°)	0.28	*0.1*	*0.5*
Mix Properties			
24. Cement Type (I or II or III)	I		
25. Cementitious Material Content (lb/yd3)	658	*400*	*800*
26. Water/Cement Ratio	0.50	*0.3*	*0.7*
27. Aggregate Type	Granite		
28. PCC zero-stress temperature (F°)		*50*	*125*
29. Ultimate shrinkage at 40% R.H (Microstrain)		*300*	*1000*
30. Reversible Shrinkage (% of ultimate shrinkage)	*50*	*30*	*80*
31. Time to develop ultimate shrinkage (days)	*35*	*30*	*50*
32. Curing Method	Curing compound		
Strength Properties			
33. Input Level			
34. 28-day PCC Modulus of rupture	-	*450*	*1200*
35. 28-day PCC Compressive strength	8370	*3000*	*8000*

36. 28-day PCC elastic modulus	3400000		
I. CRCP			
37. Slab Thickness			
38. Shoulder Type			
39. Permanent curl/wrap effective temperature difference.	*-10*	*-30*	*0*
Steel Reinforcement			
40. % Steel	*0.65*	*0.5*	*1*
41. Bar diameter (in)	*0.63*	*0.5*	*1*
42. Steel depth (in)	*3.4*	*3*	*6*
Base Properties			
43. Base type	*Granular*		
44. Erodibility index	*5*		
45. Base/Slab friction coefficient	*2.5*	*0*	*50*
46. Crack Spacing	*-*		
Cracking model			
47. Enter mean crack spacing (in)		*12*	*72*
48. Generate using model	*Generate using model*		
III. Granular Base Inputs (Unbound Compacted/Uncompacted)	A-1-a		
49. Material type	Soil-Agg. Mixture	Soil-Agg. Mixture	Soil-Agg. Mixture
50. Thickness (in.)	15.1	15.1	15.1
Strength Properties			
51. Input level (1 - 3)	3	3	3
52. Analysis type	ICM inputs	ICM inputs	ICM inputs
53. Poisson’s ratio	0.35	0.35	0.35
54. Coefficient of lateral pressure	0.5	0.5	0.5
55. Modulus (MPa)	***40000***	***38500***	***42000***
ICM inputs			
56. Plasticity Index	0	0	0
57. Gradation			
g. Passing #200 sieve	14.75	14.75	14.75
h. Passing #4 sieve	58.5	58.5	58.5
i. D60 (mm)	3.93	3.93	3.93
III. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted)	A-2-4	A-2-4	A-2-4

58. Material type		Silty-sand	Silty-sand	Silty-sand
59. Thickness (in.)		-	-	-
Strength properties				
60. Input level (1 - 3)		3	3	3
61. Analysis type		ICM inputs	ICM inputs	ICM inputs
62. Poisson's ratio		0.35	0.35	0.35
63. Coefficient of lateral pressure		0.5	0.5	0.5
64. Modulus		***32000***	***28000***	***37500***
ICM inputs				
65. Plasticity Index		3	3	3
Gradation				
66. Passing #200 sieve		36.4	36.4	36.4
67. Passing #4 sieve		77.5	77.5	77.5
68. D60 (mm)		0.414	0.414	0.414
Traffic:				
Initial two-way AADTT		1560	1560	1560
Number of lanes in design direction		2	2	2
Percent trucks in design direction (%)		40	40	40
Percent trucks in design lane (%)		90	90	90
Operational speed (mph)		70	70	70
Monthly adjustment factors		1	1	1
Vehicle class distribution	Class 4	5.0	5.0	5.0
	Class 5	15.3	15.3	15.3
	Class 6	9.2	9.2	9.2
	Class 7	0.7	0.7	0.7
	Class 8	9.6	9.6	9.6
	Class 9	55.8	55.8	55.8
	Class 10	1.2	1.2	1.2
	Class 11	2.4	2.4	2.4
	Class 12	0.6	0.6	0.6
	Class 13	0.2	0.2	0.2
Hourly traffic distribution	12 am-6 am	2.3	2.3	2.3
	6 am-10 am	5.0	5.0	5.0
	10 am-4 pm	5.9	5.9	5.9
	4 pm-8 pm	4.6	4.6	4.6
	8 pm-12 am	3.1	3.1	3.1
Traffic growth factor		4% Compound	4% Compound	4% Compound

General Traffic Inputs:													
Mean wheel location (in.)		18				18				18			
Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.82	0.18	0.00	0.00	1.82	0.18	0.00	0.00	1.82	0.18	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.35	0.81	0.01	0.00	1.35	0.81	0.01	0.00	1.35	0.81	0.01	0.00
	7	1.09	0.37	0.63	0.00	1.09	0.37	0.63	0.00	1.09	0.37	0.63	0.00
	8	2.47	0.48	0.00	0.00	2.47	0.48	0.00	0.00	2.47	0.48	0.00	0.00
	9	1.17	1.91	0.00	0.00	1.17	1.91	0.00	0.00	1.17	1.91	0.00	0.00
	10	1.16	1.17	0.53	0.16	1.16	1.17	0.53	0.16	1.16	1.17	0.53	0.16
	11	4.99	0.00	0.00	0.00	4.99	0.00	0.00	0.00	4.99	0.00	0.00	0.00
	12	3.99	1.00	0.00	0.00	3.99	1.00	0.00	0.00	3.99	1.00	0.00	0.00
	13	1.80	0.80	1.00	0.06	1.80	0.80	1.00	0.06	1.80	0.80	1.00	0.06
Axle load distribution		5037.alf file				5037.alf file				5037.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			
Tridem axle (psi)		49.2				49.2				49.2			
Quad axle (psi)		49.2				49.2				49.2			
Climate		5037.icm file				5037.icm file				5037.icm file			
Latitude (degrees.minutes)		35.58				35.58				35.58			
Longitude (degrees.minutes)		-82.47				-82.47				-82.47			
Elevation (ft)		2110				2110				2110			
Ground water table depth (ft)		10				10				10			

3. Traffic Sensitivity

Table A - 11 3011 – Coastal Region – JPCP Over Bituminous Treated Base

	Base (3011)	Min	Max
General Information			
1. Design life (years)	20	-	-
2. Existing pavement construction month (month, year)	***Sep/1/77***	***February 1st***	***July 1st***
3. Pavement overlay construction month (month, year)			
4. Traffic open month (month, year)	***Oct/1/77***	***February 1st***	***July 1st***
5. Type of design			
a. Flexible pavement	Rigid	-	-
b. JPCP			
c. CRCP			
6. Restoration			
d. JPCP			
7. Overlay			
e. AC			
f. PCC			
Site/Project Identification			
8. Location	1946 ft from SR 1745 to St 0+00. 4.2 miles from Wilson/Nash co. to St 0+00, Rocky Mount, NC.	-	-
9. Project ID	-	-	-
10. Section ID	3011	-	-
11. Station/milepost format (ft/miles/latitude, longitude)	Miles	Miles	Miles
12. Station/milepost begin	0	-	-
13. Station/milepost end	129		
14. Traffic direction (E/W/N/S)	South		
Analysis Parameters			
15. Initial IRI (in./miles)	63	63	63
16. Performance criteria			

Rigid Pavement (Limit, Reliability)			
17. Terminal IRI (in/miles)	172, 50	172, 50	172, 50
18. Transverse Cracking (% Slab Cracked)	15, 50	15, 50	15, 50
19. Mean Joint Faulting(in)	0.12, 50	0.12, 50	0.12, 50
20. CRCP Punch outs (miles)	10, 50	10, 50	10, 50
Structure			
I. CRCP/JPCP Layer			
21. Material Type	JPCP		
22. Layer Thickness (in)	10		
23. Unit Weight (pcf)	145	*140*	*160*
24. Poisson's Ratio	0.15	*0.1*	*0.3*
Thermal Properties			
25. Coefficient of Thermal Expansion (/F°* 10^{-6})	5.5	*2*	*10*
26. Thermal conductivity (BTU/hr-ft-F°)	1.25	*0.2*	*2*
27. Heat Capacity (BTU/lb- F°)	0.28	*0.1*	*0.5*
Mix Properties			
28. Cement Type (I or II or III)	I		
29. Cementitious Material Content (lb/yd3)	564	*400*	*800*
30. Water/Cement Ratio	0.48	*0.3*	*0.7*
31. Aggregate Type	Granite		
32. PCC zero-stress temperature (F°)		*50*	*125*
33. Ultimate shrinkage at 40% R.H (Microstrain)		*300*	*1000*
34. Reversible Shrinkage (% of ultimate shrinkage)	*50*	*30*	*80*
35. Time to develop ultimate shrinkage (days)	*35*	*30*	*50*
36. Curing Method	Curing compound		
Strength Properties			

37. Input Level 38. 28-day PCC Modulus of rupture	-	*450*	*1200*
39. 28-day PCC Compressive strength	7330	*3000*	*8000*
40. 28-day PCC elastic modulus	3850000		
JPCP			
41. Slab thickness	-	-	-
42. Permanent curl/wrap effective temperature difference	*-10*	*-30*	*0*
Joint Design			
43. Joint spacing (ft)	15	*10*	*20*
44. Sealant type	Silicone		
45. Random Joint Spacing	-	-	-
Dowelled Transverse Joints	-	-	-
46. Dowell diameter (in)	1.25	*1*	*1.75*
47. Dowell bar spacing (ft)	12	*10*	*14*
Edge Support			
48. Long term LTE (%)	*40*	*20*	*80*
49. Slab width (ft)	12	*12*	*14*
Base Properties			
Base type	-	-	-
50. Erodibility index	3		
51. PCC- base interface	Unbonded		
52. Loss of bond age (months)	-	*0*	*120*
II. TB			
53. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
54. Thickness (in.)	4	4	4
55. Input level	3	3	3
General properties			
56. Reference temperature	70°F	70°F	70°F
57. Effective binder content (%)	4.7	4.7	4.7
58. Air voids (%)	***7.3***	***6***	***11***
59. Total unit weight (pcf)	148	148	148
60. Poisson's ratio	0.35	0.35	0.35

Thermal properties			
61. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
62. ***Heat capacity (BTU/lb-°F)***	***0.23***	***0.22***	***0.40***
Asphalt Mix			
63. Cumulative % retained on 3/4 in. sieve	6	6	6
64. Cumulative % retained on 3/8 in. sieve	4.5	74	74
65. Cumulative % retained on #4	26	91	91
66. % passing #200	6.7	1.8	1.8
Asphalt Binder			
67. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A & VTS values	AC-20	AC-20	AC-20
III. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted)	A-2-6		
68. Material type	Clayey Sand	Clayey Sand	Clayey Sand
69. Thickness (in.)	-	-	-
Strength properties			
70. Input level (1 - 3)	3	3	3
71. Analysis type	ICM inputs	ICM inputs	ICM inputs
72. Poisson's ratio	0.35	0.35	0.35
73. Coefficient of lateral pressure	0.5	0.5	0.5
74. Modulus	***26000***	***21500***	***31000***
ICM inputs			
75. Plasticity Index	13	13	13
Gradation			
76. Passing #200 sieve	31.8	31.8	31.8
77. Passing #4 sieve	98	98	98
78. D60 (mm)	0.3	0.3	0.3
Traffic:			
Initial two-way AADTT	2323	2323	2323
Number of lanes in design	2	2	2

direction													
Percent trucks in design direction (%)		40.5				40.5				40.5			
Percent trucks in design lane (%)		90				90				90			
Operational speed (mph)		70				70				70			
Monthly adjustment factors		1				1				1			
Vehicle class distribution	Class 4	4.3				4.3				4.3			
	Class 5	8.4				8.4				8.4			
	Class 6	3.0				3.0				3.0			
	Class 7	0.1				0.1				0.1			
	Class 8	10.1				10.1				10.1			
	Class 9	72.4				72.4				72.4			
	Class 10	0.6				0.6				0.6			
	Class 11	0.8				0.8				0.8			
	Class 12	0.4				0.4				0.4			
	Class 13	0.1				0.1				0.1			
Hourly traffic distribution	12 am-6 am	2.3				2.3				2.3			
	6 am-10 am	5.0				5.0				5.0			
	10 am-4 pm	5.9				5.9				5.9			
	4 pm-8 pm	4.6				4.6				4.6			
	8 pm-12 am	3.1				3.1				3.1			
Traffic growth factor		4% Compound				4% Compound				4% Compound			
General Traffic Inputs:													
Mean wheel location (in.)		18				18				18			
Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.63	0.37	0.00	0.00	1.63	0.37	0.00	0.00	1.63	0.37	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.29	0.83	0.01	0.00	1.29	0.83	0.01	0.00	1.29	0.83	0.01	0.00
	7	1.87	0.87	0.11	0.00	1.87	0.87	0.11	0.00	1.87	0.87	0.11	0.00
	8	1.61	1.01	0.00	0.00	1.61	1.01	0.00	0.00	1.61	1.01	0.00	0.00
	9	1.25	1.87	0.00	0.00	1.25	1.87	0.00	0.00	1.25	1.87	0.00	0.00
	10	1.00	1.40	0.58	0.01	1.00	1.40	0.58	0.01	1.00	1.40	0.58	0.01
	11	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
	12	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00
	13	1.19	0.17	1.65	0.07	1.19	0.17	1.65	0.07	1.19	0.17	1.65	0.07
Axle load distribution		3011.alf file				3011.alf file				3011.alf file			
Axle Configuration:													

Average axle width (ft)	8.5	8.5	8.5
Dual tire spacing (in.)	12	12	12
Single tire (psi)	120	120	120
Dual tire (psi)	120	120	120
Tandem axle (psi)	51.6	51.6	51.6
Tridem axle (psi)	49.2	49.2	49.2
Quad axle (psi)	49.2	49.2	49.2
Climate	3011.icm file	3011.icm file	3011.icm file
Latitude (degrees.minutes)	35.87	35.87	35.87
Longitude (degrees.minutes)	-77.96	-77.96	-77.96
Elevation (ft)	165	165	165
Ground water table depth (ft)	5	5	5

Table A - 12 5826 – Mountainous Region – CRCP Over Unbound Base

	Base (5826)	Min	Max
General Information			
1. Design life (years)	20	-	-
2. Existing pavement construction month (month, year)	***Jun/1/77***	***February 1st***	***July 1st***
3. Pavement overlay construction month (month, year)			
4. Traffic open month (month, year)	***Jul/1/77***	***February 1st***	***July 1st***
5. Type of design			
a. Flexible pavement		-	-
b. JPCP			
c. CRCP	CRCP		
6. Restoration			
d. JPCP			
7. Overlay			
e. AC			
f. PCC			
Site/Project Identification			
8. Location	0.49 Miles North of 1345, Mount Airy, NC		-
9. Project ID	-	-	-
10. Section ID	5037	-	-
11. Station/milepost format (ft/miles/latitude, longitude)	Miles	Miles	Miles
12. Station/milepost begin	0		
13. Station/milepost end	98.22	-	-
14. Traffic direction (E/W/N/S)	North		
Analysis Parameters			
15. Initial IRI (in./miles)	63	63	63
16. Performance criteria			
Rigid Pavement (Limit, Reliability)			
17. Terminal IRI	172, 50	172, 50	172, 50

(in/miles)			
18. Transverse Cracking (% Slab Cracked)	15, 50	15, 50	15, 50
19. Mean Joint Faulting(in)	0.12, 50	0.12, 50	0.12, 50
20. CRCP Punch outs (miles)	10, 50	10, 50	10, 50
Structure			
I. CRCP/JPCP Layer			
21. Material Type	CRCP		
22. Layer Thickness (in)	8		
23. Unit Weight (pcf)	145	*140*	*160*
24. Poisson's Ratio	0.15	*0.1*	*0.3*
Thermal Properties			
25. Coefficient of Thermal Expansion (/F°* 10^{-6})	9	*2*	*10*
26. Thermal conductivity (BTU/hr-ft-F°)	1.25	*0.2*	*2*
27. Heat Capacity (BTU/lb- F°)	0.28	*0.1*	*0.5*
Mix Properties			
28. Cement Type (I or II or III)	I		
29. Cementitious Material Content (lb/yd3)	564	*400*	*800*
30. Water/Cement Ratio	0.48	*0.3*	*0.7*
31. Aggregate Type	Granite		
32. PCC zero-stress temperature (F°)		*50*	*125*
33. Ultimate shrinkage at 40% R.H (Microstrain)		*300*	*1000*
34. Reversible Shrinkage (% of ultimate shrinkage)	*50*	*30*	*80*
35. Time to develop ultimate shrinkage (days)	*35*	*30*	*50*
36. Curing Method	Curing compound		
Strength Properties			
37. Input Level			
38. 28-day PCC Modulus of rupture	-	*450*	*1200*

39. 28-day PCC Compressive strength	8100	*3000*	*8000*
40. 28-day PCC elastic modulus	4700000		
I. CRCP			
41. Slab Thickness			
42. Shoulder Type			
43. Permanent curl/wrap effective temperature difference.	*-10*	*-30*	*0*
44. Steel Reinforcement			
45. % Steel	*0.65*	*0.5*	*1*
46. Bar diameter (in)	*0.5*	*0.5*	*1*
47. Steel depth (in)	*3*	*3*	*6*
48. Base Properties			
49. Base type	*Granular*		
50. Erodibility index	*5*		
51. Base/Slab friction coefficient	*0.5*	*0*	*50*
Crack Spacing			
52. Cracking model			
a) Enter mean crack spacing (in)		*12*	*72*
b) Generate using model	*Generate using model*		
II. TB			
53. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
54. Thickness (in.)	1.8	1.8	1.8
55. Input level	3	3	3
General properties			
56. Reference temperature	70°F	70°F	70°F
57. Effective binder content (%)	6.5	4.7	4.7
58. Air voids (%)	***8.5***	***6***	***11***
59. Total unit weight (pcf)	148	148	148
60. Poisson's ratio	0.35	0.35	0.35
Thermal properties			
61. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
62. ***Heat capacity***	***0.23***	***0.22***	***0.40***

(BTU/lb-°F)			
Asphalt Mix			
63. Cumulative % retained on 3/4 in. sieve	6	6	6
64. Cumulative % retained on 3/8 in. sieve	4.5	74	74
65. Cumulative % retained on #4	26	91	91
66. % passing #200	6.7	1.8	1.8
Asphalt Binder			
67. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A & VTS values	AC-20	AC-20	AC-20
III. Granular Base Inputs (Unbound Compacted/Uncompacted)			
68. Material type	Crushed Stone	Crushed Stone	Crushed Stone
69. Thickness (in.)	3.6	3.6	3.6
Strength Properties			
70. Input level (1 - 3)	3	3	3
71. Analysis type	ICM inputs	ICM inputs	ICM inputs
72. Poisson's ratio	0.35	0.35	0.35
73. Coefficient of lateral pressure	0.5	0.5	0.5
74. Modulus (MPa)	***40000***	***38500***	***42000***
ICM inputs			
75. Plasticity Index	0	0	0
Gradation			
76. Passing #200 sieve	8.8	14.75	14.75
77. Passing #4 sieve	52	58.5	58.5
78. D60 (mm)	3.93	3.93	3.93
III. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted)	A-2-4	A-2-4	A-2-4
79. Material type	Silty-sand	Silty-sand	Silty-sand
80. Thickness (in.)	-	-	-
Strength properties			
81. Input level (1 - 3)	3	3	3
82. Analysis type	ICM inputs	ICM inputs	ICM inputs

83. Poisson's ratio		0.35	0.35	0.35
84. Coefficient of lateral pressure		0.5	0.5	0.5
85. Modulus		***32000***	***28000***	***37500***
ICM inputs				
86. Plasticity Index		3	3	3
Gradation				
87. Passing #200 sieve		36.3	36.4	36.4
88. Passing #4 sieve		84	77.5	77.5
89. D60 (mm)		0.414	0.414	0.414
Traffic:				
Initial two-way AADTT		660	660	660
Number of lanes in design direction		2	2	2
Percent trucks in design direction (%)		40	40	40
Percent trucks in design lane (%)		90	90	90
Operational speed (mph)		70	70	70
Monthly adjustment factors		1	1	1
Vehicle class distribution	Class 4	3.2	3.2	3.2
	Class 5	7.1	7.1	7.1
	Class 6	3.0	3.0	3.0
	Class 7	0.1	0.1	0.1
	Class 8	5.6	5.6	5.6
	Class 9	74.0	74.0	74.0
	Class 10	0.4	0.4	0.4
	Class 11	5.1	5.1	5.1
	Class 12	1.4	1.4	1.4
	Class 13	0.0	0.0	0.0
Hourly traffic distribution	12 am-6 am	2.3	2.3	2.3
	6 am-10 am	5.0	5.0	5.0
	10 am-4 pm	5.9	5.9	5.9
	4 pm-8 pm	4.6	4.6	4.6
	8 pm-12 am	3.1	3.1	3.1
Traffic growth factor		4% Compound	4% Compound	4% Compound
General Traffic Inputs:				
Mean wheel location (in.)		18	18	18
Traffic wander std. dev. (in.)		10	10	10
Design lane width (ft)		12	12	12

Number of axles per truck	Axle type->	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.79	0.21	0.00	0.00	1.79	0.21	0.00	0.00	1.79	0.21	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.21	0.88	0.00	0.00	1.21	0.88	0.00	0.00	1.21	0.88	0.00	0.00
	7	1.54	0.48	0.49	0.00	1.54	0.48	0.49	0.00	1.54	0.48	0.49	0.00
	8	2.66	0.34	0.00	0.00	2.66	0.34	0.00	0.00	2.66	0.34	0.00	0.00
	9	1.23	1.88	0.00	0.00	1.23	1.88	0.00	0.00	1.23	1.88	0.00	0.00
	10	1.03	1.35	0.57	0.05	1.03	1.35	0.57	0.05	1.03	1.35	0.57	0.05
	11	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
	12	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00
	13	1.23	0.48	1.31	0.09	1.23	0.48	1.31	0.09	1.23	0.48	1.31	0.09

Axle load distribution	5826.alf file	5826.alf file	5826.alf file
Axle Configuration:			
Average axle width (ft)	8.5	8.5	8.5
Dual tire spacing (in.)	12	12	12
Single tire (psi)	120	120	120
Dual tire (psi)	120	120	120
Tandem axle (psi)	51.6	51.6	51.6
Tridem axle (psi)	49.2	49.2	49.2
Quad axle (psi)	49.2	49.2	49.2
Climate	5826.icm file	5826.icm file	5826.icm file
Latitude (degrees.minutes)	36.47	36.47	36.47
Longitude (degrees.minutes)	-80.76	-80.76	-80.76
Elevation (ft)	1140	1140	1140
Ground water table depth (ft)	10	10	10

Table A - 13 1006 – Piedmont Region – AC with Granular Base

	Base (1006)	Min	Max
General Information 1. Design life (years) ***2. Existing pavement construction month (month, year)*** 3. Pavement overlay construction month (month, year) ***4. Traffic open month (month, year)*** 5. Type of design a. Flexible pavement b. JPCP c. CRCP 6. Restoration d. JPCP 7. Overlay e. AC f. PCC	20 ***Jul/1/82*** ***Aug/1/82*** Flexible	- ***Feb 1st*** ***February 1st*** -	- ***Mar 1st, July 1st*** ***July 1st*** -
Site/Project Identification 8. Location 9. Project ID 10. Section ID 11. Station/milepost format (ft/miles/latitude, longitude) 12. Station/milepost begin 13. Station/milepost end 14. Traffic direction (E/W/N/S)	0.75 miles east of NC54, Raleigh, NC - 1006 Miles 0 0.75 East	- - - Miles -	- - - Miles -
Analysis Parameters 15. Initial IRI (in./miles) 16. Performance criteria	63	63	63
Flexible Pavement (Limit, Reliability):			
17. Terminal IRI (in./miles)	172, 50	172, 50	172, 50

18. AC surface down cracking (ft/miles) (longitudinal cracking)	1000, 50	1000, 50	1000, 50
19. AC bottom up cracking (alligator cracking) (%)	25, 50	25, 50	25, 50
20. AC thermal fracture	1000, 50	1000, 50	1000, 50
21. Chemically stabilized layer-fatigue fracture (%)	25, 50	25, 50	25, 50
22. Permanent deformation- total pavement (in.)	0.75, 50	0.75, 50	0.75, 50
23. Permanent deformation- AC only (in.)	0.25, 50	0.25, 50	0.25, 50
Structure			
I. AC Layer			
24. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
25. Thickness (in.)	2.7	2.7	2.7
26. Input level	1	1	1
General properties			
27. Reference temperature	70°F	70°F	70°F
28. Effective binder content (%)	5	5	5
29. Air voids (%)	***6.5***	***8.5***	***11***
30. Total unit weight (pcf)	135	135	135
31. Poisson's ratio	0.30	0.30	0.30
Thermal properties			
32. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
33. Heat capacity (BTU/lb- °F)	***0.23***	***0.22***	***0.40***
Asphalt Mix			
34. Cumulative % retained on 3/4 in. sieve	0	0	0
35. Cumulative % retained on 3/8 in. sieve	1.5	1.5	1.5
36. Cumulative % retained on #4	26	26	26

37. % passing #200	6	6	6
Asphalt Binder			
38. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A & VTS values	AC-20	AC-20	AC-20
II. AC Layer			
39. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
40. Thickness (in.)	6.5	6.5	6.5
41. Input level	3		
General properties			
42. Reference temperature	70°F	70°F	70°F
43. Effective binder content (%)	4	4	4
44. Air voids (%)	***8.5***	***6***	***11***
45. Total unit weight (pcf)	146	146	146
46. Poisson's ratio	0.30	0.30	0.30
Thermal properties			
47. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
48. ***Heat capacity (BTU/lb-°F)***	***0.23***	***0.22***	***0.40***
Asphalt Mix			
49. Cumulative % retained on 3/4 in. sieve	18	18	18
50. Cumulative % retained on 3/8 in. sieve	50	50	50
51. Cumulative % retained on #4	60.5	60.5	60.5
52. % passing #200	4	4	4
Asphalt Binder			
53. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade.	AC-20	AC-20	AC-20

Corresponding A & VTS values			
III. Granular Base Inputs (Unbound Compacted/Uncompacted)			
54. Material type	Crushed gravel	Crushed gravel	Crushed gravel
55. Thickness (in.)	12	12	12
Strength Properties			
56. Input level (1 - 3)	3	3	3
57. Analysis type			
58. Poisson's ratio	ICM inputs	ICM inputs	ICM inputs
59. Coefficient of lateral	0.35	0.35	0.35
pressure	0.5	0.5	0.5
60. Modulus (MPa)	***40000***	***38500***	***42000***
ICM inputs			
61. Plasticity Index	0	0	0
Gradation			
62. Passing #200 sieve	10	10	10
63. Passing #4 sieve	45	45	45
64. D60 (mm)	8.43	8.43	8.43
I. Subgrade/Foundation Inputs (Unbound Compacted/Uncompacted)	A-4	A-4	A-4
65. Material type	Sandy Silt	Sandy Silt	Sandy Silt
66. Thickness (in.)	-	-	-
Strength properties			
67. Input level (1 - 3)	3	3	3
68. Analysis type			
69. Poisson's ratio	ICM inputs	ICM inputs	ICM inputs
70. Coefficient of lateral	0.35	0.35	0.35
pressure	0.5	0.5	0.5
71. Modulus	***24000***	***21500***	***29000***
ICM inputs			
72. Plasticity Index	17	17	17
73. Gradation			
74. Passing #200 sieve	74	74	74
75. Passing #4 sieve	85	85	85
76. D60 (mm)	0.12	0.12	0.12
Traffic:			
Initial two-way AADTT	2143	190	190
Number of lanes in design direction	2	2	2
Percent trucks in design direction (%)	40	40	40
Percent trucks in design lane (%)	90	90	90

Operational speed (mph)		70				70				70			
Monthly adjustment factors		1				1				1			
Vehicle class distribution	Class 4	7.7				7.7				7.7			
	Class 5	21.8				21.8				21.8			
	Class 6	9.4				9.4				9.4			
	Class 7	0.6				0.6				0.6			
	Class 8	10.5				10.5				10.5			
	Class 9	47.1				47.1				47.1			
	Class 10	1.5				1.5				1.5			
	Class 11	1.0				1.0				1.0			
	Class 12	0.3				0.3				0.3			
	Class 13	0.1				0.1				0.1			
Hourly traffic distribution	12 am-6 am	2.3				2.3				2.3			
	6 am-10 am	5.0				5.0				5.0			
	10 am-4 pm	5.9				5.9				5.9			
	4 pm-8 pm	4.6				4.6				4.6			
	8 pm-12 am	3.1				3.1				3.1			
Traffic growth factor		4% Compound				4% Compound				4% Compound			
General Traffic Inputs:													
Mean wheel location (in.)		18				18				18			
Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.86	0.14	0.00	0.00	1.86	0.14	0.00	0.00	1.86	0.14	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.13	0.93	0.00	0.00	1.13	0.93	0.00	0.00	1.13	0.93	0.00	0.00
	7	1.05	0.15	0.84	0.00	1.05	0.15	0.84	0.00	1.05	0.15	0.84	0.00
	8	2.56	0.45	0.00	0.00	2.56	0.45	0.00	0.00	2.56	0.45	0.00	0.00
	9	1.14	1.92	0.00	0.00	1.14	1.92	0.00	0.00	1.14	1.92	0.00	0.00
	10	1.16	1.06	0.42	0.26	1.16	1.06	0.42	0.26	1.16	1.06	0.42	0.26
	11	4.99	0.00	0.00	0.00	4.99	0.00	0.00	0.00	4.99	0.00	0.00	0.00
	12	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00
	13	1.15	0.48	1.44	0.07	1.15	0.48	1.44	0.07	1.15	0.48	1.44	0.07
Axle load distribution		1006.alf file				1006.alf file				1006.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			

Tridem axle (psi)	49.2	49.2	49.2
Quad axle (psi)	49.2	49.2	49.2
Climate	1006.icm file	1006.icm file	1006.icm file
Latitude (degrees.minutes)	35.78	35.78	35.78
Longitude (degrees.minutes)	-78.75	-78.75	-78.75
Elevation (ft)	435	435	435
Ground water table depth (ft)	5	5	5

Table A - 14 1801 – Mountainous Region – AC with Granular Base

	Base (1801)	Min	Max
General Information			
1. Design life (years)	20	-	-
2. Existing pavement construction month (month, year)	***May/1/74***	***Feb 1st***	***Mar 1st, July 1st***
3. Pavement overlay construction month (month, year)			
4. Traffic open month (month, year)	***Jun/1/74***	***February 1st***	***July 1st***
5. Type of design			
a. Flexible pavement	Flexible	-	-
b. JPCP			
c. CRCP			
6. Restoration			
d. JPCP			
7. Overlay			
e. AC			
f. PCC			
Site/Project Identification			
8. Location	1.3 miles from SR 2740 to St.)+00 WB, Asheville, NC	-	-
9. Project ID	-	-	-
10. Section ID	1801	-	-
11. Station/milepost format (ft/miles/latitude, longitude)	Miles	Miles	Miles
12. Station/milepost begin	0	-	-
13. Station/milepost end	57.6		
14. Traffic direction (E/W/N/S)	West		
Analysis Parameters			
15. Initial IRI (in./miles)	63	63	63
16. Performance criteria			
Flexible Pavement (Limit, Reliability):			
17. Terminal IRI (in./miles)	172, 50	172, 50	172, 50

18. AC surface down cracking (ft/miles) (longitudinal cracking)	1000, 50	1000, 50	1000, 50
19. AC bottom up cracking (alligator cracking) (%)	25, 50	25, 50	25, 50
20. AC thermal fracture	1000, 50	1000, 50	1000, 50
21. Chemically stabilized layer-fatigue fracture (%)	25, 50	25, 50	25, 50
22. Permanent deformation- total pavement (in.)	0.75, 50	0.75, 50	0.75, 50
23. Permanent deformation- AC only (in.)	0.25, 50	0.25, 50	0.25, 50
Structure			
I. AC Layer			
24. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
25. Thickness (in.)	2	2	2
26. Input level	1	1	1
General properties			
27. Reference temperature	70°F	70°F	70°F
28. Effective binder content (%)	5.3	5.3	5.3
29. Air voids (%)	***7.5***	***6***	***11***
30. Total unit weight (pcf)	150	150	150
31. Poisson's ratio	0.35	0.35	0.35
Thermal properties			
32. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
33. Heat capacity (BTU/lb- °F)	***0.23***	***0.22***	***0.40***
Asphalt Mix			
34. Cumulative % retained on 3/4 in. sieve	0	0	0
35. Cumulative % retained on 3/8 in. sieve	1	1	1
36. Cumulative % retained on #4	25	25	25

37. % passing #200	10	10	10
Asphalt Binder			
38. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade. Corresponding A & VTS values	AC-20	AC-20	AC-20
II. AC Layer			
39. Material type	Asphalt concrete	Asphalt concrete	Asphalt concrete
40. Thickness (in.)	5.2	5.2	5.2
41. Input level	3		
General properties			
42. Reference temperature	70°F	70°F	70°F
43. Effective binder content (%)	4	4	4
44. Air voids (%)	***7***	***6***	***11***
45. Total unit weight (pcf)	148	148	148
46. Poisson's ratio	0.35	0.35	0.35
Thermal properties			
47. Thermal conductivity (BTU/hr-ft-°F)	***0.67***	***0.44***	***0.81***
48. ***Heat capacity (BTU/lb-°F)***	***0.23***	***0.22***	***0.40***
Asphalt Mix			
49. Cumulative % retained on 3/4 in. sieve	5	5	5
50. Cumulative % retained on 3/8 in. sieve	38	38	38
51. Cumulative % retained on #4	57	57	57
52. % passing #200	4.7	4.7	4.7
Asphalt Binder			
53. Superpave binder grading (or) Conventional viscosity grade (or) Conventional penetration grade.	AC-20	AC-20	AC-20

Corresponding A & VTS values			
III. Granular Base Inputs (Unbound Compacted/Uncompacted)			
54. Material type	Crushed gravel	Crushed gravel	Crushed gravel
55. Thickness (in.)	12	12	12
Strength Properties			
56. Input level (1 - 3)	3	3	3
57. Analysis type			
58. Poisson's ratio	ICM inputs	ICM inputs	ICM inputs
59. Coefficient of lateral	0.35	0.35	0.35
pressure	0.5	0.5	0.5
60. Modulus (MPa)	***40000***	***38500***	***42000***
ICM inputs			
61. Plasticity Index	0	0	0
Gradation			
62. Passing #200 sieve	10	10	10
63. Passing #4 sieve	52	52	52
64. D60 (mm)	9.88	9.88	9.88
I. Subgrade/Foundation			
Inputs (Unbound	A-4	A-4	A-4
Compacted/Uncompacted)			
65. Material type	Clayey Silt	Clayey Silt	Clayey Silt
66. Thickness (in.)	-	-	-
Strength properties			
67. Input level (1 - 3)	3	3	3
68. Analysis type			
69. Poisson's ratio	ICM inputs	ICM inputs	ICM inputs
70. Coefficient of lateral	0.35	0.35	0.35
pressure	0.5	0.5	0.5
71. Modulus	***24000***	***21500***	***29000***
ICM inputs			
72. Plasticity Index	17	17	17
Gradation			
73. Passing #200 sieve	40.6	40.6	40.6
74. Passing #4 sieve	85	85	85
75. D60 (mm)	0.05	0.05	0.05
Traffic:			
Initial two-way AADTT	1810	1810	1810
Number of lanes in design direction	2	2	2
Percent trucks in design direction (%)	40	40	40
Percent trucks in design lane (%)	90	90	90

Operational speed (mph)		70				70				70			
Monthly adjustment factors		1				1				1			
Vehicle class distribution	Class 4	5.3				5.3				5.3			
	Class 5	16.1				16.1				16.1			
	Class 6	5.5				5.5				5.5			
	Class 7	0.7				0.7				0.7			
	Class 8	6.7				6.7				6.7			
	Class 9	61.4				61.4				61.4			
	Class 10	0.9				0.9				0.9			
	Class 11	2.6				2.6				2.6			
	Class 12	0.7				0.7				0.7			
	Class 13	0.1				0.1				0.1			
Hourly traffic distribution	12 am-6 am	2.3				2.3				2.3			
	6 am-10 am	5.0				5.0				5.0			
	10 am-4 pm	5.9				5.9				5.9			
	4 pm-8 pm	4.6				4.6				4.6			
	8 pm-12 am	3.1				3.1				3.1			
Traffic growth factor		4% Compound				4% Compound				4% Compound			
General Traffic Inputs:													
Mean wheel location (in.)		18				18				18			
Traffic wander std. dev. (in.)		10				10				10			
Design lane width (ft)		12				12				12			
Number of axles per truck	Axle type->	Si.	Ta.	Tr.	Qu.	Si.	Du.	Tr.	Qu.	Si.	Du.	Tr.	Qu.
	4	1.76	0.24	0.00	0.00	1.76	0.24	0.00	0.00	1.76	0.24	0.00	0.00
	5	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
	6	1.17	0.90	0.00	0.00	1.17	0.90	0.00	0.00	1.17	0.90	0.00	0.00
	7	1.01	0.29	0.71	0.00	1.01	0.29	0.71	0.00	1.01	0.29	0.71	0.00
	8	2.66	0.34	0.00	0.00	2.66	0.34	0.00	0.00	2.66	0.34	0.00	0.00
	9	1.16	1.92	0.00	0.00	1.16	1.92	0.00	0.00	1.16	1.92	0.00	0.00
	10	1.13	1.19	0.52	0.16	1.13	1.19	0.52	0.16	1.13	1.19	0.52	0.16
	11	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
	12	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00	4.00	1.00	0.00	0.00
	13	1.04	0.32	1.57	0.07	1.04	0.32	1.57	0.07	1.04	0.32	1.57	0.07
Axle load distribution		1801.alf file				1801.alf file				1801.alf file			
Axle Configuration:													
Average axle width (ft)		8.5				8.5				8.5			
Dual tire spacing (in.)		12				12				12			
Single tire (psi)		120				120				120			
Dual tire (psi)		120				120				120			
Tandem axle (psi)		51.6				51.6				51.6			

Tridem axle (psi)	49.2	49.2	49.2
Quad axle (psi)	49.2	49.2	49.2
Climate	1801.icm file	1801.icm file	1801.icm file
Latitude (degrees.minutes)	35.59	35.59	35.59
Longitude (degrees.minutes)	-82.42	-82.42	-82.42
Elevation (ft)	2270	2270	2270
Ground water table depth (ft)	5	5	5

APPENDIX B: TRAFFIC INPUT VARIATION

Table B - 1 Site Specific, Regional and National Values

SHRP_ID	[a]VC	Site Specific					Functional	Regional Values				
		[b]VCD	Number of Axles per truck				Classification	[b]VCD	Number of Axles per truck			
0200	4	4.7	1.80	0.20	0.00	0.00	**1**	3.7	1.71	0.29	0.00	0.00
0200	5	15.0	2.00	0.00	0.00	0.00		7.7	2.00	0.00	0.00	0.00
0200	6	4.8	1.13	0.93	0.01	0.00		3.0	1.25	0.86	0.01	0.00
0200	7	0.1	1.74	0.59	1.05	0.06		0.1	1.71	0.68	0.30	0.00
0200	8	8.8	2.55	0.45	0.00	0.00	***3011, 3044, 5826***	7.9	2.13	0.68	0.00	0.00
0200	9	60.7	1.13	1.93	0.00	0.00		73.2	1.24	1.88	0.00	0.00
0200	10	0.5	1.20	1.37	0.57	0.15		0.5	1.02	1.37	0.58	0.03
0200	11	3.7	5.00	0.00	0.00	0.00		2.9	5.00	0.00	0.00	0.00
0200	12	1.5	4.02	1.00	0.00	0.00		0.9	4.00	1.00	0.00	0.00
0200	13	0.2	2.15	1.32	1.46	0.09		0.0	1.21	0.33	1.48	0.08
0900	4	3.44	1.88	0.12	0.00	0.00	**2**	4.0	1.69	0.34	0.00	0.00
0900	5	14.99	2.00	0.00	0.00	0.00		19.9	2.00	0.00	0.00	0.00
0900	6	8.31	1.04	0.97	0.00	0.00	***0200, 0900, 1028, 1030, 1040, 1352, 1645, 1803, 1814, 1817, 1992, 2819, 2824, 3807, 3816, 5827***	11.3	1.10	0.93	0.00	0.00
0900	7	0.49	1.16	0.41	0.59	0.00		1.1	1.21	0.28	0.74	0.01
0900	8	14.15	2.83	0.16	0.00	0.00		11.2	2.57	0.43	0.00	0.00
0900	9	53.92	1.22	1.85	0.00	0.02		48.8	1.21	1.83	0.00	0.02
0900	10	2.84	1.10	0.96	0.16	0.51		1.4	1.07	1.20	0.50	0.18
0900	11	0.52	5.00	0.00	0.00	0.00		1.3	4.68	0.00	0.00	0.00
0900	12	0.04	4.01	1.00	0.00	0.00		0.3	3.75	0.94	0.00	0.00
0900	13	1.31	1.10	0.91	0.05	0.95		0.6	1.37	0.74	0.96	0.22
1006	4	7.7	1.86	0.14	0.00	0.00	**11**	5.98	1.81	0.19	0.00	0.00
1006	5	21.8	2.00	0.00	0.00	0.00		17.77	2.00	0.00	0.00	0.00
1006	6	9.4	1.13	0.93	0.00	0.00		8.07	1.22	0.88	0.00	0.00
1006	7	0.6	1.05	0.15	0.84	0.00		0.67	1.05	0.27	0.73	0.00
1006	8	10.5	2.56	0.45	0.00	0.00	***1006, 1801, 5037***	8.94	2.56	0.42	0.00	0.00
1006	9	47.1	1.14	1.92	0.00	0.00		54.76	1.16	1.92	0.00	0.00
1006	10	1.5	1.16	1.06	0.42	0.26		1.16	1.15	1.14	0.49	0.19
1006	11	1.0	4.99	0.00	0.00	0.00		1.98	5.00	0.00	0.00	0.00
1006	12	0.3	4.00	1.00	0.00	0.00		0.54	4.00	1.00	0.00	0.00
1006	13	0.1	1.15	0.48	1.44	0.07		0.12	1.33	0.53	1.34	0.07
								National Values				
1024	4	3.1	1.97	0.03	0.00	0.00		1.3	1.62	0.39	0.00	0.00
1024	5	64.7	2.00	0.00	0.00	0.00		8.5	2.00	0.00	0.00	0.00
1024	6	10.8	1.00	1.00	0.00	0.00		2.8	1.02	0.99	0.00	0.00
1024	7	0.6	1.03	0.13	0.86	0.00		0.3	1.00	0.26	0.83	0.00
1024	8	15.1	2.95	0.05	0.00	0.00		7.6	2.38	0.67	0.00	0.00
1024	9	5.1	1.11	1.94	0.00	0.00		74.0	1.13	1.93	0.00	0.00
1024	10	0.7	1.00	1.28	0.71	0.00		1.2	1.19	1.09	0.89	0.00
1024	11	0.0	0.00	0.00	0.00	0.00		3.4	4.29	0.26	0.06	0.00
1024	12	0.0	0.00	0.00	0.00	0.00		0.6	3.52	1.14	0.06	0.00
1024	13	0.0	1.00	0.00	2.00	0.00		0.3	2.15	2.13	0.35	0.00

1028	4	5.3	1.70	0.30	0.00	0.00
1028	5	22.0	2.00	0.00	0.00	0.00
1028	6	4.5	1.16	0.91	0.00	0.00
1028	7	0.1	1.00	0.00	1.00	0.00
1028	8	9.3	2.73	0.27	0.00	0.00
1028	9	57.5	1.17	1.91	0.00	0.00
1028	10	0.6	1.00	1.56	0.41	0.03
1028	11	0.4	5.00	0.00	0.00	0.00
1028	12	0.1	3.99	1.00	0.00	0.00
1028	13	0.0	1.00	0.75	1.00	0.25
1030	4	1.8	1.15	0.85	0.00	0.00
1030	5	4.8	2.00	0.00	0.00	0.00
1030	6	10.7	1.00	1.00	0.00	0.00
1030	7	1.6	1.00	0.00	1.00	0.00
1030	8	19.4	2.34	0.68	0.00	0.00
1030	9	52.1	1.13	1.94	0.00	0.00
1030	10	2.4	1.04	1.04	0.96	0.00
1030	11	1.1	5.00	0.00	0.00	0.00
1030	12	0.5	4.00	1.00	0.00	0.00
1030	13	5.7	4.98	0.98	0.00	0.00
1040	4	1.4	1.75	0.25	0.00	0.00
1040	5	18.9	2.00	0.00	0.00	0.00
1040	6	28.8	1.36	0.64	0.00	0.00
1040	7	7.6	1.05	0.89	0.15	0.00
1040	8	15.9	2.43	0.56	0.00	0.00
1040	9	21.3	1.90	0.62	0.00	0.24
1040	10	6.0	1.02	0.10	0.04	0.92
1040	11	0.0	0.00	0.00	0.00	0.00
1040	12	0.0	0.00	0.00	0.00	0.00
1040	13	0.0	1.00	0.00	2.00	0.00
1352	4	3.7	1.89	0.11	0.00	0.00
1352	5	18.5	2.00	0.00	0.00	0.00
1352	6	9.1	1.05	0.95	0.01	0.00
1352	7	1.9	1.01	0.17	0.82	0.00
1352	8	11.1	2.51	0.43	0.00	0.00
1352	9	53.6	1.19	1.90	0.00	0.00
1352	10	1.5	1.09	1.36	0.41	0.21
1352	11	0.0	5.00	0.00	0.00	0.00
1352	12	0.0	4.00	1.00	0.00	0.00
1352	13	0.6	1.00	1.29	0.20	0.50
1645	4	3.6	1.80	0.20	0.00	0.00
1645	5	14.8	2.00	0.00	0.00	0.00

1645	6	9.3	1.07	0.96	0.00	0.00
1645	7	0.7	1.42	0.34	0.60	0.00
1645	8	7.9	2.75	0.25	0.00	0.00
1645	9	60.3	1.19	1.91	0.00	0.00
1645	10	1.3	1.01	1.46	0.41	0.14
1645	11	1.5	5.00	0.00	0.00	0.00
1645	12	0.7	4.00	1.00	0.00	0.00
1645	13	0.0	1.00	0.38	1.50	0.13
1801	4	5.3	1.76	0.24	0.00	0.00
1801	5	16.1	2.00	0.00	0.00	0.00
1801	6	5.5	1.17	0.90	0.00	0.00
1801	7	0.7	1.01	0.29	0.71	0.00
1801	8	6.7	2.66	0.34	0.00	0.00
1801	9	61.4	1.16	1.92	0.00	0.00
1801	10	0.9	1.13	1.19	0.52	0.16
1801	11	2.6	5.00	0.00	0.00	0.00
1801	12	0.7	4.00	1.00	0.00	0.00
1801	13	0.1	1.04	0.32	1.57	0.07
1802	4	4.7	0.00	0.00	0.00	0.00
1802	5	2.5	2.00	0.00	0.00	0.00
1802	6	18.3	1.00	1.00	0.00	0.00
1802	7	2.7	1.00	0.00	1.00	0.00
1802	8	12.0	2.44	0.59	0.00	0.00
1802	9	20.2	1.10	1.95	0.00	0.00
1802	10	3.8	1.00	1.00	1.00	0.00
1802	11	0.4	0.00	0.00	0.00	0.00
1802	12	0.9	0.00	0.00	0.00	0.00
1802	13	34.6	0.00	0.00	0.00	0.00
1803	4	6.8	1.80	0.20	0.00	0.00
1803	5	37.3	2.00	0.00	0.00	0.00
1803	6	18.3	1.15	0.91	0.01	0.00
1803	7	0.4	1.04	0.18	0.82	0.00
1803	8	14.1	2.89	0.11	0.00	0.00
1803	9	21.9	1.14	1.92	0.00	0.00
1803	10	0.9	1.08	1.33	0.58	0.03
1803	11	0.1	5.01	0.00	0.00	0.00
1803	12	0.1	4.01	1.00	0.00	0.00
1803	13	0.1	1.00	0.71	1.14	0.14
1814	4	3.3	1.82	0.18	0.00	0.00
1814	5	35.6	2.00	0.00	0.00	0.00
1814	6	14.5	1.07	0.95	0.01	0.00
1814	7	0.9	1.10	0.34	0.64	0.02
1814	8	12.5	2.80	0.26	0.00	0.00

1814	9	31.4	1.18	1.88	0.00	0.00
1814	10	1.6	1.20	1.33	0.33	0.18
1814	11	0.2	5.00	0.00	0.00	0.00
1814	12	0.0	4.00	1.00	0.00	0.00
1814	13	0.1	1.40	0.60	1.19	0.00
1817	4	0.5	1.36	1.18	0.00	0.00
1817	5	18.0	2.00	0.00	0.00	0.00
1817	6	30.1	1.00	1.00	0.00	0.00
1817	7	2.3	1.30	0.35	0.80	0.00
1817	8	14.7	2.21	0.80	0.00	0.00
1817	9	31.2	1.12	1.94	0.00	0.00
1817	10	1.1	1.00	1.00	1.00	0.00
1817	11	0.4	5.00	0.00	0.00	0.00
1817	12	0.2	3.98	0.98	0.00	0.00
1817	13	1.5	0.00	0.00	0.00	0.00
1992	4	4.8	1.79	0.21	0.00	0.00
1992	5	14.3	2.00	0.00	0.00	0.00
1992	6	5.5	1.18	0.90	0.00	0.00
1992	7	0.4	1.07	0.01	0.96	0.00
1992	8	8.0	2.51	0.49	0.00	0.00
1992	9	65.2	1.14	1.93	0.00	0.00
1992	10	0.7	1.02	1.27	0.43	0.23
1992	11	1.0	5.00	0.00	0.00	0.00
1992	12	0.1	3.99	0.99	0.00	0.00
1992	13	0.0	2.23	0.49	0.49	0.24
2819	4	0.7	1.23	0.77	0.00	0.00
2819	5	32.4	2.00	0.00	0.00	0.00
2819	6	5.7	1.00	1.00	0.00	0.00
2819	7	0.7	1.01	0.03	0.99	0.00
2819	8	7.9	2.26	0.77	0.00	0.00
2819	9	50.4	1.18	1.91	0.00	0.00
2819	10	0.5	1.10	1.01	0.96	0.00
2819	11	1.5	5.00	0.00	0.00	0.00
2819	12	0.2	4.00	1.00	0.00	0.00
2819	13	0.1	1.21	1.31	2.13	0.52
2824	4	3.6	1.78	0.22	0.00	0.00
2824	5	12.0	2.00	0.00	0.00	0.00
2824	6	10.6	1.07	0.96	0.00	0.00
2824	7	0.4	2.05	0.68	0.19	0.00
2824	8	7.2	2.58	0.43	0.00	0.00
2824	9	63.2	1.16	1.92	0.00	0.00
2824	10	1.0	1.06	1.31	0.35	0.26
2824	11	1.9	5.00	0.00	0.00	0.00

2824	12	0.1	3.99	1.00	0.00	0.00
2824	13	0.0	0.83	0.33	1.50	0.17
2825	4	20.0	1.96	0.04	0.00	0.00
2825	5	38.3	2.00	0.00	0.00	0.00
2825	6	14.7	1.16	0.90	0.01	0.00
2825	7	9.0	1.00	0.01	0.99	0.00
2825	8	7.1	2.65	0.37	0.01	0.00
2825	9	10.3	1.10	1.86	0.01	0.04
2825	10	0.5	0.93	1.53	0.33	0.13
2825	11	0.0	4.97	0.00	0.00	0.00
2825	12	0.0	2.00	0.00	0.00	1.00
2825	13	0.0	1.00	0.60	1.40	0.00
3008	4	5.7	1.85	0.15	0.00	0.00
3008	5	19.2	2.00	0.00	0.00	0.00
3008	6	7.4	1.12	0.93	0.00	0.00
3008	7	0.2	1.06	0.25	0.74	0.00
3008	8	9.9	2.61	0.40	0.00	0.00
3008	9	50.5	1.13	1.93	0.00	0.00
3008	10	0.5	1.01	1.40	0.50	0.11
3008	11	5.0	5.00	0.00	0.00	0.00
3008	12	1.5	4.00	1.00	0.00	0.00
3008	13	0.1	1.00	0.62	1.37	0.06
3011	4	4.3	1.63	0.37	0.00	0.00
3011	5	8.4	2.00	0.00	0.00	0.00
3011	6	3.0	1.29	0.83	0.01	0.00
3011	7	0.1	1.87	0.87	0.11	0.00
3011	8	10.1	1.61	1.01	0.00	0.00
3011	9	72.4	1.25	1.87	0.00	0.00
3011	10	0.6	1.00	1.40	0.58	0.01
3011	11	0.8	5.00	0.00	0.00	0.00
3011	12	0.4	4.00	1.00	0.00	0.00
3011	13	0.1	1.19	0.17	1.65	0.07
3807	4	4.4	1.82	0.18	0.00	0.00
3807	5	14.8	2.00	0.00	0.00	0.00
3807	6	7.8	1.10	0.94	0.00	0.00
3807	7	0.2	1.07	0.27	0.73	0.00
3807	8	10.1	2.54	0.46	0.00	0.00
3807	9	57.4	1.13	1.93	0.00	0.00
3807	10	0.6	1.06	1.40	0.50	0.07
3807	11	3.3	5.00	0.00	0.00	0.00
3807	12	1.3	4.00	1.00	0.00	0.00
3807	13	0.1	1.09	0.57	1.36	0.07

3816	4	11.5	1.79	0.21	0.00	0.00
3816	5	34.8	2.00	0.00	0.00	0.00
3816	6	9.8	1.12	0.93	0.00	0.00
3816	7	0.3	1.05	0.14	0.86	0.00
3816	8	8.7	2.61	0.39	0.00	0.00
3816	9	33.7	1.16	1.89	0.00	0.01
3816	10	0.8	1.10	1.26	0.36	0.21
3816	11	0.2	4.90	0.05	0.00	0.00
3816	12	0.1	4.01	1.00	0.00	0.00
3816	13	0.0	1.00	1.40	0.20	0.40
5037	4	5.0	1.82	0.18	0.00	0.00
5037	5	15.3	2.00	0.00	0.00	0.00
5037	6	9.2	1.35	0.81	0.01	0.00
5037	7	0.7	1.09	0.37	0.63	0.00
5037	8	9.6	2.47	0.48	0.00	0.00
5037	9	55.8	1.17	1.91	0.00	0.00
5037	10	1.1	1.16	1.17	0.53	0.16
5037	11	2.4	4.99	0.00	0.00	0.00
5037	12	0.6	3.99	1.00	0.00	0.00
5037	13	0.2	1.80	0.80	1.00	0.06
5826	4	3.2	1.79	0.21	0.00	0.00
5826	5	7.1	2.00	0.00	0.00	0.00
5826	6	3.0	1.21	0.88	0.00	0.00
5826	7	0.1	1.54	0.48	0.49	0.00
5826	8	5.6	2.66	0.34	0.00	0.00
5826	9	74.0	1.23	1.88	0.00	0.00
5826	10	0.4	1.03	1.35	0.57	0.05
5826	11	5.1	5.00	0.00	0.00	0.00
5826	12	1.4	4.00	1.00	0.00	0.00
5826	13	0.0	1.23	0.48	1.31	0.09
5827	4	4.2	1.76	0.24	0.00	0.00
5827	5	10.9	2.00	0.00	0.00	0.00
5827	6	3.1	1.08	0.95	0.00	0.00
5827	7	0.2	1.33	0.14	0.66	0.09
5827	8	8.8	2.60	0.40	0.00	0.00
5827	9	66.7	1.20	1.90	0.00	0.00
5827	10	0.4	1.07	1.45	0.54	0.00
5827	11	5.0	5.00	0.00	0.00	0.00
5827	12	0.7	4.00	1.00	0.00	0.00
5827	13	0.0	1.00	0.88	1.13	0.13

Note:
[a]VC: Vehicle Class
[b]VCD: Vehicle Class Distribution

APPENDIX C: SENSITIVITY ANALYSIS TABLES

1.1.1 Material Sensitivity

Table C-1 1817- Piedmont-AC with Granular Base - Air voids-AC-Layer-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	118.4	118.5	118.6	98.21	98.19	98.16	0.2	0.12	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	1.3	6.7	22.8	99.24	92.38	82.48	21.5	2.15	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	4.9	5.2	5.6	99.29	99.08	98.76	0.7	2.80	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.15	0.16	0.18	93.7	90.12	82.38	0.03	12.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.3	0.31	0.34	99.999	99.999	99.999	0.04	5.33	I

Table C-2 1817- Piedmont-AC with Granular Base - Heat Capacity – AC-Layer-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	118.5	118.5	118.5	98.19	98.19	98.19	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	6.7	6.7	6.3	92.36	92.38	92.76	-0.4	-0.04	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.2	5.2	5.2	99.08	99.08	99.08	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.16	0.16	89.99	90.12	91.7	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	0.31	99.999	99.999	99.999	0	0.00	I

Table C-3 1817- Piedmont-AC with Granular Base - Thermal Conductivity – AC-Layer-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	118.5	118.5	118.5	98.19	98.19	98.19	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	6.1	6.7	7	93.08	92.38	92.02	0.9	0.09	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.2	5.2	5.3	99.11	99.08	99.07	0.1	0.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.15	0.16	0.17	92.85	90.12	88.35	0.02	8.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.3	0.31	0.32	99.999	99.999	99.999	0.02	2.67	I

Table C-4 1817- Piedmont-AC with Granular Base - Air voids – AC-Layer-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	117.1	118.5	120.7	98.41	98.19	97.78	3.6	2.09	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	5.7	6.7	10.9	93.57	92.38	88.54	5.2	0.52	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	1.6	5.2	11.3	99.999	99.08	89.62	9.7	38.80	LS/S
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.15	0.16	0.18	93.87	90.12	82.71	0.03	12.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.3	0.31	0.33	99.999	99.999	99.999	0.03	4.00	I

Table C-5 1817- Piedmont-AC with Granular Base - Heat Capacity – AC-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	118.5	118.5	118.5	98.19	98.19	98.19	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	6.8	6.7	5.9	92.28	92.38	93.28	-0.9	-0.09	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.2	5.2	5.2	99.08	99.08	99.09	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.16	0.15	89.71	90.12	92.98	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	0.3	99.999	99.999	99.999	-0.01	-1.33	I

Table C-6 1817- Piedmont-AC with Granular Base -Thermal Conductivity – AC-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	118.5	118.5	118.5	98.19	98.19	98.19	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	7	6.7	6.5	92	92.38	92.64	-0.5	-0.05	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.3	5.2	5.2	99.06	99.08	99.09	-0.1	-0.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.17	0.16	0.16	87.2	90.12	91.5	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.32	0.31	0.31	99.999	99.999	99.999	-0.01	-1.33	I

Table C-7 1817- Piedmont-AC with Granular Base – Granular Base Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	118.7	118.5	118.3	98.16	98.19	98.22	-0.4	-0.23	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	7.5	6.7	5.8	91.57	92.38	93.34	-1.7	-0.17	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.7	5.2	4.7	98.7	99.08	99.43	-1	-4.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.16	0.16	90.18	90.12	90.05	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	0.31	99.999	99.999	99.999	0	0.00	I

Table C-8 1817- Piedmont-AC with Granular Base - Subgrade Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	118.5	118.5	118.4	98.18	98.19	98.2	-0.1	-0.06	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	5.5	6.7	8.3	93.72	92.38	90.76	2.8	0.28	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.4	5.2	5.1	98.97	99.08	99.19	-0.3	-1.20	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.16	0.16	90.12	90.12	90.12	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.33	0.31	0.3	99.999	99.999	99.999	-0.03	-4.00	I

Table C-9 1817- Piedmont-AC with Granular Base - Creep Compliance – Level1VsLevel3

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Level-3	Base	Level-3		%	
Terminal IRI (in/mi)	172	50	118.5	118.3	98.19	98.23	-0.2	-0.12	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	6.7	5.6	92.38	93.59	-1.1	-0.11	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.2	4.6	99.08	99.48	-0.6	-2.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.15	90.12	92.64	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.3	99.999	99.999	-0.01	-1.33	I

Table C-10 1817- Piedmont-AC with Granular Base – Surface Shortwave Absorptivity

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	118.2	118.5	118.6	98.24	98.19	98.17	0.4	0.23	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	4.4	6.7	10.2	95.11	92.38	89.12	5.8	0.58	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	4.5	5.2	5.5	99.54	99.08	98.87	1	4.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.09	0.16	0.2	99.85	90.12	73.08	0.11	44.00	S
Permanent Deformation (Total Pavement) (in):	0.75	50	0.24	0.31	0.36	99.999	99.999	99.999	0.12	16.00	I/LS

Table C-11 1817- Piedmont-AC with Granular Base - Base Vs Jun/Jul

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season1	Base	Season1		%	
Terminal IRI (in/mi)	172	50	118.5	122.9	98.19	96.89	4.4	2.56	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	6.7	6.6	92.38	92.48	-0.1	-0.01	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.2	5.2	99.08	99.12	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.16	90.12	90.61	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	99.999	99.999	0	0.00	I

Table C-12 1817- Piedmont-AC with Granular Base - Base Vs Mar/Apr

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season2	Base	Season2		%	
Terminal IRI (in/mi)	172	50	118.5	123.1	98.19	96.84	4.6	2.67	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	6.7	6.7	92.38	92.35	0	0.00	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.2	5.2	99.08	99.09	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.16	90.12	89.74	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	99.999	99.999	0	0.00	I

Table C-13 1817- Piedmont-AC with Granular Base - Base Vs Sep/Oct

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season3	Base	Season3		%	
Terminal IRI (in/mi)	172	50	118.5	123	98.19	96.88	4.5	2.62	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	6.7	6.5	92.38	92.55	-0.2	-0.02	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.2	5.2	99.08	99.13	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.16	90.12	90.82	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	99.999	99.999	0	0.00	I

Table C-14 1817- Piedmont-AC with Granular Base - Truck Growth Factor – 4Vs1.1

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	TG-1.1	Base	TG-1.1		%	
Terminal IRI (in/mi)	172	50	118.5	118	98.19	98.28	-0.5	-0.29	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	6.7	4.3	92.38	95.22	-2.4	-0.24	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.2	3.8	99.08	99.8	-1.4	-5.60	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.14	90.12	95.45	-0.02	-8.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.29	99.999	99.999	-0.02	-2.67	I

Table C-15 1817- Piedmont-AC with Granular Base - |E*| Level1VsLevel2VsLevel3-S9.5BC

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Level3	Level2	Level1	Level3	Level2	Level1		%	
Terminal IRI (in/mi)	172	50	118.5	118.5	118.8	98.18	98.19	98.13	0.3	0.17	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	7	6.8	22.2	92.06	92.22	82.62	15.2	1.52	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.3	5.3	6.2	99.03	99.07	98.22	0.9	3.60	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.17	0.16	0.38	87.73	88.99	10.09	0.21	84.00	ES
Permanent Deformation (Total Pavement) (in):	0.75	50	0.32	0.32	0.54	99.999	99.999	96.01	0.22	29.33	LS

Table C-16 1817- Piedmont-AC with Granular Base - |E*| Level1VsLevel3-S9.5B0

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Level-3	Level-1	Level-3	Level-1		%	
Terminal IRI (in/mi)	172	50	118.5	118.9	98.18	98.12	0.4	0.23	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	7	21.9	92.07	82.76	14.9	1.49	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.3	6.3	99.03	98.08	1	4.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.17	0.37	87.83	11.48	0.2	80.00	ES
Permanent Deformation (Total Pavement) (in):	0.75	50	0.32	0.54	99.999	96.75	0.22	29.33	LS

Table C-17 1817- Piedmont-AC with Granular Base - |E*| Level1VsLevel3-S9.5B1

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Level-3	Level-1	Level-3	Level-1		%	
Terminal IRI (in/mi)	172	50	118.4	118.5	98.2	98.18	0.1	0.06	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	6.3	7.1	92.8	91.96	0.8	0.08	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.1	5.3	99.18	98.99	0.2	0.80	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.17	90.82	87.9	0.01	4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.32	99.999	99.999	0.01	1.33	I

Table C-18 1817- Piedmont-AC with Granular Base - |E*| Level1VsLevel2VsLevel3-B25BC

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Level3	Level2	Level1	Level3	Level2	Level1			
Terminal IRI (in/mi)	172	50	118.5	118.4	118.3	98.19	98.2	98.22	-0.2	-0.12	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	7.1	6.8	195	91.92	92.28	67.38	187.9	18.79	I/LS
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.2	5.1	4.7	99.11	99.16	99.41	-0.5	-2.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.16	0.27	89.64	90.82	40.22	0.11	44.00	S
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	0.43	99.999	99.999	99.89	0.12	16.00	I/LS

Table C-19 1814 - Mountainous Region – AC with Granular Base - Air voids – AC-Layer-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	113.3	113.8	114.6	99.03	98.98	98.89	1.3	0.76	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	500	1640	4160	59.65	38.91	9.31	3660	366.00	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.1	19.4	21.4	71.46	67.42	61.16	3.3	13.20	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.13	99.39	98.92	97.26	0.02	8.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.29	0.31	99.999	99.999	99.999	0.03	4.00	I

Table C-20 1814 - Mountainous Region – AC with Granular Base - Heat Capacity – AC-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	113.4	113.3	113.3	99.03	99.03	99.03	-0.1	-0.06	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	513	500	517	59.38	59.65	59.3	4	0.40	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.2	18.1	18.1	71.14	71.46	71.44	-0.1	-0.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.1	99.38	99.39	99.51	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.28	0.28	99.999	99.999	99.999	0	0.00	I

Table C-21 1814 - Mountainous Region – AC with Granular Base - Thermal Conductivity – AC-Layer-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	113.2	113.3	113.4	99.04	99.03	99.02	0.2	0.12	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	504	500	517	59.57	59.65	59.3	13	1.30	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	17.8	18.1	18.3	72.36	71.46	70.83	0.5	2.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.1	0.11	0.11	99.68	99.39	99.26	0.01	4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.27	0.28	0.28	99.999	99.999	99.999	0.01	1.33	I

Table C-22 1814 - Mountainous Region – AC with Granular Base - Air voids – AC-Layer-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	113.3	113.4	119.8	99.03	99.03	98.14	6.5	3.78	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	500	513	483	59.65	59.38	60.01	-17	-1.70	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.1	18.2	32.7	71.46	71.14	29.1	14.6	58.40	S/VS
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.12	99.39	99.39	98.27	0.01	4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.28	0.3	99.999	99.999	99.999	0.02	2.67	I

Table C-23 1814 - Mountainous Region – AC with Granular Base - Heat Capacity – AC-Layer-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	113.4	113.3	113.3	99.03	99.03	99.04	-0.1	-0.06	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	513	500	514	59.38	59.65	59.37	1	0.10	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.2	18.1	18	71.14	71.46	71.75	-0.2	-0.80	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.1	99.37	99.39	99.59	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.28	0.27	99.999	99.999	99.999	-0.01	-1.33	I

Table C-24 1814 - Mountainous Region – AC with Granular Base - Thermal Conductivity – AC-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	113.4	113.3	113.3	99.02	99.03	99.03	-0.1	-0.06	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	517	500	512	59.3	59.65	59.4	-5	-0.50	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.4	18.1	18.1	70.53	71.46	71.46	-0.3	-1.20	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.1	99.13	99.39	99.51	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.29	0.28	0.28	99.999	99.999	99.999	-0.01	-1.33	I

Table C-25 1814 - Mountainous Region – AC with Granular Base – Granular Base Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	113.8	113.3	112.9	98.99	99.03	99.08	-0.9	-0.52	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	588	500	429	57.84	59.65	61.19	-159	-15.90	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	19.3	18.1	16.9	67.74	71.46	75.09	-2.4	-9.60	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.11	99.39	99.39	99.39	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.28	0.28	99.999	99.999	99.999	0	0.00	I

Table C-26 1814 - Mountainous Region – AC with Granular Base - Subgrade Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	113.5	113.3	113.1	99.01	99.03	99.05	-0.4	-0.23	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	472	500	580	60.26	59.65	58	108	10.80	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.6	18.1	17.6	69.9	71.46	72.99	-1	-4.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.11	99.39	99.39	99.39	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.29	0.28	0.27	99.999	99.999	99.999	-0.02	-2.67	I

Table C-27 1814 - Mountainous Region – AC with Granular Base - Creep Compliance-Level1Vs3

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Level-1	Base	Level-1		%	
Terminal IRI (in/mi)	172	50	113.3	116.8	99.03	98.62	3.5	2.03	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	500	1440	59.65	42.26	940	94.00	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.1	28.8	71.46	39.01	10.7	42.80	S
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	99.39	98.85	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.32	99.999	99.999	0.04	5.33	I

Table C-28 1814 - Mountainous Region – AC with Granular Base - Base vs. Feb/Mar

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season1	Base	Season1		%	
Terminal IRI (in/mi)	172	50	113.3	112.3	99.03	99.13	-1	-0.58	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	500	513	59.65	59.38	13	1.30	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.1	18.2	71.46	71.14	0.1	0.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.1	99.39	99.45	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.28	99.999	99.999	0	0.00	I

Table C-29 1814 - Mountainous Region – AC with Granular Base - Base vs. May/June

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season2	Base	Season2		%	
Terminal IRI (in/mi)	172	50	113.3	112.4	99.03	99.12	-0.9	-0.52	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	500	572	59.65	58.17	72	7.20	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.1	17.4	71.46	73.57	-0.7	-2.80	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.1	99.39	99.45	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.26	99.999	99.999	-0.02	-2.67	I

Table C-30 1814 - Mountainous Region – AC with Granular Base - Base vs. Nov/Dec

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season3	Base	Season3		%	
Terminal IRI (in/mi)	172	50	113.3	112.7	99.03	99.1	-0.6	-0.35	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	500	516	59.65	59.32	16	1.60	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.1	18.3	71.46	70.84	0.2	0.80	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.1	99.39	99.44	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.28	99.999	99.999	0	0.00	I

Table C-31 1814 - Mountainous Region – AC with Granular Base – Surface Shortwave Absorptivity

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	113.6	113.3	115.9	99.01	99.03	98.74	2.3	1.34	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	701	500	913	55.6	59.65	51.6	212	21.20	LS
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.7	18.1	24.4	69.6	71.46	51.82	5.7	22.80	LS
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.07	0.11	0.12	99.99	99.39	97.78	0.05	20.00	LS
Permanent Deformation (Total Pavement) (in):	0.75	50	0.25	0.28	0.32	99.999	99.999	99.999	0.07	9.33	I

Table C-32 1814 - Mountainous Region – AC with Granular Base - |E*|-Level1VsLevel3-S9.5BC

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Level-3	Level-1	Level-3	Level-1		%	
Terminal IRI (in/mi)	172	50	113.4	119	99.03	98.27	5.6	3.26	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	640	1720	56.8	37.61	1080	108.00	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.3	32.5	70.84	29.57	14.2	56.80	S/VS
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.1	0.34	99.73	18.57	0.24	96.00	ES
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.54	99.999	96.61	0.26	34.67	I

Table C-33 1814 - Mountainous Region – AC with Granular Base – Truck Growth Factor-4Vs1.1

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	TG-1.1	Base	TG-1.1		%	
Terminal IRI (in/mi)	172	50	113.3	113.1	99.03	99.05	-0.2	-0.12	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	500	572	59.65	58.17	72	7.20	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.1	17.6	71.46	72.99	-0.5	-2.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.09	99.39	99.84	-0.02	-8.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.28	99.999	99.999	0	0.00	I

Table C-34 0901 – Piedmont – AC with Bituminous Treated Base - Air voids – AC –Layer-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	85.9	86	86.2	99.999	99.999	99.999	0.3	0.17	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	859	3850	7630	52.6	11.57	0.34	6771	677.10	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.1	5.7	6.5	99.66	99.38	98.79	1.4	5.60	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.12	0.15	99.32	97.94	92.53	0.04	16.00	I/LS
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.33	0.36	99.999	99.999	99.99	0.05	6.67	I

Table C-35 0901 – Piedmont – AC with Bituminous Treated Base - Heat Capacity – AC – Layer-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	85.9	85.9	85.9	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	860	859	830	52.58	52.6	53.14	-30	-3.00	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.1	5.1	5.2	99.66	99.66	99.65	0.1	0.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.1	99.31	99.32	99.56	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	0.3	99.999	99.999	99.999	-0.01	-1.33	I

Table C-36 0901 – Piedmont – AC with Bituminous Treated Base - Thermal Conductivity – AC –Layer-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	85.9	85.9	85.9	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	735	859	904	54.95	52.6	51.76	169	16.90	I/LS
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	4.9	5.1	5.2	99.74	99.66	99.63	0.3	1.20	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.1	0.11	0.11	99.63	99.32	99.17	0.01	4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.3	0.31	0.31	99.999	99.999	99.999	0.01	1.33	I

Table C-37 0901 – Piedmont – AC with Bituminous Treated Base - Air voids – AC – Layer-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	85.9	86	86.1	99.999	99.999	99.999	0.2	0.12	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	859	878	902	52.6	52.25	51.8	43	4.30	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.1	5.5	6.1	99.66	99.48	99.12	1	4.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.12	99.32	98.89	97.84	0.01	4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.32	0.33	99.999	99.999	99.999	0.02	2.67	I

Table C-38 0901 – Piedmont – AC with Bituminous Treated Base - Heat Capacity – AC – Layer-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	85.9	85.9	85.9	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	864	859	806	52.51	52.6	53.6	-58	-5.80	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.1	5.1	5.1	99.67	99.66	99.69	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.1	99.3	99.32	99.57	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	0.3	99.999	99.999	99.999	-0.01	-1.33	I

Table C-39 0901 – Piedmont – AC with Bituminous Treated Base - Thermal Conductivity – AC –Layer-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	85.9	85.9	85.9	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	834	859	868	53.07	52.6	52.43	34	3.40	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5	5.1	5.1	99.7	99.66	99.66	0.1	0.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.11	99.21	99.32	99.36	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	0.31	99.999	99.999	99.999	0	0.00	I

Table C-40 0901 – Piedmont – AC with Bituminous Treated Base - Air voids – Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	85.9	87.7	91	99.999	99.999	99.999	5.1	2.97	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	859	1350	2270	52.6	43.8	29.19	1411	141.10	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.1	14.3	27.6	99.66	83.34	42.27	22.5	90.00	ES
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.11	99.32	99.31	99.28	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	0.32	99.999	99.999	99.999	0.01	1.33	I

Table C-41 0901 – Piedmont – AC with Bituminous Treated Base - Heat Capacity – Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	85.9	85.9	85.9	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	864	859	801	52.51	52.6	53.69	-63	-6.30	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.1	5.1	5	99.66	99.66	99.7	-0.1	-0.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.11	99.32	99.32	99.39	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	0.31	99.999	99.999	99.999	0	0.00	I

Table C-42 0901 – Piedmont – AC with Bituminous Treated Base - Thermal Conductivity – Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	85.9	85.9	85.9	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	930	859	816	51.28	52.6	53.41	-114	-11.40	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.3	5.1	5	99.61	99.66	99.7	-0.3	-1.20	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.11	99.15	99.32	99.41	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	0.31	99.999	99.999	99.999	0	0.00	I

Table C-43 0901 – Piedmont – AC with Bituminous Treated Base – Granular Base Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	86.1	85.9	85.8	99.999	99.999	99.999	-0.3	-0.17	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	1030	859	643	49.46	52.6	56.74	-387	-38.70	LS/S
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.9	5.1	4.4	99.24	99.66	99.88	-1.5	-6.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.1	0.11	0.11	99.45	99.32	99.19	0.01	4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.32	0.31	0.3	99.999	99.999	99.999	-0.02	-2.67	I

Table C-44 0901 – Piedmont – AC with Bituminous Treated Base - Subgrade Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	86.1	85.9	85.8	99.999	99.999	99.999	-0.3	-0.17	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	529	859	1430	59.05	52.6	42.43	901	90.10	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.8	5.1	4.3	99.32	99.66	99.89	-1.5	-6.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.1	0.11	0.11	99.43	99.32	99.18	0.01	4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.34	0.31	0.27	99.999	99.999	99.999	-0.07	-9.33	I

Table C-45 0901 – Piedmont – AC with Bituminous Treated Base - Base Vs Feb/Mar

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season1	Base	Season1		%	
Terminal IRI (in/mi)	172	50	85.9	85.7	99.999	99.999	-0.2	-0.12	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	859	760	52.6	54.47	-99	-9.90	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.1	4.9	99.66	99.74	-0.2	-0.80	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.1	99.32	99.55	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.3	99.999	99.999	-0.01	-1.33	I

Table C-46 0901 – Piedmont – AC with Bituminous Treated Base - Base Vs May/Jun

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season2	Base	Season2		%	
Terminal IRI (in/mi)	172	50	85.9	85.8	99.999	99.999	-0.1	-0.06	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	859	757	52.6	54.53	-102	-10.20	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.1	4.9	99.66	99.73	-0.2	-0.80	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.1	99.32	99.53	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.3	99.999	99.999	-0.01	-1.33	I

Table C-47 0901 – Piedmont – AC with Bituminous Treated Base - Base Vs Nov/Dec

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season3	Base	Season3		%	
Terminal IRI (in/mi)	172	50	85.9	85.7	99.999	99.999	-0.2	-0.12	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	859	761	52.6	54.45	-98	-9.80	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.1	4.9	99.66	99.74	-0.2	-0.80	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.1	99.32	99.54	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.3	99.999	99.999	-0.01	-1.33	I

Table C-48 0901 – Piedmont – AC with Bituminous Treated Base – Surface Shortwave Absorptivity

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	85.5	85.9	86.2	99.999	99.999	99.999	0.7	0.41	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	109	859	1630	71.15	52.6	39.08	1521	152.10	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	5.1	6.5	99.999	99.66	98.86	3.7	14.80	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.06	0.11	0.14	99.999	99.32	95.96	0.08	32.00	LS
Permanent Deformation (Total Pavement) (in):	0.75	50	0.24	0.31	0.34	99.999	99.999	99.999	0.1	13.33	I

Table C-49 0901 – Piedmont – AC with Bituminous Treated Base - |E*|-Level1VsLevel2VsLevel3-S9.5BC

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Level3	Level2	Level1	Level3	Level2	Level1			
Terminal IRI (in/mi)	172	50	86	86	86.9	99.999	99.999	99.999	0.9	0.52	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	1150	1080	4260	47.3	48.55	8.65	3110	311.00	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.5	5.4	10.2	99.48	99.54	93.44	4.7	18.80	I/LS
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.12	0.12	0.46	98.25	98.57	2.87	0.34	136.00	ES
Permanent Deformation (Total Pavement) (in):	0.75	50	0.33	0.32	0.69	99.999	99.999	67.47	0.36	48.00	S

Table C-50 0901 – Piedmont – AC with Bituminous Treated Base - |E*|-Level1VsLevel2VsLevel3-I19BC

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Level3	Level2	Level1	Level3	Level2	Level1		%	
Terminal IRI (in/mi)	172	50	86	86	86.7	99.999	99.999	99.999	0.7	0.41	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	888	883	1260	52.06	52.15	45.36	372	37.20	LS/S
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.8	5.6	9.2	99.35	99.43	95.22	3.4	13.60	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.12	0.12	0.19	98.54	98.73	76.65	0.07	28.00	LS
Permanent Deformation (Total Pavement) (in):	0.75	50	0.32	0.32	0.41	99.999	99.999	99.93	0.09	12.00	I

Table C-51 0901 – Piedmont – AC with Bituminous Treated Base - |E*|-Level1VsLevel2VsLevel3-B25BC

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Level3	Level2	Level1	Level3	Level2	Level1			
Terminal IRI (in/mi)	172	50	86	85.9	86.6	99.999	99.999	99.999	0.6	0.35	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	1100	936	6520	48.19	51.17	1.17	5420	542.00	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.5	5.2	8.6	99.51	99.63	96.21	3.1	12.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.11	0.12	99.32	99.32	98.74	0.01	4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.31	0.34	99.999	99.999	99.999	0.03	4.00	I

Table C-52 0901 – Piedmont – AC with Bituminous Treated Base – Truck Growth Factor - 4Vs1

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	TG-1	Base	TG-1		%	
Terminal IRI (in/mi)	172	50	85.9	85.7	99.999	99.999	-0.2	-0.12	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	859	563	52.6	58.34	-296	-29.60	LS
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.1	3.8	99.66	99.96	-1.3	-5.20	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.09	99.32	99.81	-0.02	-8.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.29	99.999	99.999	-0.02	-2.67	I

Table C-53 1028 – Coastal Region – AC with Bituminous Treated Base - Air voids – AC – Layer-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	84.8	84.8	84.8	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	29.9	180	565	80.27	67.92	58.31	535.1	53.51	S
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.6	2.8	3	99.999	99.999	99.999	0.4	1.60	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.13	0.14	0.15	97.47	95.6	91.79	0.02	8.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.25	0.26	0.28	99.999	99.999	99.999	0.03	4.00	I

Table C-54 1028 – Coastal Region – AC with Bituminous Treated Base - Heat Capacity – AC – Layer-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	84.8	84.8	84.8	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	180	180	178	67.92	67.92	68	-2	-0.20	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	2.8	2.8	99.999	99.999	99.999	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.14	0.13	95.52	95.6	96.85	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	0.25	99.999	99.999	99.999	-0.01	-1.33	I

Table C-55 1028 – Coastal Region – AC with Bituminous Treated Base - Thermal Conductivity – AC – Layer-I

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	84.8	84.8	84.8	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	172	180	183	68.22	67.92	67.81	11	1.10	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.7	2.8	2.8	99.999	99.999	99.999	0.1	0.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.13	0.14	0.14	96.78	95.6	95.06	0.01	4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	0.26	99.999	99.999	99.999	0	0.00	I

Table C-56 1028 – Coastal Region – AC with Bituminous Treated Base - Air voids - AC – Layer-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	84.4	84.8	85.4	99.999	99.999	99.999	1	0.58	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	122	180	243	70.44	67.92	65.85	121	12.10	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	0.8	2.8	6	99.999	99.999	99.26	5.2	20.80	LS
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.12	0.14	0.16	98.03	95.6	89.99	0.04	16.00	I/LS
Permanent Deformation (Total Pavement) (in):	0.75	50	0.24	0.26	0.29	99.999	99.999	99.999	0.05	6.67	I

Table C-57 1028 – Coastal Region – AC with Bituminous Treated Base - Heat Capacity – AC – Layer-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	84.8	84.8	84.8	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	181	180	171	67.88	67.92	68.26	-10	-1.00	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	2.8	2.8	99.999	99.999	99.999	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.14	0.13	95.39	95.6	97.58	-0.01	-4.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	0.25	99.999	99.999	99.999	-0.01	-1.33	I

Table C-58 1028 – Coastal Region – AC with Bituminous Treated Base - Thermal Conductivity – AC – Layer-II

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	84.8	84.8	84.8	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	181	180	179	67.88	67.92	67.96	-2	-0.20	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	2.8	2.8	99.999	99.999	99.999	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.14	0.14	95.16	95.6	95.91	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	0.26	99.999	99.999	99.999	0	0.00	I

Table C-59 1028 – Coastal Region – AC with Bituminous Treated Base - Subgrade Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	84.9	84.8	84.7	99.999	99.999	99.999	-0.2	-0.12	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	301	180	88.5	64.24	67.92	72.5	-212.5	-21.25	LS
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	3.4	2.8	2.2	99.99	99.999	99.999	-1.2	-4.80	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.14	0.14	96.02	95.6	95.1	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	0.26	99.999	99.999	99.999	0	0.00	I

Table C-60 1028 – Coastal Region – AC with Bituminous Treated Base - Creep Compliance – Level1Vs3

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Level-1	Base	Level-1		%	
Terminal IRI (in/mi)	172	50	84.8	84.8	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	180	180	67.92	67.92	0	0.00	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	2.8	99.999	99.999	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.14	95.6	95.6	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	99.999	99.999	0	0.00	I

Table C-61 1028 – Coastal Region – AC with Bituminous Treated Base – Truck Growth Factor - 4Vs1.03

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Truck Growth Factor-1%	Base	Truck Growth Factor-1%		%	
Terminal IRI (in/mi)	172	50	84.8	84.7	99.999	99.999	-0.1	-0.06	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	180	117	67.92	70.73	-63	-6.30	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	2.1	99.999	99.999	-0.7	-2.80	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.12	95.6	98.24	-0.02	-8.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.24	99.999	99.999	-0.02	-2.67	I

Table C-62 1028 – Coastal Region – AC with Bituminous Treated Base - Base Vs Aug/Sep

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season1	Base	Season1		%	
Terminal IRI (in/mi)	172	50	84.8	84.8	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	180	176	67.92	68.07	-4	-0.40	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	2.8	99.999	99.999	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.14	95.6	96.16	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	99.999	99.999	0	0.00	I

Table C-63 1028 – Coastal Region – AC with Bituminous Treated Base - Base Vs Feb/Mar

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season2	Base	Season2		%	
Terminal IRI (in/mi)	172	50	84.8	85.1	99.999	99.999	0.3	0.17	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	180	179	67.92	67.96	-1	-0.10	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	2.8	99.999	99.999	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.14	95.6	95.6	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	99.999	99.999	0	0.00	I

Table C-64 1028 – Coastal Region – AC with Bituminous Treated Base -Base Vs May/Jun

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Season3	Base	Season3		%	
Terminal IRI (in/mi)	172	50	84.8	84.8	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	180	185	67.92	67.73	5	0.50	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	2.8	99.999	99.999	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.14	95.6	95.68	0	0.00	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	99.999	99.999	0	0.00	I

Table C-65 1028 – Coastal Region – AC with Bituminous Treated Base – Surface Shortwave Absorptivity

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	84.6	84.8	84.9	99.999	99.999	99.999	0.3	0.17	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	72.8	180	243	73.8	67.92	65.85	170.2	17.02	I/LS
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	1.9	2.8	3.2	99.999	99.999	99.99	1.3	5.20	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.08	0.14	0.18	99.97	95.6	84.9	0.1	40.00	S
Permanent Deformation (Total Pavement) (in):	0.75	50	0.19	0.26	0.3	99.999	99.999	99.999	0.11	14.67	I

Table C-66 1028 – Coastal Region – AC with Bituminous Treated Base - |E*| – Level1VsLevel2VsLevel3 – S9.5C

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Level3	Level2	Level1	Level3	Level2	Level1		%	
Terminal IRI (in/mi)	172	50	84.8	84.8	84.8	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	202	188	329	67.14	67.63	63.54	127	12.70	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.9	2.8	2.9	99.999	99.999	99.999	0	0.00	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.15	0.19	94.5	93.33	78.31	0.05	20.00	LS
Permanent Deformation (Total Pavement) (in):	0.75	50	0.27	0.27	0.32	99.999	99.999	99.999	0.05	6.67	I

Table C-67 1028 – Coastal Region – AC with Bituminous Treated Base - |E*| – Level1VsLevel2VsLevel3 – S9.5C0

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Level3	Level2	Level1	Level3	Level2	Level1			
Terminal IRI (in/mi)	172	50	84.8	84.8	84.8	99.999	99.999	99.999	0	0.00	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	178	163	288	67.98	68.57	64.59	110	11.00	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	2.7	2.9	99.999	99.999	99.999	0.1	0.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.14	0.19	96.11	95.24	80.71	0.05	20.00	LS
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	0.31	99.999	99.999	99.999	0.05	6.67	I

Table C-68 1028 – Coastal Region – AC with Bituminous Treated Base - |E*| – Level1VsLevel3 – S9.5C2

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Level-3	Level-1	Level-3	Level-1		%	
Terminal IRI (in/mi)	172	50	84.8	84.8	99.999	99.999	0	0.23	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	182	235	67.85	66.09	53	5.3	I
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	2.9	99.999	99.999	0.1	0.4	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50						0.00	I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.17	95.91	86.84	0.03	12	I
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.29	99.999	99.999	0.03	4	I

Table C-69 1028 – Coastal Region – AC with Bituminous Treated Base - |E*| - Level1VsLevel2VsLevel3 – S9.5C1

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Level3	Level2	Level1	Level3	Level2	Level1			
Terminal IRI (in/mi)	172	50	86	86	86.9	99.999	99.999	99.999	0.9	0.52	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	1150	1080	4260	47.3	48.55	8.65	3110	311.00	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.5	5.4	10.2	99.48	99.54	93.44	4.7	18.80	I/LS
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.12	0.12	0.46	98.25	98.57	2.87	0.34	136.00	ES
Permanent Deformation (Total Pavement) (in):	0.75	50	0.33	0.32	0.69	99.999	99.999	67.47	0.36	48.00	S

Table C-70 1028 – Coastal Region – AC with Bituminous Treated Base - |E*| – Level1VsLevel2VsLevel3 – S12.5C

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Level3	Level2	Level1	Level3	Level2	Level1			
Terminal IRI (in/mi)	172	50	84.9	84.8	84.8	99.999	99.999	99.999	-0.1	-0.06	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	244	244	1160	65.82	65.83	47.12	916	91.60	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	3.1	3	3	99.99	99.999	99.999	-0.1	-0.40	I
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.17	0.25	90.24	88.38	51.65	0.09	36.00	S
Permanent Deformation (Total Pavement) (in):	0.75	50	0.29	0.29	0.37	99.999	99.999	99.99	0.08	10.67	I

Table C-71 1028 – Coastal Region – AC with Bituminous Treated Base - |E*| – Level1VsLevel2VsLevel3 – B25C

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Level3	Level2	Level1	Level3	Level2	Level1			
Terminal IRI (in/mi)	172	50	84.8	84.8	84.3	99.999	99.999	99.999	-0.5	-0.29	I
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	177	158	10600	68.02	68.78	0.01	10423	1042.30	ES
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.7	2.5	100	99.999	99.999	0	97.3	389.20	ES
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	99.999	99.999	99.999	0	0.00	I
Chemically Stabilized Layer (Fatigue Fracture)	25	50									I
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.14	9.3	95.52	96.16	0	9.16	3664.00	ES
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	9.43	99.999	99.999	0	9.17	1222.67	ES

Table C-72 0201 – Piedmont – JPCP over Unbound Base – Coefficient of Thermal Expansion

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	69.2	80.4	204.6	99.99	99.85	24.3	135.4	78.72	VS/ES
Transverse Cracking (% slabs cracked)	15	50	0	3.7	88.4	99.93	97.17	0.04	88.4	589.33	ES
Mean Joint Faulting (in)	0.12	50	0.001	0.016	0.121	99.999	99.999	49.62	0.12	100.00	ES

Table C-73b 0201 – Piedmont – JPCP over Unbound Base - Heat Capacity – JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	93.4	80.4	75.5	99.3	99.85	99.93	-17.9	-10.41	I
Transverse Cracking (% slabs cracked)	15	50	18.5	3.7	0.1	36.9	97.17	99.92	-18.4	-122.67	ES
Mean Joint Faulting (in)	0.12	50	0.018	0.016	0.012	99.999	99.999	99.999	-0.006	-5.00	I

Table C-74 0201 – Piedmont – JPCP over Unbound Base – Load Transfer Efficiency - JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	87	80.4	75.4	99.64	99.85	99.93	-11.6	-6.74	I
Transverse Cracking (% slabs cracked)	15	50	9.7	3.7	0.3	75	97.17	99.89	-9.4	-62.67	VS
Mean Joint Faulting (in)	0.12	50	0.019	0.016	0.012	99.99	99.999	99.999	-0.007	-5.83	I

Table C-75 0201 – Piedmont – JPCP over Unbound Base - Thermal Conductivity – JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	123.9	80.4	75.8	90.67	99.85	99.93	-48.1	-27.97	LS
Transverse Cracking (% slabs cracked)	15	50	40.9	3.7	0.7	5.16	97.17	99.82	-40.2	-268.00	ES
Mean Joint Faulting (in)	0.12	50	0.041	0.016	0.012	98.17	99.999	99.999	-0.029	-24.17	LS

Table C-76 0201 – Piedmont – JPCP over Unbound Base - Unit Weight - JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	83.1	80.4	75.8	99.76	99.85	99.94	-7.3	-4.24	I
Transverse Cracking (% slabs cracked)	15	50	4.4	3.7	2.4	95.73	97.17	98.91	-2	-13.33	I
Mean Joint Faulting (in)	0.12	50	0.02	0.016	0.009	99.99	99.999	99.999	-0.011	-9.17	I

Table C-77 0201 – Piedmont – JPCP over Unbound Base - Heat Capacity – Chemically stabilized Material

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	80.3	80.4	83	99.85	99.85	99.78	2.7	1.57	I
Transverse Cracking (% slabs cracked)	15	50	3.6	3.7	5.8	97.34	97.17	91.77	2.2	14.66	I
Mean Joint Faulting (in)	0.12	50	0.016	0.016	0.018	99.999	99.999	99.999	0.002	1.67	I

Table C-78 0201 – Piedmont – JPCP over Unbound Base - Thermal Conductivity – Chemically stabilized Material

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	79.7	80.4	82.7	99.86	99.85	99.81	3	1.74	I
Transverse Cracking (% slabs cracked)	15	50	2.2	3.7	7.1	99.08	97.17	86.92	4.9	32.67	LS
Mean Joint Faulting (in)	0.12	50	0.017	0.016	0.015	99.999	99.999	99.999	-0.002	-1.67	I

Table C-79 0201 – Piedmont – JPCP over Unbound Base - Joint Spacing

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	76.4	80.4	135.5	99.86	99.85	85.33	59.1	34.36	LS
Transverse Cracking (% slabs cracked)	15	50	0	3.7	65.9	99.93	97.17	0.53	65.9	439.34	ES
Mean Joint Faulting (in)	0.12	50	0.009	0.016	0.032	99.999	99.999	99.54	0.023	19.17	I/LS

Table C-80 0201 – Piedmont – JPCP over Unbound Base – Granular Base Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	80.4	80.4	80.5	99.85	99.85	99.85	0.1	0.06	I
Transverse Cracking (% slabs cracked)	15	50	3.7	3.7	3.8	97.17	97.17	96.98	0.1	0.67	I
Mean Joint Faulting (in)	0.12	50	0.016	0.016	0.016	99.999	99.999	99.999	0	0.00	I

Table C-81 0201 – Piedmont – JPCP over Unbound Base - Subgrade Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	80.5	80.4	80.4	99.85	99.85	99.85	-0.1	-0.06	I
Transverse Cracking (% slabs cracked)	15	50	3.7	3.7	3.8	97.17	97.17	96.98	0.1	0.67	I
Mean Joint Faulting (in)	0.12	50	0.016	0.016	0.016	99.999	99.999	99.999	0	0.00	I

Table C-82 0201 – Piedmont – JPCP over Unbound Base – Surface Shortwave Absorptivity

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	74.1	80.4	91.2	99.95	99.85	99.43	17.1	9.94	I
Transverse Cracking (% slabs cracked)	15	50	0	3.7	14.7	99.93	97.17	51.28	14.7	98	ES
Mean Joint Faulting (in)	0.12	50	0.01	0.016	0.02	99.999	99.999	99.99	0.01	8.34	I

Table C-83 0201 – Piedmont – JPCP over Unbound Base - Dowell Diameter

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	80.4	156.7	99.85	62.57	76.3	44.36	S
Transverse Cracking (% slabs cracked)	15	50	3.7	3.7	97.17	97.17	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.016	0.162	99.999	28.47	0.146	121.67	ES

Table C-84 0201 – Piedmont – JPCP over Unbound Base - Unit Weight – Chemically stabilized Material

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	80.4	80.4	99.85	99.85	0	0.00	I
Transverse Cracking (% slabs cracked)	15	50	3.7	3.7	97.17	97.17	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.016	0.016	99.999	99.999	0	0.00	I

Table C-85 0201 – Piedmont – JPCP over Unbound Base - Base Vs Dec/Jan

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	80.4	78.1	99.85	99.9	-2.3	-1.34	I
Transverse Cracking (% slabs cracked)	15	50	3.7	3.3	97.17	97.82	-0.4	-2.67	I
Mean Joint Faulting (in)	0.12	50	0.016	0.012	99.999	99.999	-0.004	-3.34	I

Table C-86 0201 – Piedmont – JPCP over Unbound Base - Base Vs Mar/Apr

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	80.4	78.5	99.85	99.89	-1.9	-1.10	I
Transverse Cracking (% slabs cracked)	15	50	3.7	3.3	97.17	97.82	-0.4	-2.67	I
Mean Joint Faulting (in)	0.12	50	0.016	0.013	99.999	99.999	-0.003	-2.5	I

Table C-87 0201 – Piedmont – JPCP over Unbound Base - Base Vs Sep/Oct

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	80.4	79.7	99.85	99.86	-0.7	-0.41	I
Transverse Cracking (% slabs cracked)	15	50	3.7	3.3	97.17	97.82	-0.4	-2.67	I
Mean Joint Faulting (in)	0.12	50	0.016	0.015	99.999	99.999	-0.001	0.83	I

Table C-88 0209 – Piedmont – JPCP over Bituminous Treated Base – Coefficient of Thermal Expansion

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	66.1	71.7	148.7	99.99	99.97	72.97	82.6	48.02	S
Transverse Cracking (% slabs cracked)	15	50	0.2	3.1	74.4	99.91	98.11	0.21	74.2	494.67	ES
Mean Joint Faulting (in)	0.12	50	0	0.005	0.042	99.999	99.999	97.94	0.042	35	LS

Table C-89 0209 – Piedmont – JPCP over Bituminous Treated Base - Heat Capacity – JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	73.8	71.7	68.5	99.96	99.97	99.98	-5.3	-3.08	I
Transverse Cracking (% slabs cracked)	15	50	6.9	3.1	0.7	87.73	98.11	99.82	-6.2	-41.34	S
Mean Joint Faulting (in)	0.12	50	0.004	0.005	0.004	99.999	99.999	99.999	0	0.00	I

Table C-90 0209 – Piedmont – JPCP over Bituminous Treated Base – Load Transfer Efficiency - JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	75.5	71.7	67.5	99.94	99.97	99.99	-8	-4.65	I
Transverse Cracking (% slabs cracked)	15	50	8.2	3.1	0.2	82.13	98.11	99.91	-8	-53.34	S
Mean Joint Faulting (in)	0.12	50	0.006	0.005	0.003	99.999	99.999	99.999	-0.003	-2.5	I

Table C-91 0209 – Piedmont – JPCP over Bituminous Treated Base - Thermal Conductivity – JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	127.1	71.7	68.1	90.51	99.97	99.98	-59	-34.30	LS
Transverse Cracking (% slabs cracked)	15	50	66.4	3.1	0.5	0.51	98.11	99.86	-65.9	-439.34	ES
Mean Joint Faulting (in)	0.12	50	0.013	0.005	0.004	99.999	99.999	99.999	-0.009	-7.5	I

Table C-92 0209 – Piedmont – JPCP over Bituminous Treated Base - Heat Capacity – Chemically stabilized Material

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	71.7	71.7	72.6	99.97	99.97	99.97	0.9	0.52	I
Transverse Cracking (% slabs cracked)	15	50	3.1	3.1	4.1	98.11	98.11	96.39	1	6.67	I
Mean Joint Faulting (in)	0.12	50	0.004	0.005	0.005	99.999	99.999	99.999	0.001	0.83	I

Table C-93 0209 – Piedmont – JPCP over Bituminous Treated Base - Thermal Conductivity – Chemically stabilized Material

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	71.3	71.7	73.6	99.97	99.97	99.96	2.3	1.34	I
Transverse Cracking (% slabs cracked)	15	50	1.8	3.1	5.6	99.37	98.11	92.43	3.8	25.34	LS
Mean Joint Faulting (in)	0.12	50	0.006	0.005	0.004	99.999	99.999	99.999	-0.002	-1.67	I

Table C-94 0209 – Piedmont – JPCP over Bituminous Treated Base - Joint Spacing

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	68.7	71.7	83.2	99.97	99.97	99.86	14.5	8.43	I
Transverse Cracking (% slabs cracked)	15	50	0.1	3.1	17.6	99.92	98.11	39.95	17.5	116.67	ES
Mean Joint Faulting (in)	0.12	50	0.004	0.005	0.007	99.999	99.999	99.999	0.003	0.25	I

Table C-95 0209 – Piedmont – JPCP over Bituminous Treated Base – Granular Base Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	71.8	71.7	71.7	99.97	99.97	99.97	-0.1	-0.06	I
Transverse Cracking (% slabs cracked)	15	50	3.2	3.1	3.1	97.97	98.11	98.11	-0.1	-0.67	I
Mean Joint Faulting (in)	0.12	50	0.005	0.005	0.004	99.999	99.999	99.999	-0.001	0.83	I

Table C-96 0209 – Piedmont – JPCP over Bituminous Treated Base - Subgrade Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	72	71.7	71.6	99.97	99.97	99.97	-0.4	-0.23	I
Transverse Cracking (% slabs cracked)	15	50	3.3	3.1	3	97.82	98.11	98.24	-0.3	-2	I
Mean Joint Faulting (in)	0.12	50	0.005	0.005	0.004	99.999	99.999	99.999	-0.001	0.83	I

Table C-97 0209 – Piedmont – JPCP over Bituminous Treated Base – Surface Shortwave Absorptivity

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	68.6	71.7	76.8	99.98	99.97	99.94	8.2	4.77	I
Transverse Cracking (% slabs cracked)	15	50	0.1	3.1	8.6	99.92	98.11	80.28	8.5	56.67	S/VS
Mean Joint Faulting (in)	0.12	50	0.003	0.005	0.006	99.999	99.999	99.999	0.003	0.25	I

Table C-98 0209 – Piedmont – JPCP over Bituminous Treated Base - Dowell Diameter

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	71.7	118	99.97	90.75	46.3	26.92	LS
Transverse Cracking (% slabs cracked)	15	50	3.1	3.1	98.11	98.11	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.005	0.095	99.999	67.3	0.09	75	ES

Table C-99 0209 – Piedmont – JPCP over Bituminous Treated Base – Heat Capacity – Asphalt Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	72.2	71.7	74.9	99.97	99.97	99.95	2.7	1.57	I
Transverse Cracking (% slabs cracked)	15	50	3.6	3.1	6.7	97.34	98.11	88.52	3.1	20.67	LS
Mean Joint Faulting (in)	0.12	50	0.005	0.005	0.005	99.999	99.999	99.999	0	0.00	I

Table C-100 0209 – Piedmont – JPCP over Bituminous Treated Base - Thermal Conductivity - Asphalt Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	71.5	71.7	72.1	99.97	99.97	99.97	0.6	0.35	I
Transverse Cracking (% slabs cracked)	15	50	2.5	3.1	3.5	98.81	98.11	97.51	1	6.67	I
Mean Joint Faulting (in)	0.12	50	0.005	0.005	0.005	99.999	99.999	99.999	0	0.00	I

Table C-101 0209 – Piedmont – JPCP over Bituminous Treated Base - Air voids – Asphalt Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	72.4	72.2	71.7	99.97	99.97	99.97	-0.7	-0.41	I
Transverse Cracking (% slabs cracked)	15	50	3.8	3.7	3.1	96.98	97.17	98.11	-0.7	-4.67	I
Mean Joint Faulting (in)	0.12	50	0.005	0.005	0.005	99.999	99.999	99.999	0	0.00	I

Table C-102 0209 – Piedmont – JPCP over Bituminous Treated Base - NCDOT W/C vs. Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	71.7	70.5	99.97	99.98	-1.2	-0.70	I
Transverse Cracking (% slabs cracked)	15	50	3.1	2.9	98.11	98.37	-0.2	-1.34	I
Mean Joint Faulting (in)	0.12	50	0.005	0.004	99.999	99.999	-0.001	0.83	I

Table C-103 0209 – Piedmont – JPCP over Bituminous Treated Base - Base Vs Dec/Jan

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	71.7	70.6	99.97	99.98	-1.1	-0.64	I
Transverse Cracking (% slabs cracked)	15	50	3.1	1.6	98.11	99.48	-1.5	-10	I
Mean Joint Faulting (in)	0.12	50	0.005	0.005	99.999	99.999	0	0.00	I

Table C-104 0209 – Piedmont – JPCP over Bituminous Treated Base - Base Vs Mar/Apr

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	71.7	71.3	99.97	99.97	-0.4	-0.23	I
Transverse Cracking (% slabs cracked)	15	50	3.1	2.4	98.11	98.91	-0.7	-4.67	I
Mean Joint Faulting (in)	0.12	50	0.005	0.005	99.999	99.999	0	0.00	I

Table C-105 0209 – Piedmont – JPCP over Bituminous Treated Base - Base Vs Sep/Oct

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	71.7	71.2	99.97	99.97	-0.5	-0.29	I
Transverse Cracking (% slabs cracked)	15	50	3.1	2.3	98.11	99	-0.8	-5.34	I
Mean Joint Faulting (in)	0.12	50	0.005	0.005	99.999	99.999	0	0.00	I

Table C-106 3011 – Coastal – JPCP over Bituminous Treated Base – Coefficient of Thermal Expansion

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	66	74.4	141.5	99.99	99.91	74.93	75.5	43.90	S
Transverse Cracking (% slabs cracked)	15	50	0	0	3	99.93	99.93	98.24	3	20	LS
Mean Joint Faulting (in)	0.12	50	0	0.02	0.14	99.999	99.99	38.59	0.14	116.67	ES

Table C-107 3011 – Coastal – JPCP over Bituminous Treated Base - Heat Capacity – JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	76.8	74.4	74.3	99.88	99.91	99.93	-2.5	-1.45	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.021	0.02	0.016	99.98	99.99	99.999	-0.005	-4.17	I

Table C-108 3011 – Coastal – JPCP over Bituminous Treated Base – Load Transfer Efficiency- JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	77.9	74.4	73.3	99.85	99.91	99.94	-4.6	-2.67	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.023	0.02	0.014	99.95	99.99	99.999	-0.009	-7.5	I

Table C-109 3011 – Coastal – JPCP over Bituminous Treated Base - Thermal Conductivity – JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	91.8	74.4	74.9	99.05	99.91	99.91	-16.9	-9.83	I
Transverse Cracking (% slabs cracked)	15	50	7	0	0	87.33	99.93	99.93	-7	-46.67	S
Mean Joint Faulting (in)	0.12	50	0.039	0.02	0.018	98.63	99.99	99.999	-0.021	-17.5	I/LS

Table C-110 3011 – Coastal – JPCP over Bituminous Treated Base - Air voids – Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	74.4	74.4	74.4	99.91	99.91	99.91	0	0.00	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.02	0.02	0.02	99.99	99.99	99.99	0	0.00	I

Table C-111 3011 – Coastal – JPCP over Bituminous Treated Base - Heat Capacity – Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	74.4	74.4	74.9	99.91	99.91	99.9	0.5	0.29	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.02	0.02	0.021	99.99	99.99	99.98	0.001	0.83	I

Table C-112 3011 – Coastal – JPCP over Bituminous Treated Base - Thermal Conductivity – Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	74.8	74.4	74.3	99.9	99.91	99.91	-0.5	-0.29	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.021	0.02	0.02	99.98	99.99	99.99	-0.001	0.83	I

Table C-113 3011 – Coastal – JPCP over Bituminous Treated Base - Joint Spacing

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	72.6	74.4	84.1	99.91	99.91	99.7	11.5	6.69	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0.5	99.93	99.93	99.86	0.5	3.34	I
Mean Joint Faulting (in)	0.12	50	0.009	0.02	0.046	99.999	99.99	96.92	0.037	30.83	LS

Table C-114 3011 – Coastal – JPCP over Bituminous Treated Base - Dowell Diameter

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	104.2	74.4	70.3	96.21	99.91	99.97	-33.9	-19.71	I/LS
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.073	0.02	0.009	82.54	99.99	99.999	-0.064	-53.34	S

Table C-115 3011 – Coastal – JPCP over Bituminous Treated Base - SG – Layer -1- Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	74.6	74.4	74.2	99.91	99.91	99.91	-0.4	-0.23	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.02	0.02	0.019	99.99	99.99	99.99	-0.001	-0.83	I

Table C-116 3011 – Coastal – JPCP over Bituminous Treated Base - SG Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	74.5	74.4	74.4	99.91	99.91	99.91	-0.1	-0.06	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.02	0.02	0.02	99.99	99.99	99.99	0	0.00	I

Table C-117 3011 – Coastal – JPCP over Bituminous Treated Base – Surface Shortwave Absorptivity

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	74.1	74.4	78	99.93	99.91	99.84	3.9	2.27	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.016	0.02	0.023	99.999	99.99	99.95	0.007	5.83	I

Table C-118 3011 – Coastal – JPCP over Bituminous Treated Base - Mile post – 10 miles

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	74.4	76.2	99.91	99.89	1.8	1.05	I
Transverse Cracking (% slabs cracked)	15	50	0	0	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.02	0.02	99.99	99.99	0	0.00	I

Table C-119 3011 – Coastal – JPCP over Bituminous Treated Base - No Mile post

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	74.4	74.4	99.91	99.91	0	0.00	I
Transverse Cracking (% slabs cracked)	15	50	0	0	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.02	0.02	99.99	99.99	0	0.00	I

Table C-120 3011 – Coastal – JPCP over Bituminous Treated Base - Base Vs Dec/Jan

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	74.4	69.9	99.91	99.97	-4.5	-2.62	I
Transverse Cracking (% slabs cracked)	15	50	0	0	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.02	0.008	99.99	99.999	-0.012	-10.00	I

Table C-121 3011 – Coastal – JPCP over Bituminous Treated Base - Base Vs Mar/Apr

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	74.4	71	99.91	99.96	-3.4	-1.98	I
Transverse Cracking (% slabs cracked)	15	50	0	0	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.02	0.01	99.99	99.999	-0.01	-8.33	I

Table C-122 3011 – Coastal – JPCP over Bituminous Treated Base -Base Vs Jun/Jul

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	74.4	77.2	99.91	99.87	2.8	1.63	I
Transverse Cracking (% slabs cracked)	15	50	0	0	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.02	0.022	99.99	99.97	0.002	1.67	I

Table C-123 3011 – Coastal – JPCP over Bituminous Treated Base – Truck Growth Factor – 4 Vs 1

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	74.4	73.2	99.91	99.94	-1.2	-0.70	I
Transverse Cracking (% slabs cracked)	15	50	0	0	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.02	0.014	99.99	99.999	-0.006	-5.00	I

Table C-124 3816 – Piedmont – JPCP over Non-Bituminous Treated Base – Coefficient of Thermal Expansion

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	65.1	67.2	90.8	99.99	99.99	98.97	25.7	14.94	I
Transverse Cracking (% slabs cracked)	15	50	0	0	1	99.93	99.93	99.74	1	6.67	I
Mean Joint Faulting (in)	0.12	50	0	0.004	0.048	99.999	99.999	96.23	0.048	40	S

Table C-125 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Heat Capacity – JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	67.6	67.2	66.7	99.98	99.99	99.99	-0.9	-0.52	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.005	0.004	0.003	99.999	99.999	99.999	-0.002	-1.67	I

Table C-126 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Load Transfer Efficiency - JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	67.7	67.2	66.6	99.98	99.99	99.99	-1.1	-0.64	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.005	0.004	0.003	99.999	99.999	99.999	-0.002	-1.67	I

Table C-127 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Thermal Conductivity – JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	71.7	67.2	66.6	99.96	99.99	99.99	-5.1	-2.97	I
Transverse Cracking (% slabs cracked)	15	50	1.2	0	0	99.67	99.93	99.93	-1.2	-8	I
Mean Joint Faulting (in)	0.12	50	0.011	0.004	0.003	99.999	99.999	99.999	-0.008	-6.67	I

Table C-128 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Heat Capacity – Chemically Stabilized Material

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	67.2	67.2	67.8	99.99	99.99	99.98	0.6	0.35	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.004	0.004	0.005	99.999	99.999	99.999	0.001	0.83	I

Table C-129 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Thermal Conductivity – Chemically Stabilized Material

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	69.9	67.2	69.2	99.98	99.99	99.98	-0.7	-0.41	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.005	0.004	0.004	99.999	99.999	99.999	-0.001	0.83	I

Table C-130 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Joint Spacing

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	66.6	67.2	69.9	99.98	99.99	99.98	3.3	1.92	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0.3	99.93	99.93	99.89	0.3	2	I
Mean Joint Faulting (in)	0.12	50	0.002	0.004	0.012	99.999	99.999	99.999	0.01	8.34	I

Table C-131 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Subgrade – 1 - Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	67.3	67.2	67.1	99.98	99.99	99.99	-0.2	-0.12	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.004	0.004	0.004	99.999	99.999	99.999	0	0.00	I

Table C-132 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Subgrade Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	67.2	67.2	67.2	99.99	99.99	99.99	0	0.00	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.004	0.004	0.004	99.999	99.999	99.999	0	0.00	I

Table C-133 3816 – Piedmont – JPCP over Non-Bituminous Treated Base – Surface Shortwave Absorptivity

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	66.6	67.2	67.6	99.99	99.99	99.98	1	0.58	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.003	0.004	0.005	99.999	99.999	99.999	0.002	1.67	I

Table C-134 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Dowell Diameter

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	68.3	67.2	66.3	99.98	99.99	99.99	-2	-1.16	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.006	0.004	0.002	99.999	99.999	99.999	-0.004	-3.34	I

Table C-135 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Unit Weight - Chemically Stabilized Material

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	67.2	67.2	67.2	99.99	99.99	99.99	0	0.00	I
Transverse Cracking (% slabs cracked)	15	50	0	0	0	99.93	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.004	0.004	0.004	99.999	99.999	99.999	0	0.00	I

Table C-136 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Base Vs Jan/Feb

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	67.2	68.4	99.99	99.99	1.2	0.70	I
Transverse Cracking (% slabs cracked)	15	50	0	0	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.004	0.002	99.999	99.999	-0.002	-1.67	I

Table C-137 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Base Vs Jul/Aug

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	67.2	70.8	99.99	99.97	3.6	2.09	I
Transverse Cracking (% slabs cracked)	15	50	0	0	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.004	0.007	99.999	99.999	0.003	2.5	I

Table C-138 3816 – Piedmont – JPCP over Non-Bituminous Treated Base - Base Vs Oct/Nov

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	67.2	69.1	99.99	99.98	1.9	1.10	I
Transverse Cracking (% slabs cracked)	15	50	0	0	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.004	0.004	99.999	99.999	0	0.00	I

Table C-139 3816 – Piedmont – JPCP over Non-Bituminous Treated Base – Truck Growth Factor 4 Vs 1.1

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	67.2	69.4	99.99	99.98	2.2	1.28	I
Transverse Cracking (% slabs cracked)	15	50	0	0	99.93	99.93	0	0.00	I
Mean Joint Faulting (in)	0.12	50	0.004	0.004	99.999	99.999	0	0.00	I

Table C-140 5827 – Piedmont – CRCP Over Unbound Base – Coefficient of Thermal Expansion

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	63.7	65.4	80.2	99.999	99.999	99.94	16.5	9.59	I
CRCP Punch outs (per mi)	10	50	0	0.9	8.4	99.999	99.2	56.84	8.4	84	ES

Table C-141 5827 – Piedmont – CRCP Over Unbound Base - Heat Capacity – JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	65.3	65.4	65.5	99.999	99.999	99.999	0.2	0.12	I
CRCP Punch outs (per mi)	10	50	0.8	0.9	0.9	99.34	99.2	99.08	0.1	1	I

Table C-142 5827 – Piedmont – CRCP Over Unbound Base - Bar Diameter

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	65.4	65.4	66.2	99.999	99.999	99.999	0.8	0.47	I
CRCP Punch outs (per mi)	10	50	0.9	0.9	1.3	99.2	99.2	97.65	0.4	4	I

Table C-143 5827 – Piedmont – CRCP Over Unbound Base - Thermal Conductivity – JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	69.7	65.4	64.7	99.999	99.999	99.999	-5	-2.91	I
CRCP Punch outs (per mi)	10	50	3	0.9	0.5	86.98	99.2	99.9	-2.5	-25	LS

Table C-144 5827 – Piedmont – CRCP Over Unbound Base - Percent Steel

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change %	Sensitivity
			Min	Base	Max	Min	Base	Max			
Terminal IRI (in/mi)	172	50	65.5	65.4	65.4	99.999	99.999	99.999	-0.1	-0.06	I
CRCP Punch outs (per mi)	10	50	0.9	0.9	0.9	99.1	99.2	99.2	0	0.00	I

Table C-145 5827 – Piedmont – CRCP Over Unbound Base - Steel Depth

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	65.4	65.4	99.999	99.999	0	0.00	I
CRCP Punch outs (per mi)	10	50	0.9	0.9	99.2	99.19	0	0.00	I

Table C-146 5827 – Piedmont – CRCP Over Unbound Base – Granular Base Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	65.4	65.4	65.4	99.999	99.999	99.999	0	0.00	I
CRCP Punch outs (per mi)	10	50	0.8	0.9	0.9	99.21	99.2	99.18	0.1	1	I

Table C-147 5827 – Piedmont – CRCP Over Unbound Base - Subgrade Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	65.2	65.4	65.7	99.999	99.999	99.999	0.5	0.29	I
CRCP Punch outs (per mi)	10	50	0.7	0.9	1	99.49	99.2	98.68	0.3	3	I

Table C-148 5827 – Piedmont – CRCP Over Unbound Base – Surface Shortwave Absorptivity

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	64.5	65.4	65.8	99.999	99.999	99.999	1.3	0.76	I
CRCP Punch outs (per mi)	10	50	0.4	0.9	1.1	99.95	99.2	98.46	0.7	7	I

Table C-149 5827 – Piedmont – CRCP Over Unbound Base - Asphalt Tied

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	65.4	65.4	99.999	99.999	0	0.00	I
CRCP Punch outs (per mi)	10	50	0.9	0.9	99.2	99.19	0	0.00	I

Table C-150 5827 – Piedmont – CRCP Over Unbound Base - Gravel Shoulder

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	65.4	65.4	99.999	99.999	0	0.00	I
CRCP Punch outs (per mi)	10	50	0.9	0.9	99.2	99.19	0	0.00	I

Table C-151 5827 – Piedmont – CRCP Over Unbound Base – Base Vs Dec/Jan

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	65.4	65.3	99.999	99.999	-0.1	-0.06	I
CRCP Punch outs (per mi)	10	50	0.9	0.8	99.2	99.36	-0.1	-1	I

Table C-152 5827 – Piedmont – CRCP Over Unbound Base - Base Vs Jun/Jul

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	65.4	65.4	99.999	99.999	0	0.00	I
CRCP Punch outs (per mi)	10	50	0.9	0.9	99.2	99.19	0	0.00	I

Table C-153 5827 – Piedmont – CRCP Over Unbound Base - Base Vs Sep/Oct

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	65.4	65.3	99.999	99.999	-0.1	-0.06	I
CRCP Punch outs (per mi)	10	50	0.9	0.8	99.2	99.28	-0.1	-1	I

Table C-154 5827 – Piedmont – CRCP Over Unbound Base – Truck Growth Factor – 4 Vs 1.1

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	65.4	65.4	99.999	99.999	0	0.00	I
CRCP Punch outs (per mi)	10	50	0.9	0.8	99.2	99.23	-0.1	-1	I

Table C-155 5037 – Mountainous Region – CRCP Over Unbound Base – Coefficient of Thermal Expansion

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	63.5	64.8	78.6	99.999	99.999	99.96	15.1	8.78	I
CRCP Punch outs (per mi)	10	50	0	0.7	7.7	99.999	99.58	60.2	7.7	77	VS

Table C-156 5037 – Mountainous Region – CRCP Over Unbound Base - Heat Capacity – CRCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	64.8	64.8	64.9	99.999	99.999	99.999	0.1	0.06	I
CRCP Punch outs (per mi)	10	50	0.7	0.7	0.7	99.64	99.58	99.56	0	0.00	I

Table C-157 5037 – Mountainous Region – CRCP Over Unbound Base - Bar Diameter

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	64.8	64.8	97.5	99.999	99.999	98.32	32.7	19.01	I/LS
CRCP Punch outs (per mi)	10	50	0.7	0.7	17.4	99.58	99.58	26.98	16.7	167	ES

Table C-158 5037 – Mountainous Region – CRCP Over Unbound Base - Thermal Conductivity – JPCP

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	68.4	64.8	64.3	99.999	99.999	99.999	-4.1	-2.38	I
CRCP Punch outs (per mi)	10	50	2.5	0.7	0.4	90.42	99.58	99.94	-2.1	-21	LS

Table C-159 5037 – Mountainous Region – CRCP Over Unbound Base - Percent Steel

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	108.7	64.8	64.8	95.06	99.999	99.999	-43.9	-25.52	LS
CRCP Punch outs (per mi)	10	50	23.1	0.7	0.7	16.46	99.58	99.58	-22.4	-224	ES

Table C-160 5037 – Mountainous Region – CRCP Over Unbound Base - Steel Depth

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	64.8	64.8	65	99.999	99.999	99.999	0.2	0.12	I
CRCP Punch outs (per mi)	10	50	0.7	0.7	0.8	99.58	99.58	99.42	0.1	1	I

Table C-161 5037 – Mountainous Region – CRCP Over Unbound Base – Granular Base Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	64.9	64.8	64.8	99.999	99.999	99.999	-0.1	-0.06	I
CRCP Punch outs (per mi)	10	50	0.7	0.7	0.7	99.54	99.58	99.62	0	0.00	I

Table C-162 5037 – Mountainous Region – CRCP Over Unbound Base - Subgrade Modulus

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	64.8	64.8	64.9	99.999	99.999	99.999	0.1	0.06	I
CRCP Punch outs (per mi)	10	50	0.7	0.7	0.8	99.66	99.58	99.44	0.1	1	I

Table C-163 5037 – Mountainous Region – CRCP Over Unbound Base – Surface Shortwave Absorptivity

Performance Criteria	Distress Target	Reliability Target	Distress Predicted			Reliability Predicted			Change in Distress	Percent Change	Sensitivity
			Min	Base	Max	Min	Base	Max		%	
Terminal IRI (in/mi)	172	50	64.3	64.8	65.1	99.999	99.999	99.999	0.8	0.47	I
CRCP Punch outs (per mi)	10	50	0.5	0.7	0.9	99.93	99.58	99.17	0.4	4	I

Table C-164 5037 – Mountainous Region – CRCP Over Unbound Base - Asphalt Tied

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	64.8	65.1	99.999	99.999	0.3	0.17	I
CRCP Punch outs (per mi)	10	50	0.7	0.8	99.58	99.29	0.1	1	I

Table C-165 5037 – Mountainous Region – CRCP Over Unbound Base - Gravel Shoulder

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change	Sensitivity
			Base	Max	Base	Max		%	
Terminal IRI (in/mi)	172	50	64.8	65.1	99.999	99.999	0.3	0.17	I
CRCP Punch outs (per mi)	10	50	0.7	0.8	99.58	99.29	0.1	1	I

Table C-166 5037 – Mountainous Region – CRCP Over Unbound Base - Base Vs Apr/May

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	64.8	64.7	99.999	99.999	-0.1	-0.06	I
CRCP Punch outs (per mi)	10	50	0.7	0.6	99.58	99.71	-0.1	-1	I

Table C-167 5037 – Mountainous Region – CRCP Over Unbound Base - Base Vs Jan/Feb

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	64.8	64.7	99.999	99.999	-0.1	-0.06	I
CRCP Punch outs (per mi)	10	50	0.7	0.6	99.58	99.71	-0.1	-1	I

Table C-168 5037 – Mountainous Region – CRCP Over Unbound Base - Base Vs Jul/Aug

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	64.8	64.8	99.999	99.999	0	0.00	I
CRCP Punch outs (per mi)	10	50	0.7	0.7	99.58	99.62	0	0.00	I

Table C-169 5037 – Mountainous Region – CRCP Over Unbound Base – Truck Growth Factor– 4 Vs1.1

Performance Criteria	Distress Target	Reliability Target	Distress Predicted		Reliability Predicted		Change in Distress	Percent Change %	Sensitivity
			Base	Max	Base	Max			
Terminal IRI (in/mi)	172	50	64.8	64.8	99.999	99.999	0	0.00	I
CRCP Punch outs (per mi)	10	50	0.7	0.7	99.58	99.63	0	0.00	I

1.1.2 Traffic Sensitivity

Table C-170 Functional Classification – 1 - 3011 – Coastal Region – JPCP Over Bituminous Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted					Reliability Predicted					Comparison of Scenarios									
			1	2	3	4	5	1	2	3	4	5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Terminal IRI (in/mi)	172	50	74.4	74.8	75.1	73.1	72.1	99.9	99.9	99.9	99.9	100	-0.2	-0.4	0.76	1.34	-0.2	0.99	1.57	1.16	1.74	0.58
Transverse Cracking (% slabs cracked)	15	50	0	0	0	0	0	99.9	99.9	99.9	99.9	99.9	0	0	0	0	0	0	0	0	0	0
Mean Joint Faulting (in)	0.12	50	0.02	0.02	0.02	0.01	0.01	100	100	100	100	100	2.5	1.67	5	6.67	-0.8	2.5	4.17	3.33	5	1.67

Table C-171 Functional Classification – 1 – 5826 – Mountainous Region – CRCP Over Unbound Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted					Reliability Predicted					Comparison of Scenarios									
			1	2	3	4	5	1	2	3	4	5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Terminal IRI (in/mi)	172	50	70.1	73.6	73.6	72	72.1	100	100	100	100	100	-2.03	-2.03	-1.1	-1.16	0	0.93	0.87	0.93	0.87	-0.06
CRCP Punch outs (per mi)	10	50	3.2	5	5	4.2	4.3	99.9	74.7	74.8	79.5	79.2	-18	-18	-10	-11	0	8	7	8	7	-1

Table C-172 Functional Classification – 2 – 0201 – Piedmont Region – JPCP Over Unbound Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted					Reliability Predicted					Comparison of Scenarios									
			1	2	3	4	5	1	2	3	4	5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Terminal IRI (in/mi)	172	50	80.4	76.4	75.5	74.7	75.2	99.9	99.9	99.9	99.9	99.9	2.33	2.85	3.31	3.02	0.52	0.99	0.7	0.47	0.17	-0.3
Transverse Cracking (% slabs cracked)	15	50	3.7	0.8	0.6	0.4	0.4	99.9	99.8	99.8	99.9	99.9	19.3	20.7	22	22	1.33	2.67	2.67	1.33	1.33	0
Mean Joint Faulting (in)	0.12	50	0.02	0.01	0.01	0.01	0.01	100	100	100	100	100	2.5	3.33	5	4.17	0.83	2.5	1.67	1.67	0.83	-0.8

Table C-173 Functional Classification – 2 – 1028 – Coastal Region – AC with Bituminous Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted					Reliability Predicted					Comparison of Scenarios									
			1	2	3	4	5	1	2	3	4	5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Terminal IRI (in/mi)	172	50	84.8	84.6	84.6	84.6	84.6	98.2	100	100	100	100	0.12	0.12	0.12	0.12	0.00	0.00	0	0	0	0
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	180	80.3	74.4	61.3	84.2	92.4	73.1	73.6	75	72.83	9.97	10.56	11.87	9.58	0.59	1.90	-0.39	1.31	-0.98	-2.29
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	2.8	1.8	1.8	1.5	1.8	99.1	100	100	100	100	4.00	4.00	5.20	4.00	0.00	1.20	0	1.2	0	-1.2
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	1	1	100	100	100	100	100	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0
Chemically Stabilized Layer (Fatigue Fracture)	25	50											0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Permanent Deformation (AC Only) (in):	0.25	50	0.14	0.14	0.14	0.14	0.18	90.1	94.6	95.7	95.9	82.3	0.00	0.00	0.00	-16.00	0.00	0.00	-16	0	-16	-16
Permanent Deformation (Total Pavement) (in):	0.75	50	0.26	0.26	0.25	0.25	0.29	100	100	100	100	100	0.00	1.33	1.33	-4.00	1.33	1.33	-4	0	-5.33	-5.33

Table C-174 Functional Classification – 2 – 1814 – Mountainous Region – AC with Granular Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted					Reliability Predicted					Comparison of Scenarios									
			1	2	3	4	5	1	2	3	4	5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Terminal IRI (in/mi)	172	50	113	115	118	116	118	98.2	98.8	98.5	98.7	98.4	-1.10	-2.50	-1.69	-2.85	-1.40	-0.58	-1.74	0.814	-0.35	-1.16
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	500	876	1400	1190	1660	92.4	52.3	42.9	46.6	38.58	-37.60	-90.00	-69.00	-116.00	-52.40	-31.40	-78.4	21	-26	-47
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	18.1	22.8	28.4	25.3	29.6	99.1	56.8	40.1	49.1	36.85	-18.80	-41.20	-28.80	-46.00	-22.40	-10.00	-27.2	12.4	-4.8	-17.2
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	1	1	100	100	100	100	100	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0
Chemically Stabilized Layer (Fatigue Fracture)	25	50											0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Permanent Deformation (AC Only) (in):	0.25	50	0.11	0.1	0.11	0.11	0.12	90.1	99.4	98.8	98.9	97.79	4.00	0.00	0.00	-4.00	-4.00	-4.00	-8	0	-4	-4
Permanent Deformation (Total Pavement) (in):	0.75	50	0.28	0.3	0.32	0.31	0.32	100	100	100	100	100	-2.67	-5.33	-4.00	-5.33	-2.67	-1.33	-2.67	1.333	0	-1.33

Table C-175 Functional Classification – 2 – 1817 – Piedmont Region – AC with Granular Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted					Reliability Predicted					Comparison of Scenarios									
			1	2	3	4	5	1	2	3	4	5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Terminal IRI (in/mi)	172	50	119	119	119	119	119	98.2	98.1	98.1	98.1	98.09	-0.17	-0.41	-0.17	-0.35	-0.23	0.00	-0.17	0.233	0.058	-0.17
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	6.7	8.2	9.7	8.5	9.8	92.4	90.9	89.6	90.6	89.48	-0.15	-0.30	-0.18	-0.31	-0.15	-0.03	-0.16	0.12	-0.01	-0.13
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	5.2	6.2	7.1	6.2	6.8	99.1	98.2	97.2	98.2	97.54	-4.00	-7.60	-4.00	-6.40	-3.60	0.00	-2.4	3.6	1.2	-2.4
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	1	1	100	100	100	100	100	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0
Chemically Stabilized Layer (Fatigue Fracture)	25	50											0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Permanent Deformation (AC Only) (in):	0.25	50	0.16	0.15	0.16	0.16	0.17	90.1	91.8	89.1	90.3	87.97	4.00	0.00	0.00	-4.00	-4.00	-4.00	-8	0	-4	-4
Permanent Deformation (Total Pavement) (in):	0.75	50	0.31	0.32	0.33	0.32	0.33	100	100	100	100	100	-1.33	-2.67	-1.33	-2.67	-1.33	0.00	-1.33	1.333	0	-1.33

Table C-176 Functional Classification – 2 – 3816 – Piedmont Region – JPCP with Non-Bituminous Treated Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted					Reliability Predicted					Comparison of Scenarios									
			1	2	3	4	5	1	2	3	4	5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Terminal IRI (in/mi)	172	50	67.2	68.5	69	68.7	67.4	100	100	100	100	100	-0.8	-1	-0.9	-0.1	-0.3	-0.1	0.64	0.17	0.93	0.76
Transverse Cracking (% slabs cracked)	15	50	0	0	0	0	0	99.9	99.9	99.9	99.9	99.9	0	0	0	0	0	0	0	0	0	0
Mean Joint Faulting (in)	0.12	50	0	0	0	0	0	100	100	100	100	100	1.67	0.83	0.83	0	-0.8	-0.8	-1.7	0	-0.8	-0.8

Table C-177 Functional Classification – 2 – 5827 – Piedmont Region – CRCP Over Unbound Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted					Reliability Predicted					Comparison of Scenarios									
			1	2	3	4	5	1	2	3	4	5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Terminal IRI (in/mi)	172	50	65.4	68.3	68	67.6	67.6	100	100	100	100	100	-1.69	-1.51	-1.28	-1.28	0.17	0.41	0.41	0.23	0.23	0
CRCP Punch outs (per mi)	10	50	0.9	2.3	2.2	2	2	99.9	91.6	92.3	93.7	93.8	-14	-13	-11	-11	1	3	3	2	2	0

Table C-178 Functional Classification – 11 – 1006 – Piedmont Region – AC with Granular Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted					Reliability Predicted					Comparison of Scenarios									
			1	2	3	4	5	1	2	3	4	5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Terminal IRI (in/mi)	172	50	116	117	117	116	116	98.2	98.6	98.6	98.7	98.68	-0.12	-0.29	0.23	0.06	-0.17	0.35	0.174	0.523	0.349	-0.17
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	354	397	456	337	485	92.4	61.9	60.6	63.3	59.97	-4.30	-10.20	1.70	-13.10	-5.90	6.00	-8.8	11.9	-2.9	-14.8
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	11.9	12.5	13.5	10.8	11.6	99.1	88.2	85.6	92.2	90.42	-2.40	-6.40	4.40	1.20	-4.00	6.80	3.6	10.8	7.6	-3.2
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	1	1	100	100	100	100	100	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0
Chemically Stabilized Layer (Fatigue Fracture)	25	50											0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Permanent Deformation (AC Only) (in):	0.25	50	0.18	0.19	0.2	0.19	0.2	90.1	79.1	75.5	80.1	73.83	-4.00	-8.00	-4.00	-8.00	-4.00	0.00	-4	4	0	-4
Permanent Deformation (Total Pavement) (in):	0.75	50	0.36	0.36	0.37	0.37	0.38	100	100	100	100	99.99	0.00	-1.33	-1.33	-2.67	-1.33	-1.33	-2.67	0	-1.33	-1.33

Table C-179 Functional Classification – 11 – 1801 –Mountainous Region – AC with Granular Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted					Reliability Predicted					Comparison of Scenarios									
			1	2	3	4	5	1	2	3	4	5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Terminal IRI (in/mi)	172	50	133	133	133	131	132	98.2	94	94.2	95	94.51	0.12	0.35	1.28	0.70	0.23	1.16	0.581	0.93	0.349	-0.58
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	7580	7580	7350	6590	7360	92.4	0.36	0.47	1.09	0.47	0.00	23.00	99.00	22.00	23.00	99.00	22	76	-1	-77
AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	25.1	24.6	23.6	19.5	22.1	99.1	51.2	54.3	67.4	59.07	2.00	6.00	22.40	12.00	4.00	20.40	10	16.4	6	-10.4
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	1	1	1	1	100	100	100	100	100	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0
Chemically Stabilized Layer (Fatigue Fracture)	25	50											0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Permanent Deformation (AC Only) (in):	0.25	50	0.18	0.17	0.17	0.17	0.18	90.1	85.6	85.4	88.4	83.24	4.00	4.00	4.00	0.00	0.00	0.00	-4	0	-4	-4
Permanent Deformation (Total Pavement) (in):	0.75	50	0.37	0.37	0.37	0.36	0.38	100	100	100	100	99.99	0.00	0.00	1.33	-1.33	0.00	1.33	-1.33	1.333	-1.33	-2.67

Table C-180 Functional Classification – 11 – 5037 – Mountainous Region – CRCP Over Unbound Base

Performance Criteria	Distress Target	Reliability Target	Distress Predicted					Reliability Predicted					Comparison of Scenarios									
			1	2	3	4	5	1	2	3	4	5	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
Terminal IRI (in/mi)	172	50	64.8	64.7	64.7	64.6	64.6	100	100	100	100	100	0.06	0.06	0.12	0.12	0	0.06	0.06	0.06	0.06	0
CRCP Punch outs (per mi)	10	50	0.7	0.6	0.6	0.6	0.6	99.9	99.7	99.7	99.8	99.8	1	1	1	1	0	0	0	0	0	0

1.1.3 Ground Water Table Depth Sensitivity

Table C-181 Ground water table – Flexible pavement - 1814

Performance Criteria	Percent Change (%) W.r.to 5ft (Base case)								
	10 ft	15 ft	20 ft	25 ft	30 ft	35 ft	40 ft	45 ft	50 ft
Terminal IRI (in/mi)	-0.1	-0.2	-0.5	-0.6	-1.2	-1.2	-1.1	-1.4	-1.7
AC Surface Down Cracking (Long. Cracking) (ft/500):	31.1	25.2	10.3	7.7	-14.0	-12.7	-9.8	-26.3	-40.7
AC Bottom Up Cracking (Alligator Cracking) (%):	-0.4	-3.2	-9.2	-11.6	-21.6	-21.2	-20.4	-25.6	-32.8
AC Thermal Fracture (Transverse Cracking) (ft/mi):	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chemically Stabilized Layer (Fatigue Fracture)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Deformation (AC Only) (in):	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Deformation (Total Pavement) (in):	6.7	6.7	6.7	6.7	-2.7	-2.7	-2.7	-2.7	-4.0

Table C-182 Ground water table – Rigid pavement - 5037

Performance Criteria	Percent Change (%) W.r.to 10ft (Base Case)								
	5 ft	15 ft	20 ft	25 ft	30 ft	35 ft	40 ft	45 ft	50 ft
Terminal IRI (in/mi)	0.5814	0.69767	0.6977	0.7558	0	0	0	0	0.7558
CRCP Punch outs (per mi)	5	6	7	7	0	0	0	0	7

APPENDIX D: SENSITIVITY ANALYSIS CHARTS

Figure D -1 1817-Airvoids-AC Layer-1

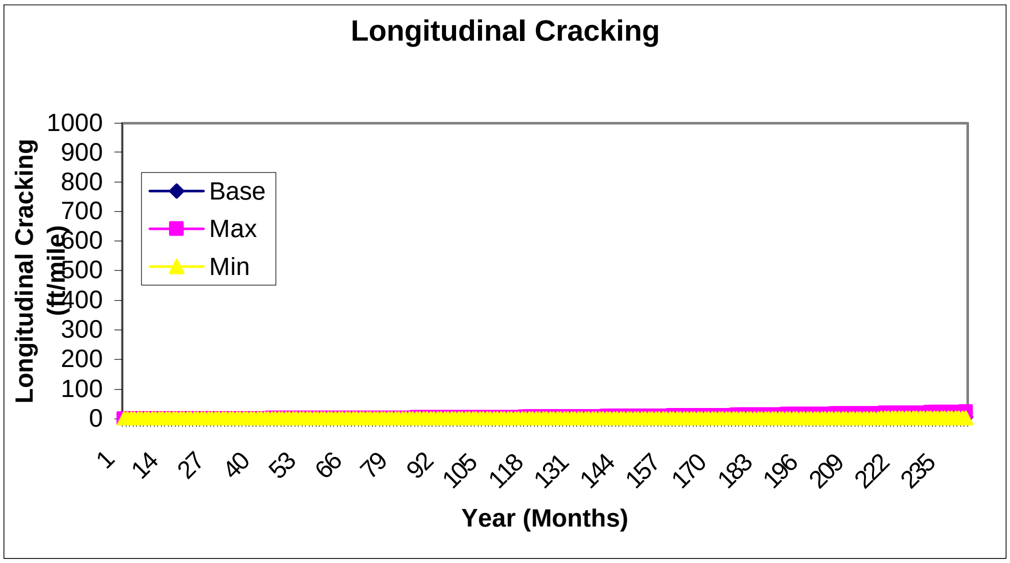


Figure D -2 1817-Airvoids-AC Layer-1

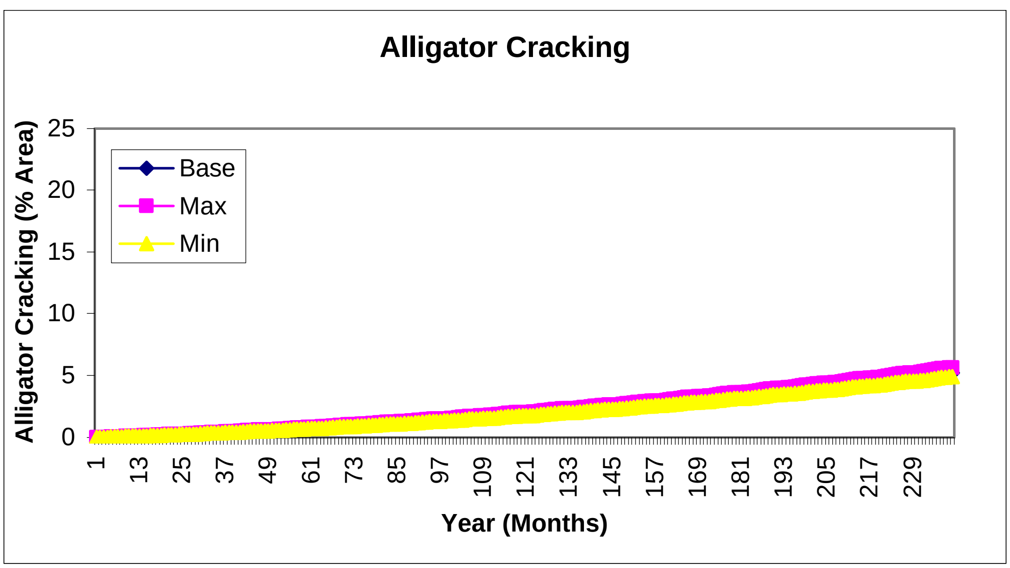


Figure D -3 1817-Airvoids-AC Layer-1

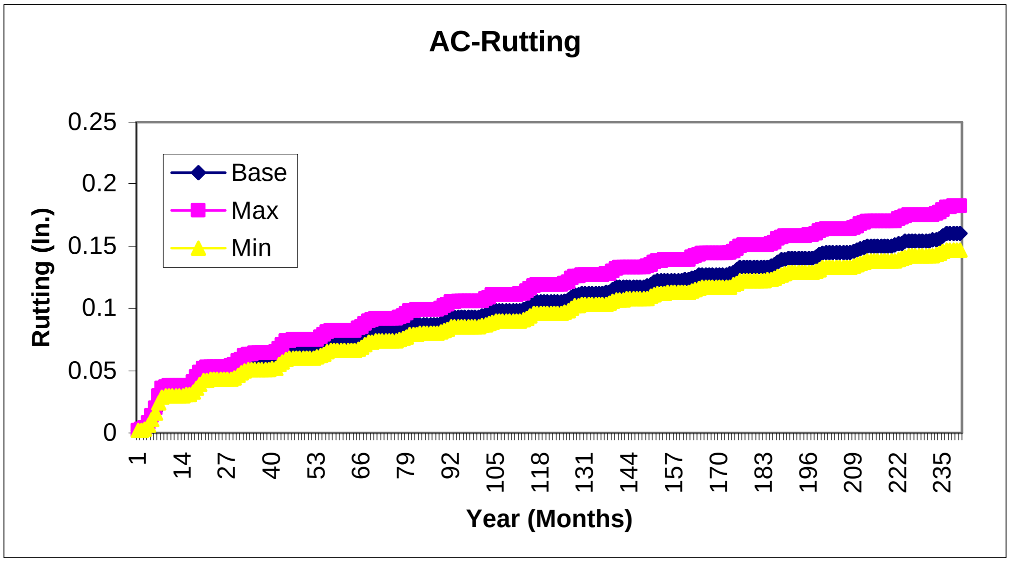


Figure D -4 1817-Airvoids-AC Layer-1

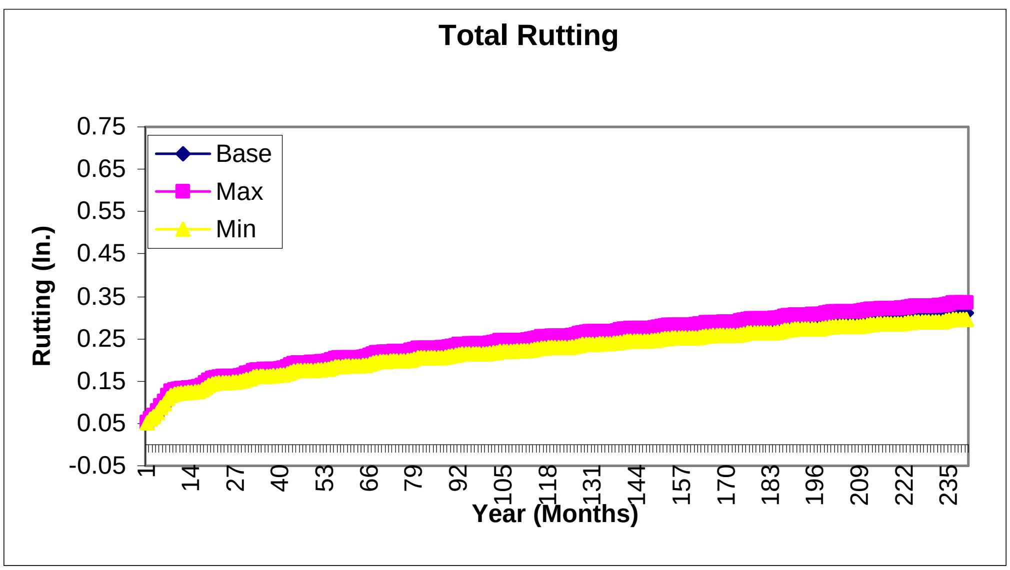


Figure D -5 1817-Airvoids-AC Layer-1

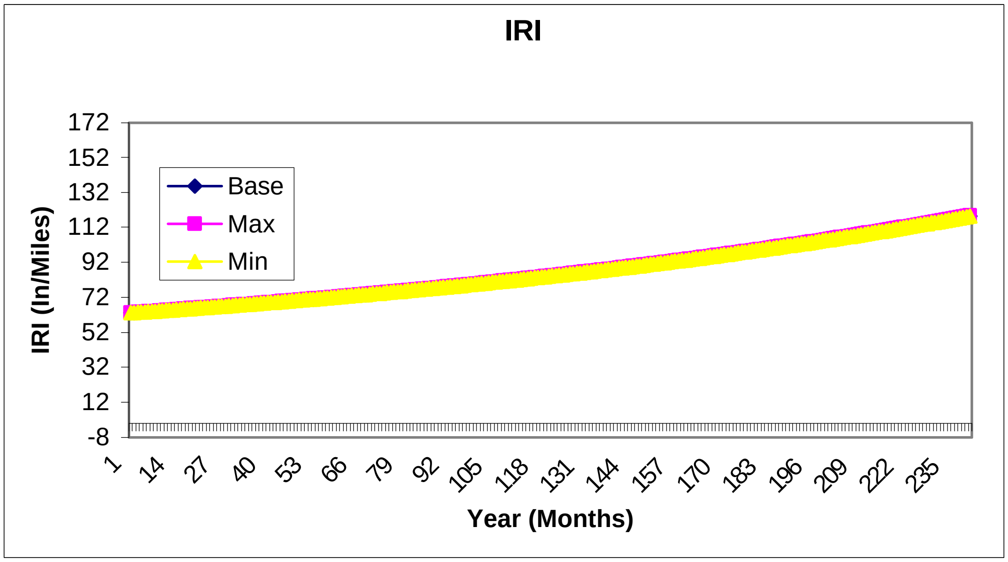


Figure D -6 1817-HeatCapacity-AC Layer-1

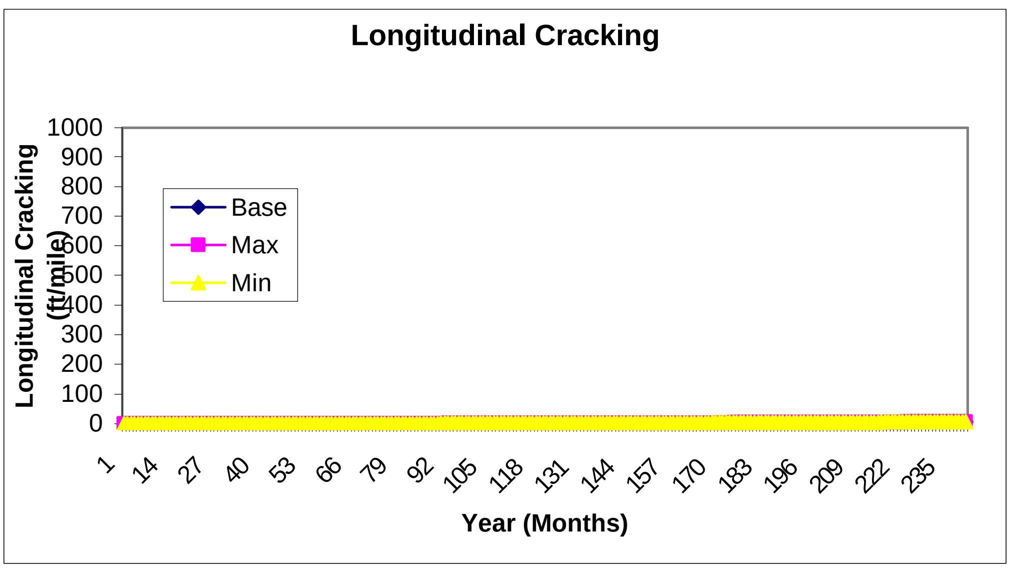


Figure D -7 1817-HeatCapacity-AC Layer-1

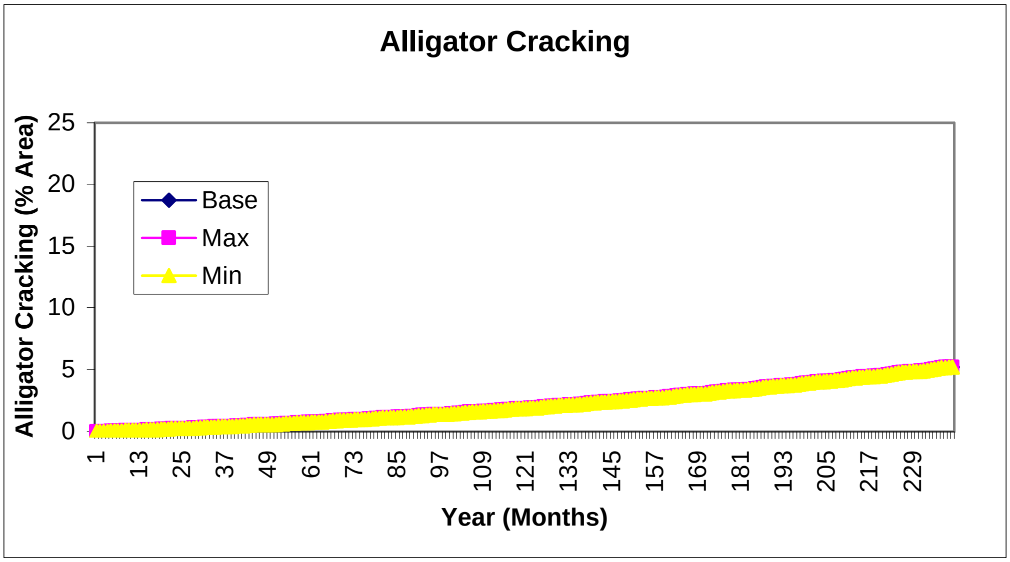


Figure D -8 1817-HeatCapacity-AC Layer-1

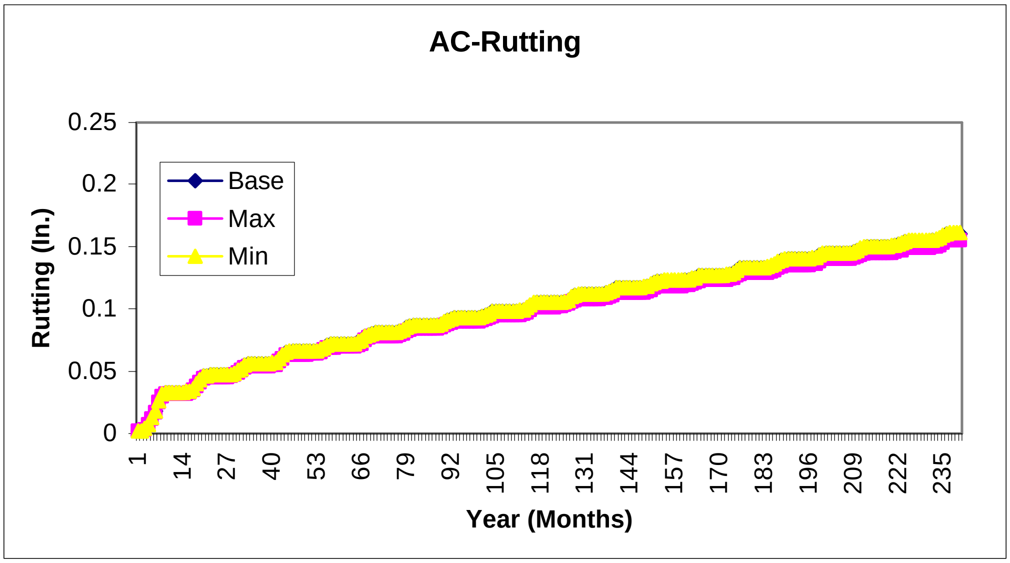


Figure D -9 1817-HeatCapacity-AC Layer-1

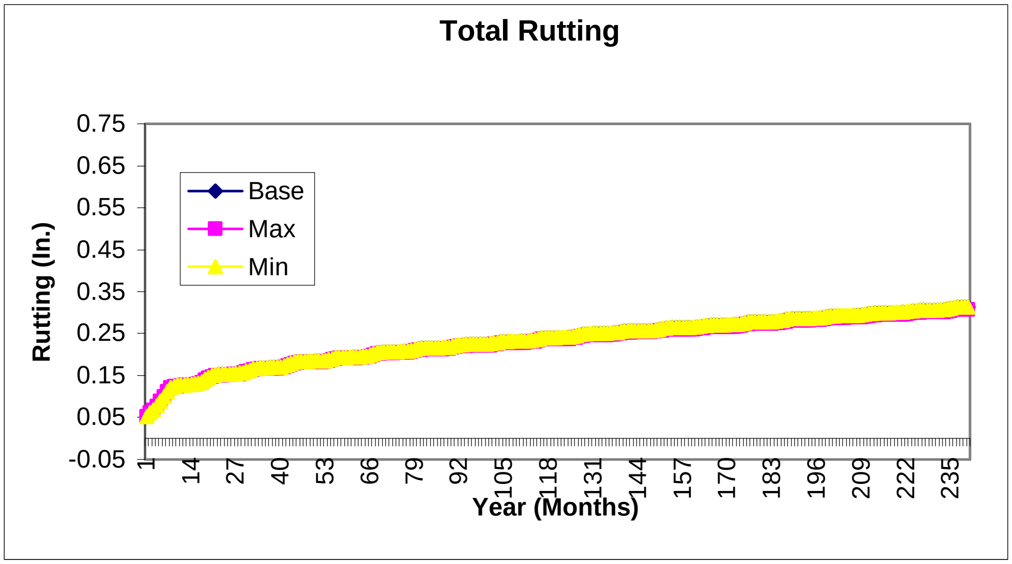


Figure D -10 1817-HeatCapacity-AC Layer-1

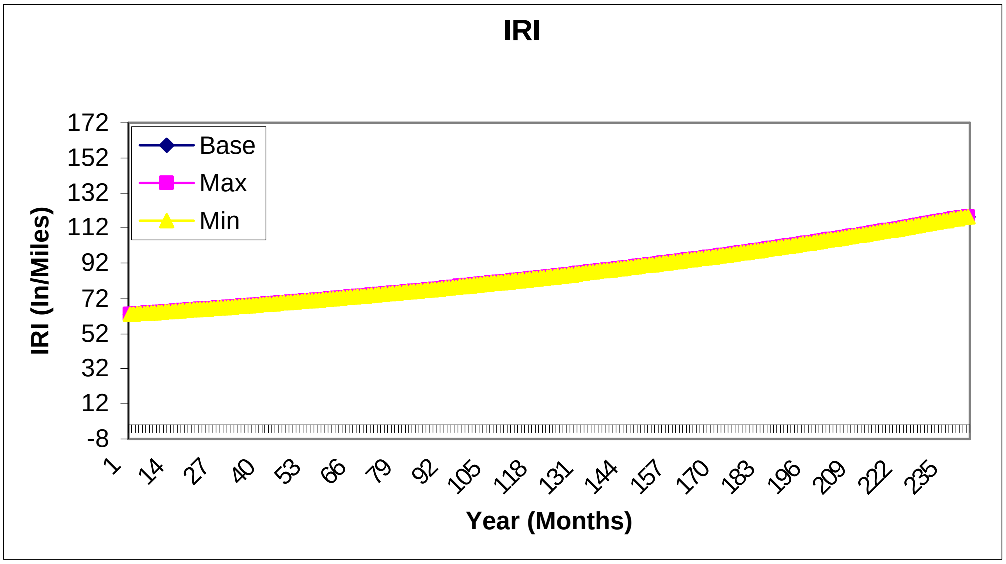


Figure D -11 1817-ThermalConductivity-AC Layer-1

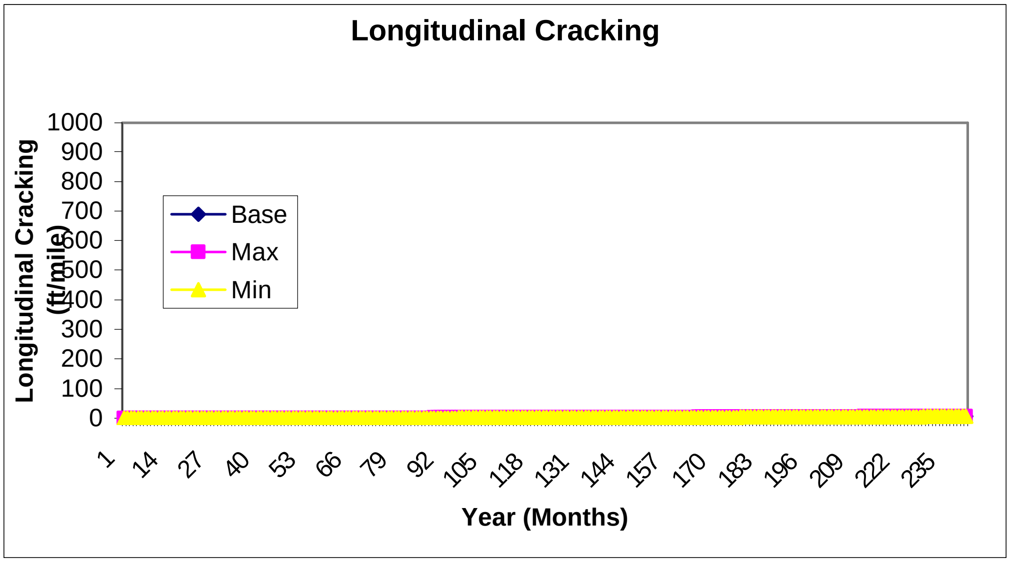


Figure D -12 1817-ThermalConductivity-AC Layer-1

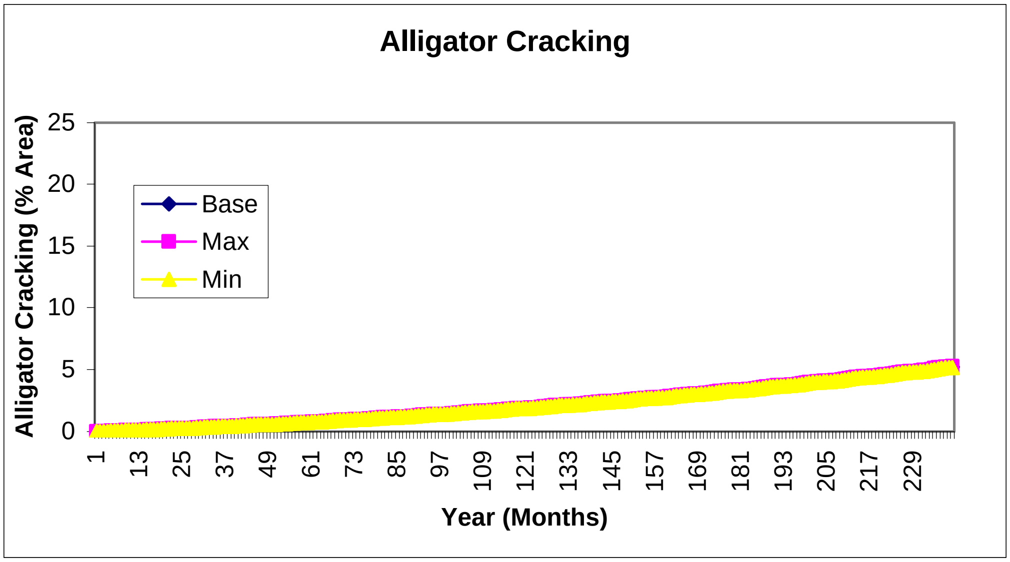


Figure D -13 1817-ThermalConductivity-AC Layer-1

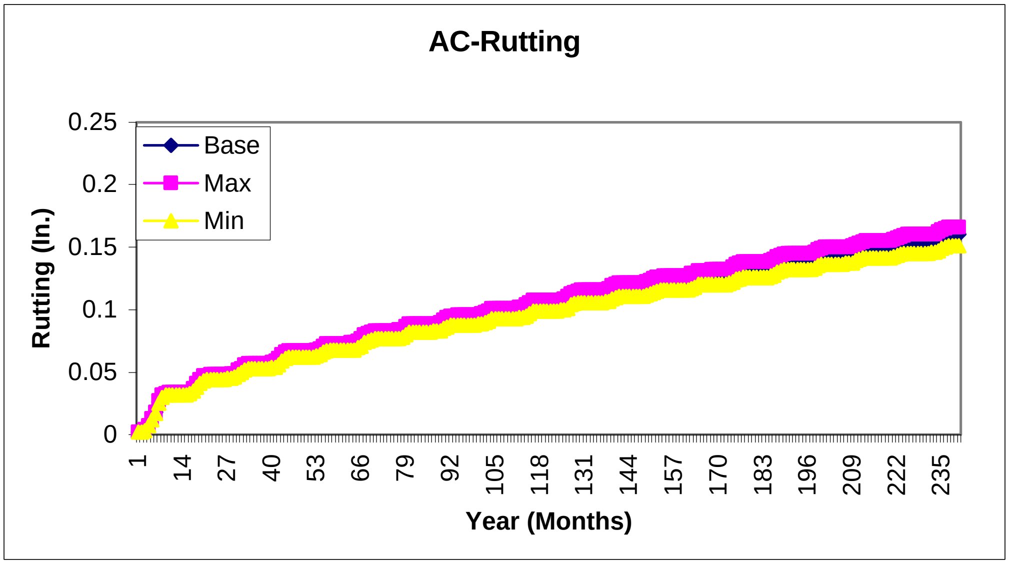


Figure D -14 1817-ThermalConductivity-AC Layer-1

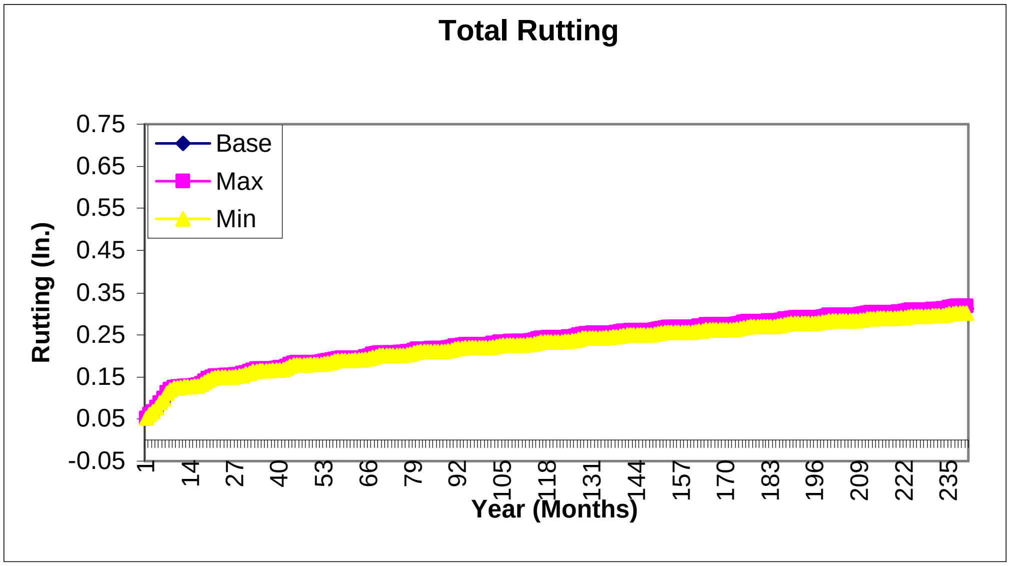


Figure D -15 1817-ThermalConductivity-AC Layer-1

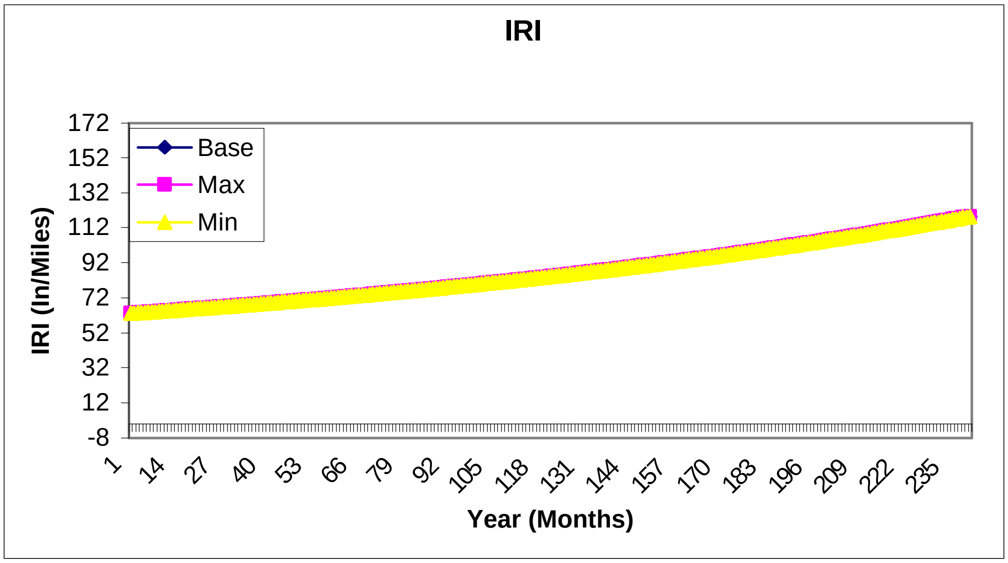


Figure D -16 1817-Airvoids-AC Layer-1I

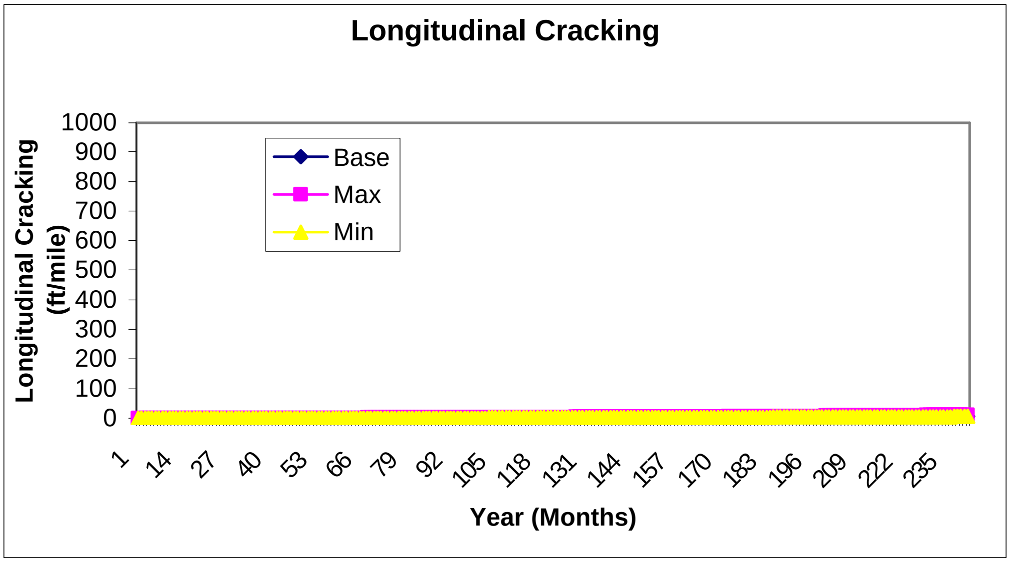


Figure D -17 1817-Airvoids-AC Layer-1I

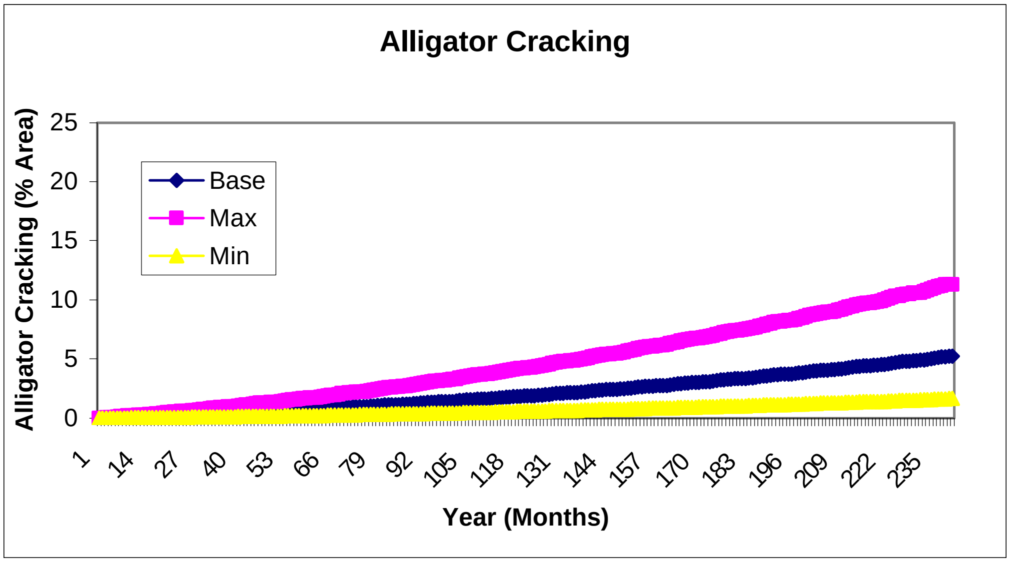


Figure D -18 1817-Airvoids-AC Layer-1

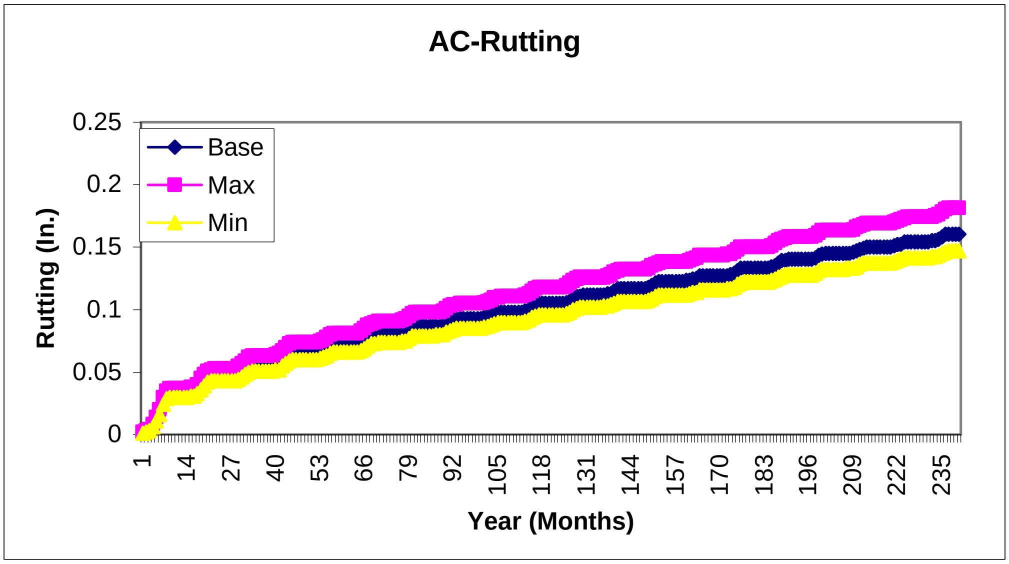


Figure D -19 1817-Airvoids-AC Layer-1I

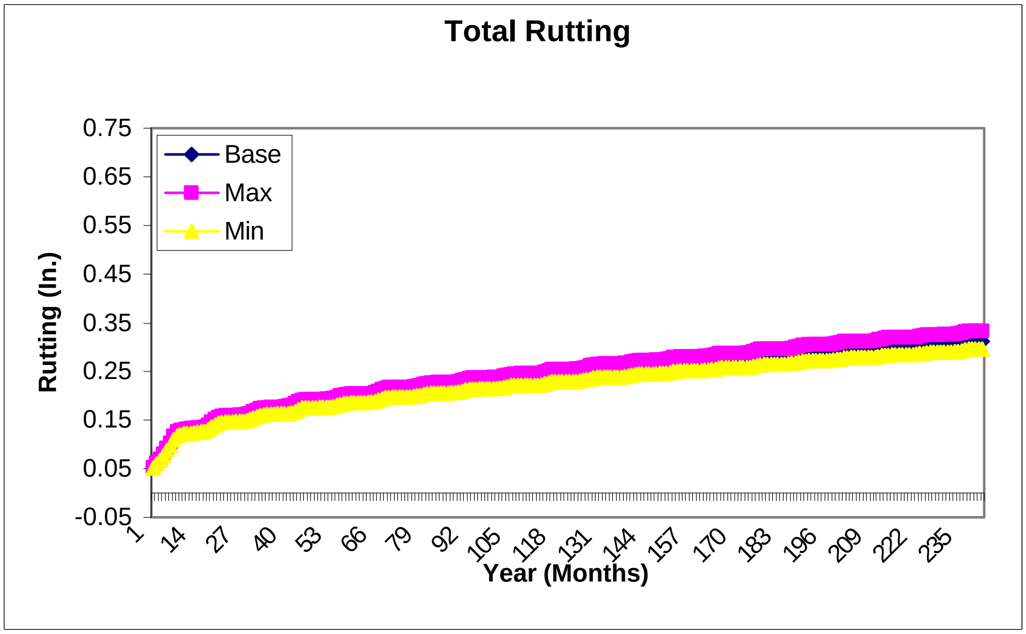


Figure D -20 1817-Airvoids-AC Layer-1I

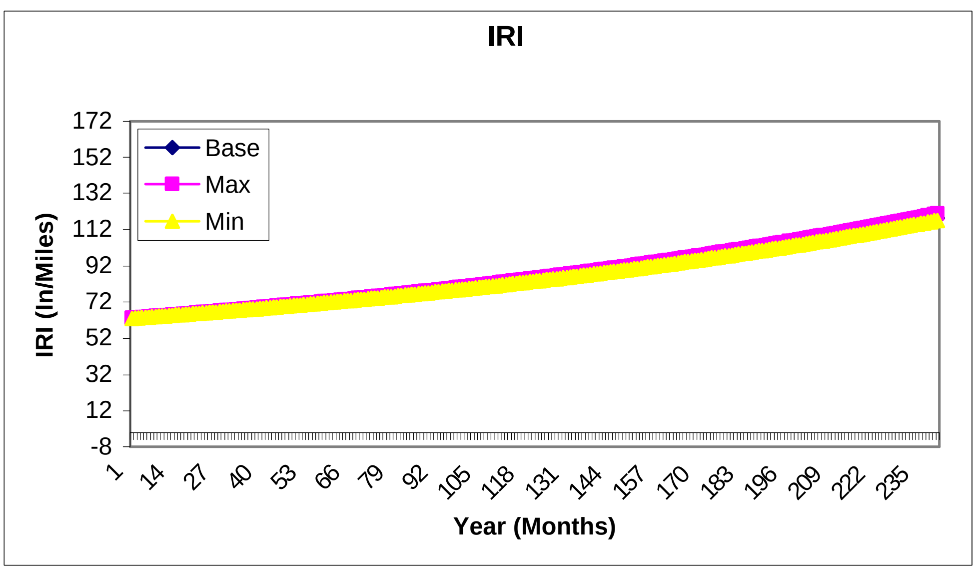


Figure D -21 1817-HeatCapacity-AC Layer-1I

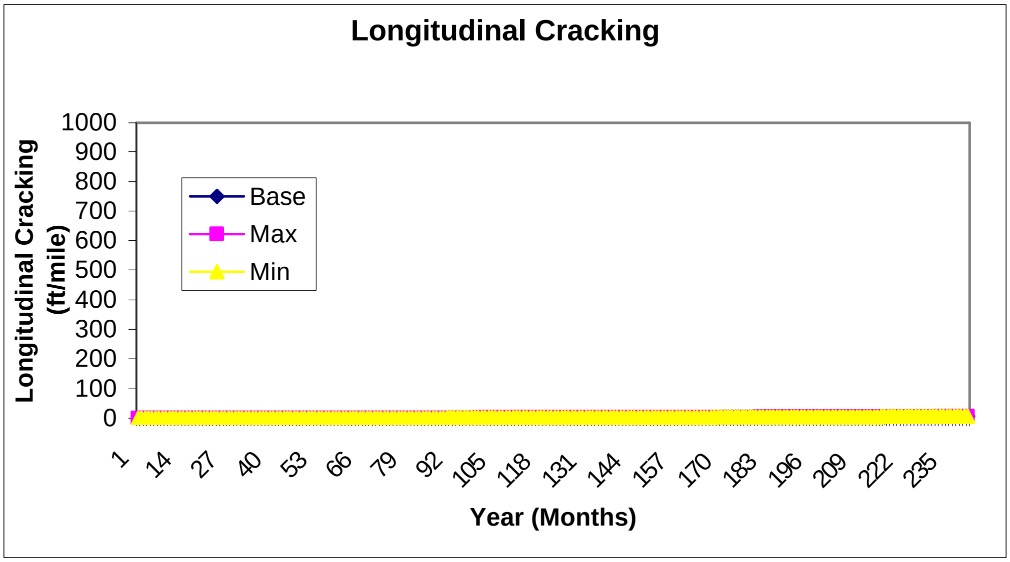


Figure D -22 1817-HeatCapacity-AC Layer-1I

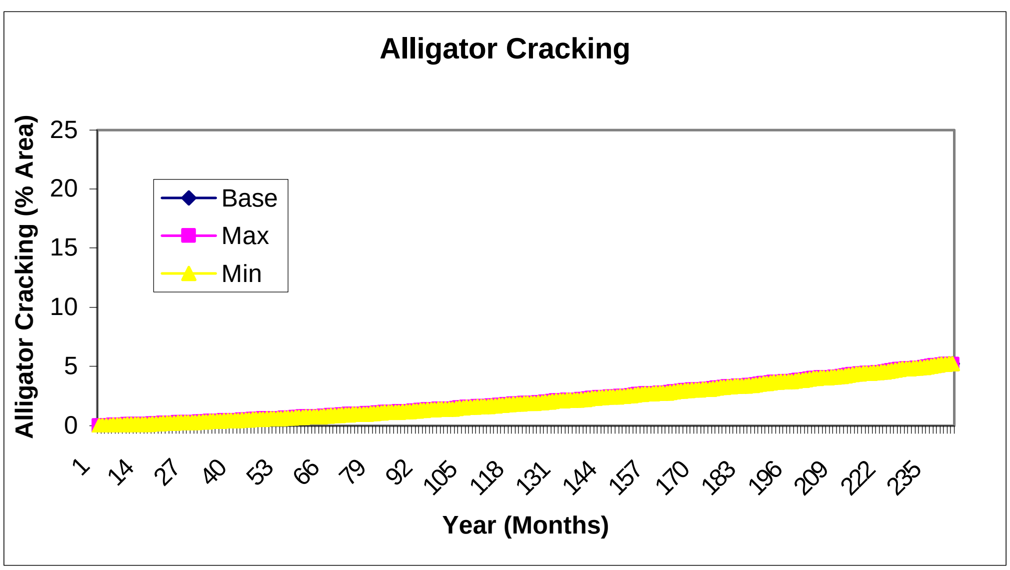


Figure D -23 1817-HeatCapacity-AC Layer-1I

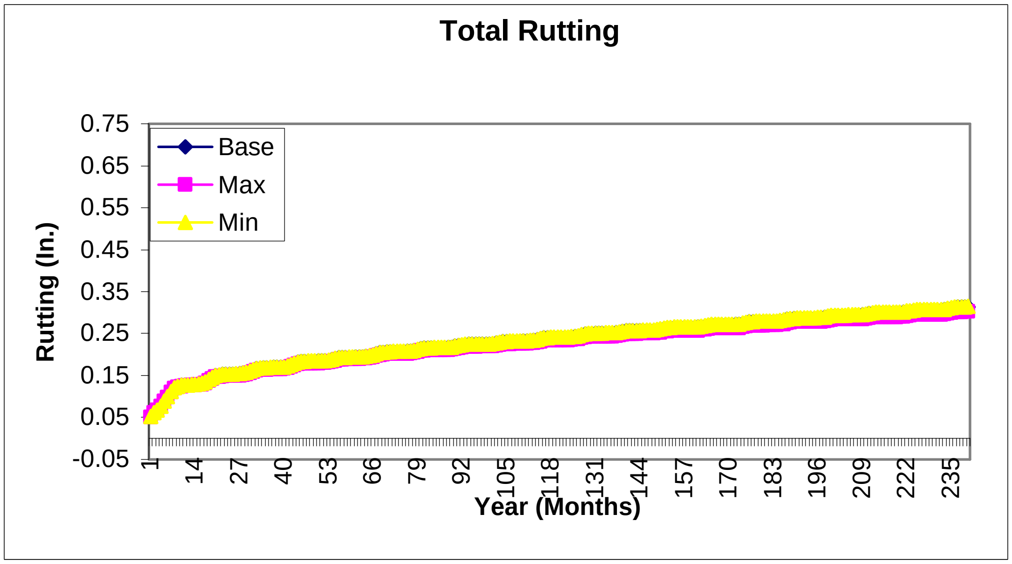


Figure D -24 1817-HeatCapacity-AC Layer-1I

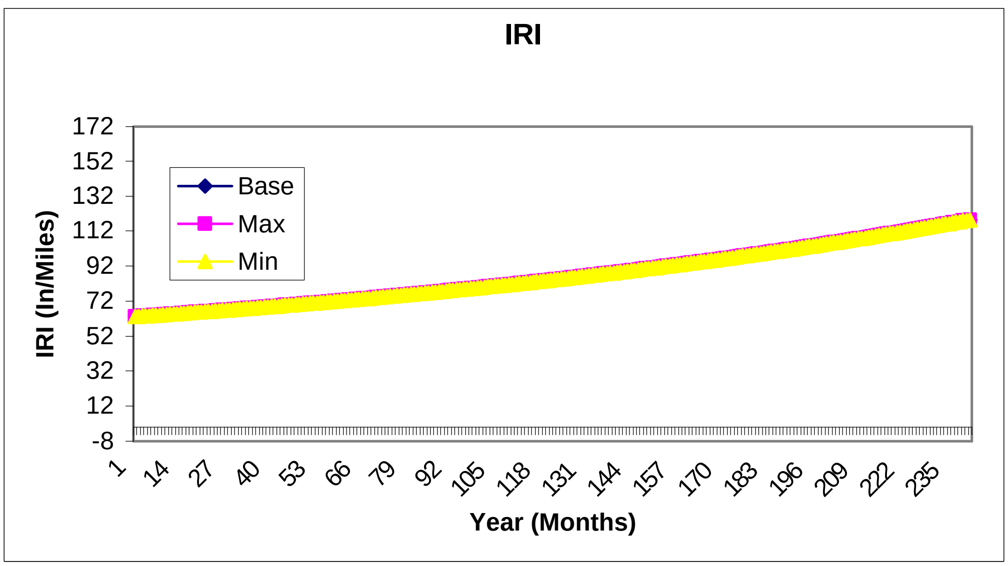


Figure D -25 1817-HeatCapacity-AC Layer-1I

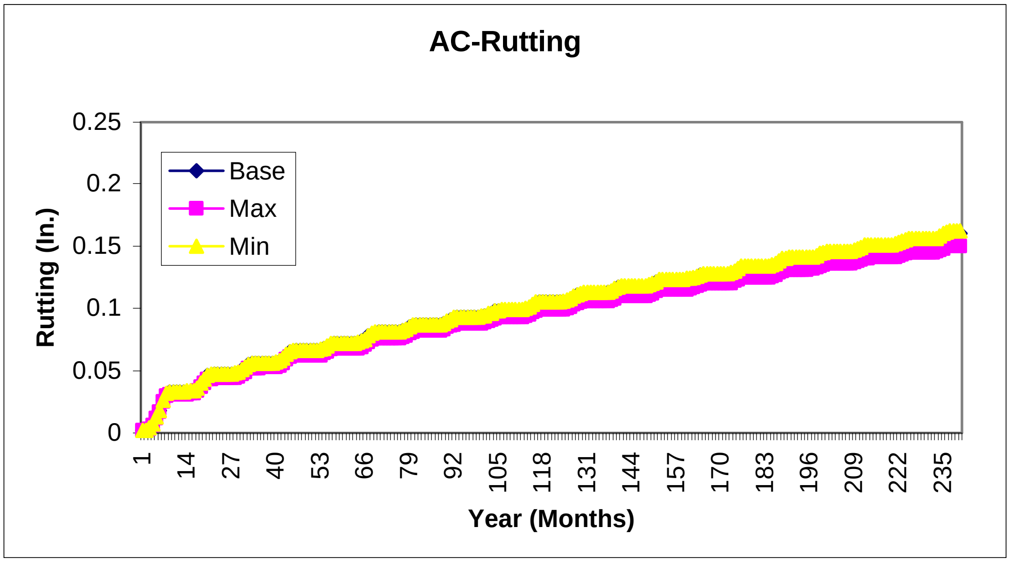


Figure D -26 1817-ThermalConductivity-AC Layer-1I

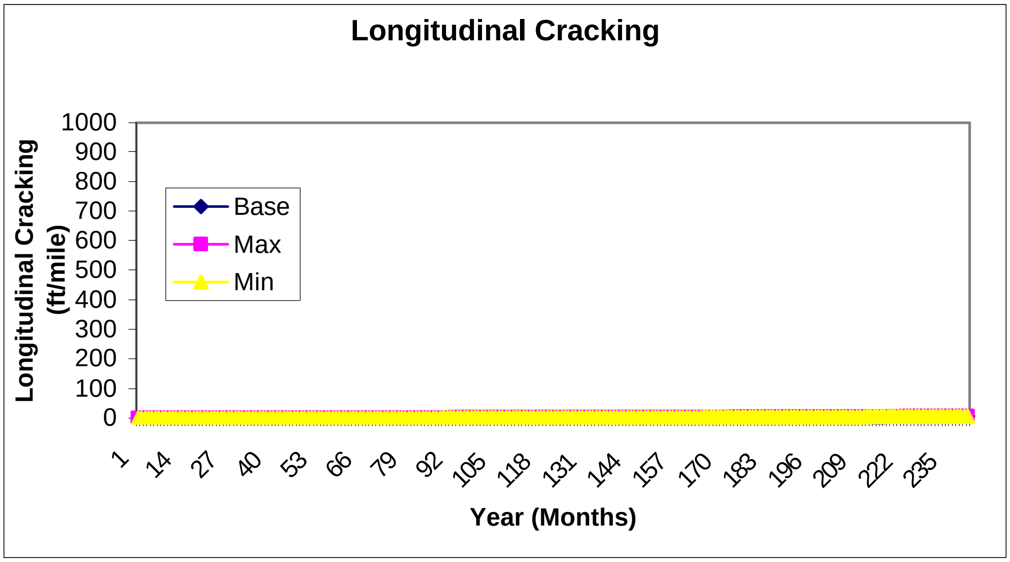


Figure D -27 1817-ThermalConductivity-AC Layer-1I

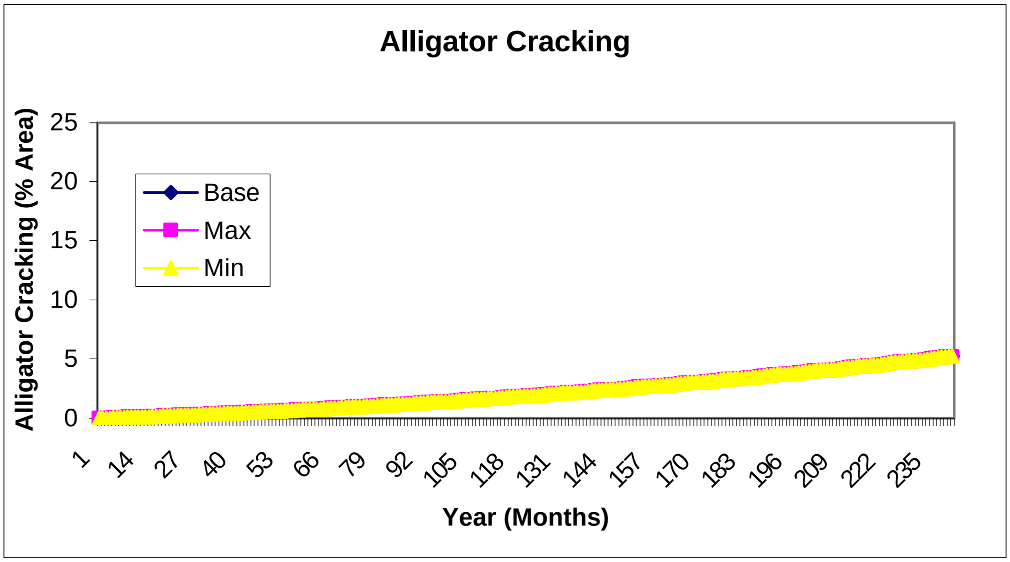


Figure D -28 1817-ThermalConductivity-AC Layer-1I

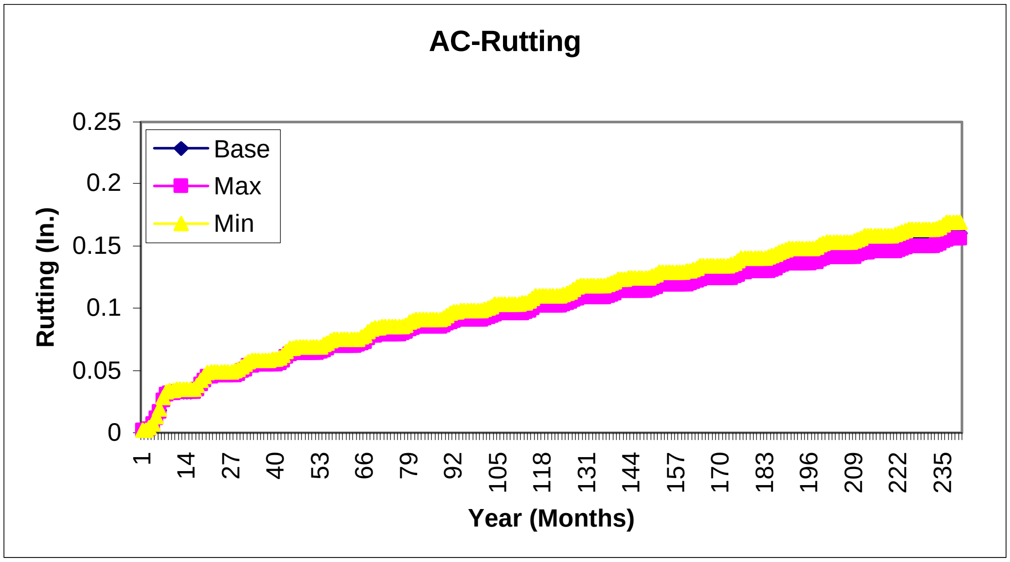


Figure D -29 1817-ThermalConductivity-AC Layer-1I

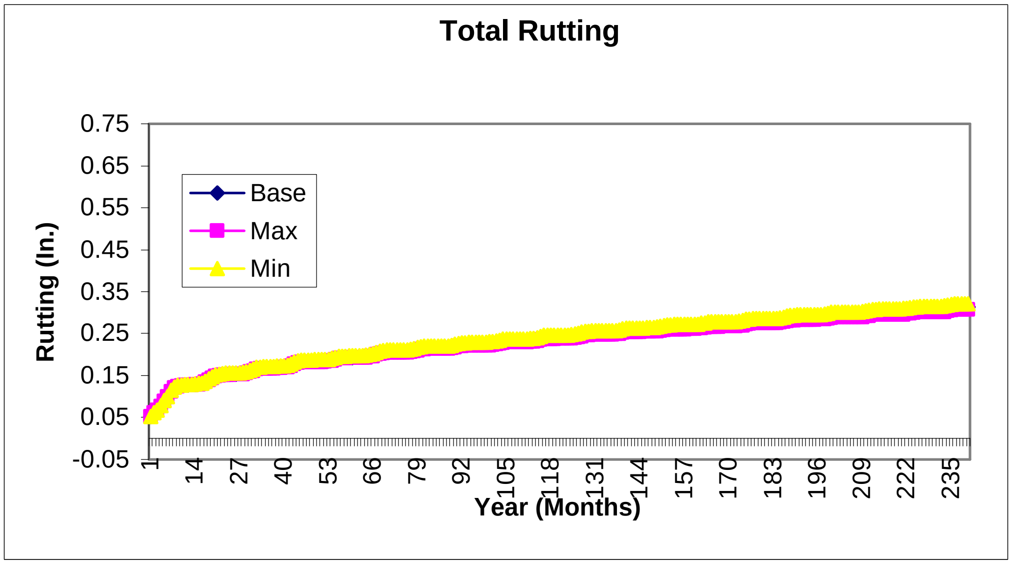


Figure D -30 1817-ThermalConductivity-AC Layer-1I

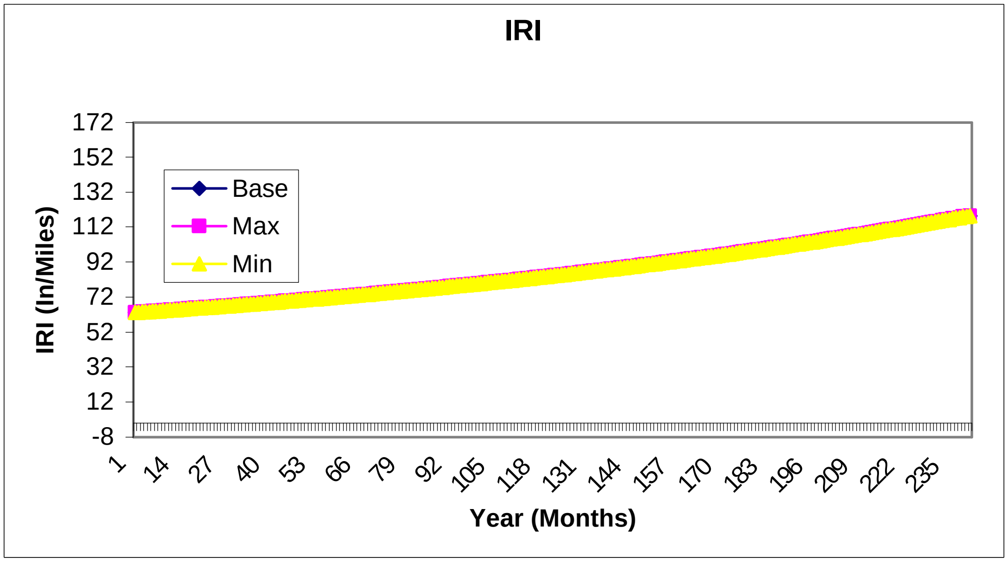


Figure D -31 1817-Granular Case Modulus

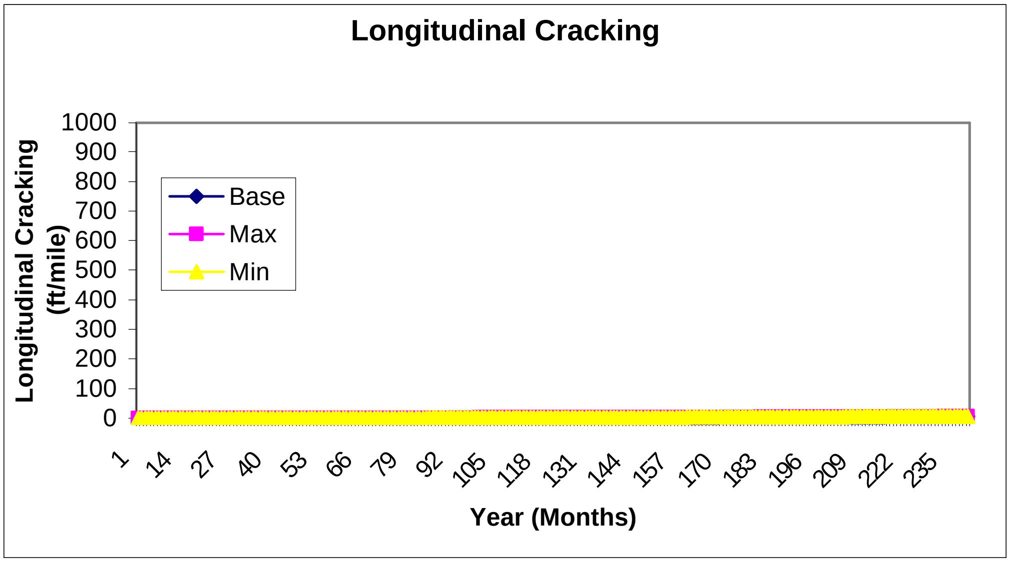


Figure D -32 1817-Granular Case Modulus

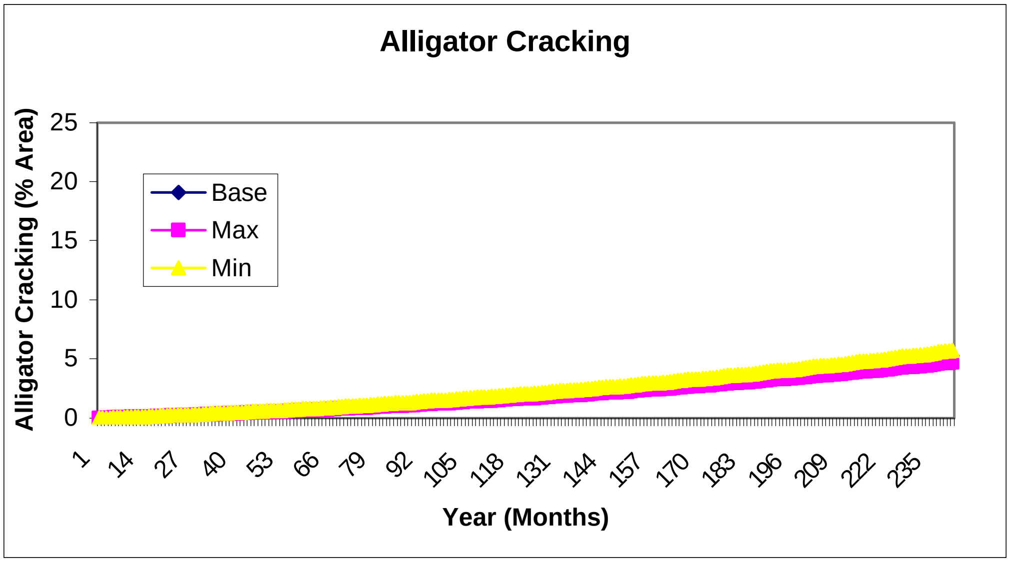


Figure D -33 1817-Granular Case Modulus

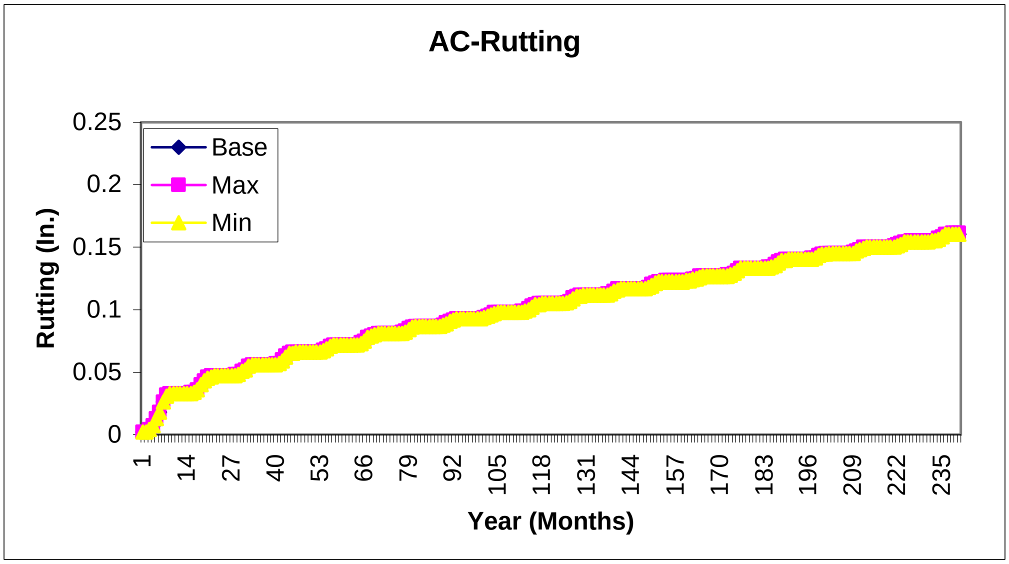


Figure D -34 1817-Granular Case Modulus

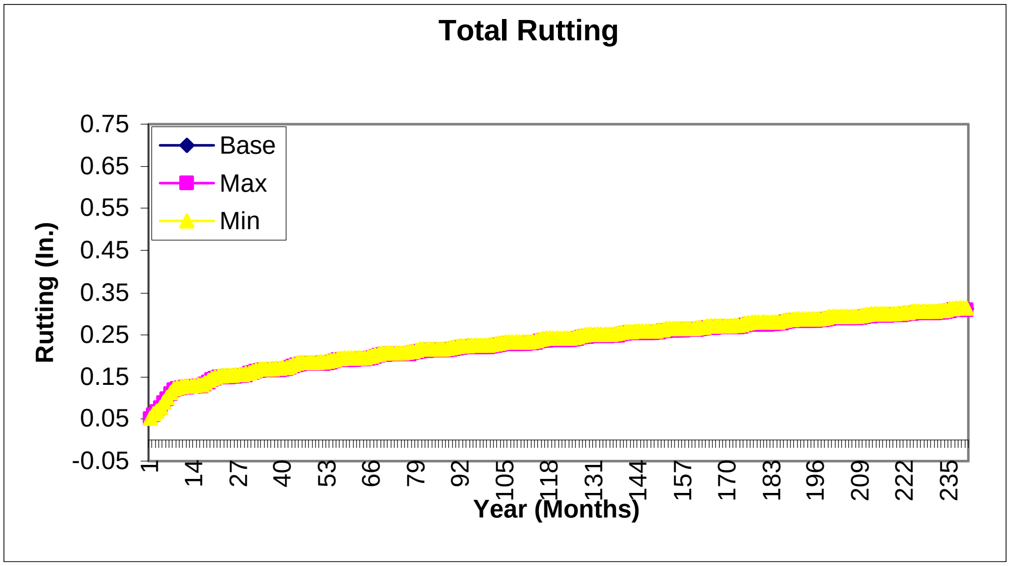


Figure D -35 1817-Granular Case Modulus

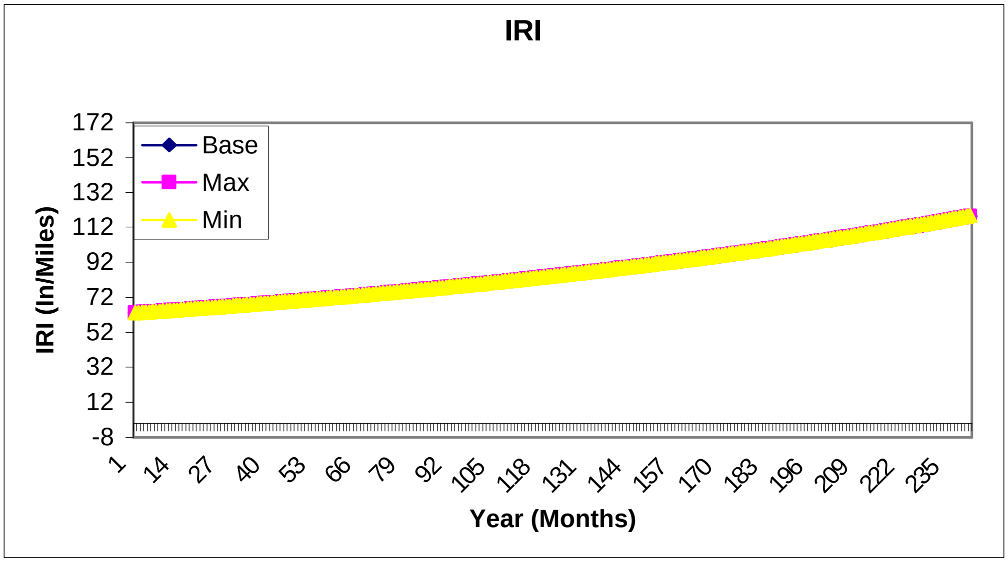


Figure D -36 1817-Subgrade Modulus

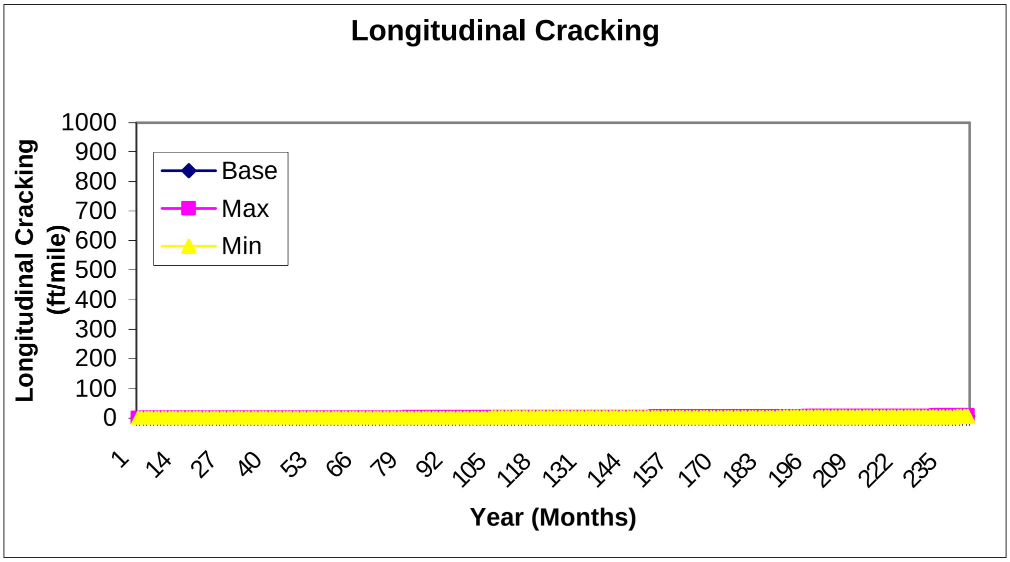


Figure D -37 1817-Subgrade Modulus

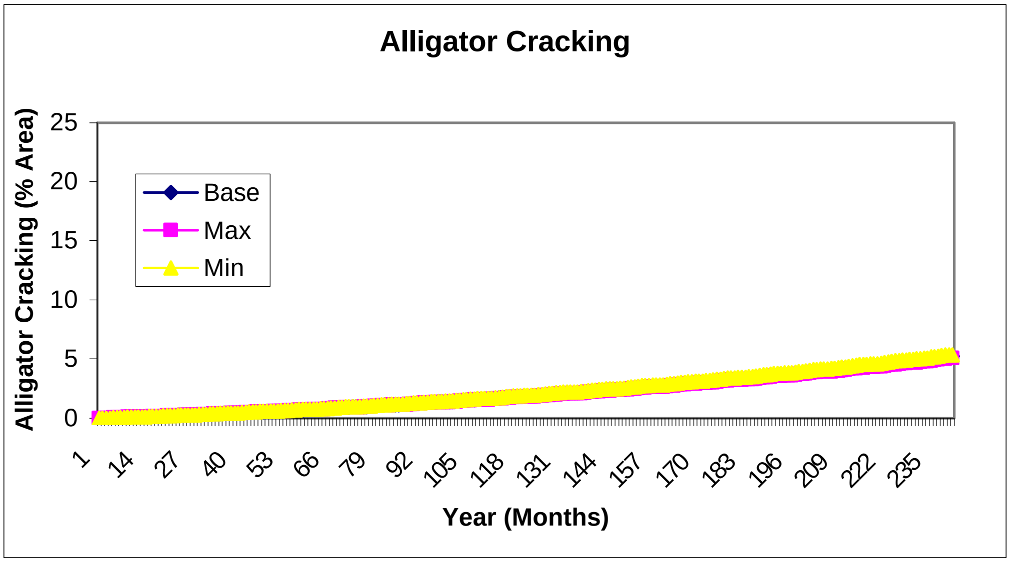


Figure D -38 1817-Subgrade Modulus

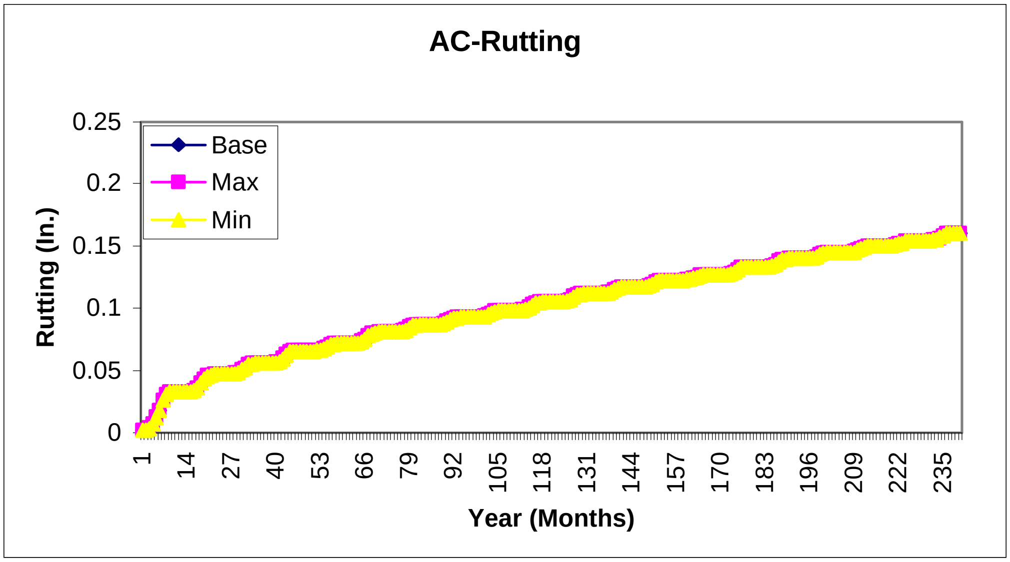


Figure D -39 1817-Subgrade Modulus

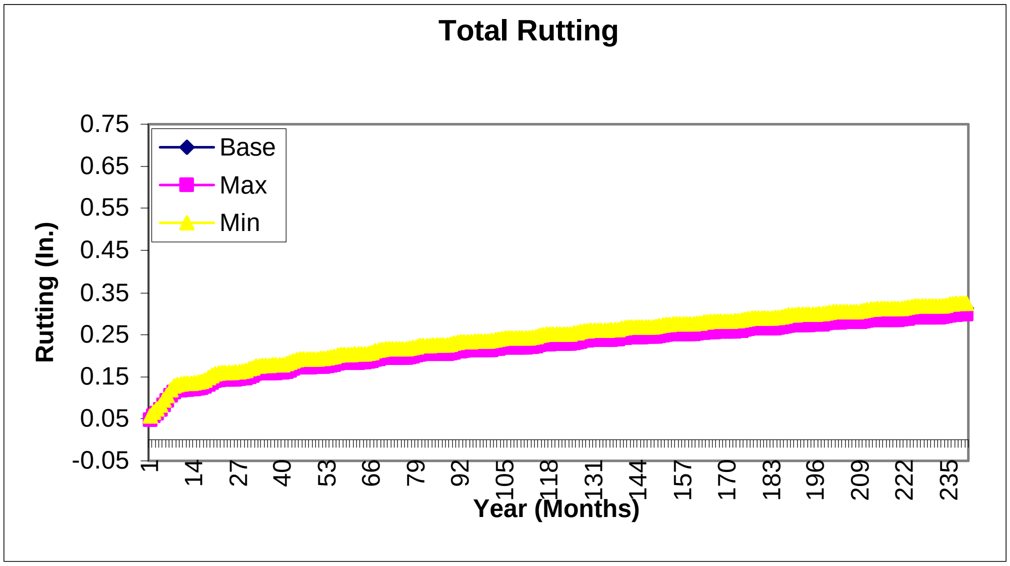


Figure D -40 1817-Subgrade Modulus

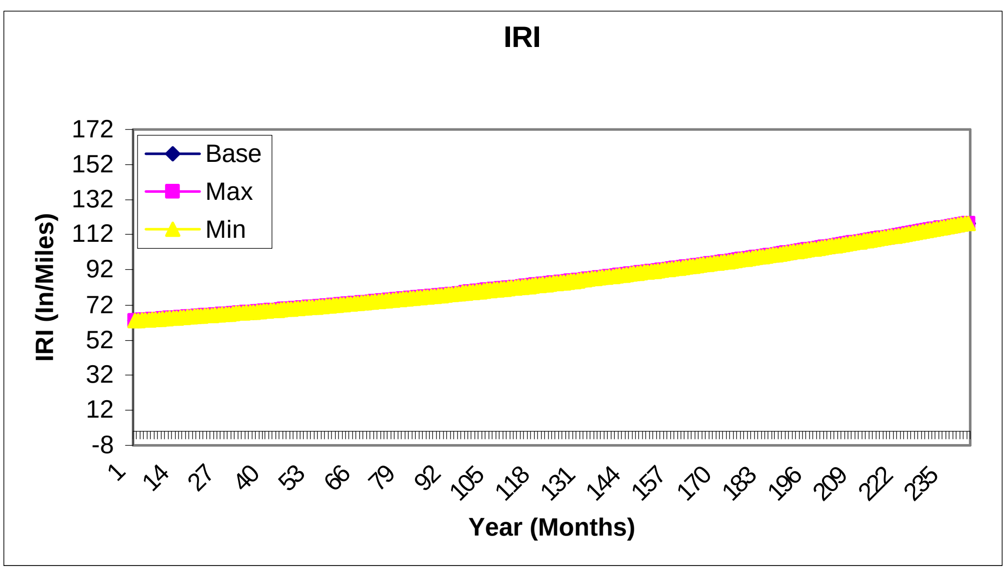


Figure D -41 1817-Creep Compliance

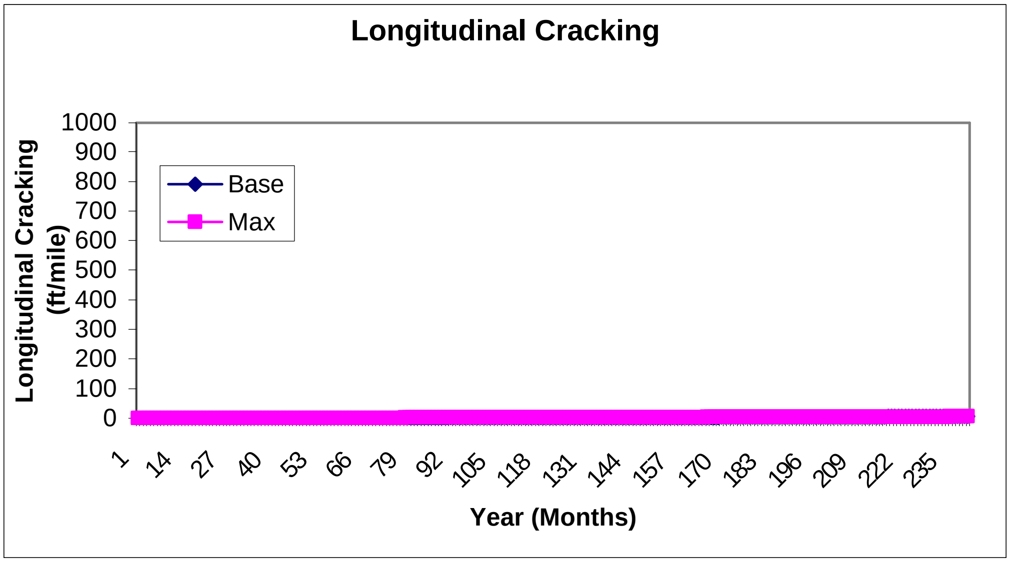


Figure D -42 1817-Creep Compliance

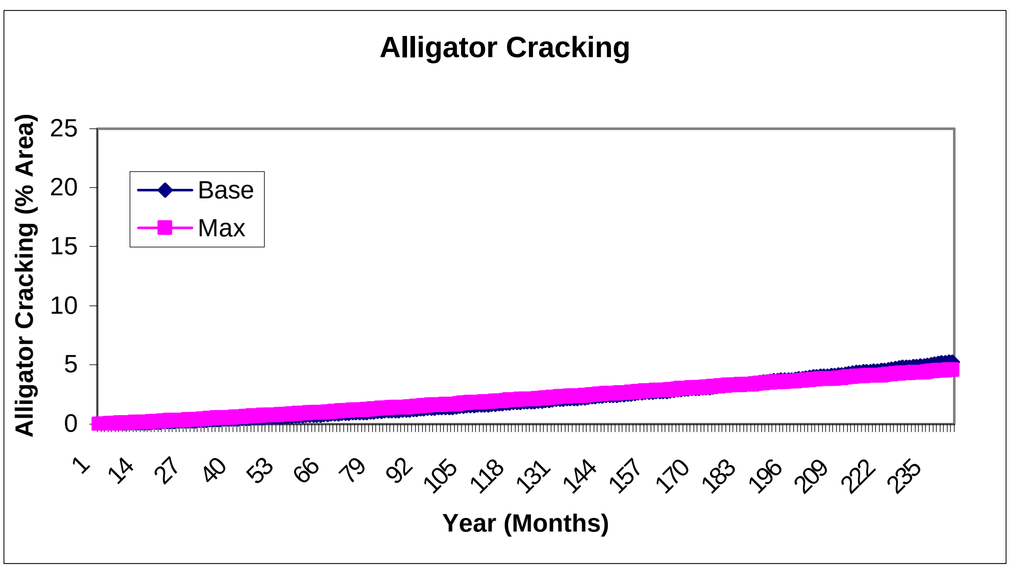


Figure D -43 1817-Creep Compliance

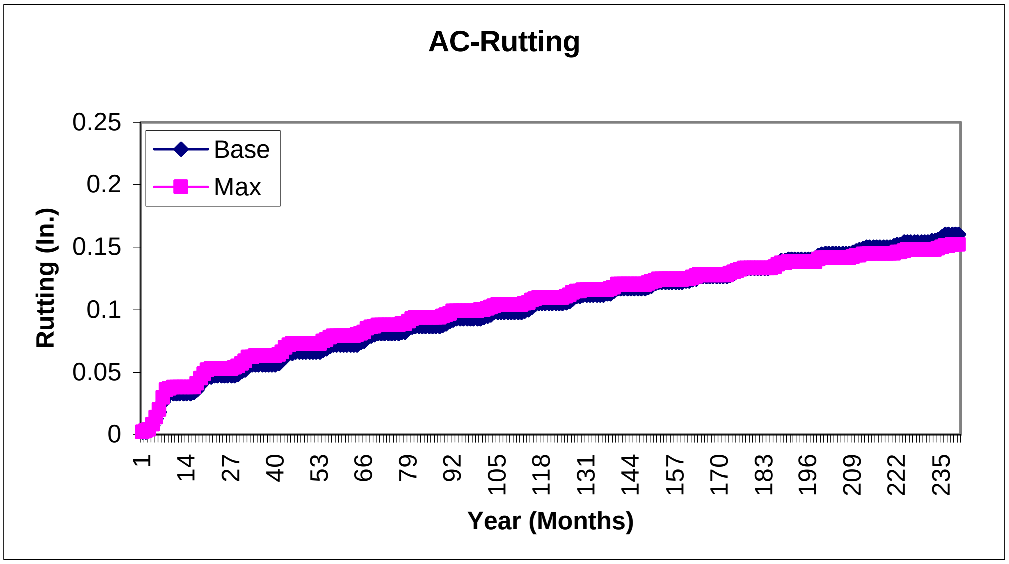


Figure D -44 1817-Creep Compliance

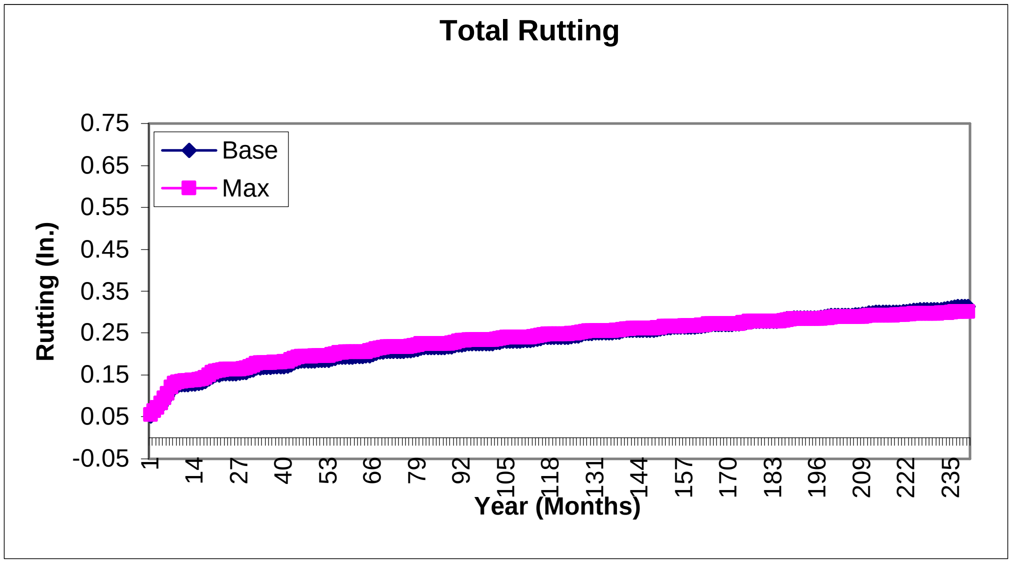


Figure D -45 1817-Creep Compliance

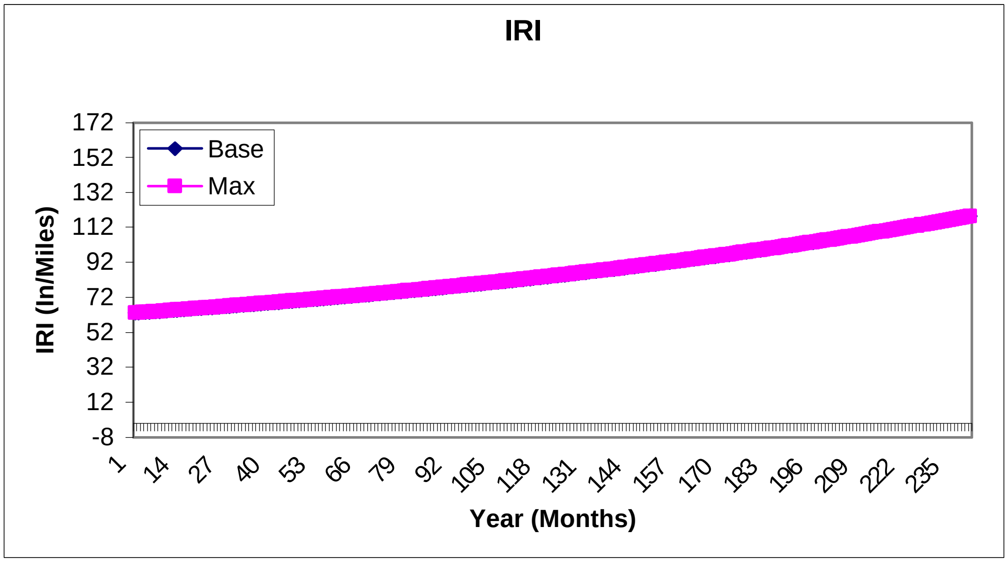


Figure D -46 1817 – Surface Shortwave Absorptivity

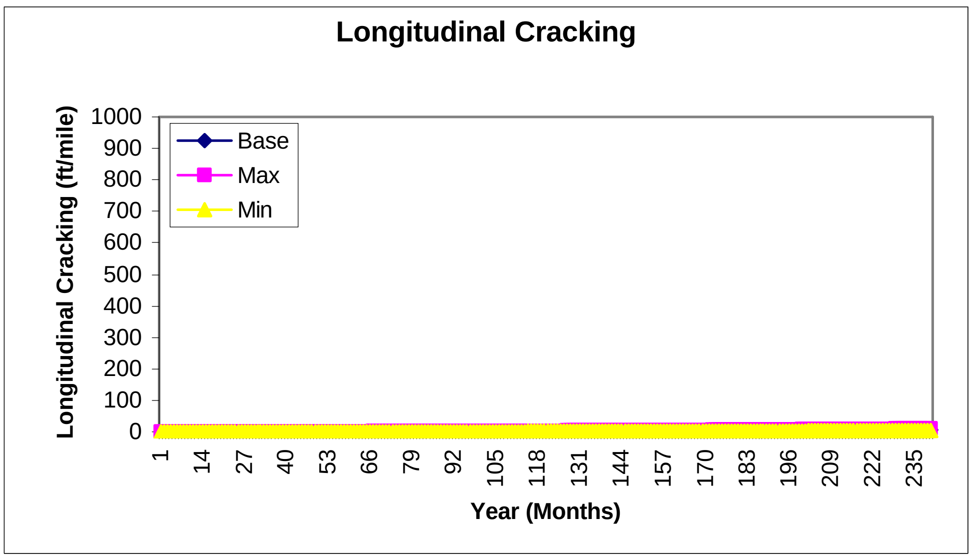


Figure D -47 1817 – Surface Shortwave Absorptivity

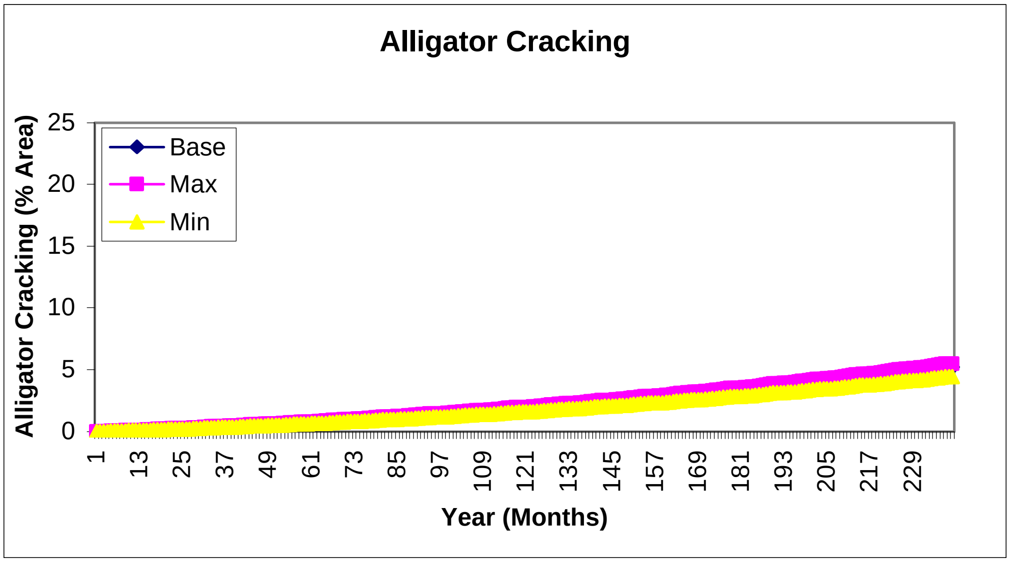


Figure D -48 1817 – Surface Shortwave Absorptivity

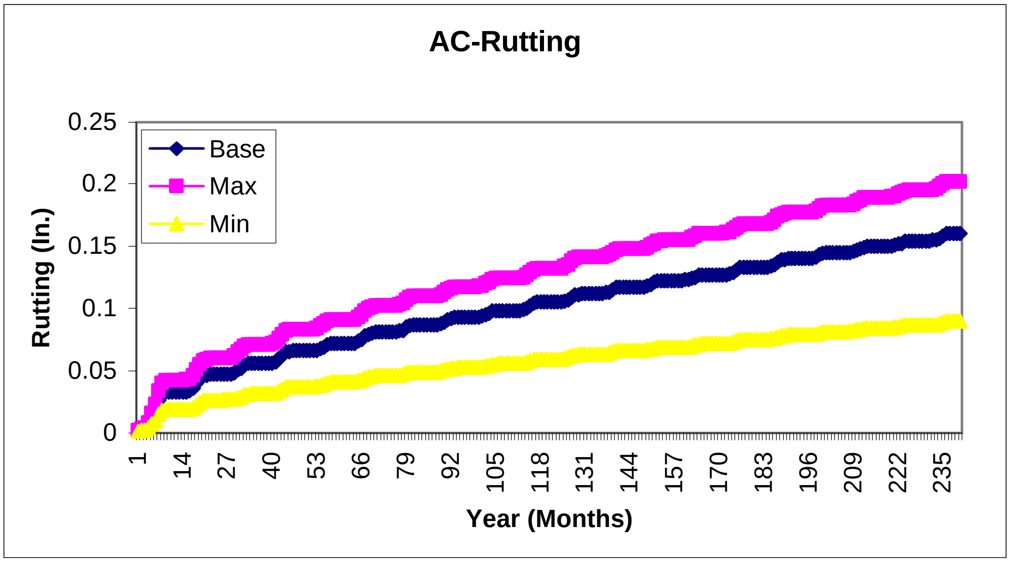


Figure D -49 1817 – Surface Shortwave Absorptivity

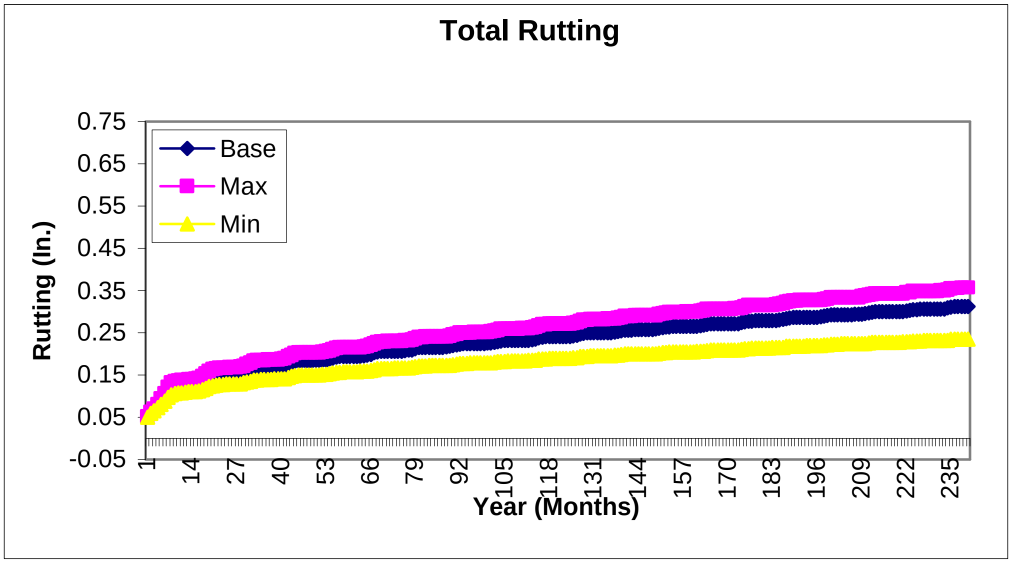


Figure D -50 1817 – Surface Shortwave Absorptivity

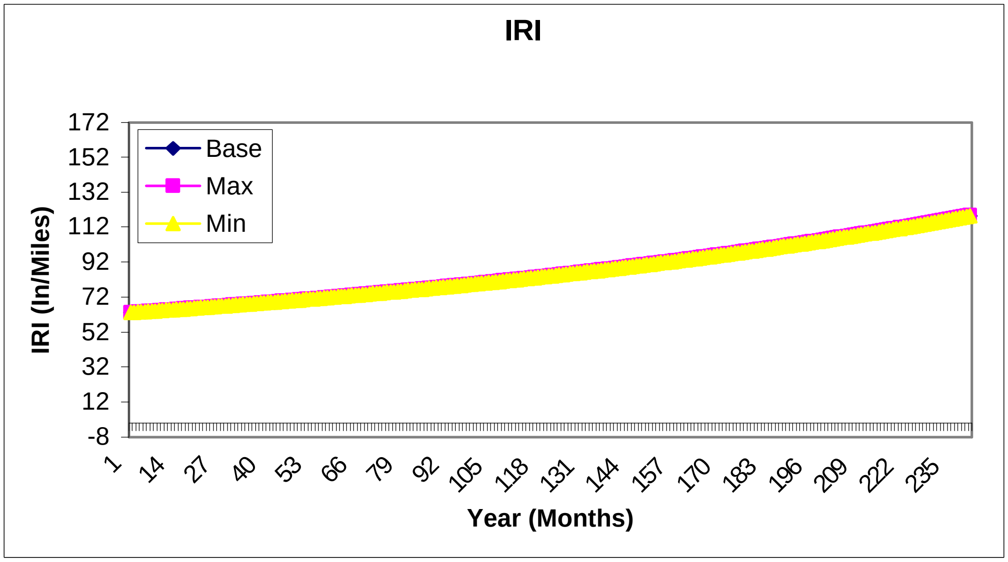


Figure D -51 1817 – Base Vs Jun/Jul

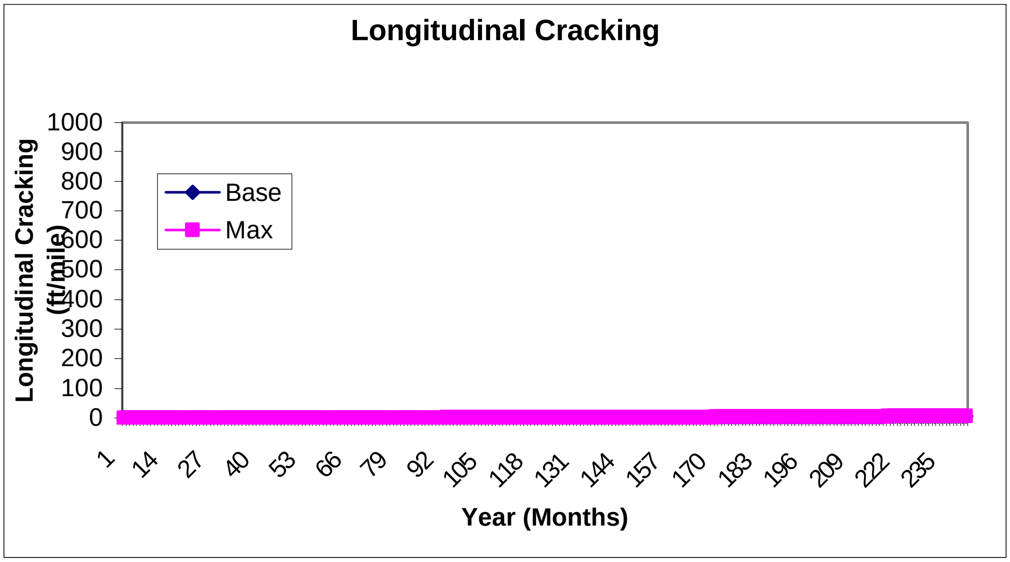


Figure D -52 1817 – Base Vs Jun/Jul

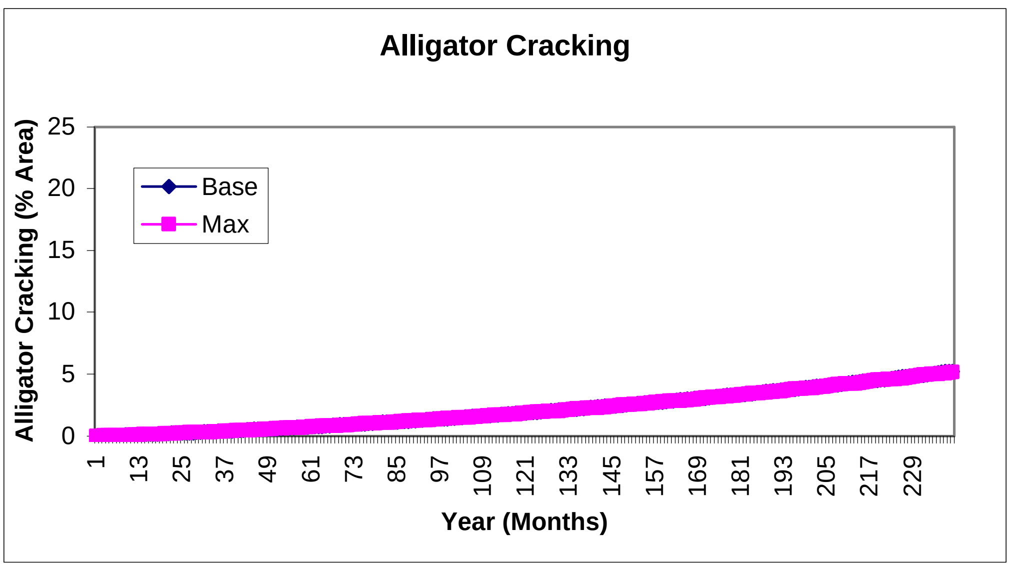


Figure D -53 1817 – Base Vs Jun/Jul

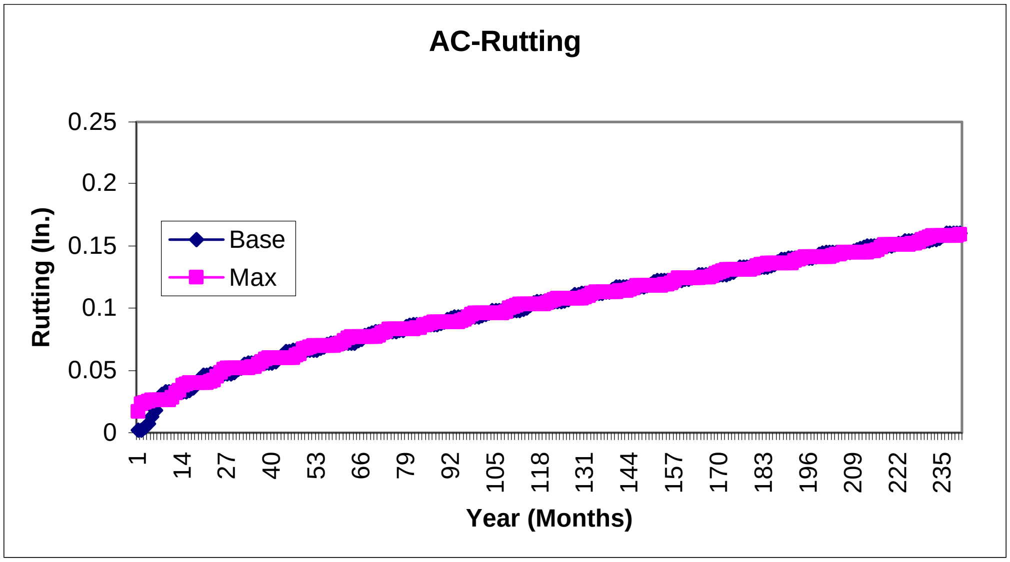


Figure D -54 1817 – Base Vs Jun/Jul

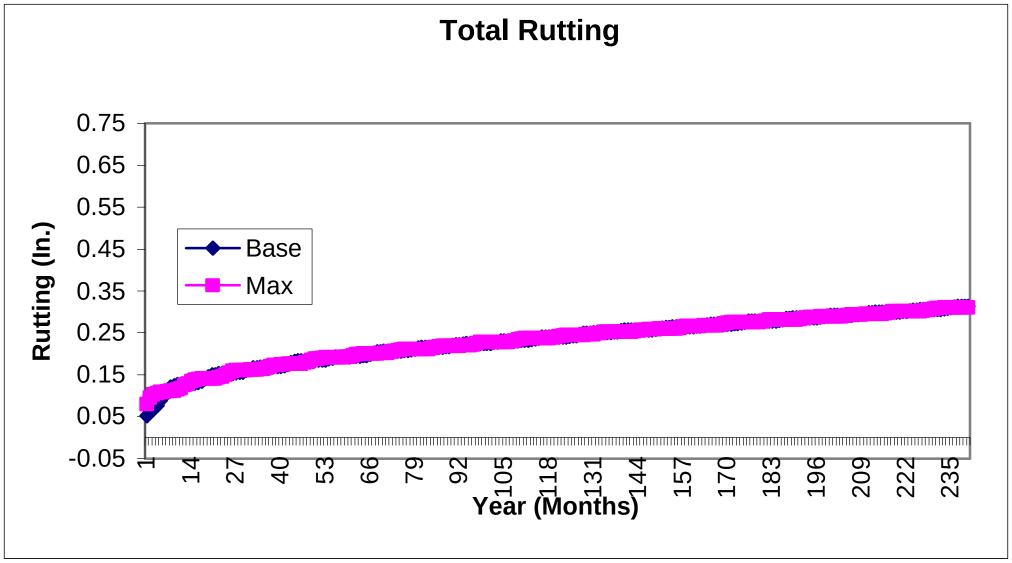


Figure D -55 1817 – Base Vs Jun/Jul

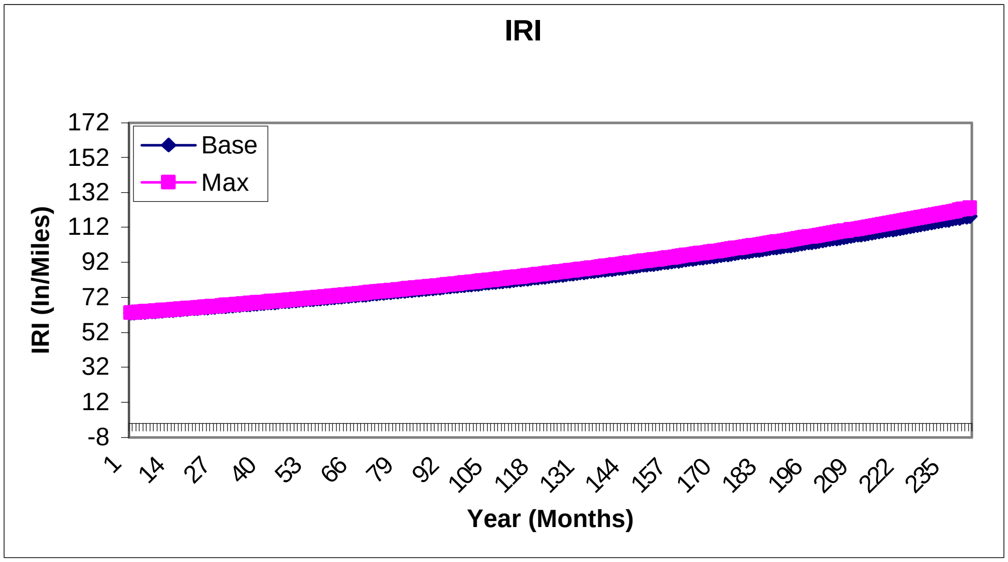


Figure D -56 1817 – Base Vs Mar/Apr

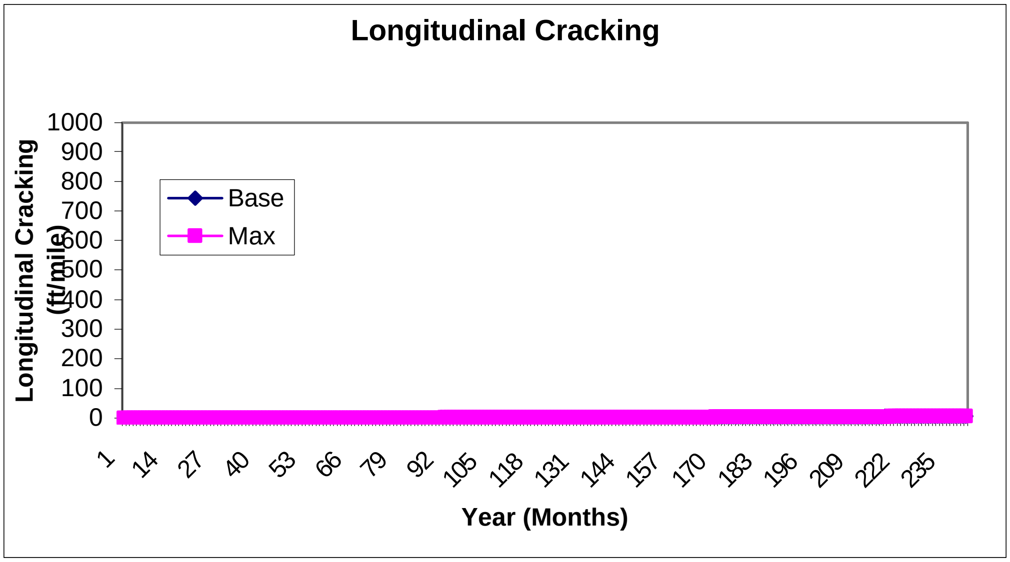


Figure D -57 1817 – Base Vs Mar/Apr

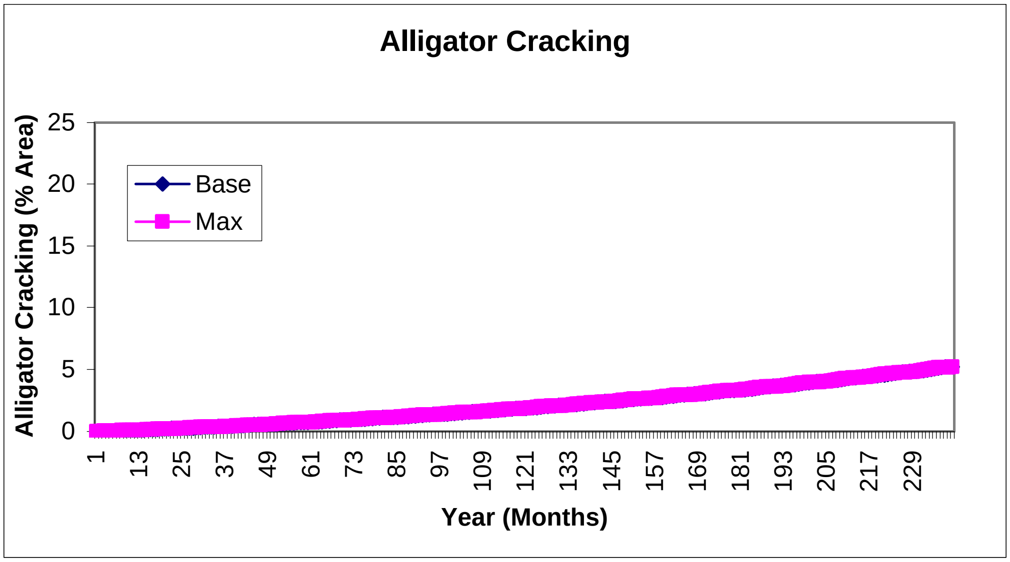


Figure D -58 1817 – Base Vs Mar/Apr

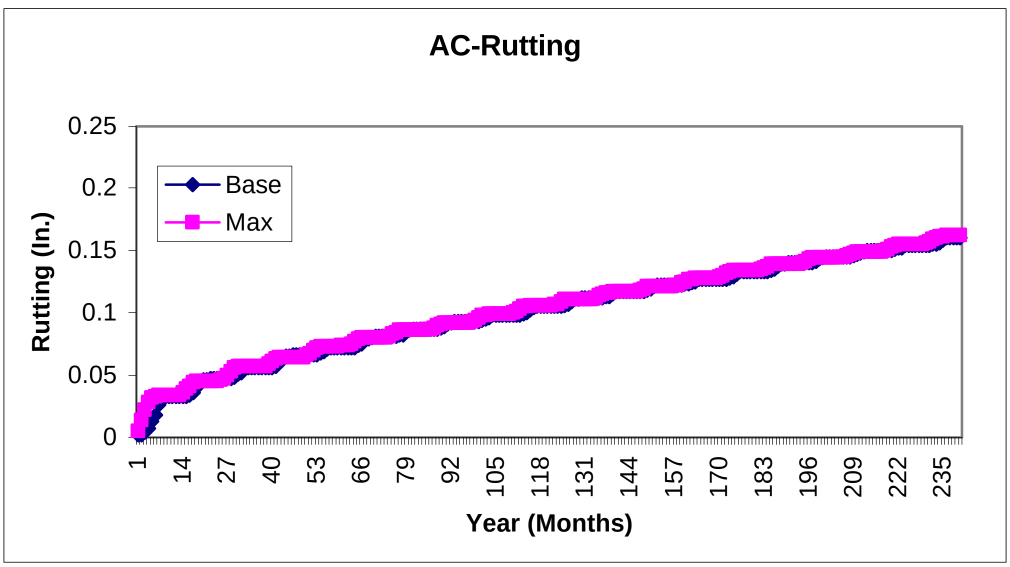


Figure D -59 1817 – Base Vs Mar/Apr

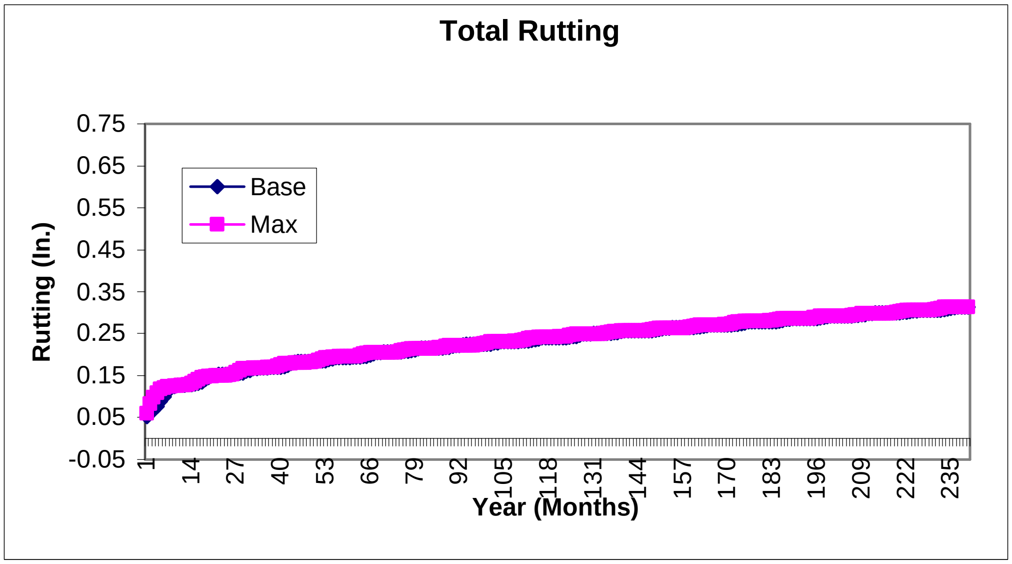


Figure D -60 1817 – Base Vs Mar/Apr

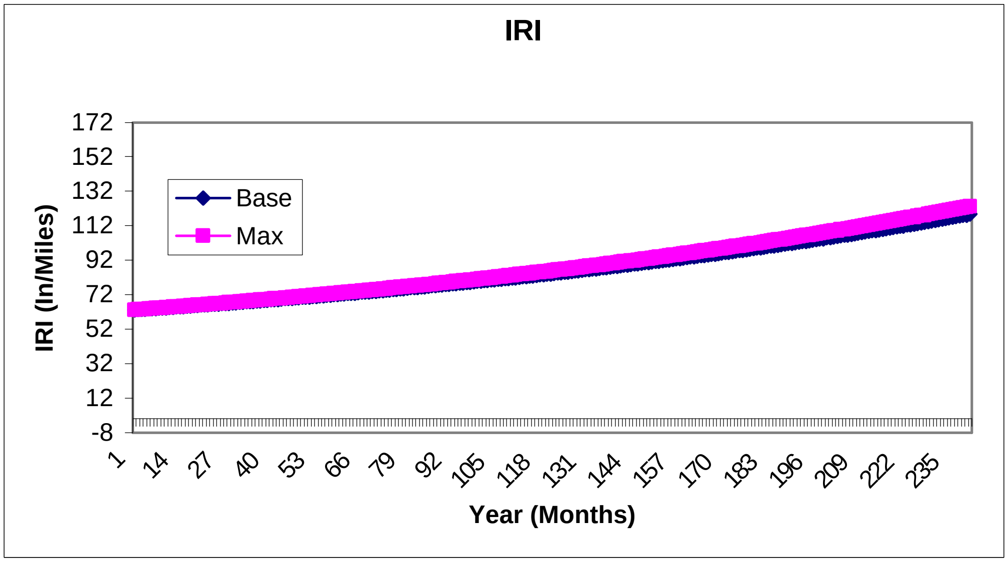


Figure D -61 1817 – Base Vs Sep/Oct

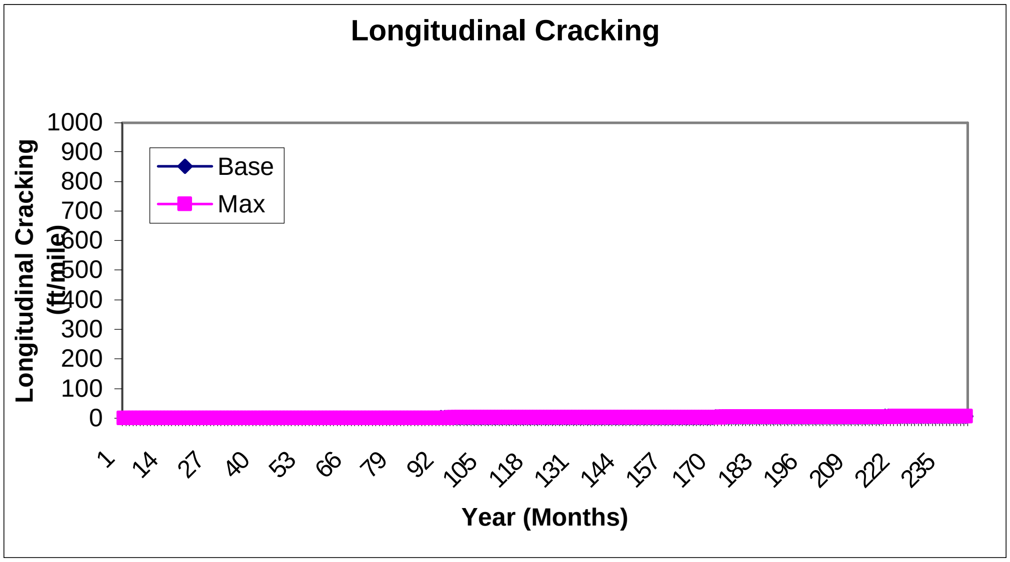


Figure D -62 1817 – Base Vs Sep/Oct

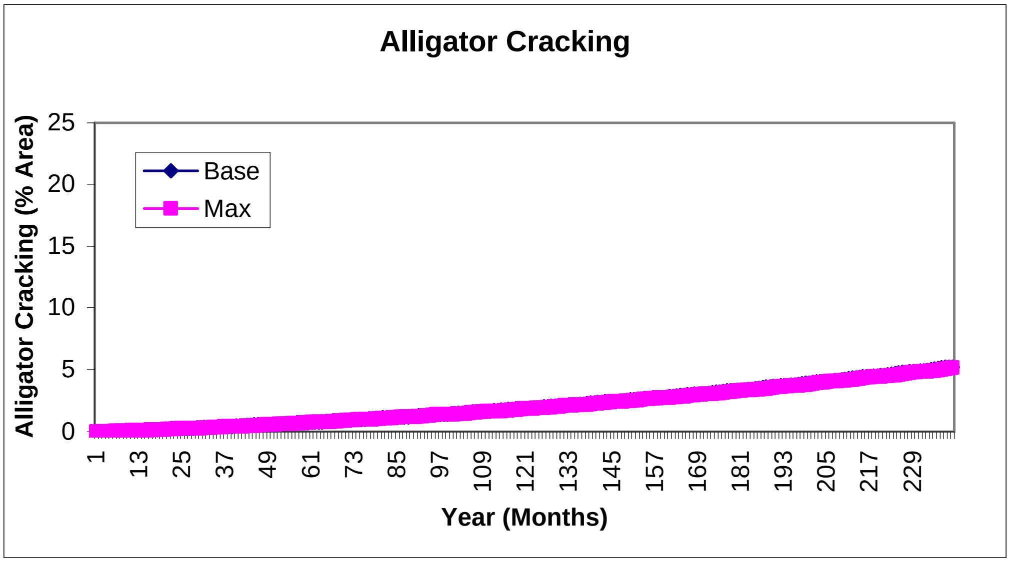


Figure D -63 1817 – Base Vs Sep/Oct

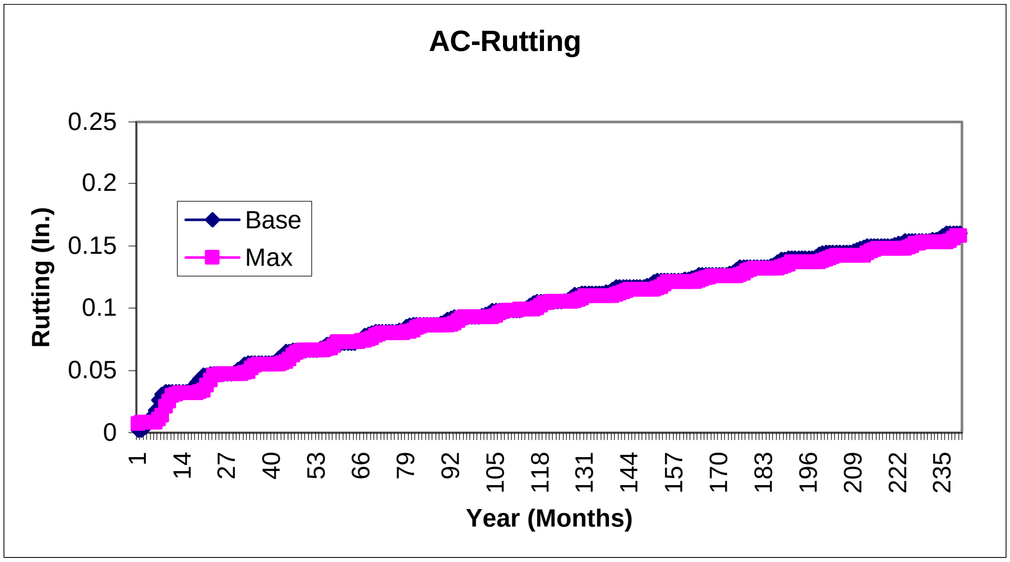


Figure D -64 1817 – Base Vs Sep/Oct

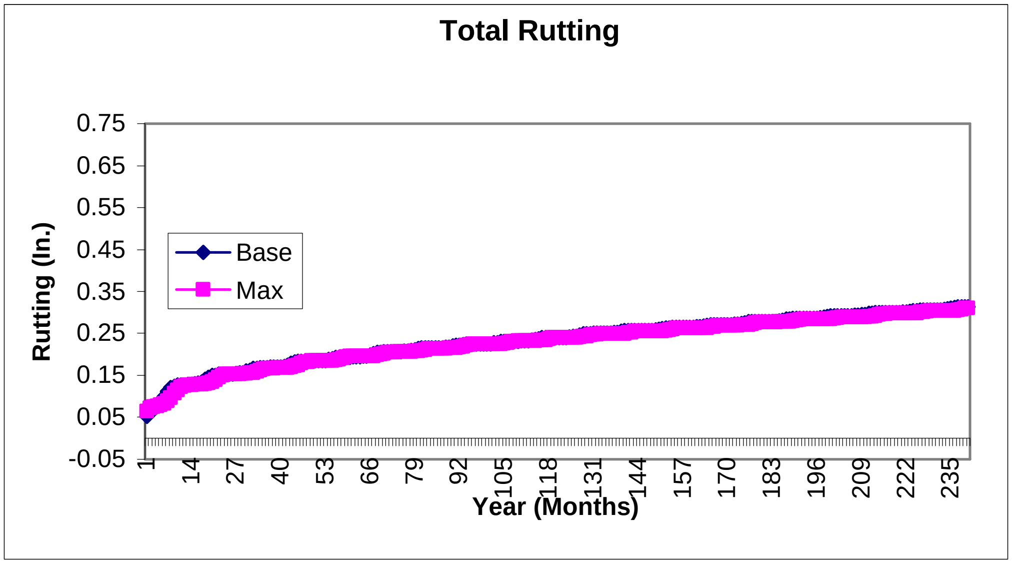


Figure D -65 1817 – Base Vs Sep/Oct

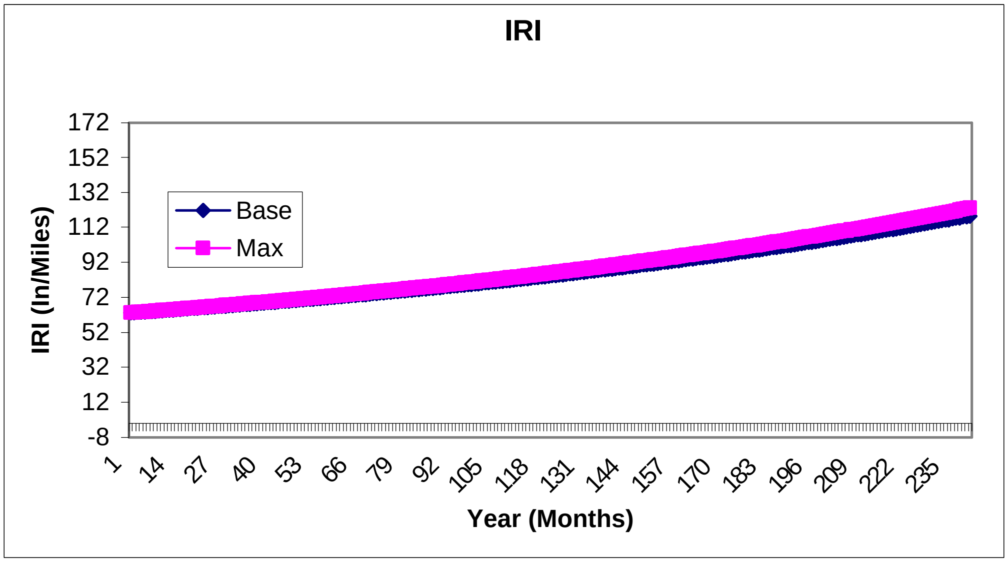


Figure D -66 1817 – |E*| – Level1VsLevel2VsLevel3-S9.5BC

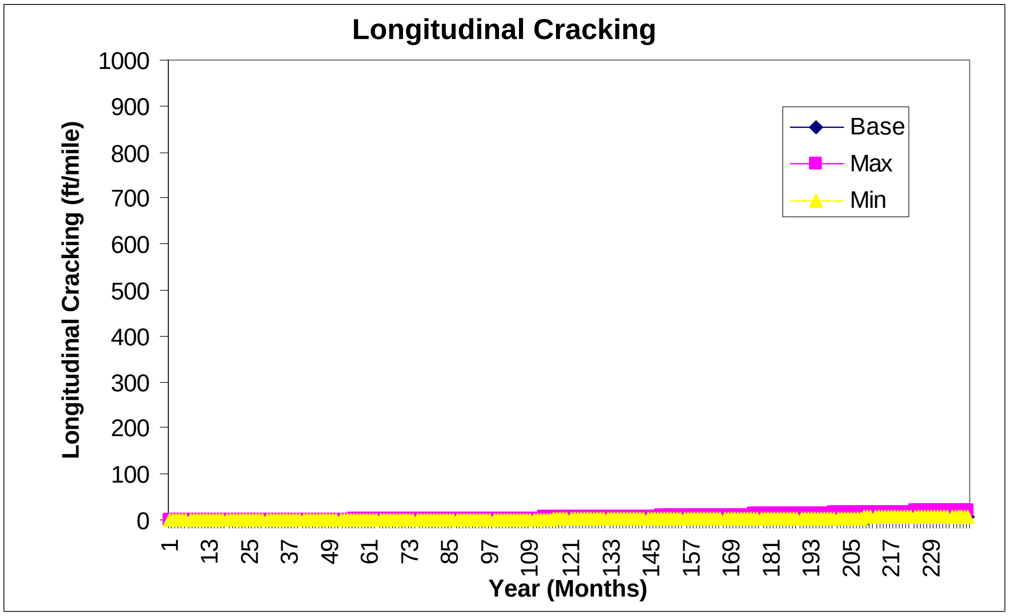


Figure D -67 1817 – |E*| – Level1VsLevel2VsLevel3-S9.5BC

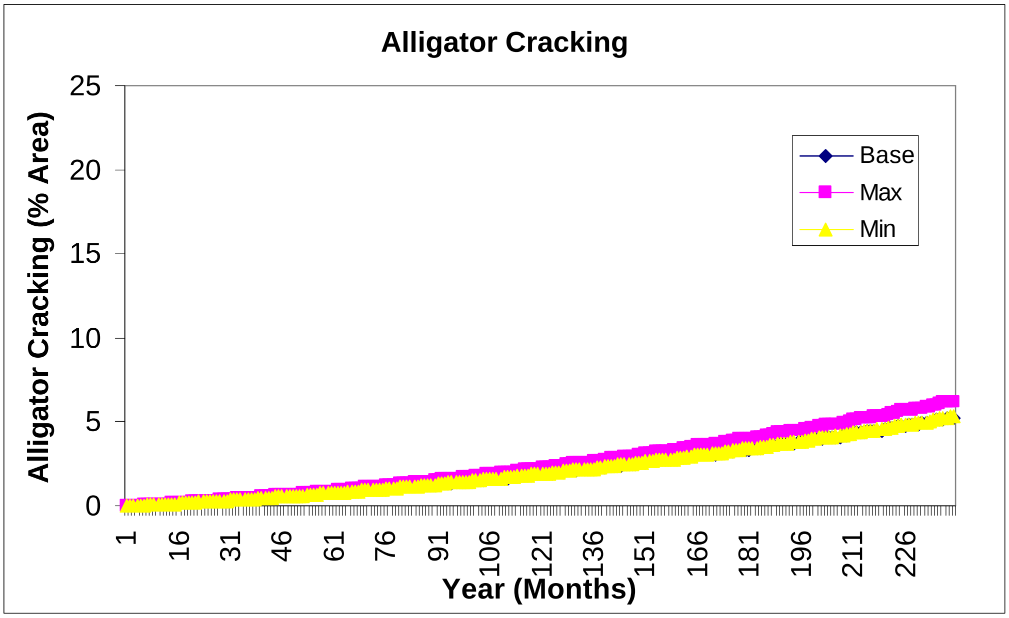


Figure D -68 1817 – |E*| – Level1VsLevel2VsLevel3-S9.5BC

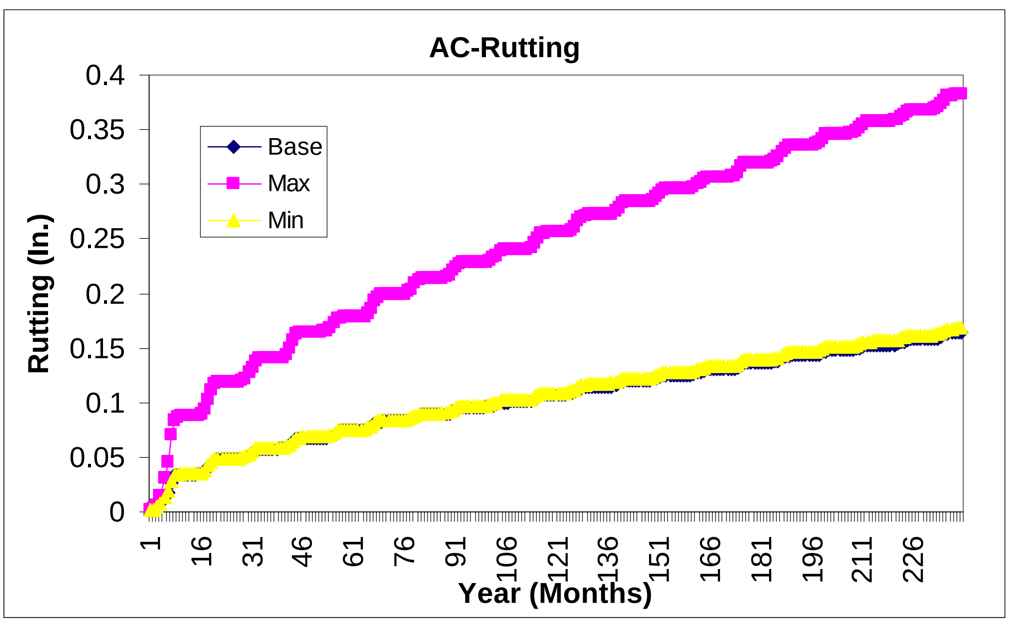


Figure D -69 1817 – |E*| – Level1VsLevel2VsLevel3-S9.5BC

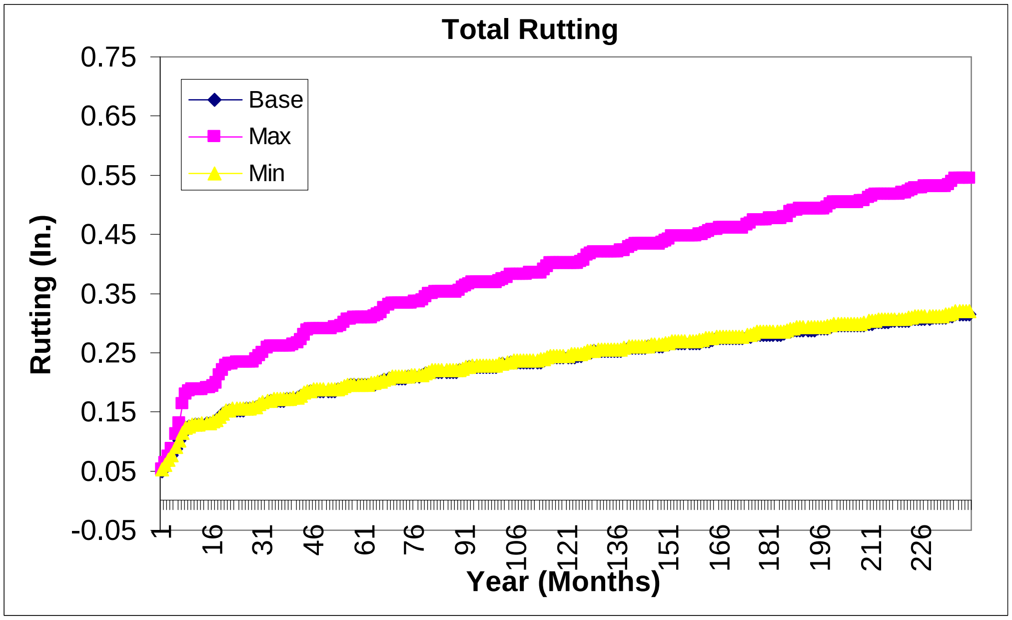


Figure D -70 1817 – |E*| – Level1VsLevel2VsLevel3-S9.5BC

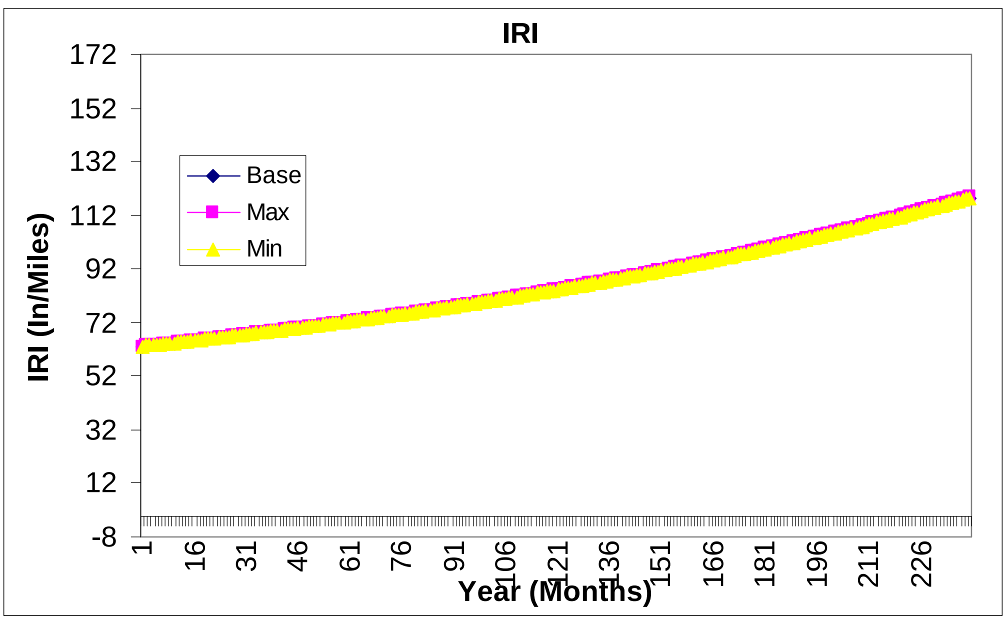


Figure D -71 1817 – |E*| – Level1VsLevel2VsLevel3-B25BC

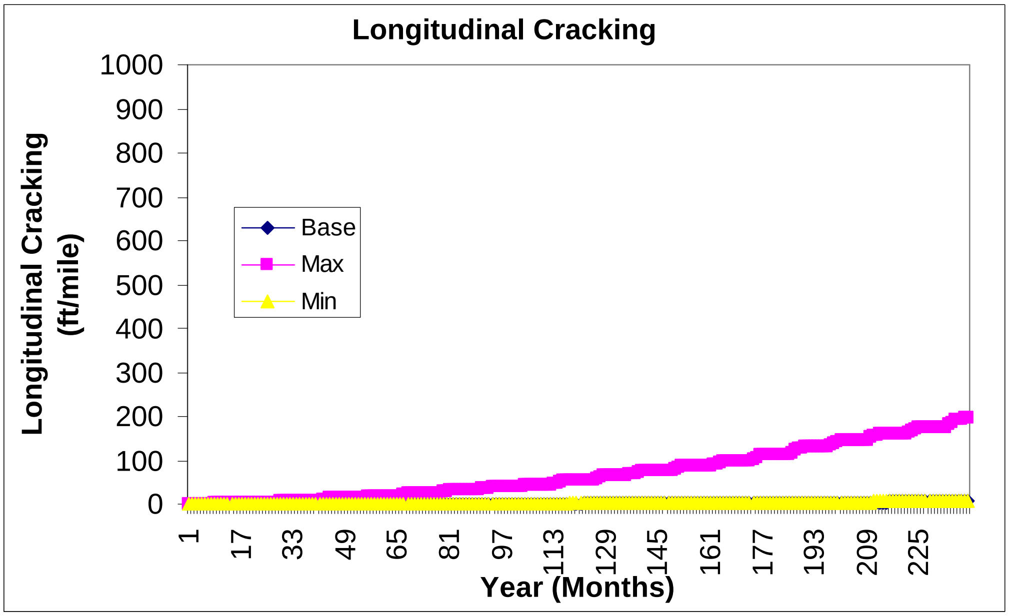


Figure D -72 1817 – |E*| – Level1VsLevel2VsLevel3-B25BC

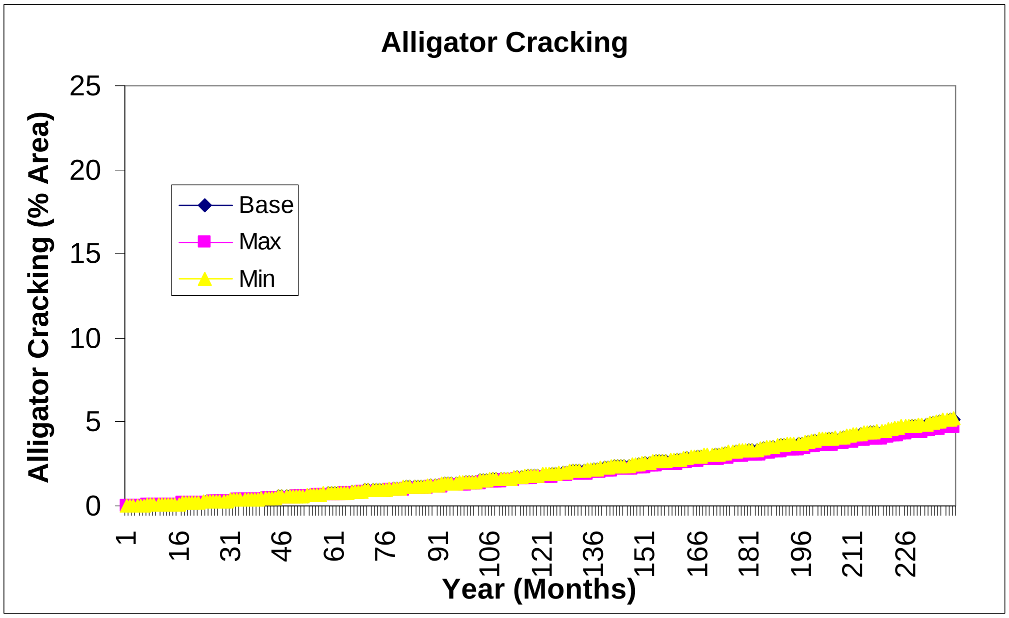


Figure D -73 1817 – |E*| – Level1VsLevel2VsLevel3-B25BC

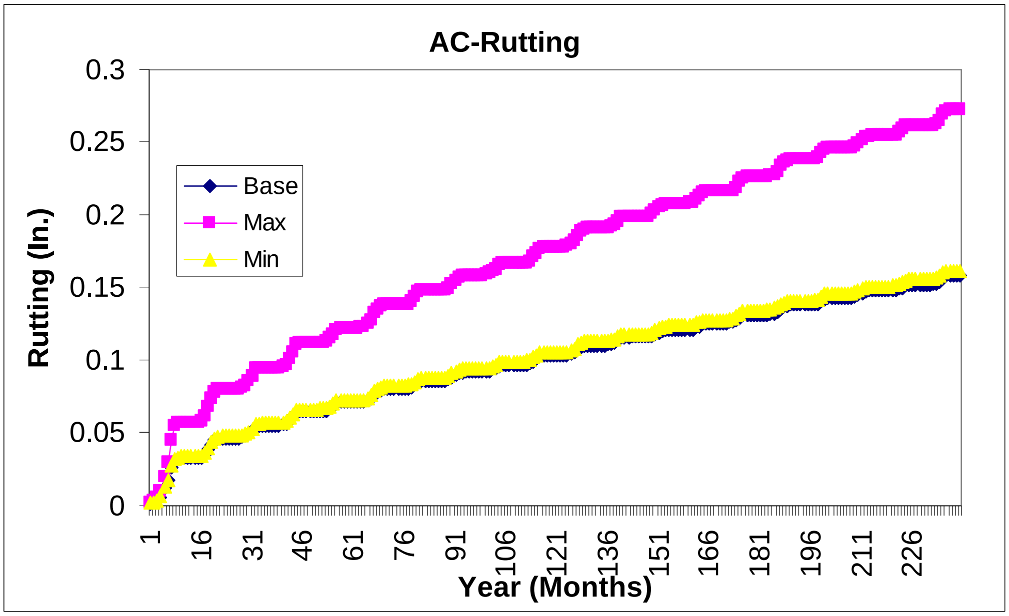


Figure D -74 1817 – |E*| – Level1VsLevel2VsLevel3-B25BC

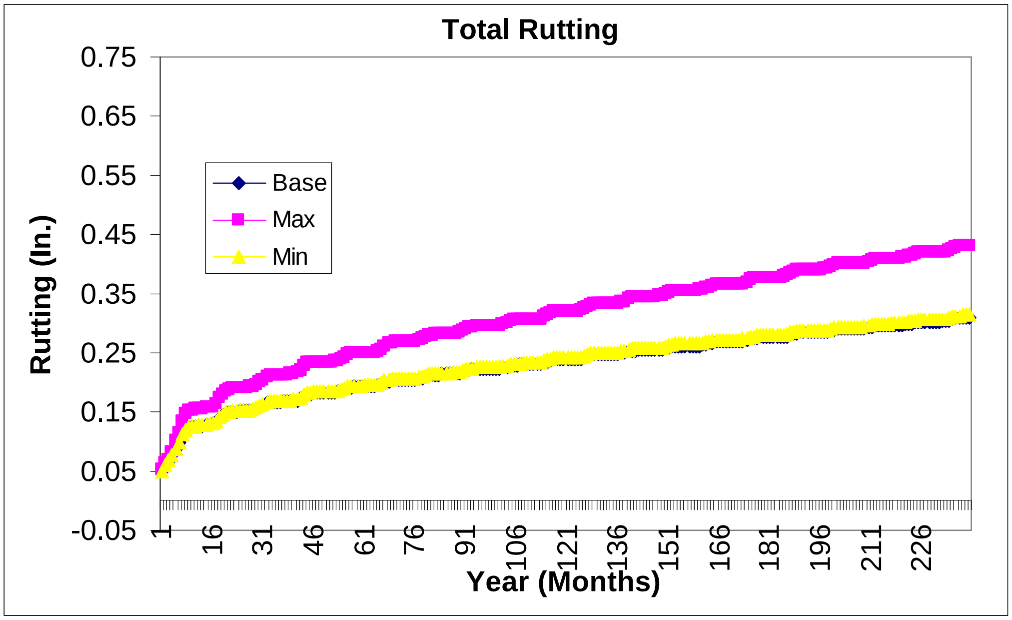


Figure D -75 1817 – |E*| – Level1VsLevel2VsLevel3-B25BC

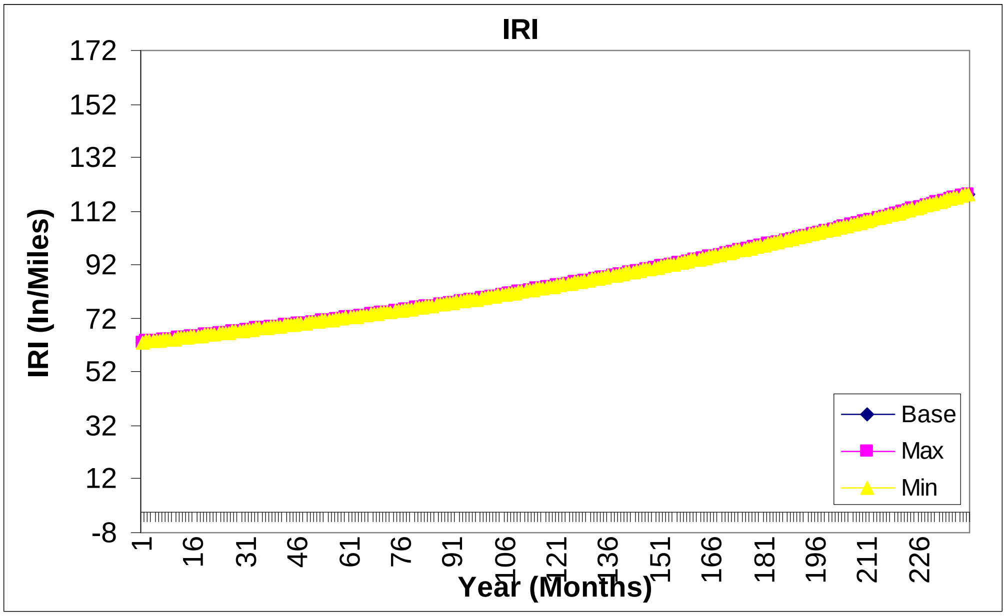


Figure D -76 1817 – Truck Growth Factor

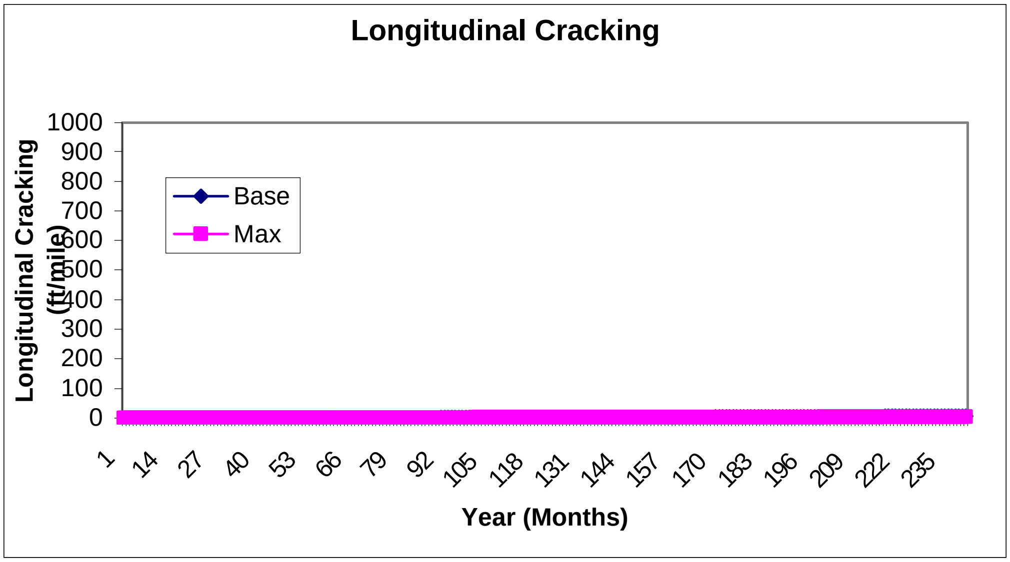


Figure D -77 1817 – Truck Growth Factor

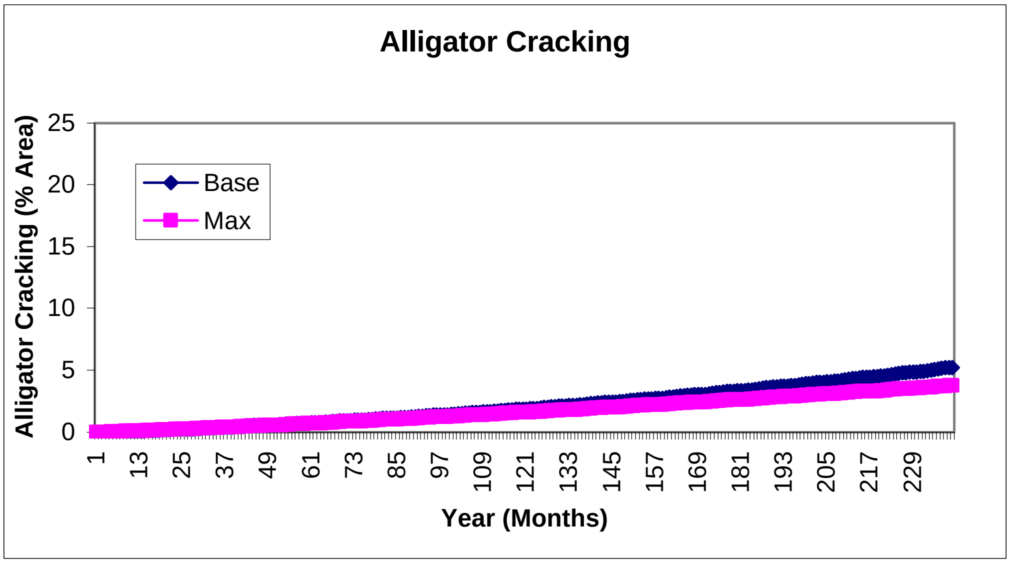


Figure D -78 1817 – Truck Growth Factor

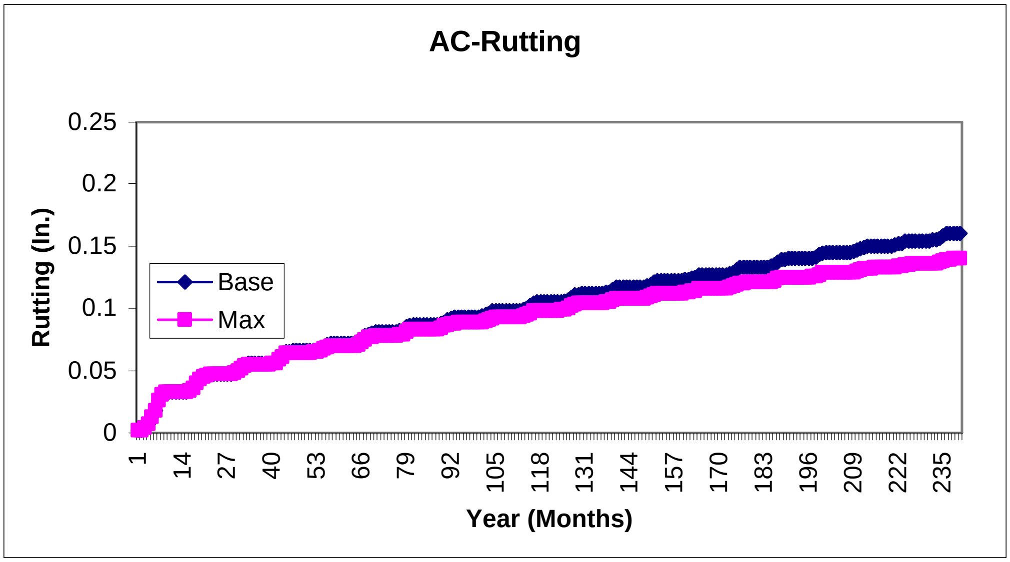


Figure D -79 1817 – Truck Growth Factor

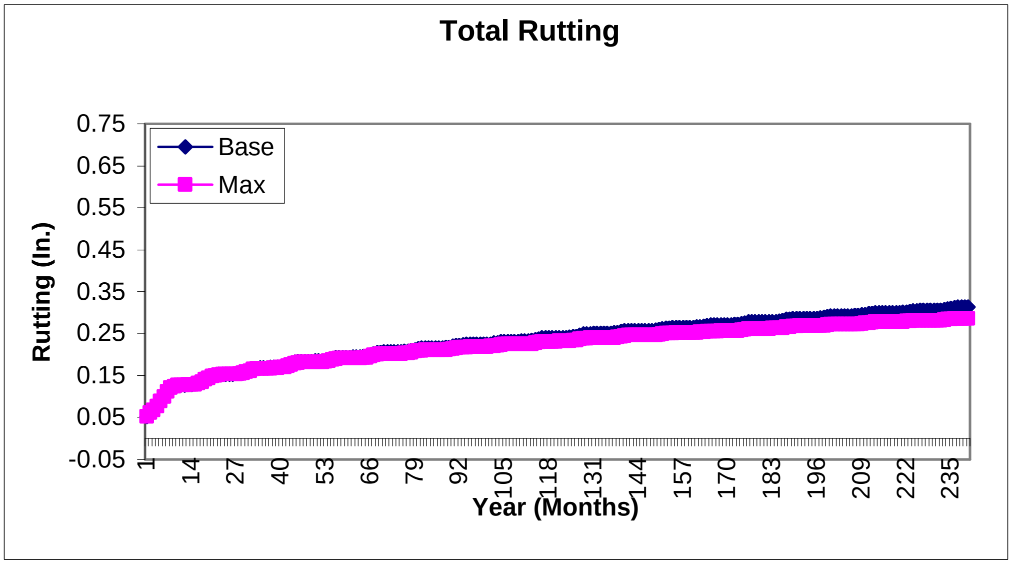


Figure D -80 1817 – Truck Growth Factor

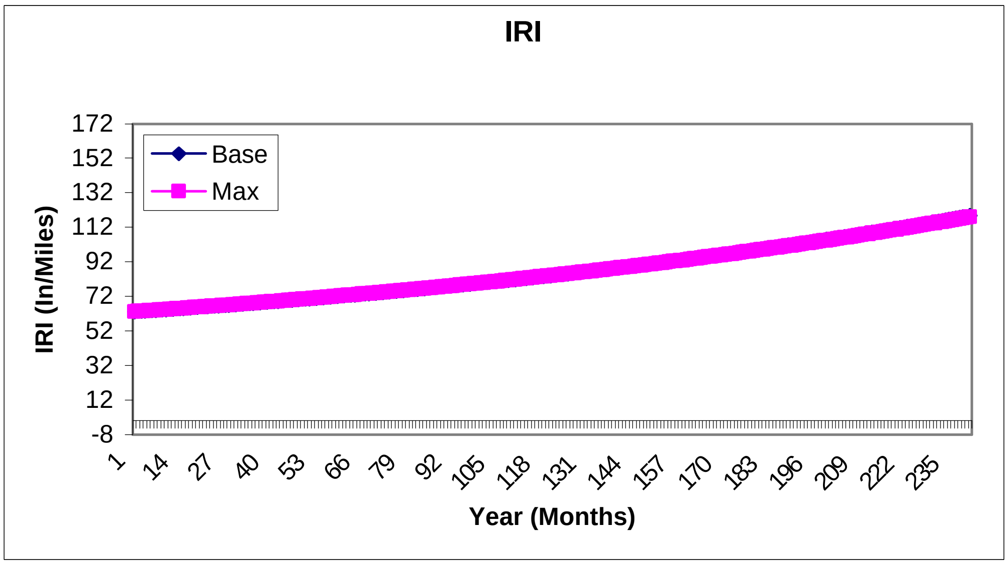


Figure D -81 1814 – Airvoids – ACLayer - I

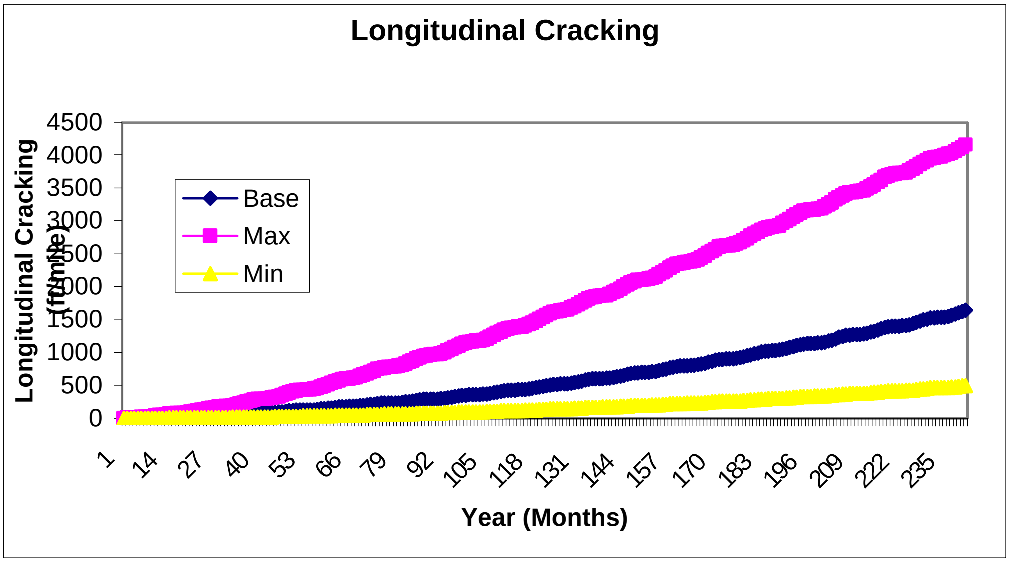


Figure D -82 1814 – Airvoids – ACLayer - I

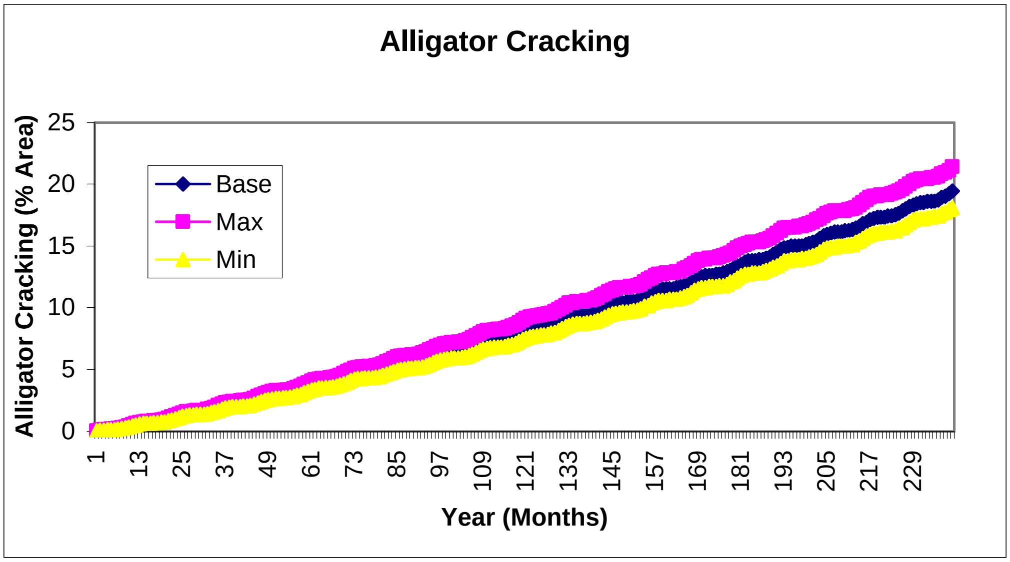


Figure D -83 1814 – Airvoids – ACLayer - I

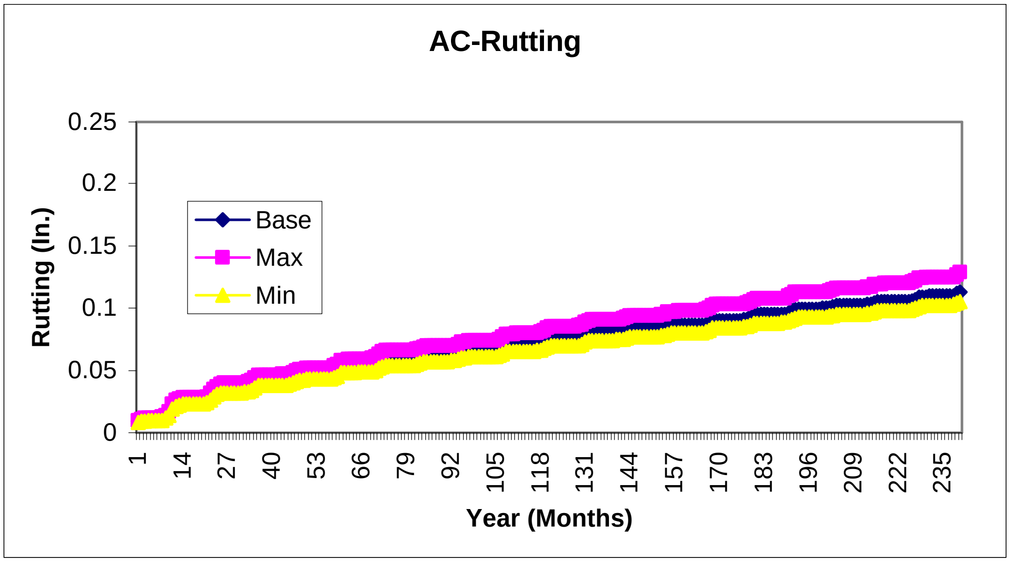


Figure D -84 1814 – Airvoids – ACLayer - I

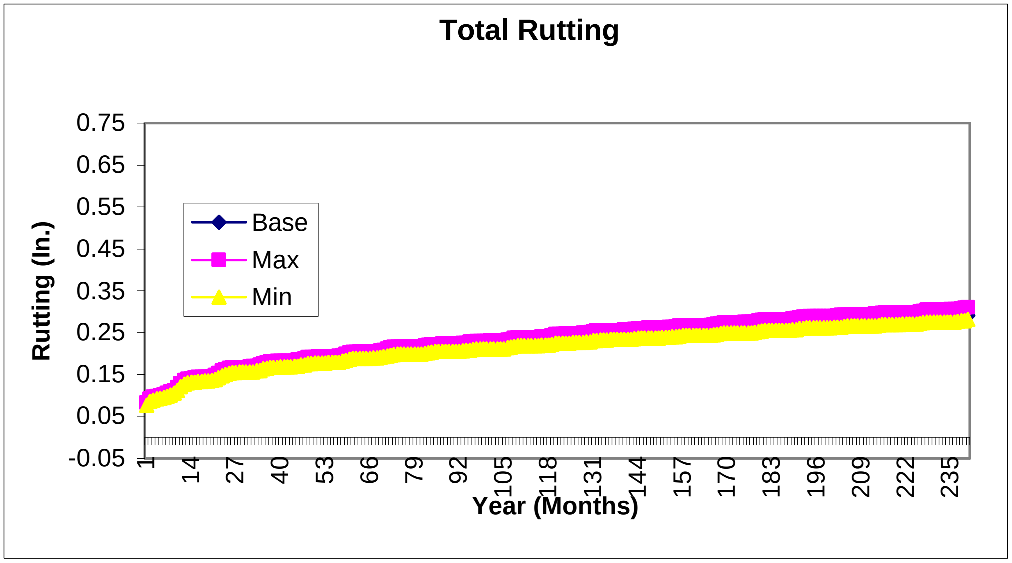


Figure D -85 1814 – Airvoids – ACLayer - I

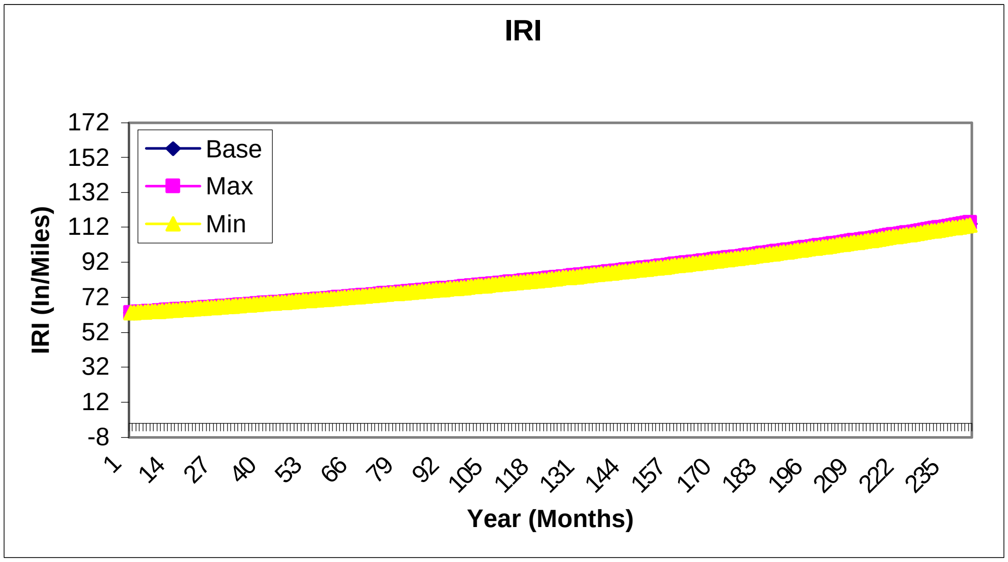


Figure D -86 1814 – HeatCapacity – ACLayer - I

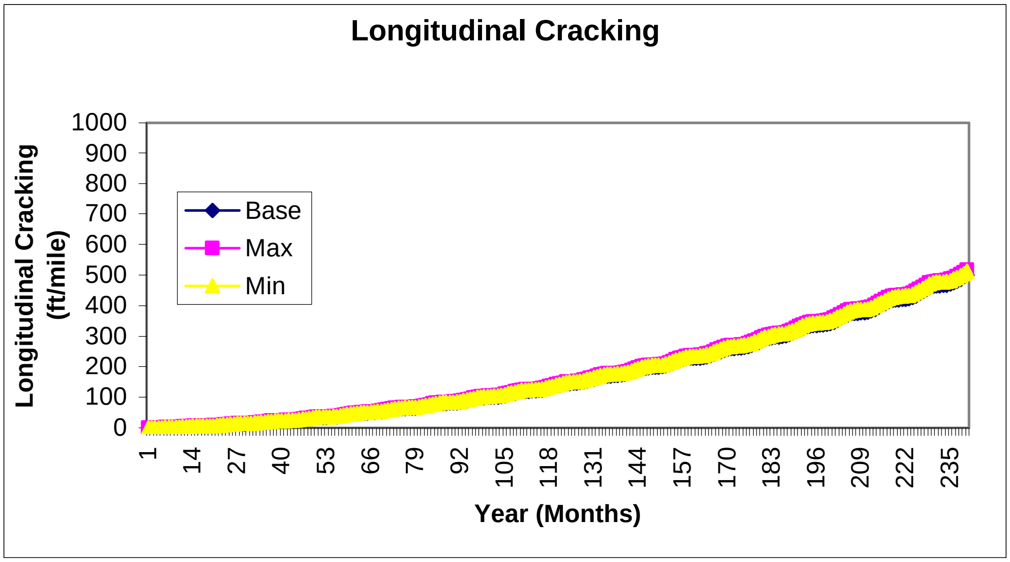


Figure D -87 1814 – HeatCapacity – ACLayer - I

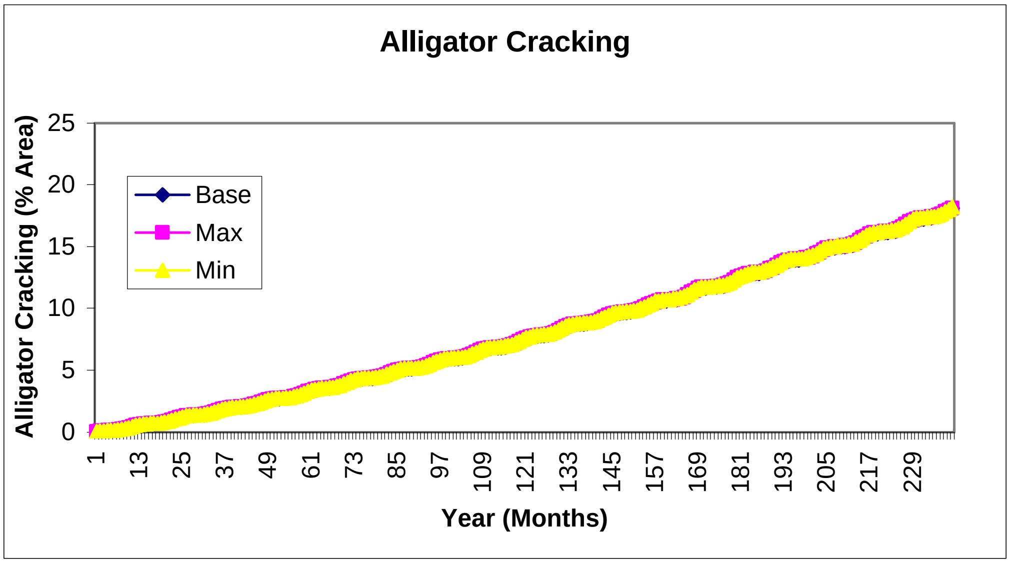


Figure D -88 1814 – HeatCapacity – ACLayer - I

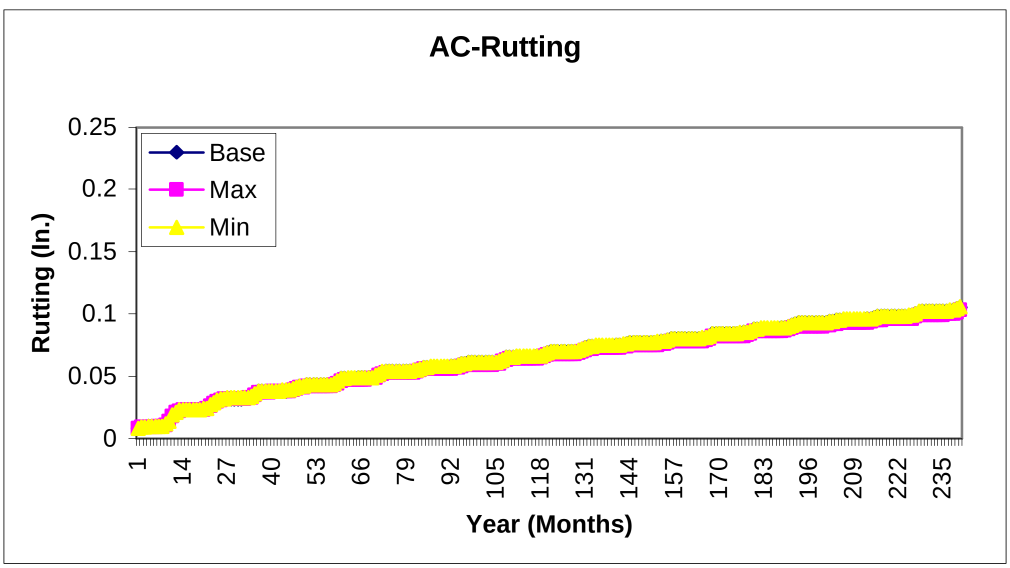


Figure D -89 1814 – HeatCapacity – ACLayer - I

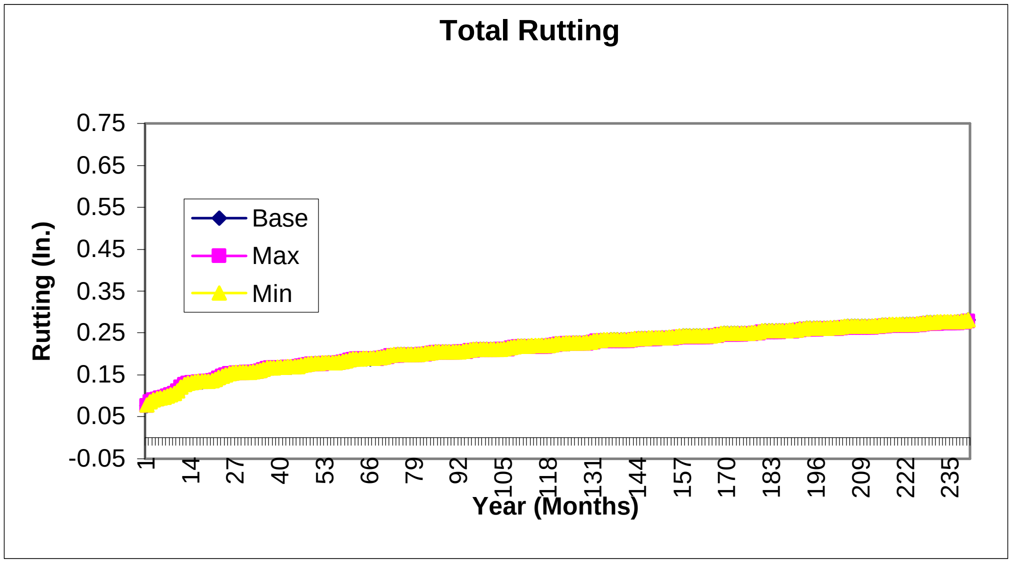


Figure D -90 1814 – HeatCapacity – ACLayer - I

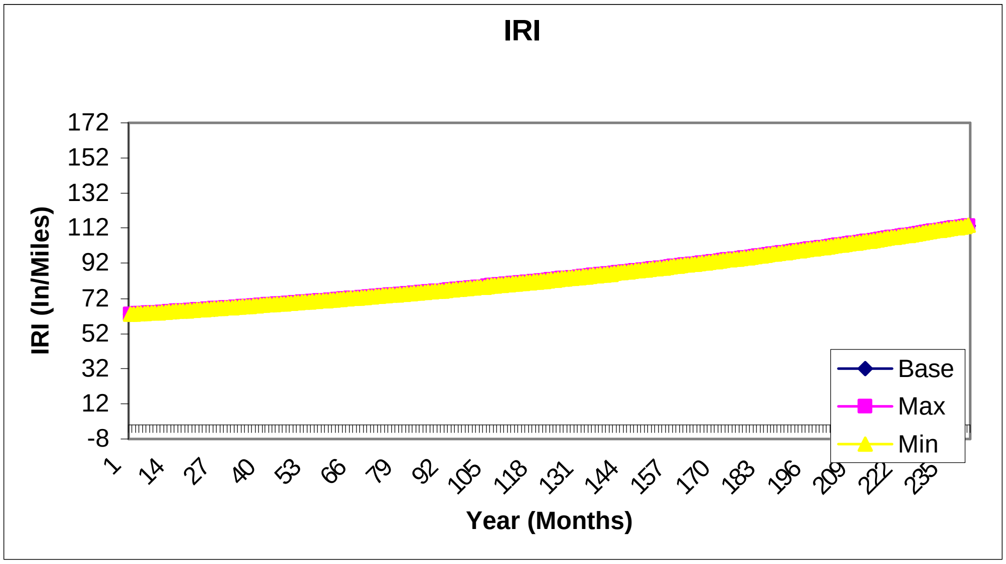


Figure D -91 1814 – ThermalConductivity – ACLayer - I

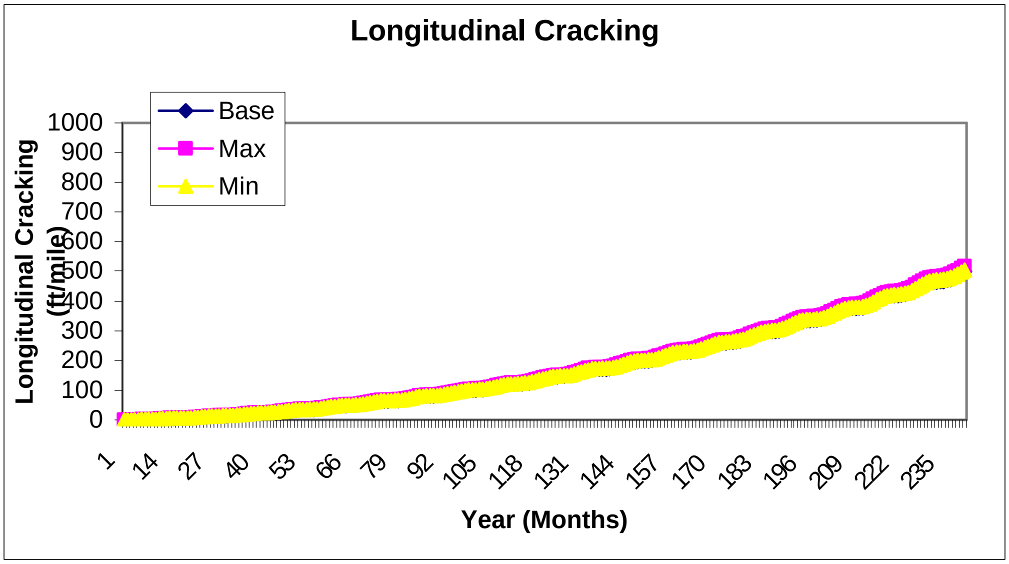


Figure D -92 1814 – ThermalConductivity – ACLayer - I

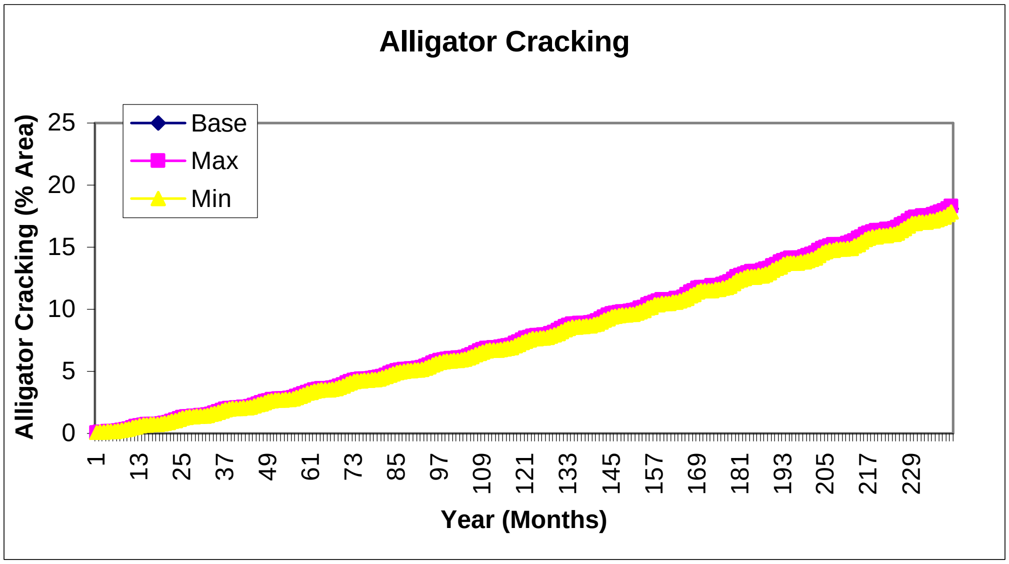


Figure D -93 1814 – ThermalConductivity – ACLayer - I

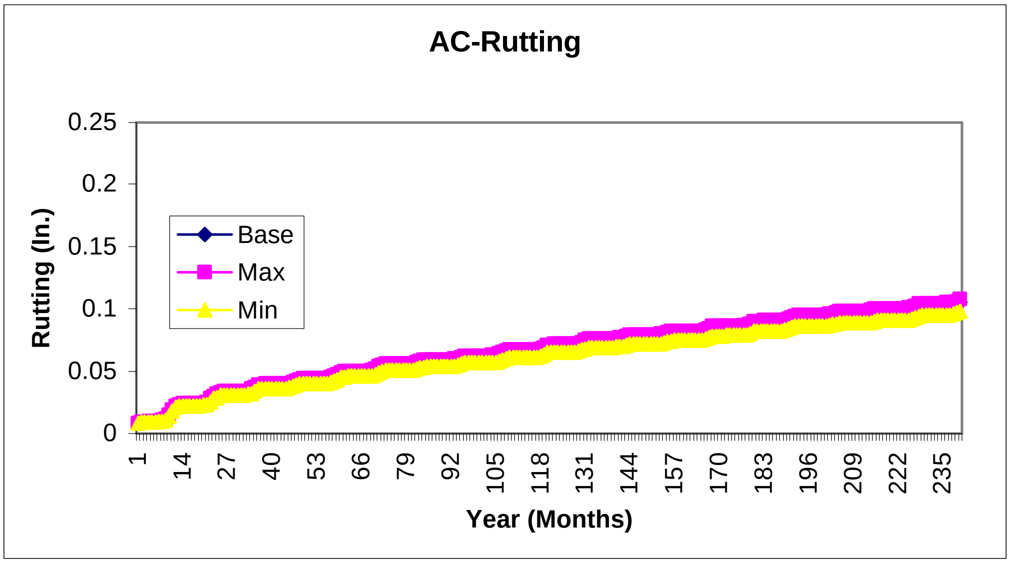


Figure D -94 1814 – ThermalConductivity – ACLayer - I

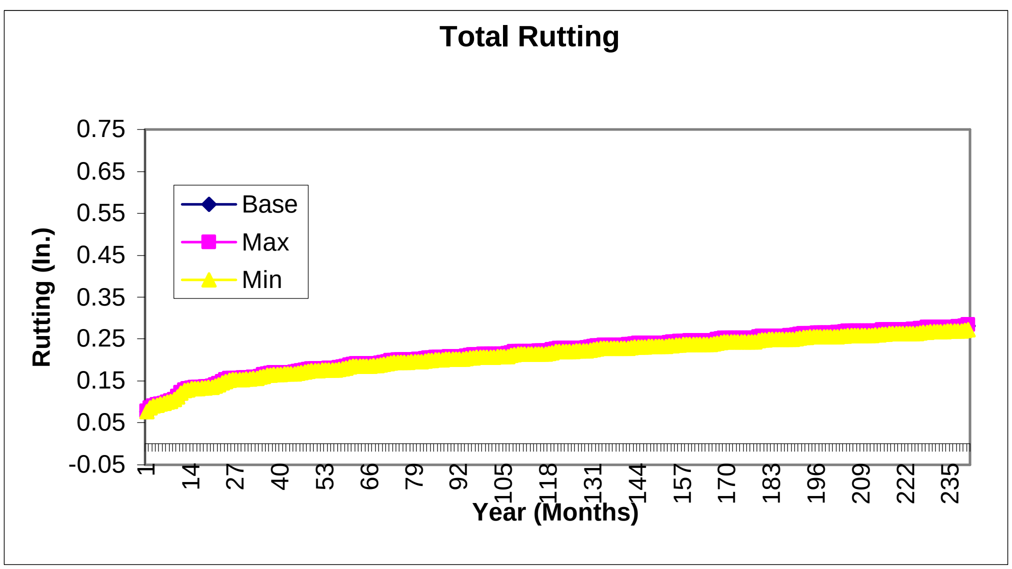


Figure D -95 1814 – ThermalConductivity – ACLayer - I

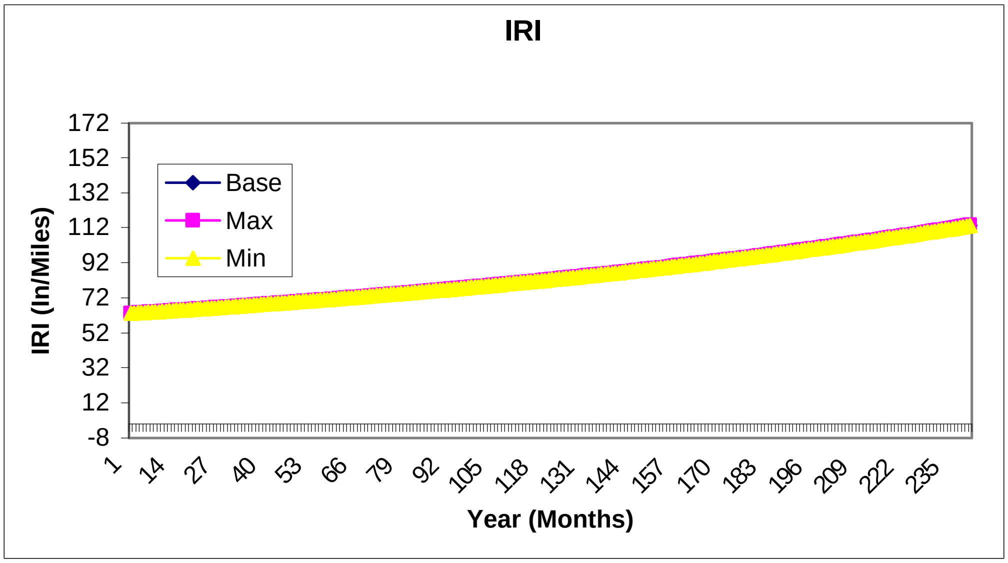


Figure D -96 1814 – Airvoids– ACLayer - II

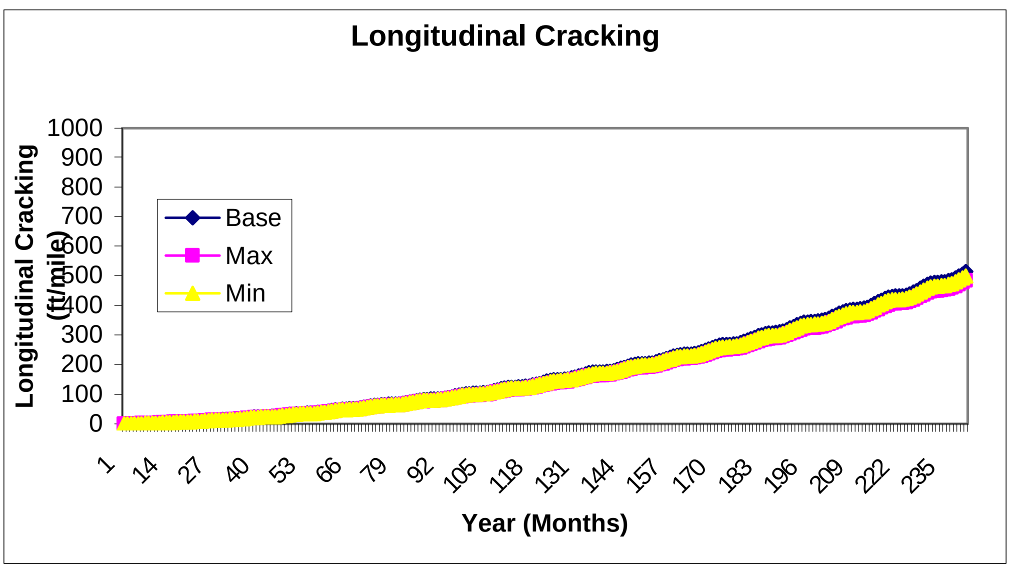


Figure D -97 1814 – Airvoids– ACLayer - II

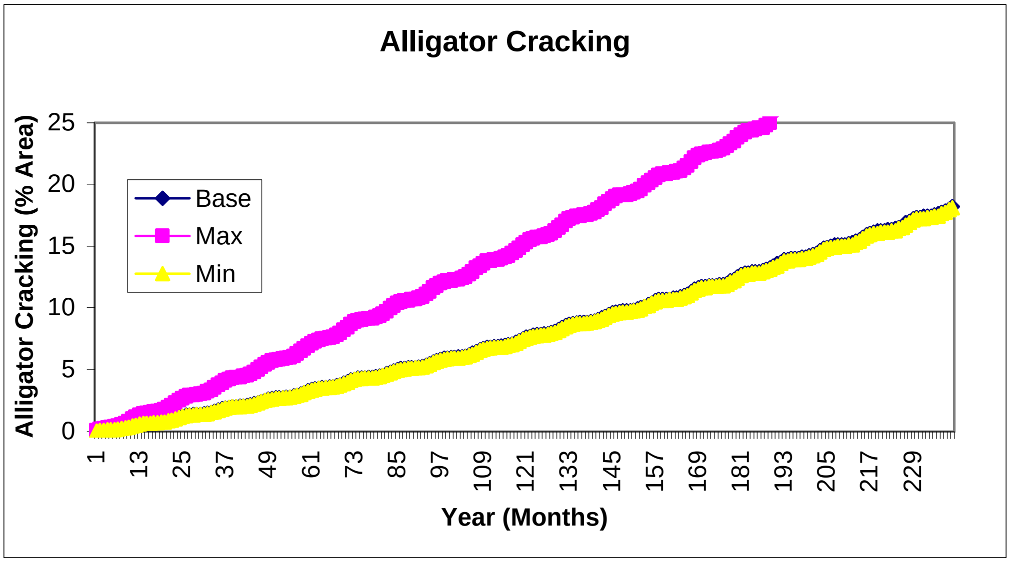


Figure D -98 1814 – Airvoids– ACLayer - II

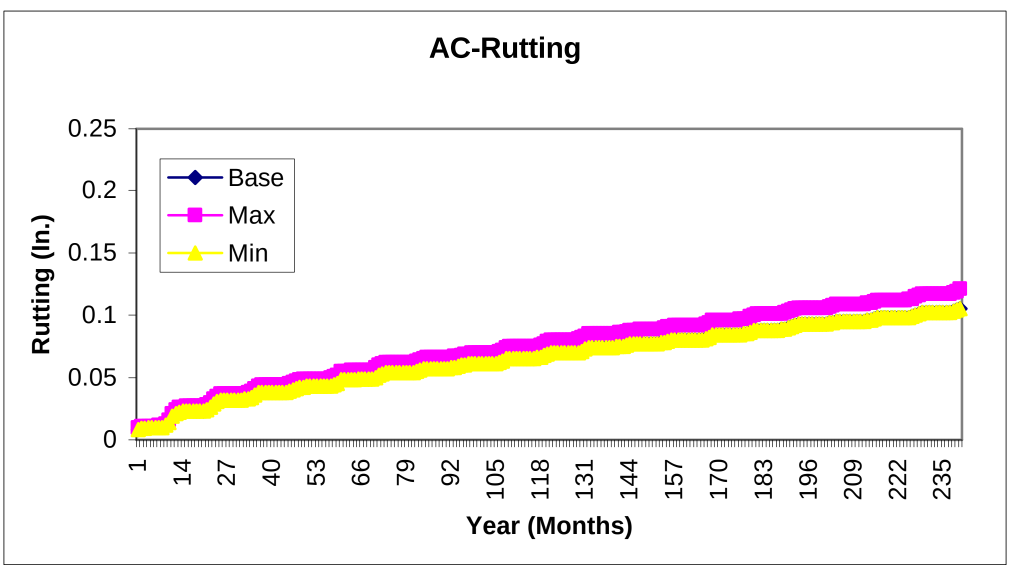


Figure D -99 1814 – Airvoids– ACLayer - II

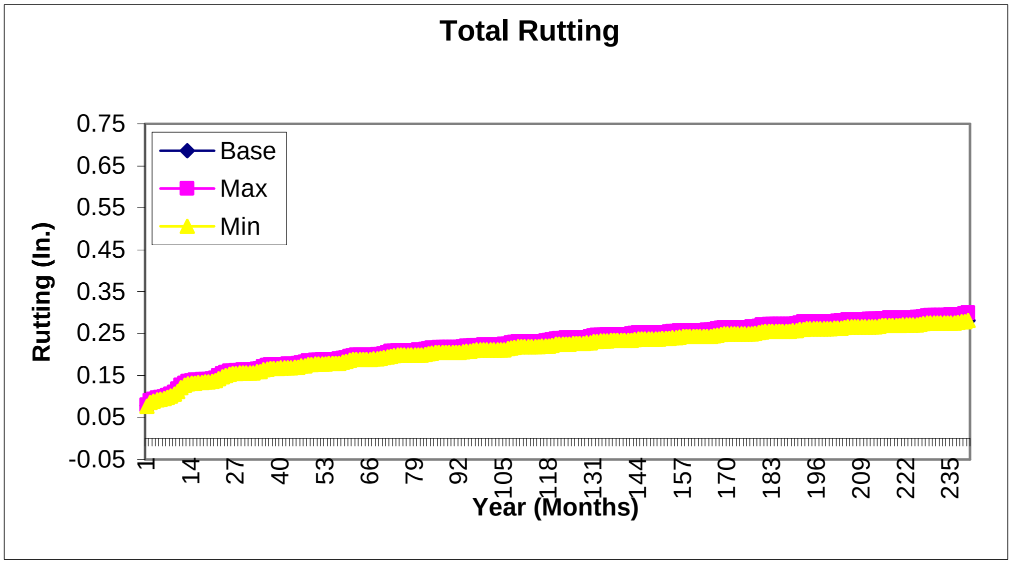


Figure D -100 1814 – Airvoids– ACLayer - II

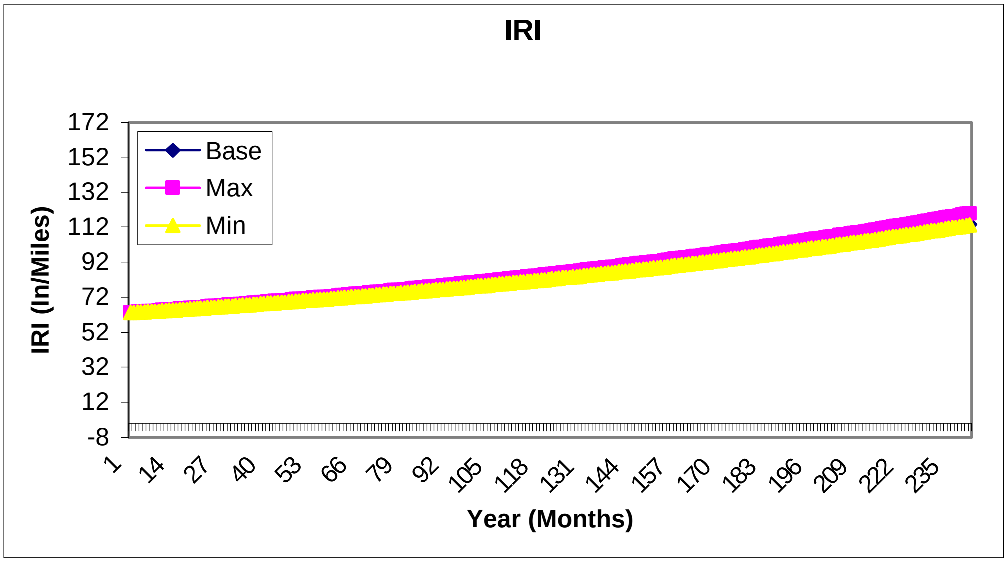


Figure D -101 1814 – HeatCapacity– ACLayer - II

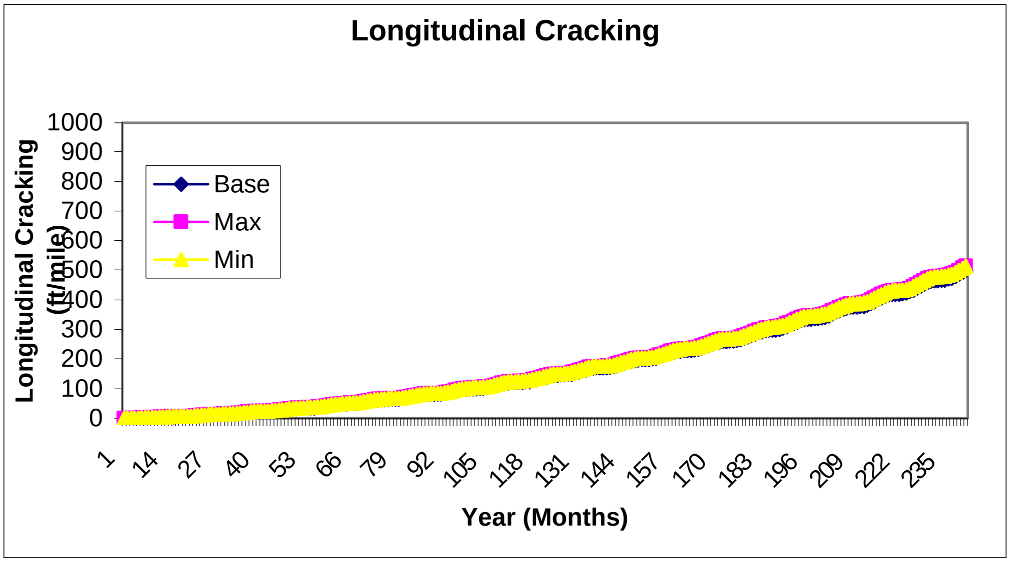


Figure D -102 1814 – HeatCapacity– ACLayer - II

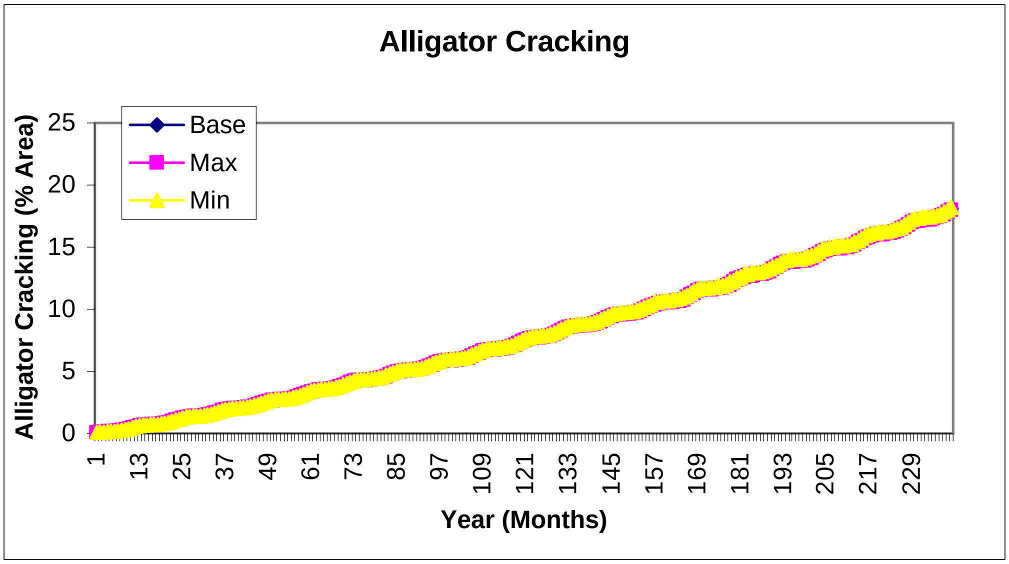


Figure D -103 1814 – HeatCapacity– ACLayer - II

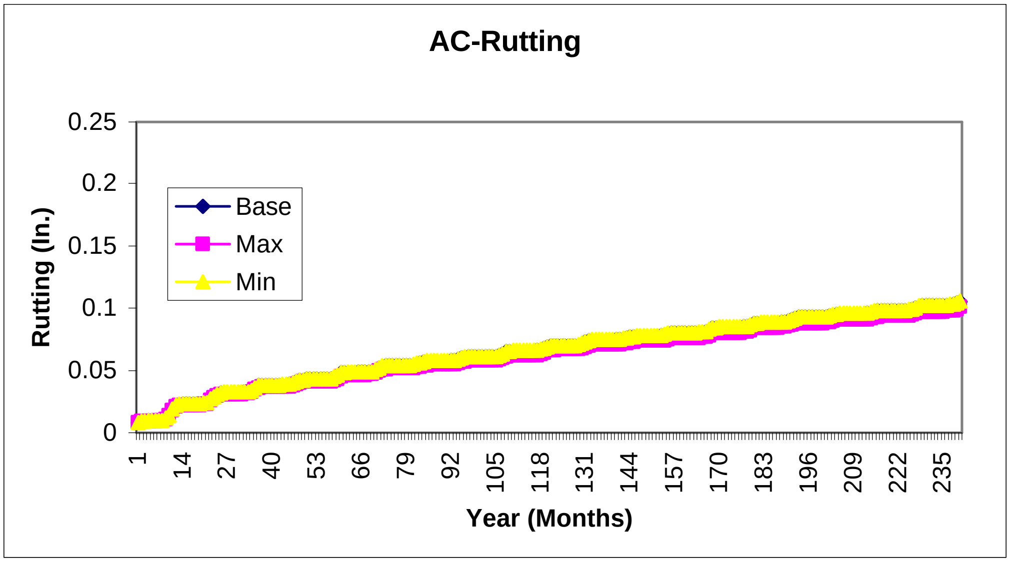


Figure D -104 1814 – HeatCapacity– ACLayer - II

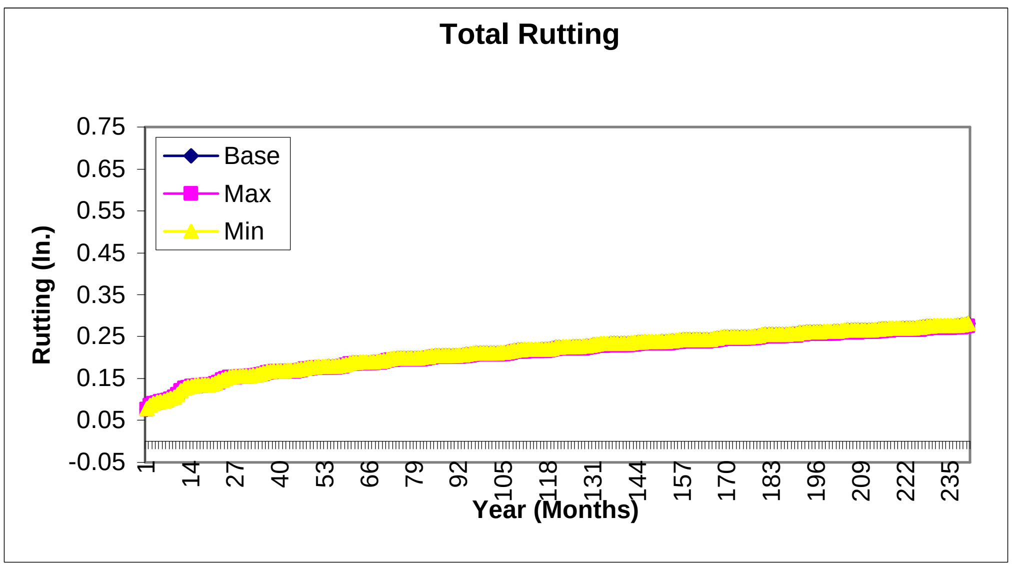


Figure D -105 1814 – HeatCapacity– ACLayer - II

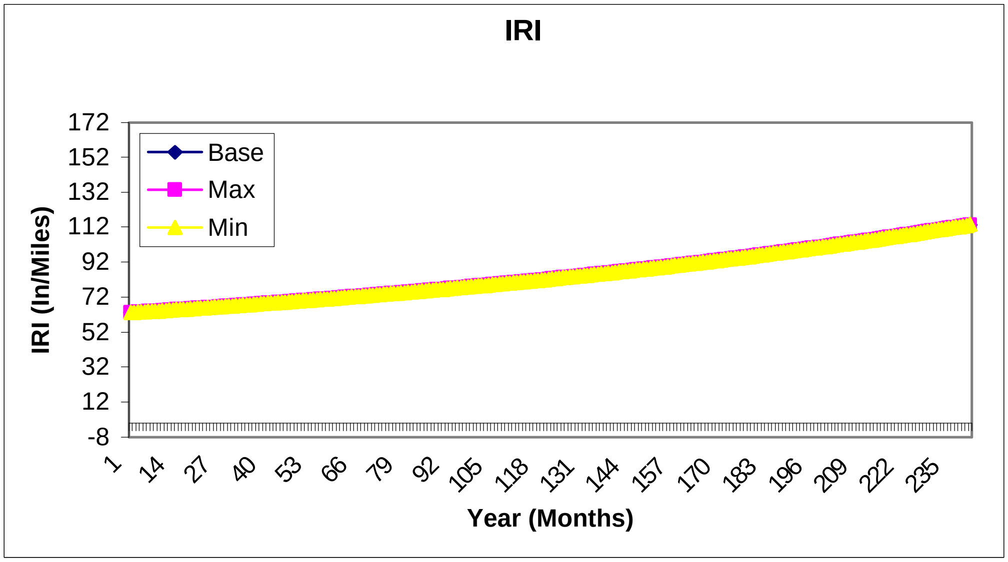


Figure D -106 1814 – ThermalConductivity– ACLayer - II

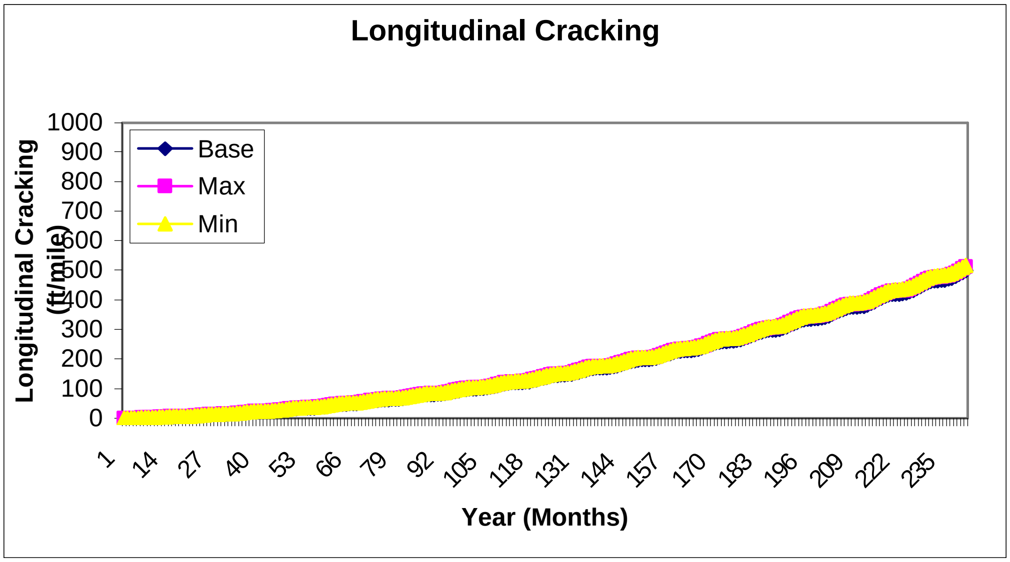


Figure D -107 1814 – ThermalConductivity– ACLayer - II

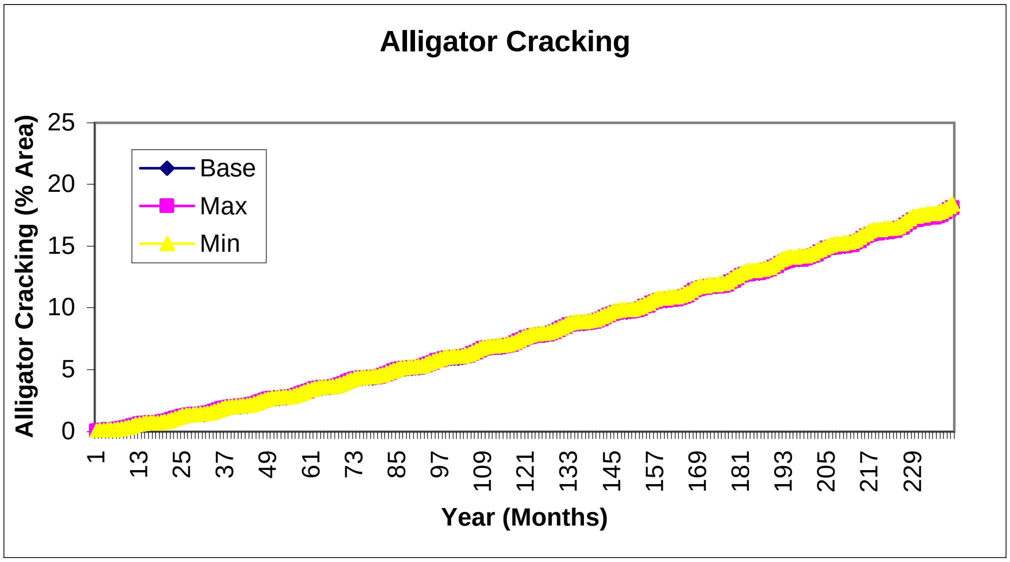


Figure D -108 1814 – ThermalConductivity– ACLayer - II

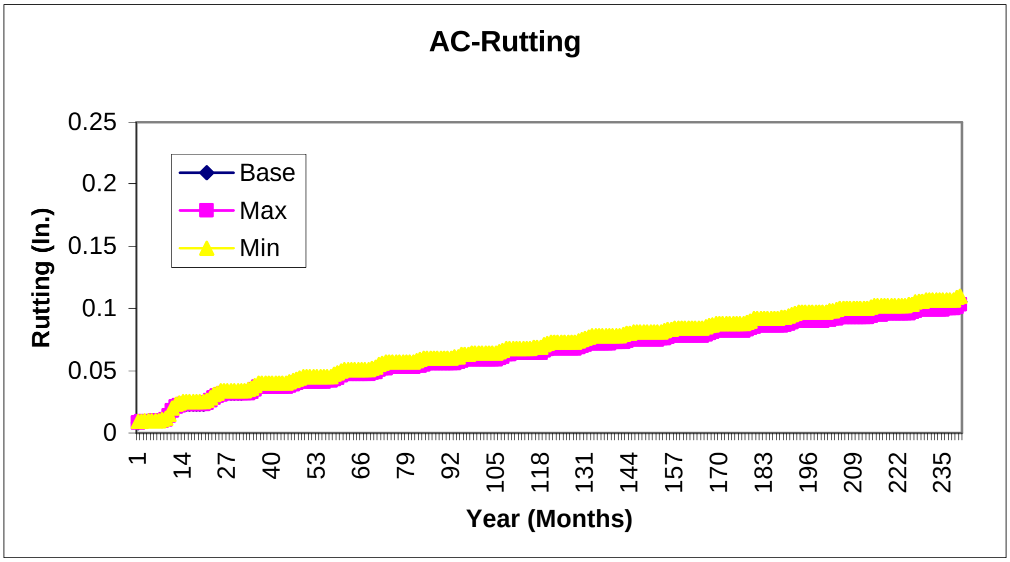


Figure D -109 1814 – ThermalConductivity– ACLayer - II

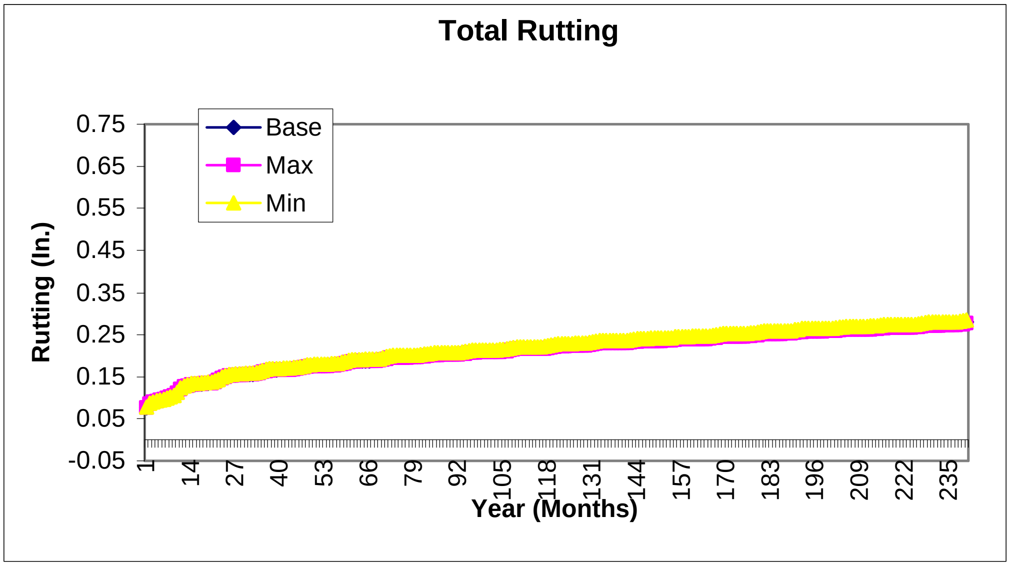


Figure D -110 1814 – ThermalConductivity– ACLayer - II

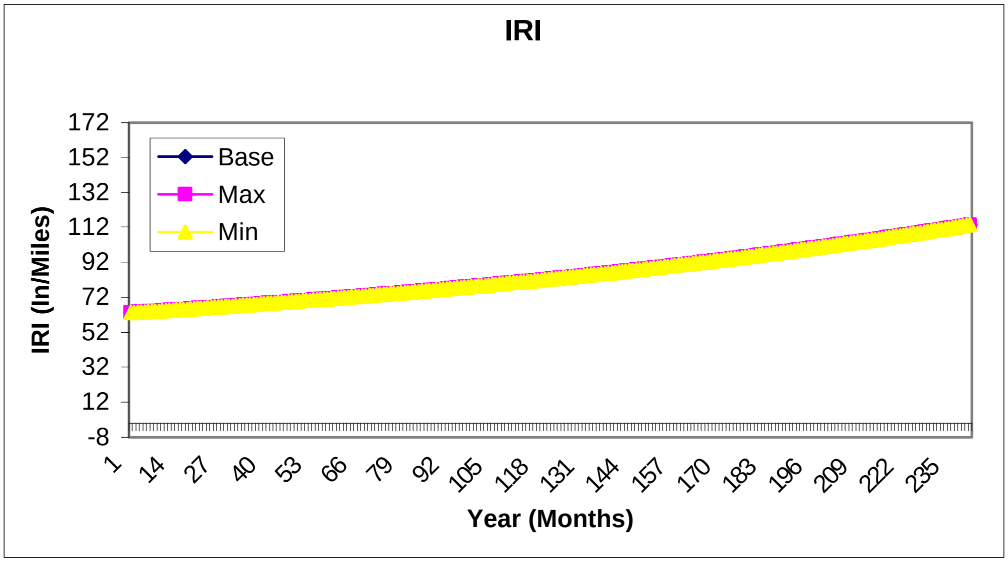


Figure D -111 1814 – Granular Base Modulus

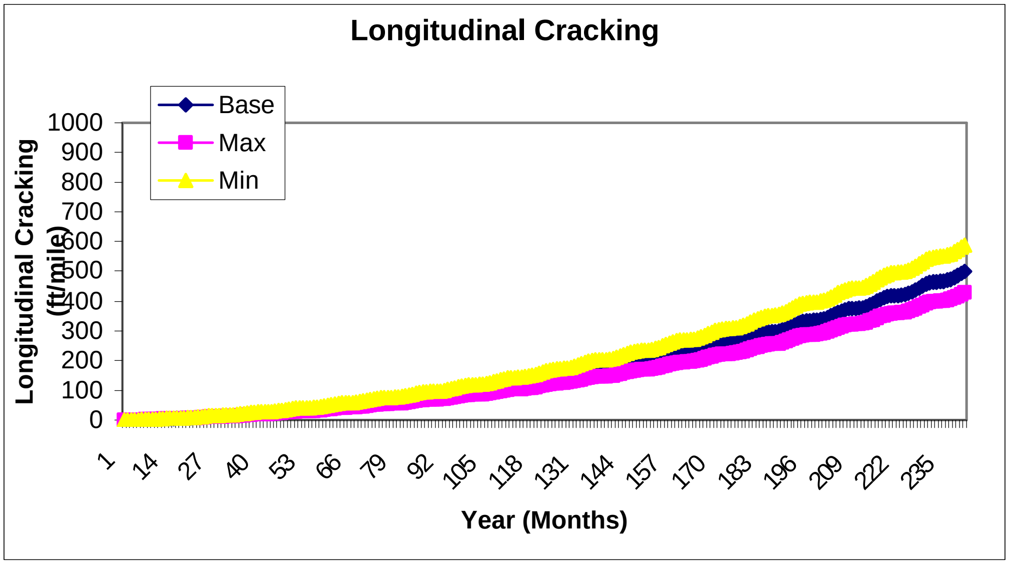


Figure D -112 1814 – Granular Base Modulus

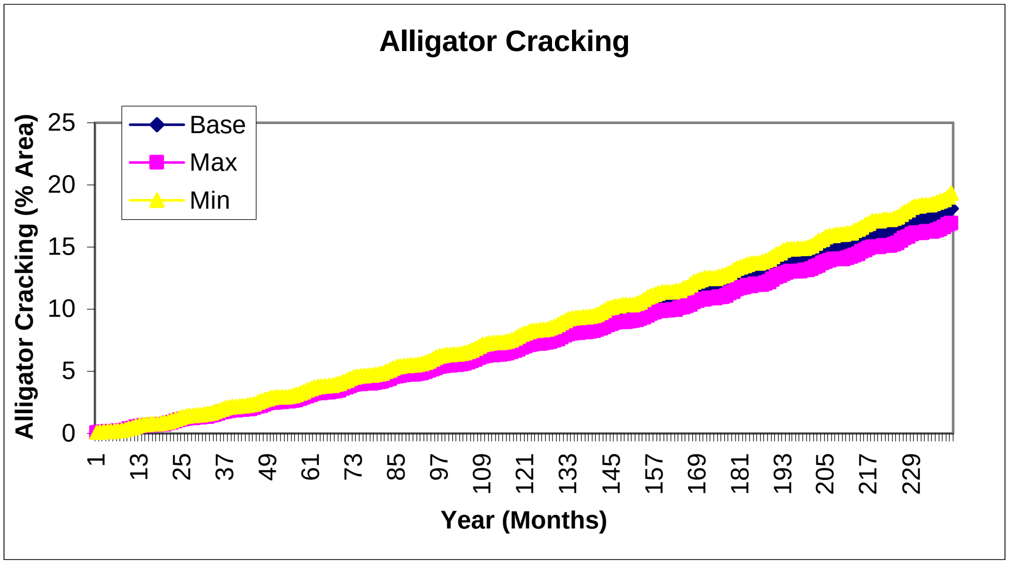


Figure D -113 1814 – Granular Base Modulus

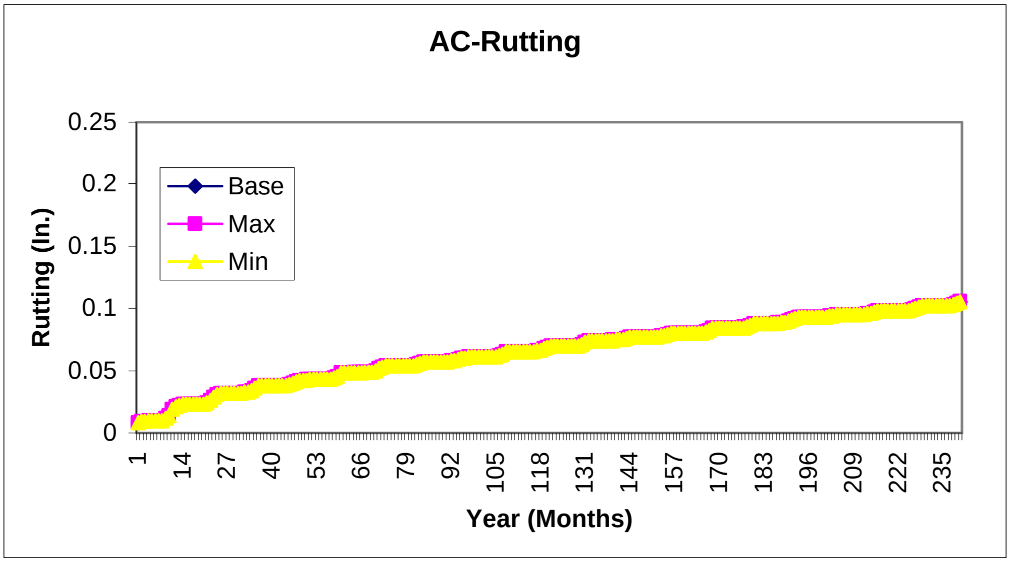


Figure D -114 1814 – Granular Base Modulus

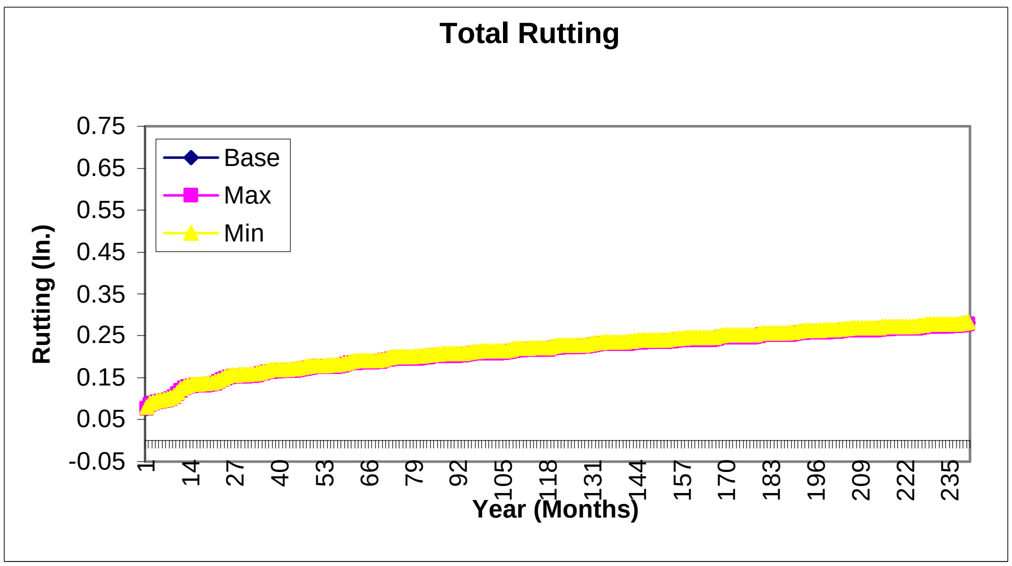


Figure D -115 1814 – Granular Base Modulus

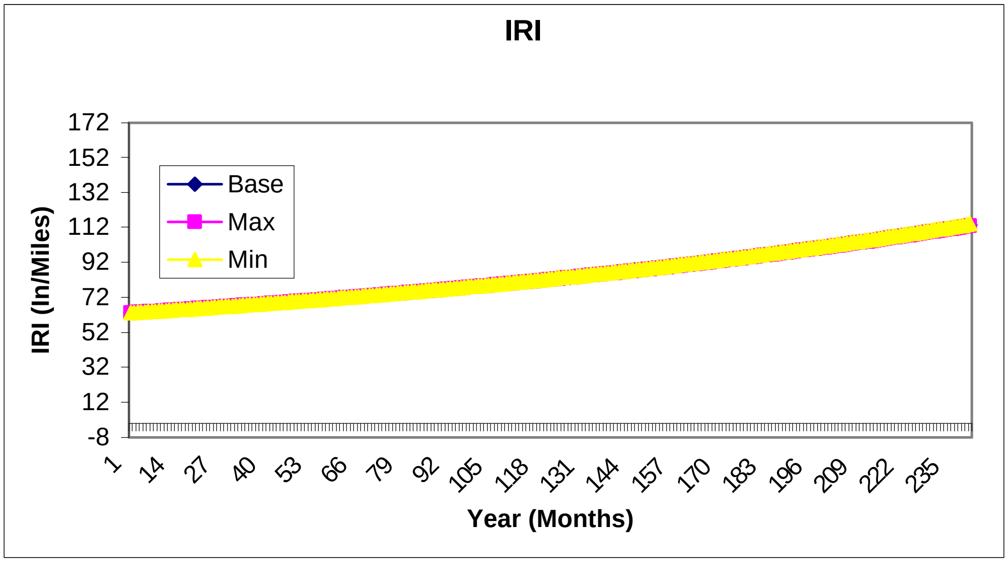


Figure D -116 1814 – Subgrade Modulus

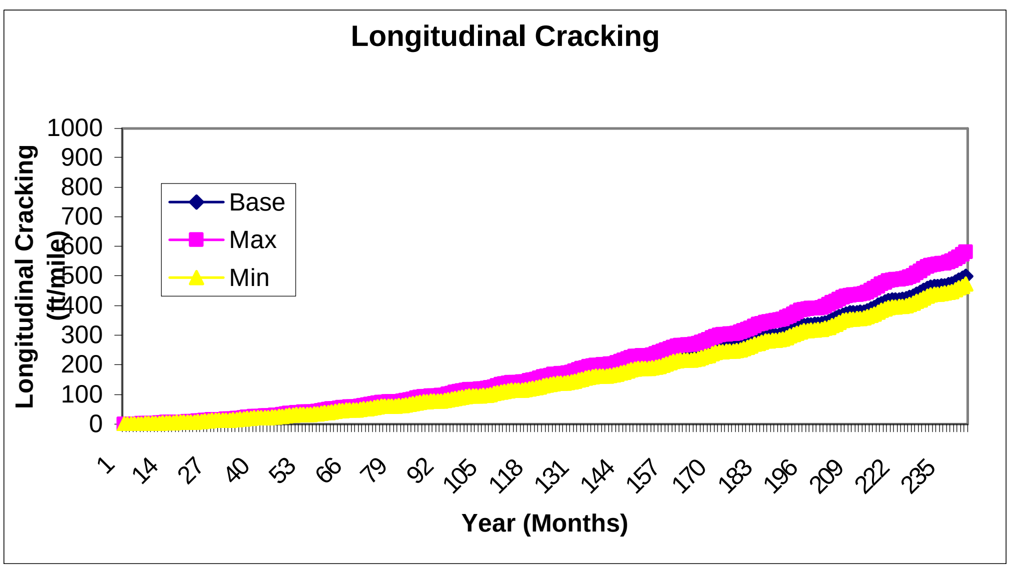


Figure D -117 1814 – Subgrade Modulus

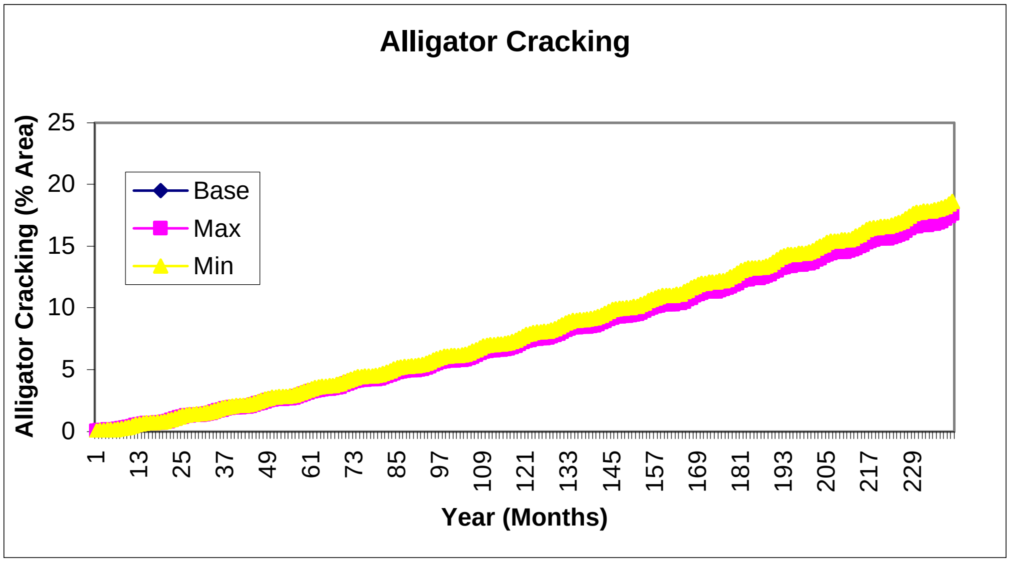


Figure D -118 1814 – Subgrade Modulus

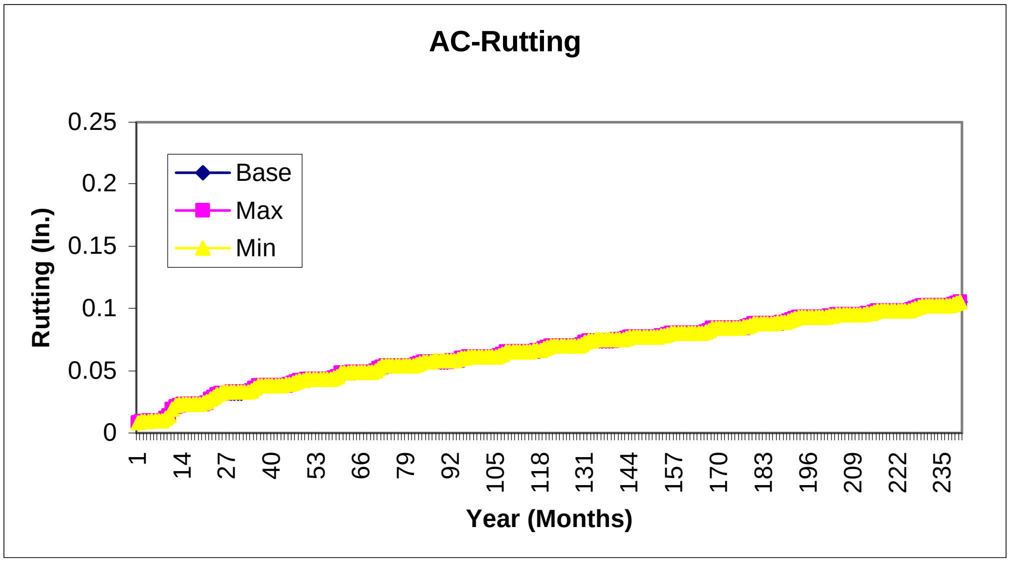


Figure D -119 1814 – Subgrade Modulus

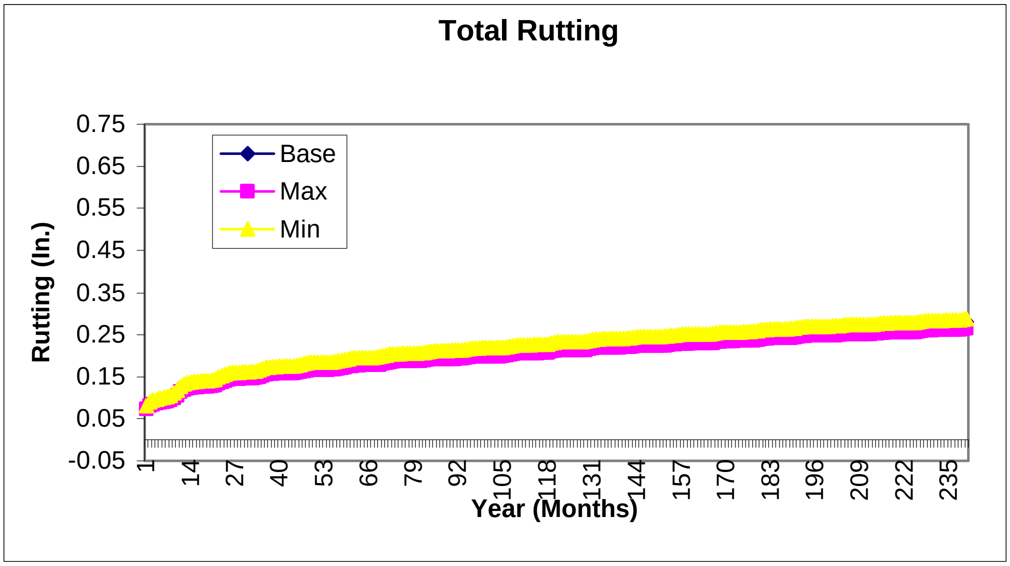


Figure D -120 1814 – Subgrade Modulus

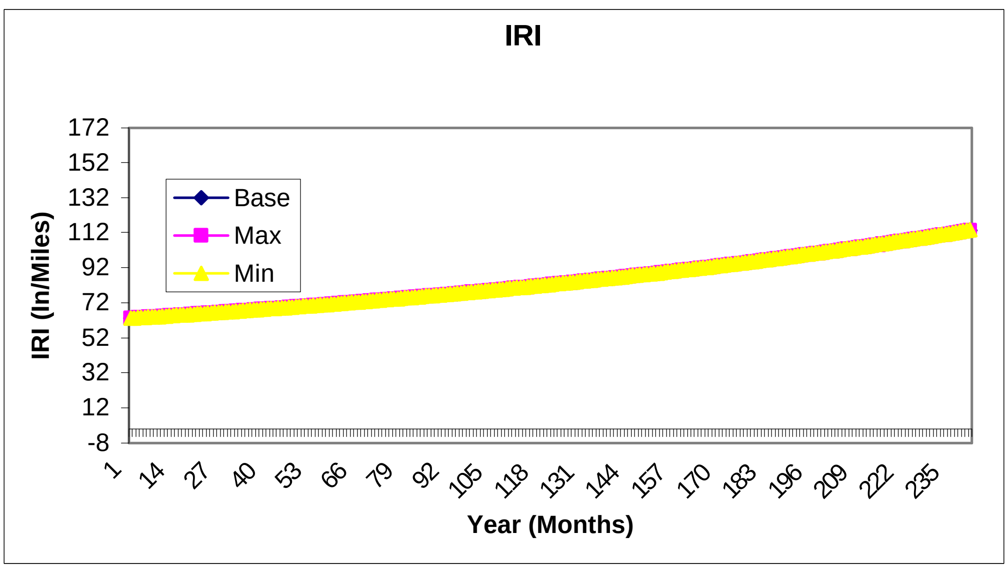


Figure D -121 1814 Surface Shortwave Absorptivity

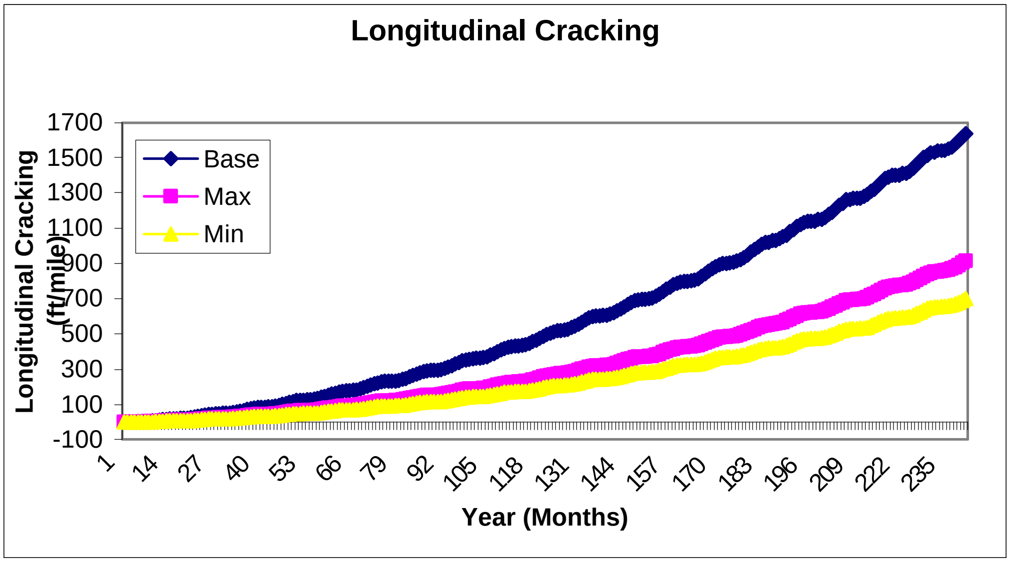


Figure D -122 1814 Surface Shortwave Absorptivity

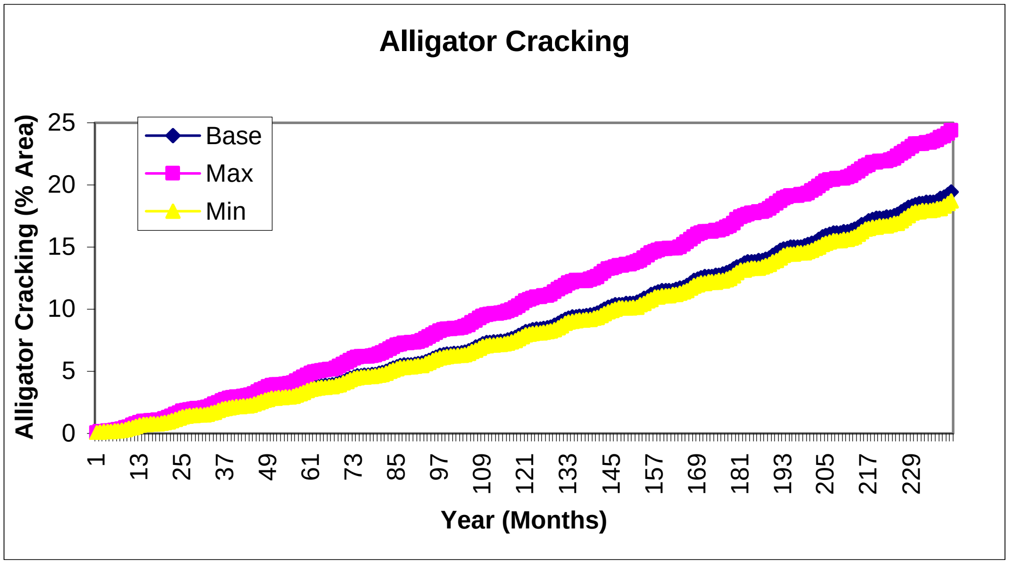


Figure D -123 1814 Surface Shortwave Absorptivity

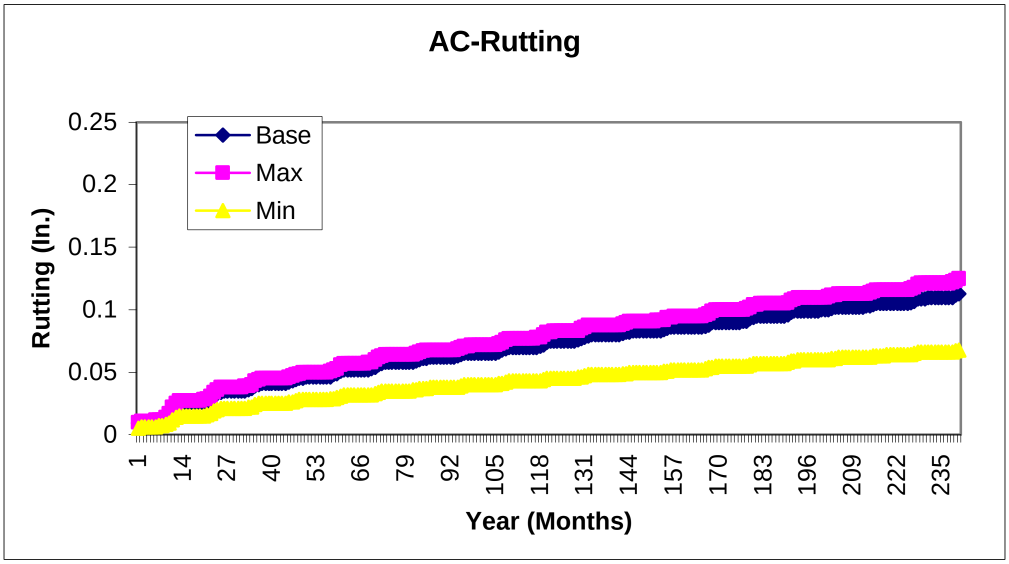


Figure D -124 1814 Surface Shortwave Absorptivity

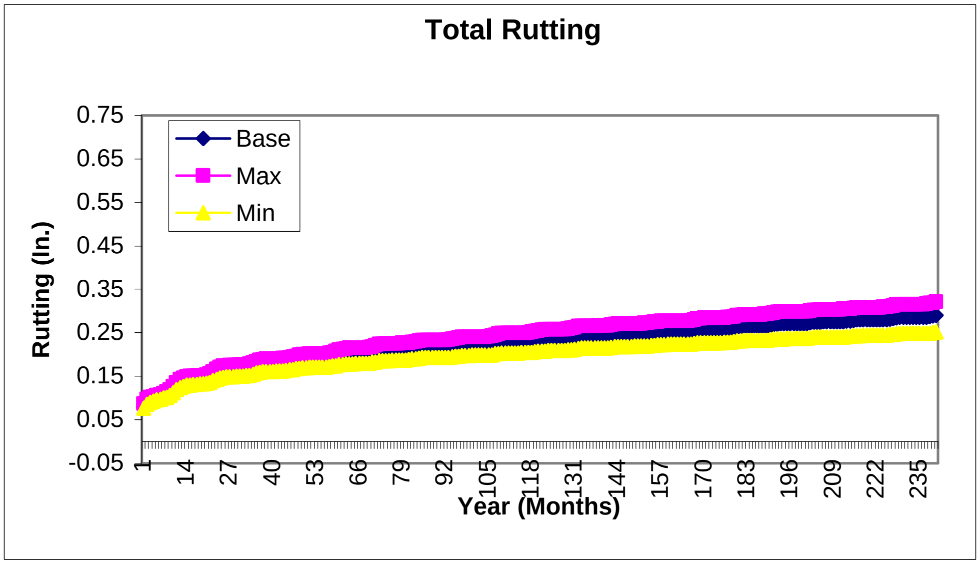


Figure D -125 1814 Surface Shortwave Absorptivity

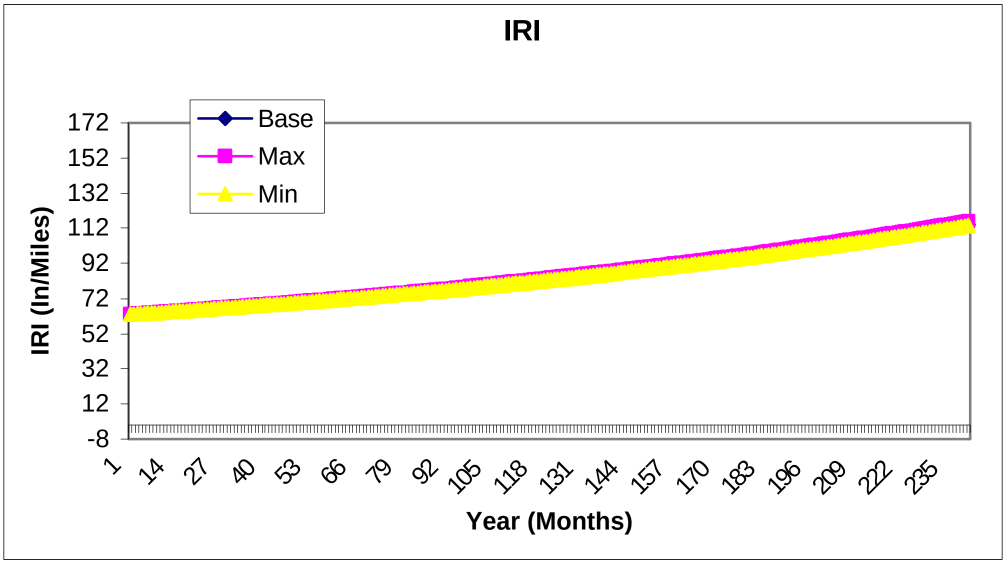


Figure D -126 1814 – CreepCompliance

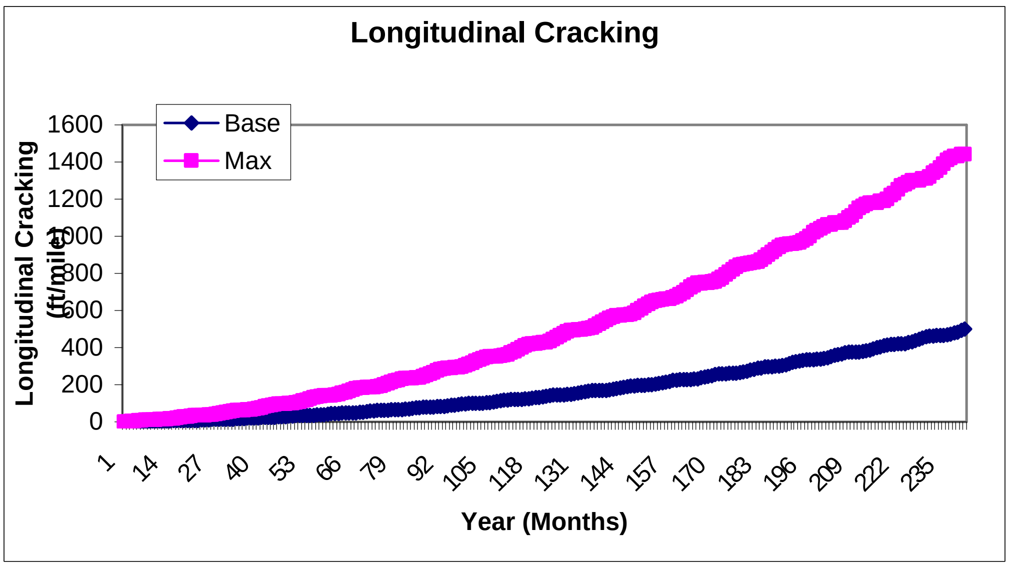


Figure D -127 1814 – CreepCompliance

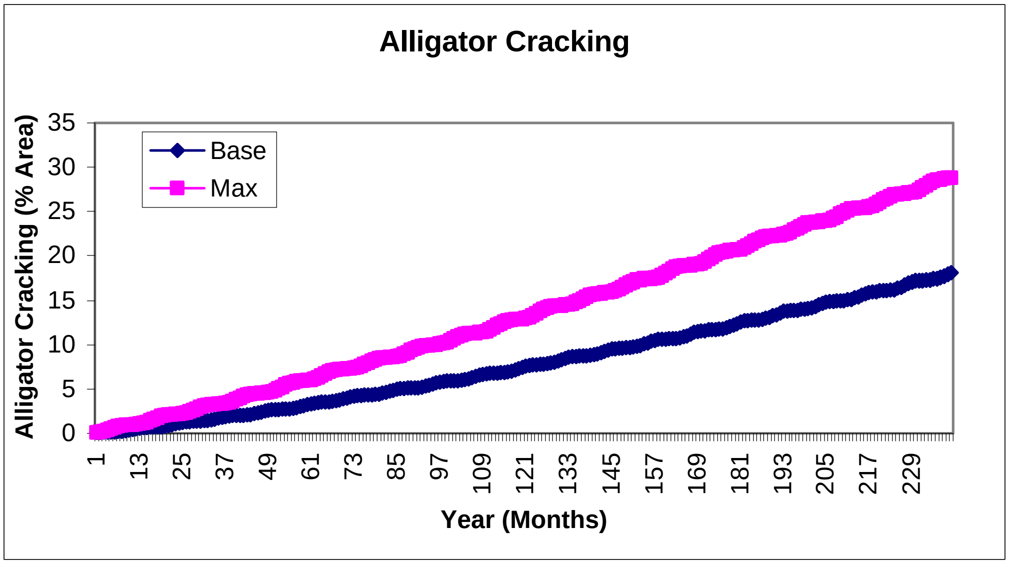


Figure D -128 1814 – CreepCompliance

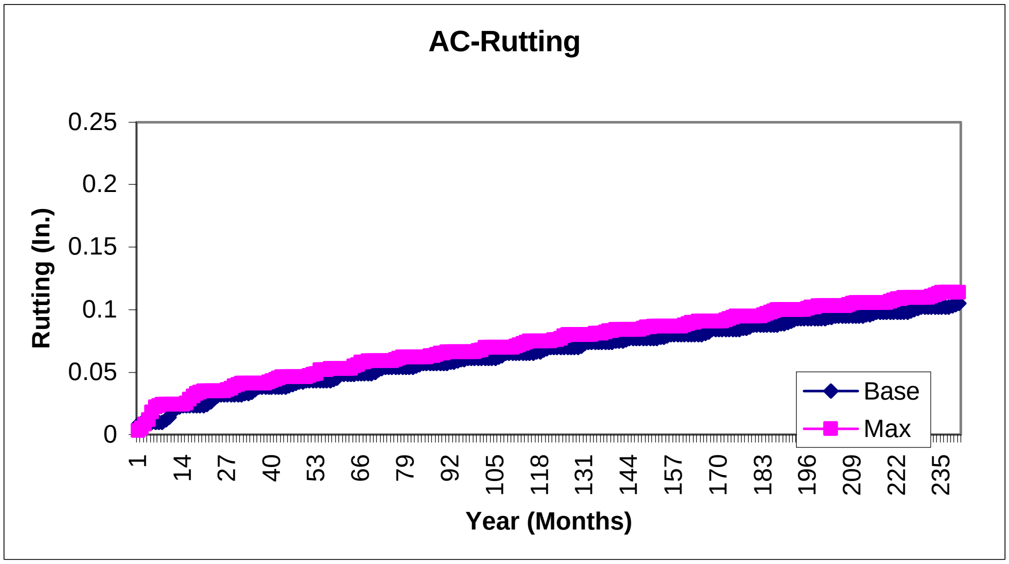


Figure D -129 1814 – CreepCompliance

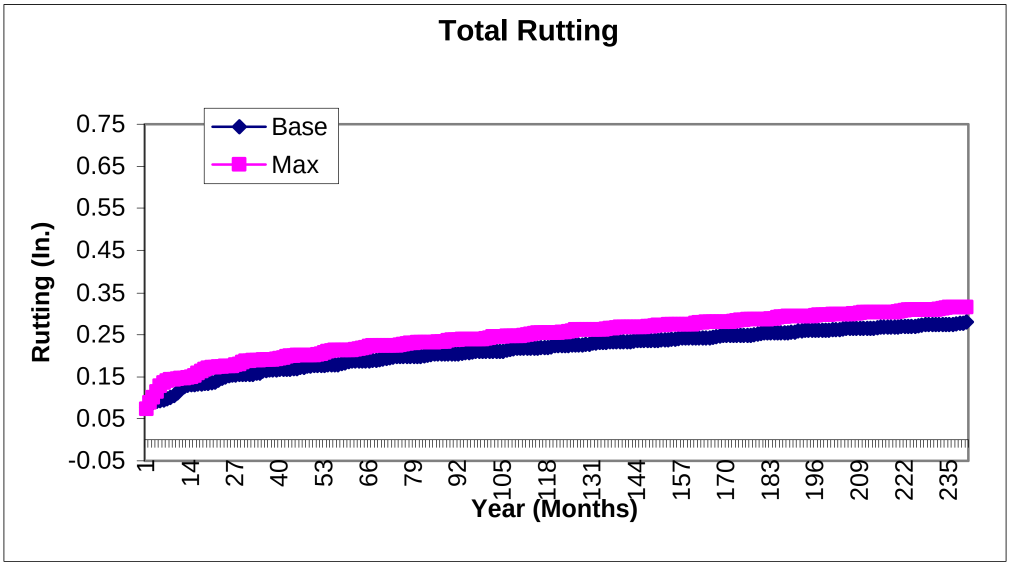


Figure D -130 1814 – CreepCompliance

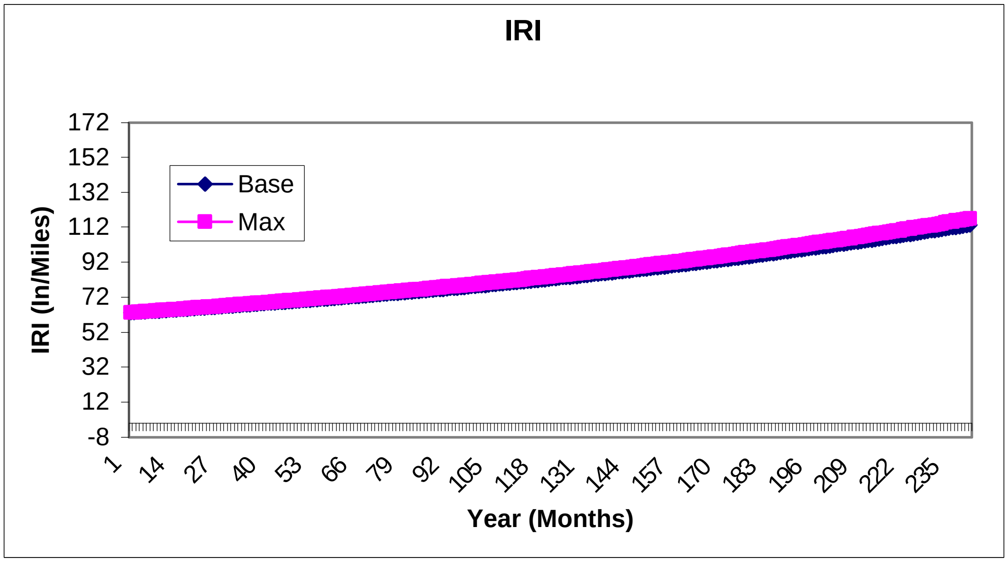


Figure D -131 1814 – Base Vs FeC/Mar

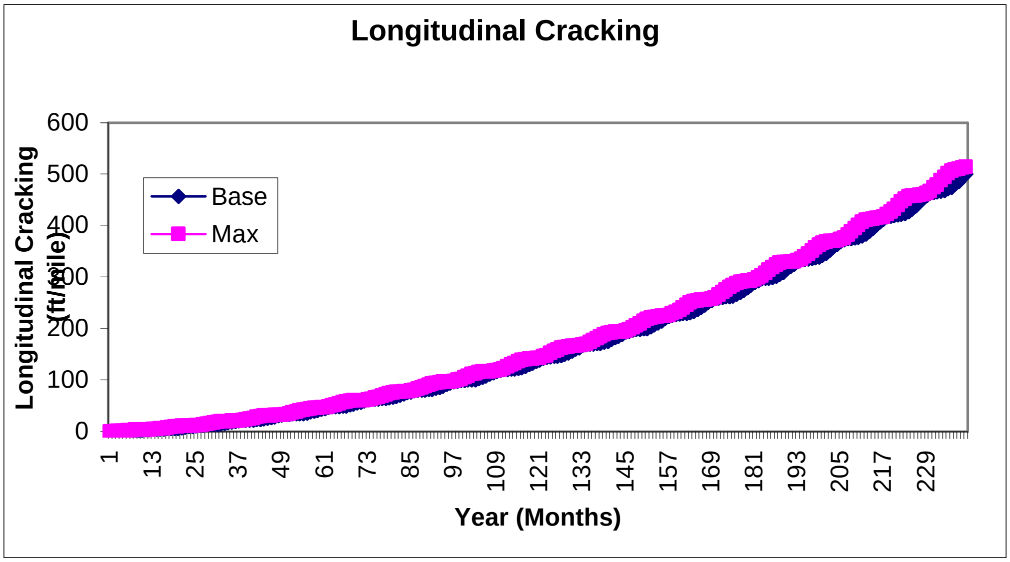


Figure D -132 1814 – Base Vs FeC/Mar

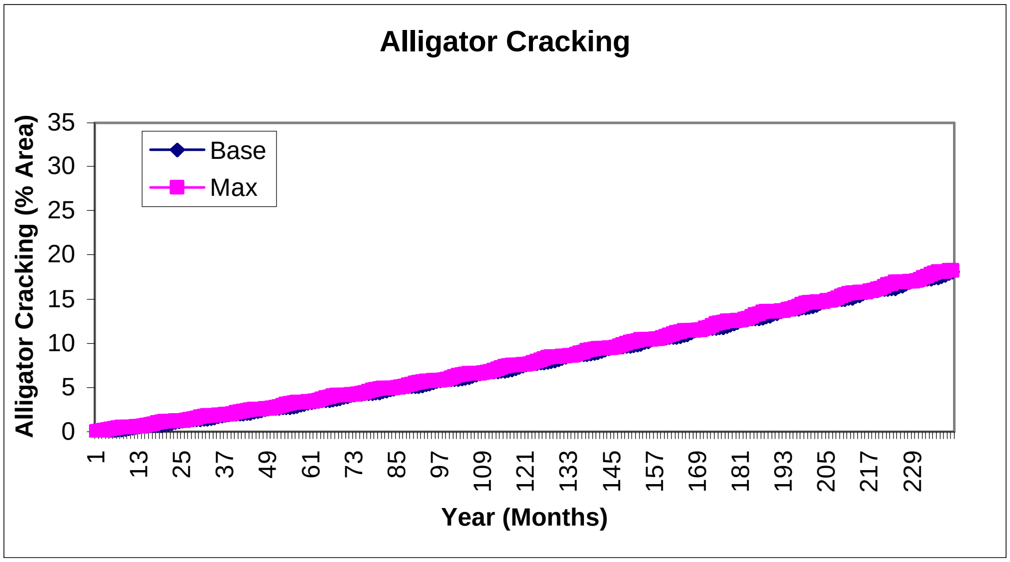


Figure D -133 1814 – Base Vs FeC/Mar

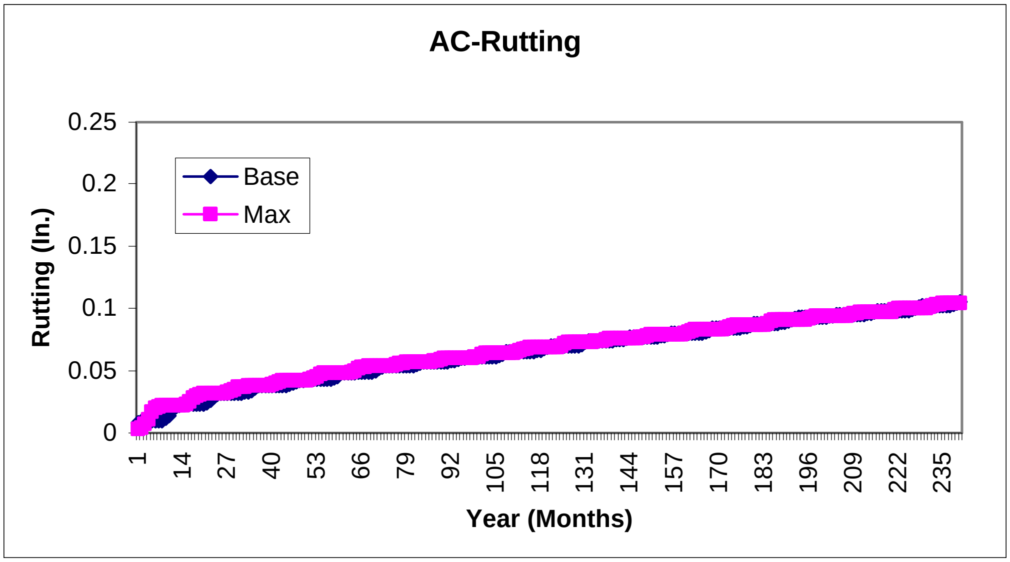


Figure D -134 1814 – Base Vs FeC/Mar

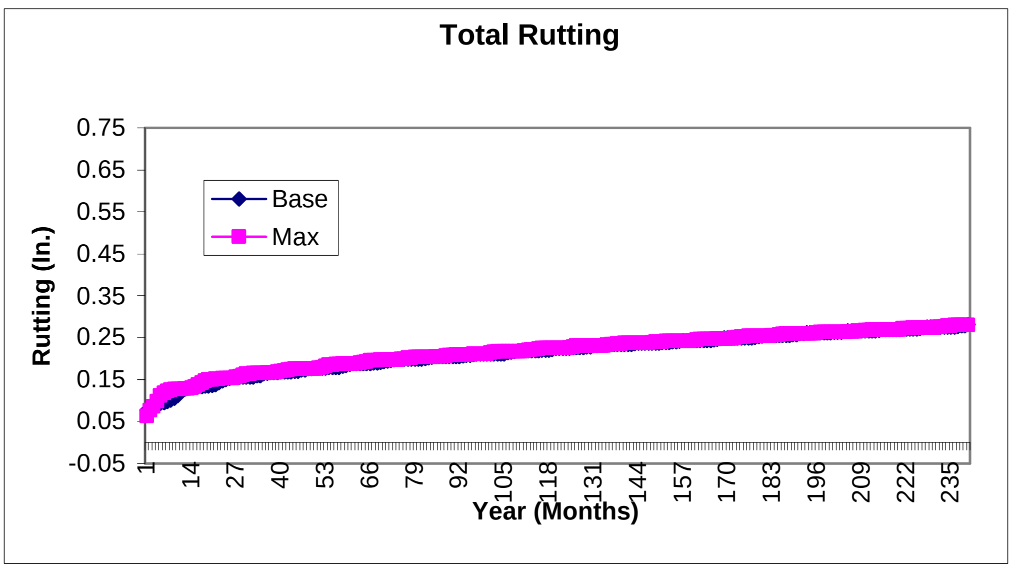


Figure D -135 1814 – Base Vs FeC/Mar

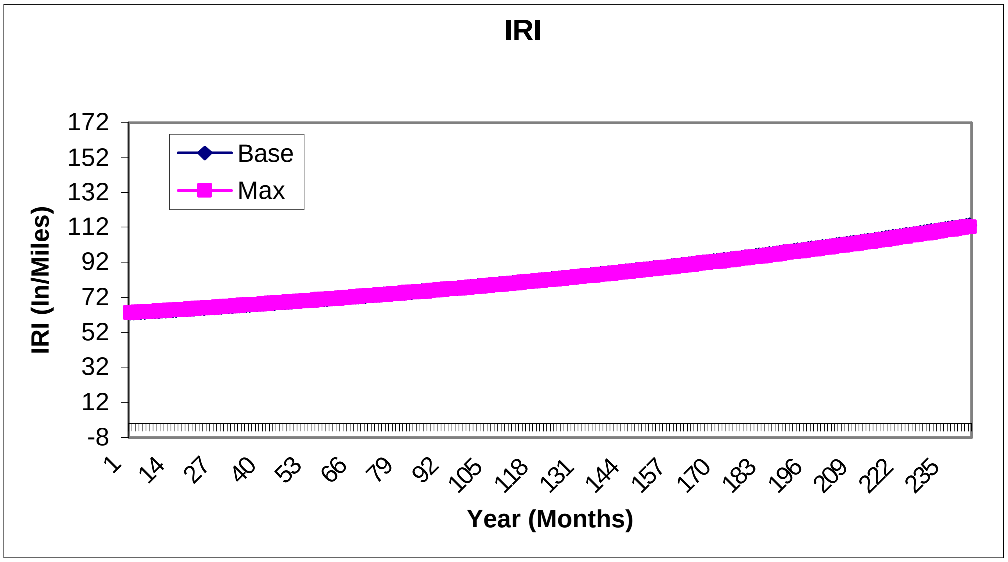


Figure D -136 1814 – Base Vs Nov/Dec

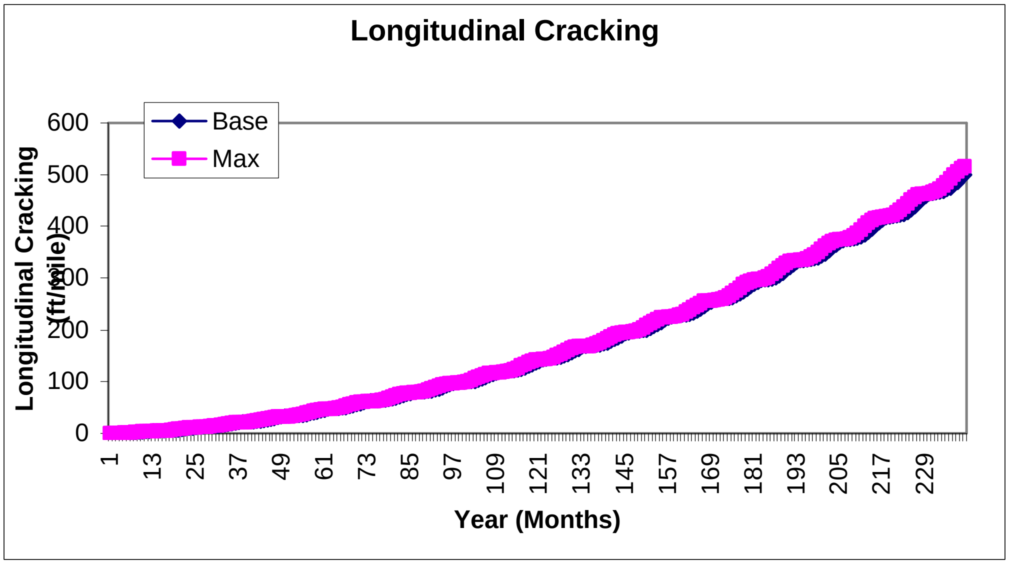


Figure D -137 1814 – Base Vs Nov/Dec

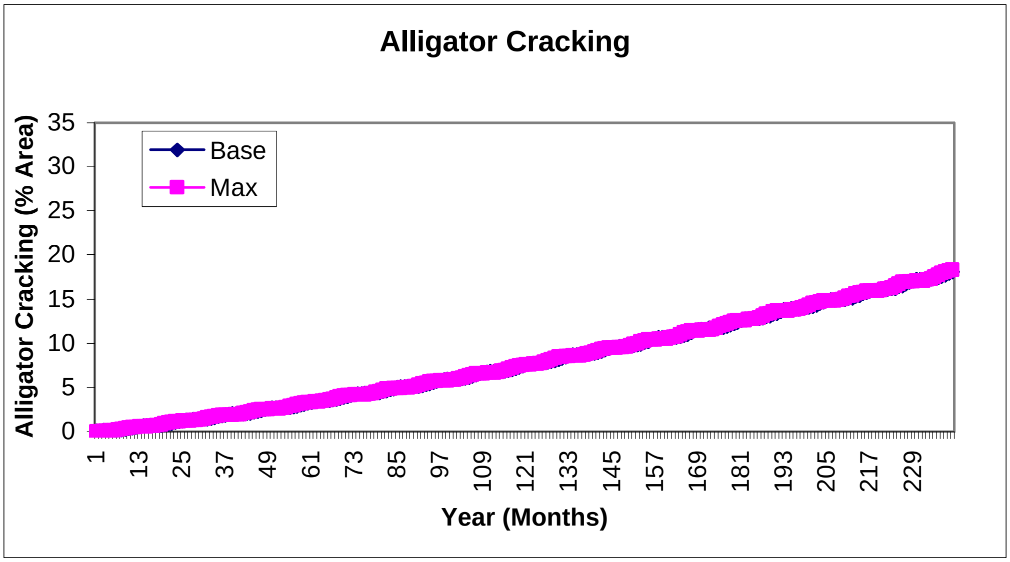


Figure D -138 1814 – Base Vs Nov/Dec

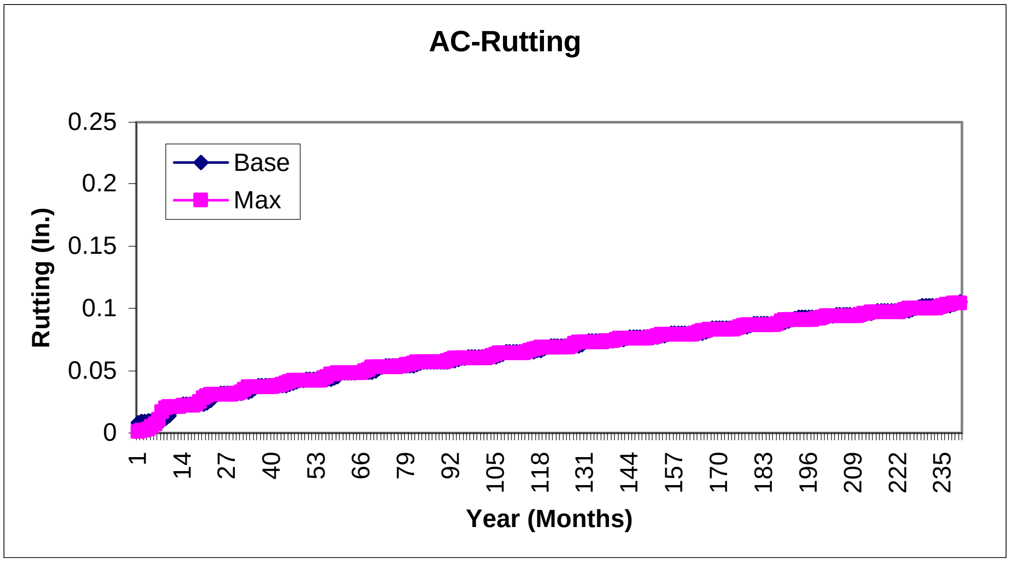


Figure D -139 1814 – Base Vs Nov/Dec

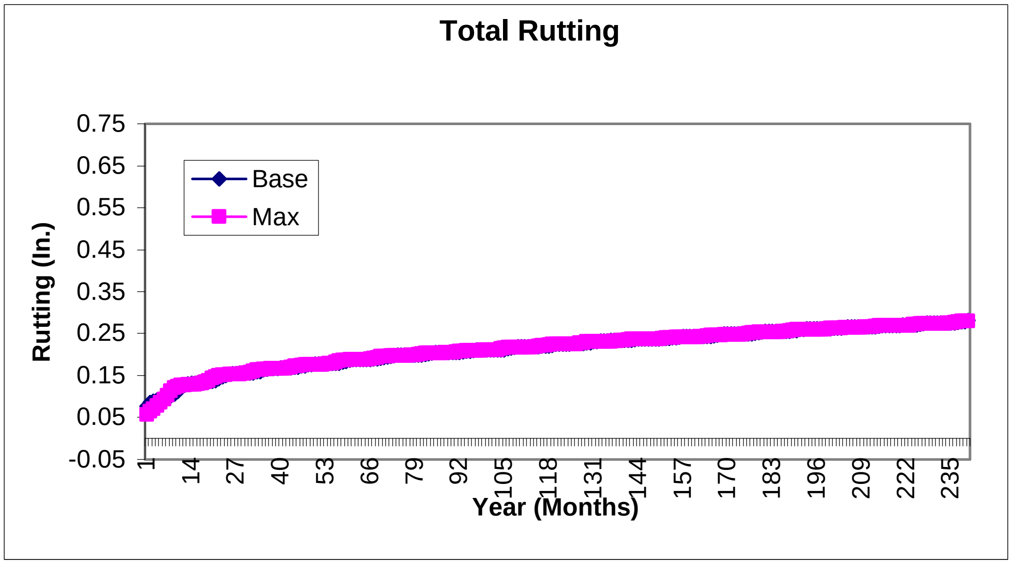


Figure D -140 1814 – Base Vs Nov/Dec

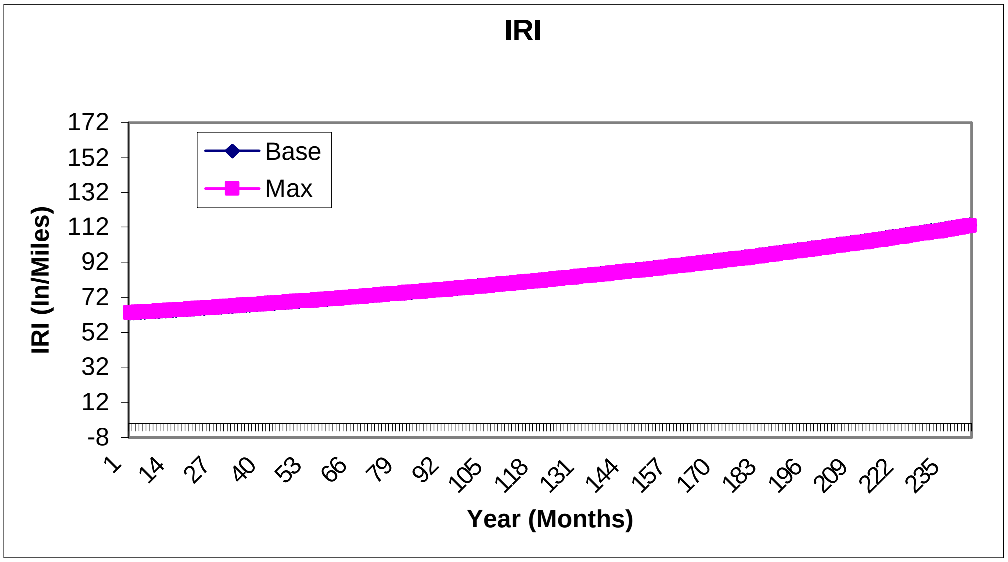


Figure D -141 1814 – Base Vs May/Jun

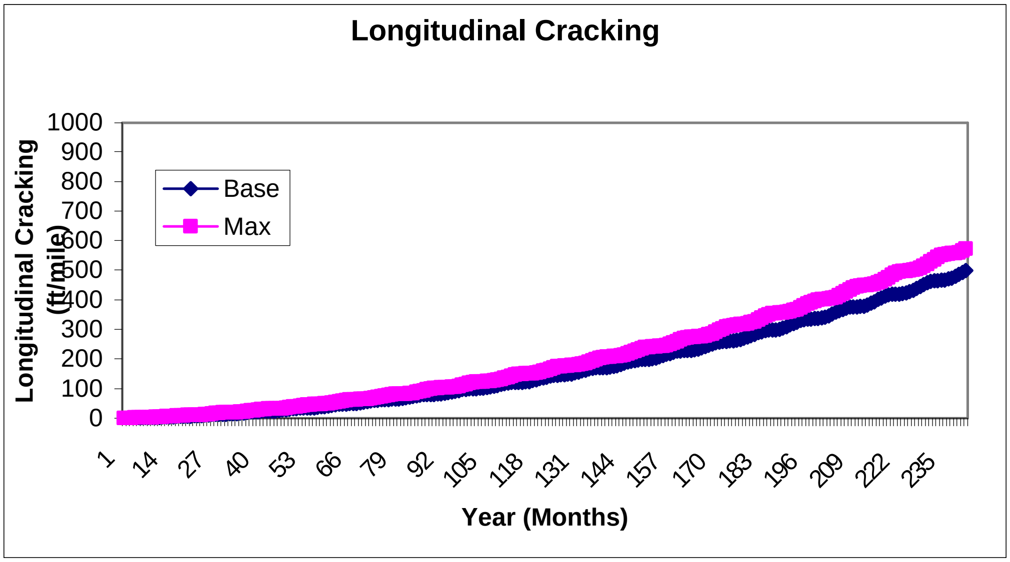


Figure D -142 1814 – Base Vs May/Jun

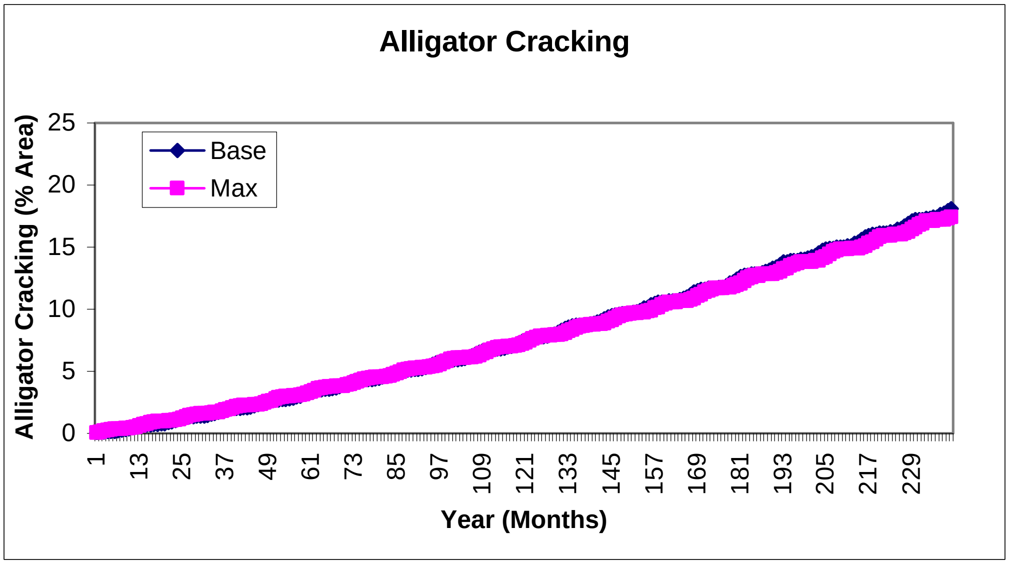


Figure D -143 1814 – Base Vs May/Jun

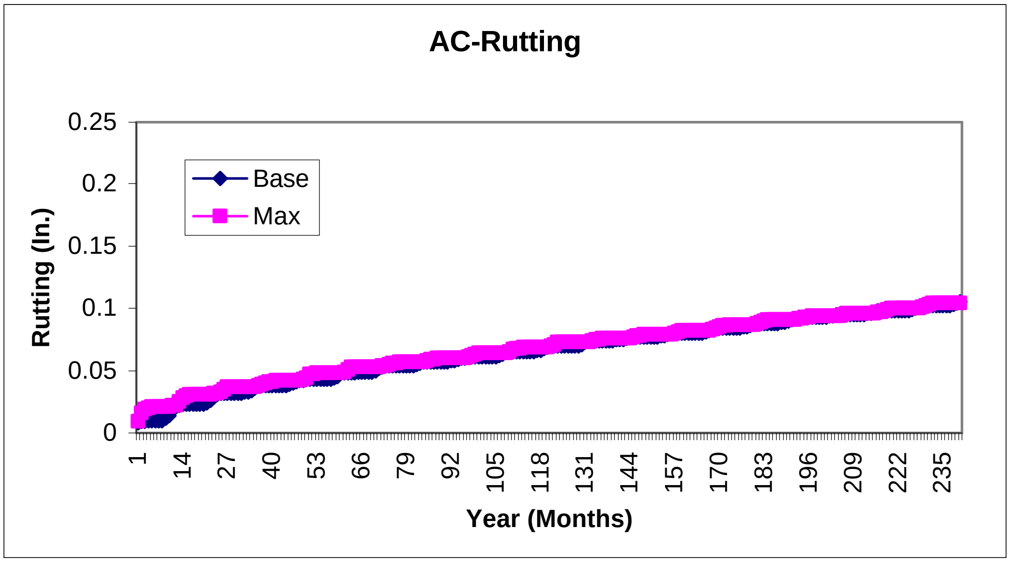


Figure D -144 1814 – Base Vs May/Jun

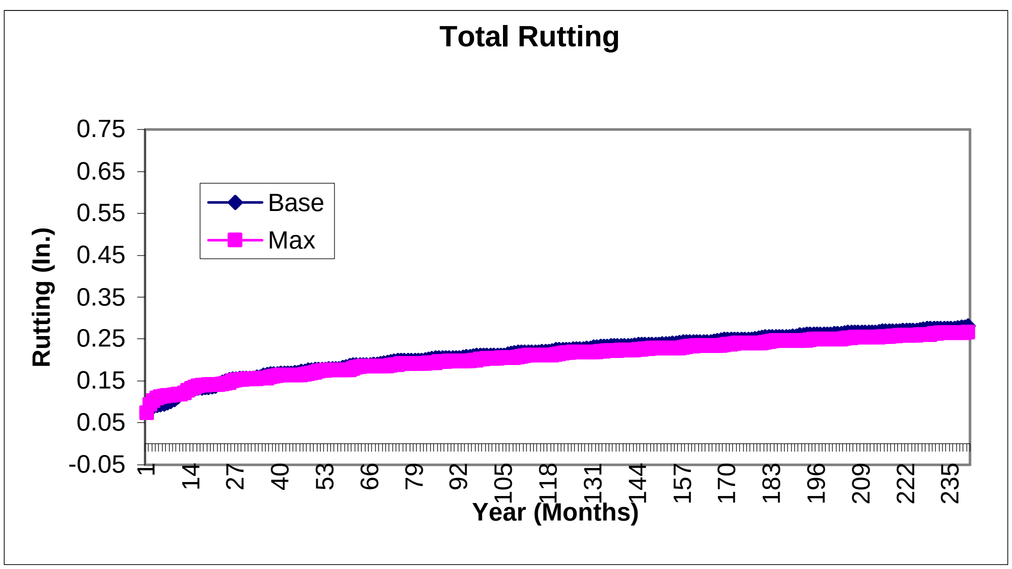


Figure D -145 1814 – Base Vs May/Jun

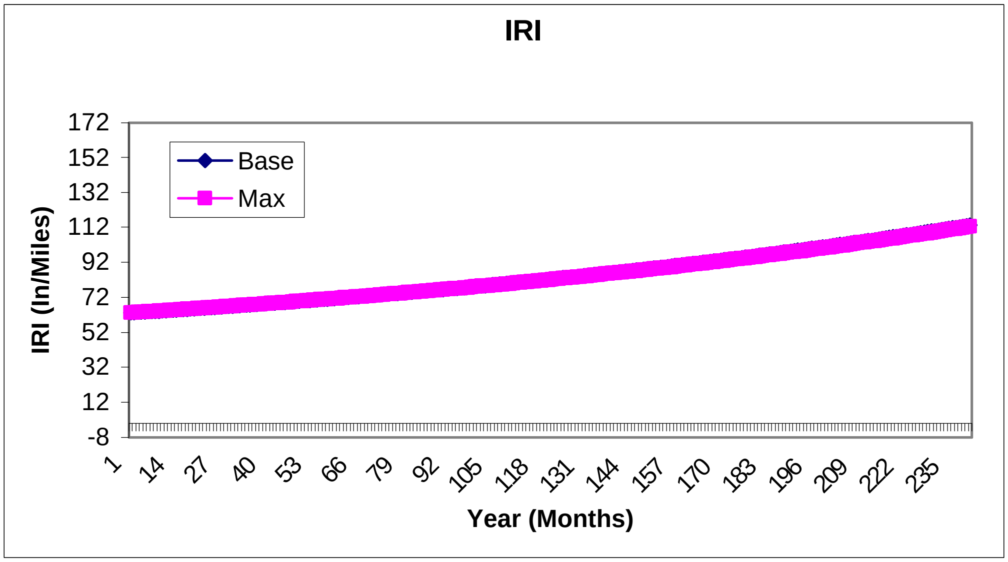


Figure D -146 1814 – |E*| – Level1VsLevel3

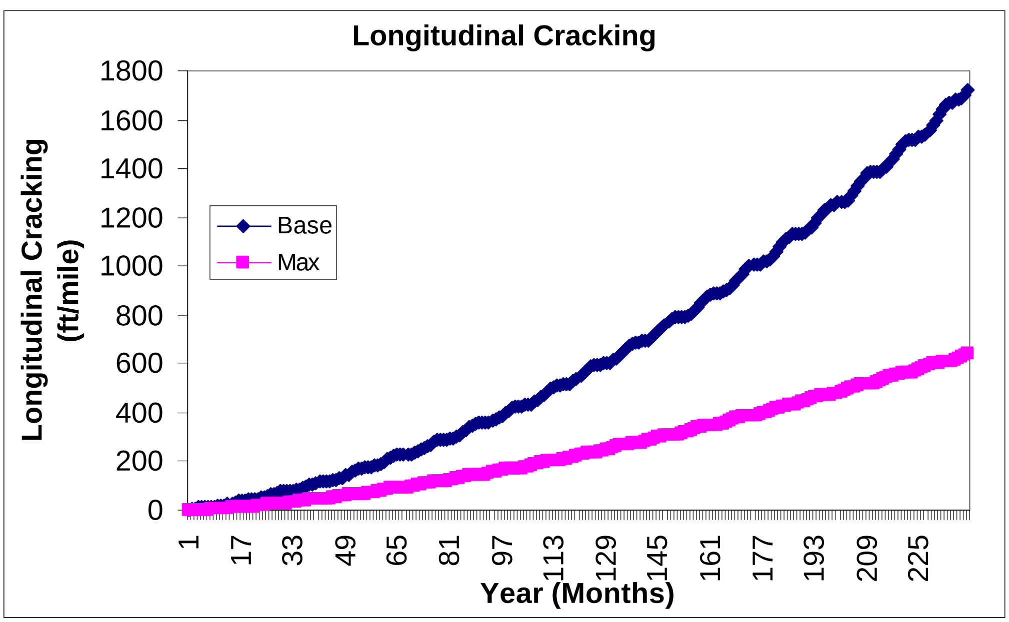


Figure D -147 1814 – |E*| – Level1VsLevel3

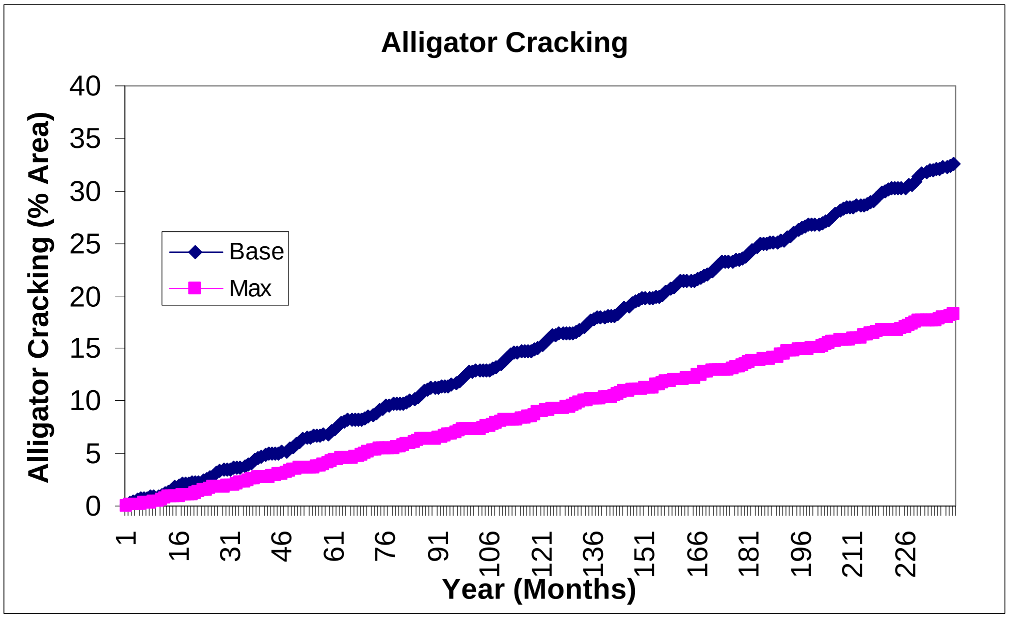


Figure D -148 1814 – |E*| – Level1VsLevel3

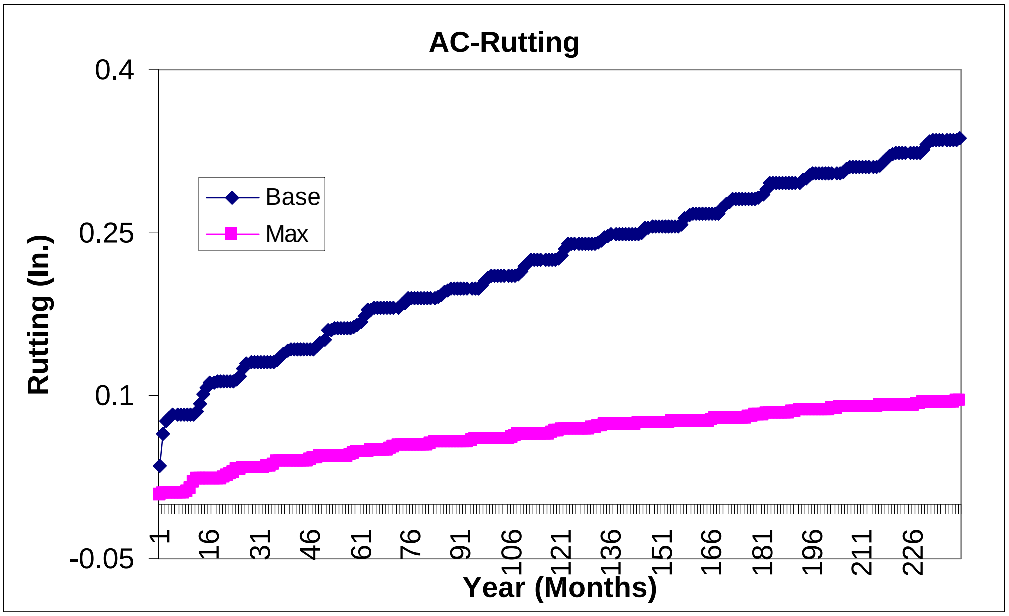


Figure D -149 1814 – |E*| – Level1VsLevel3

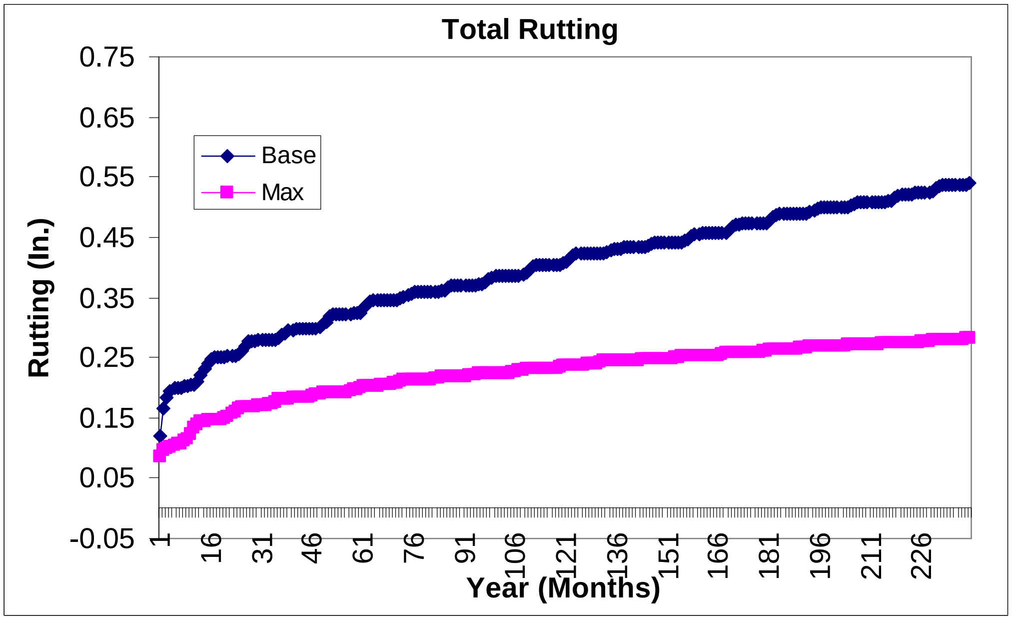


Figure D -150 1814 – |E*| – Level1VsLevel3

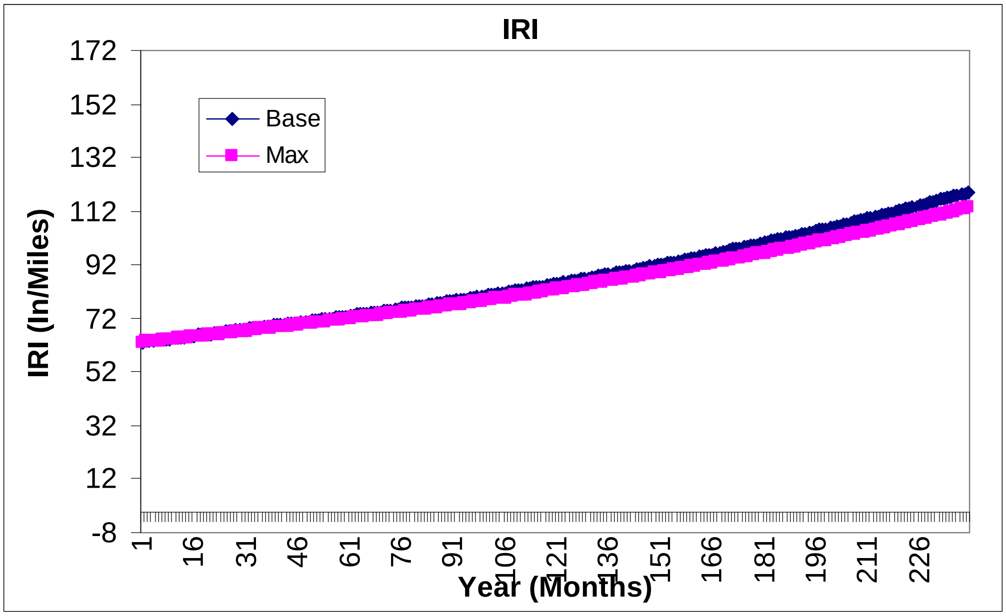


Figure D -151 1814 – Truck Growth Factor

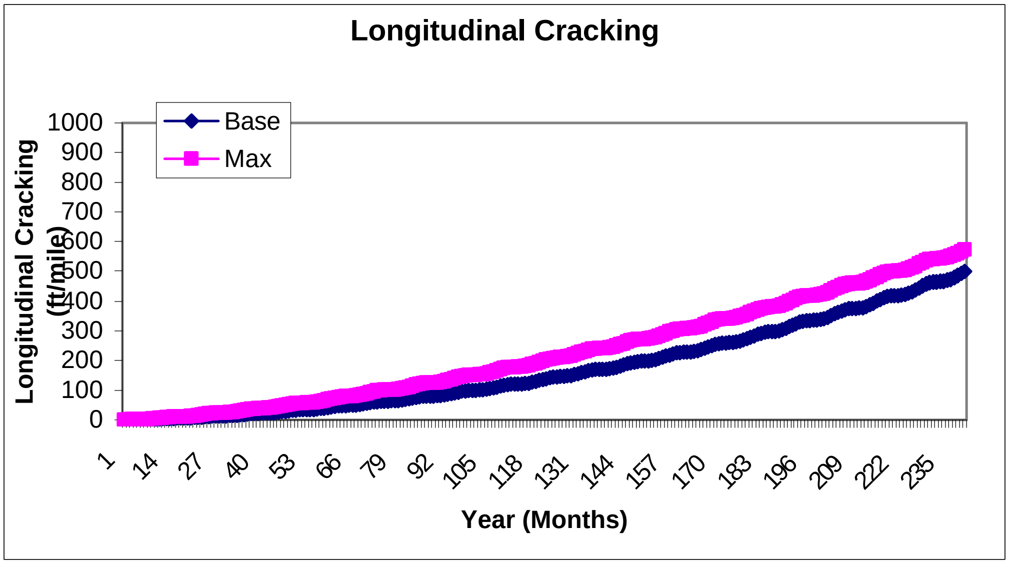


Figure D -152 1814 – Truck Growth Factor

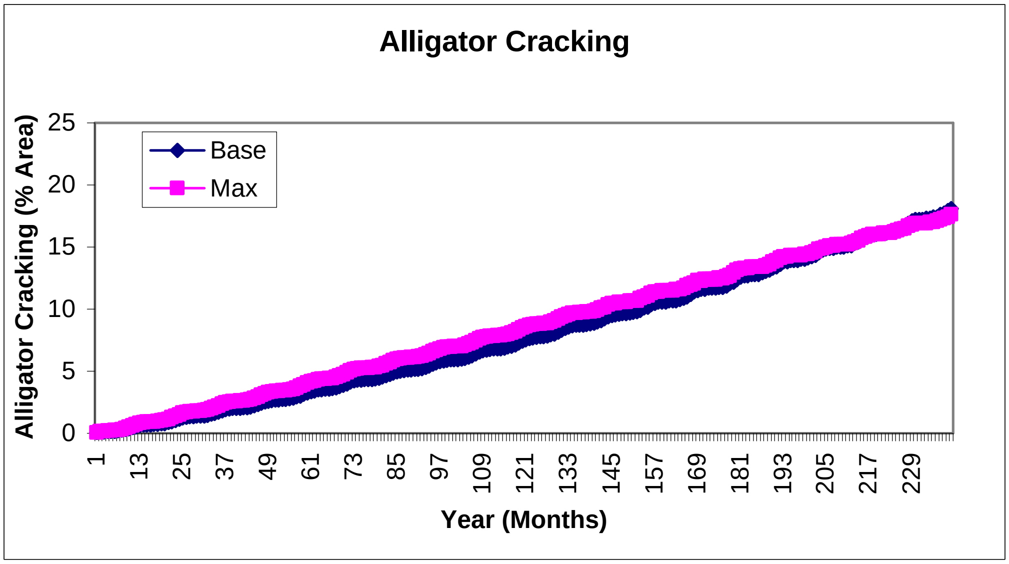


Figure D -153 1814 – Truck Growth Factor

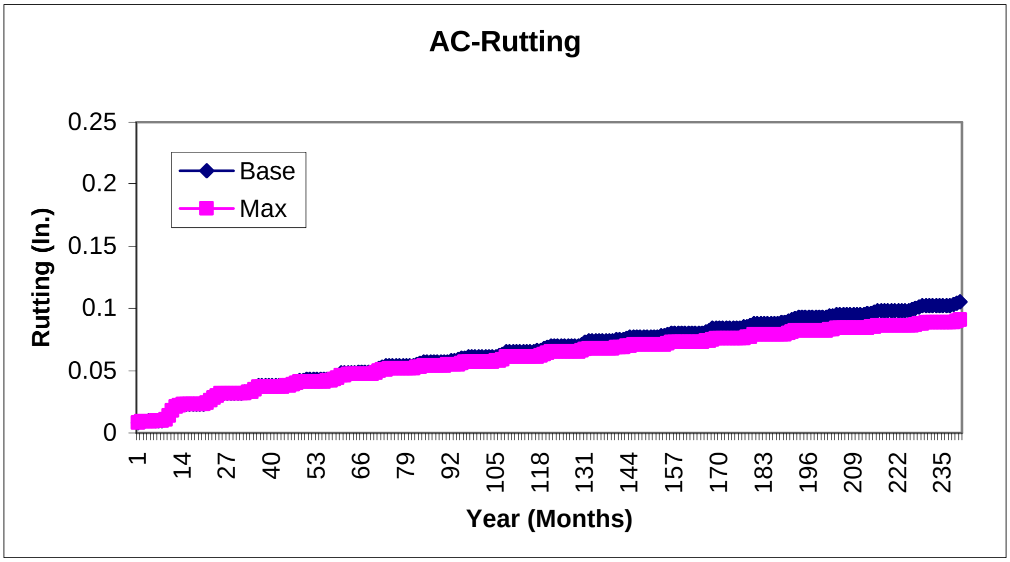


Figure D -154 1814 – Truck Growth Factor

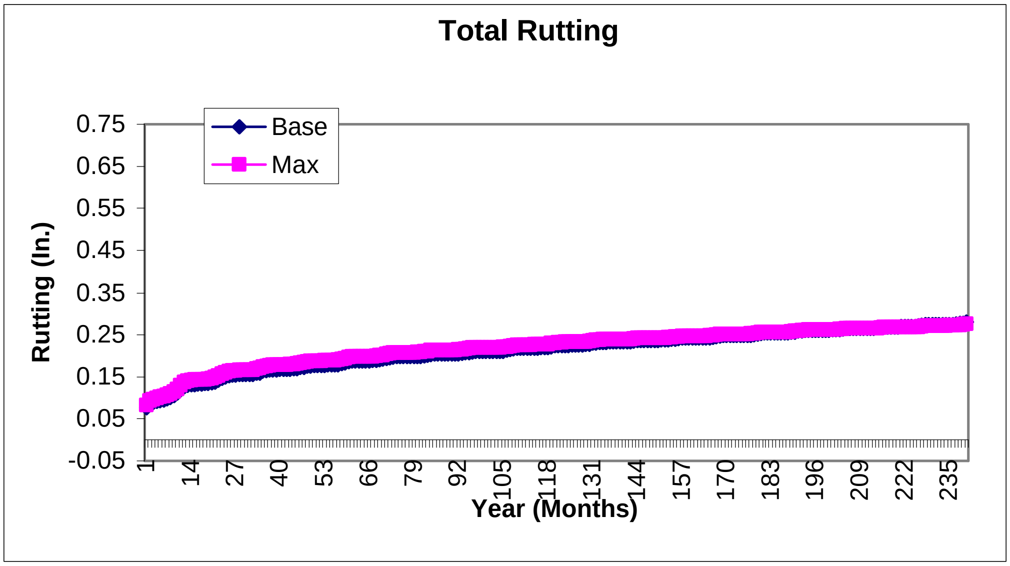


Figure D -155 1814 – Truck Growth Factor

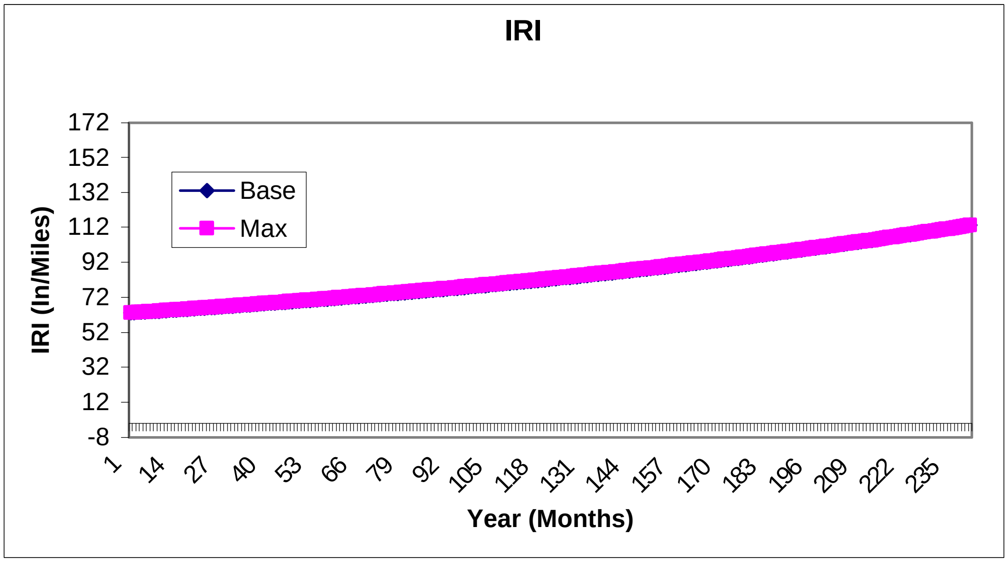


Figure D -156 0901 – Airvoids – ACLayer - I

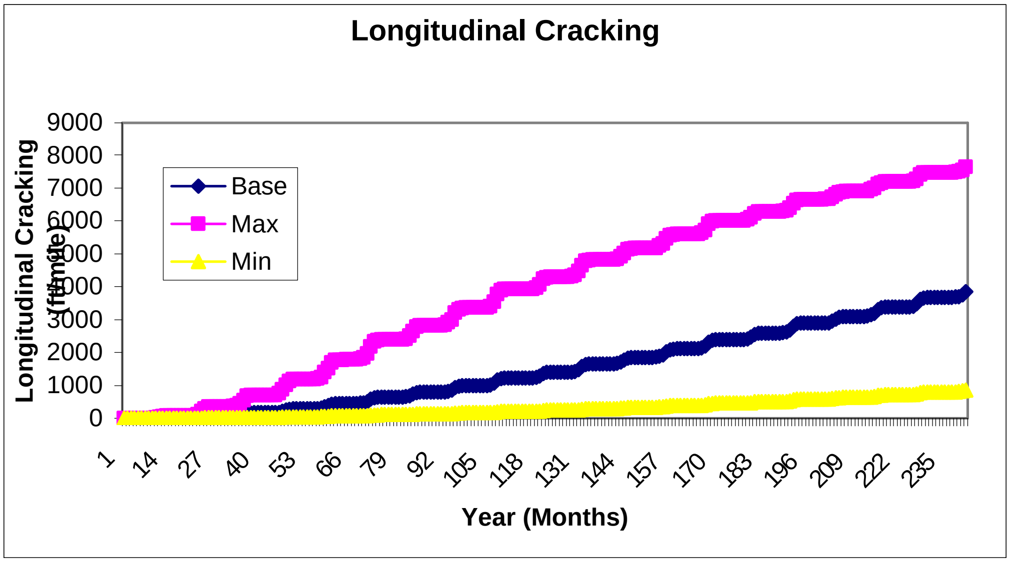


Figure D -157 0901 – Airvoids – ACLayer - I

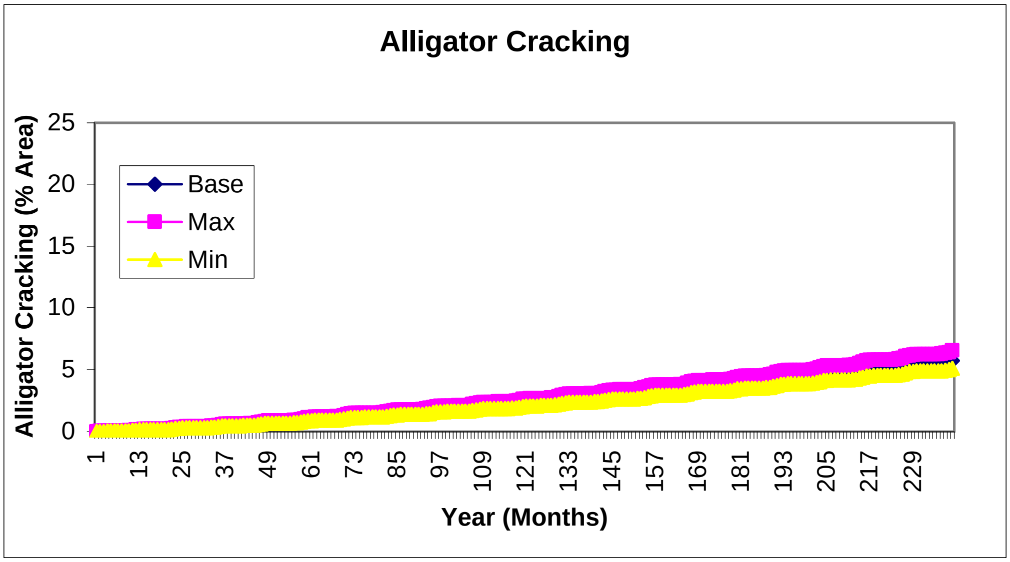


Figure D -158 0901 – Airvoids – ACLayer - I

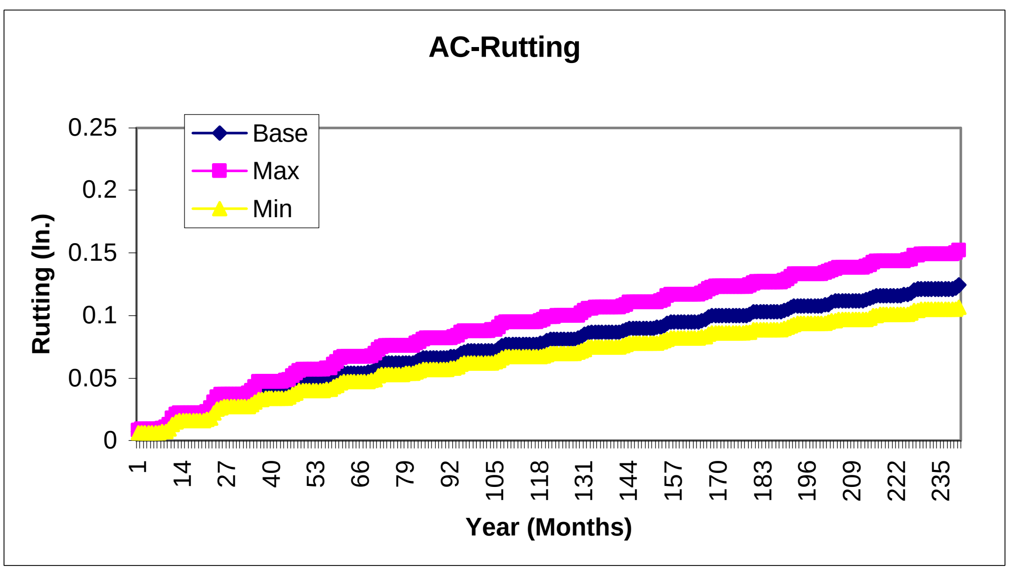


Figure D -159 0901 – Airvoids – ACLayer - I

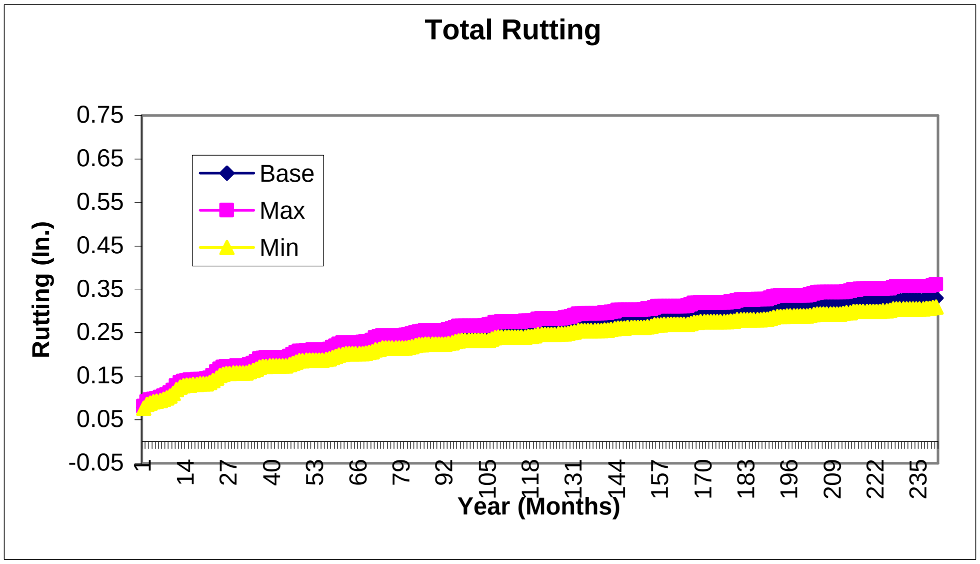


Figure D -160 0901 – Airvoids – ACLayer - I

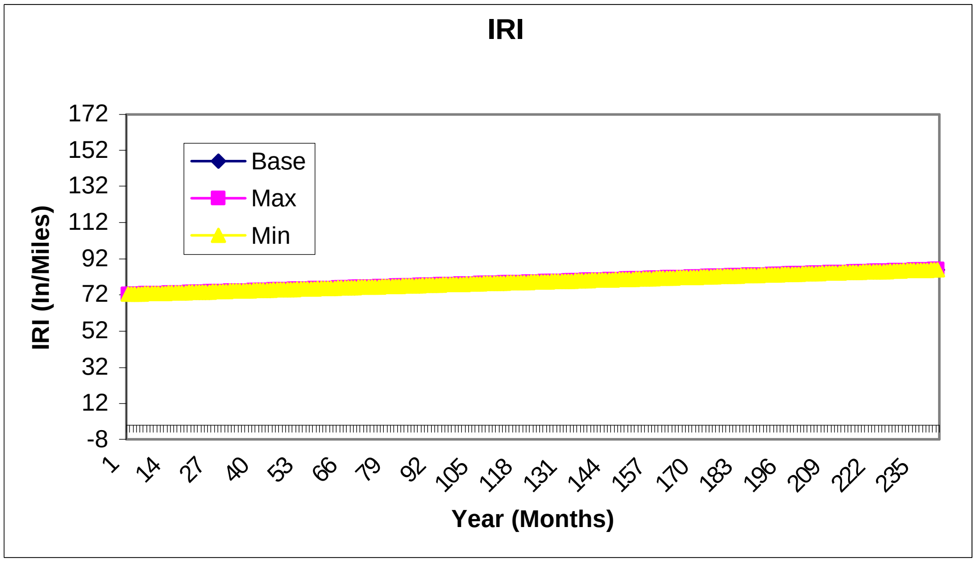


Figure D -161 0901 – HeatCapacity – ACLayer - I

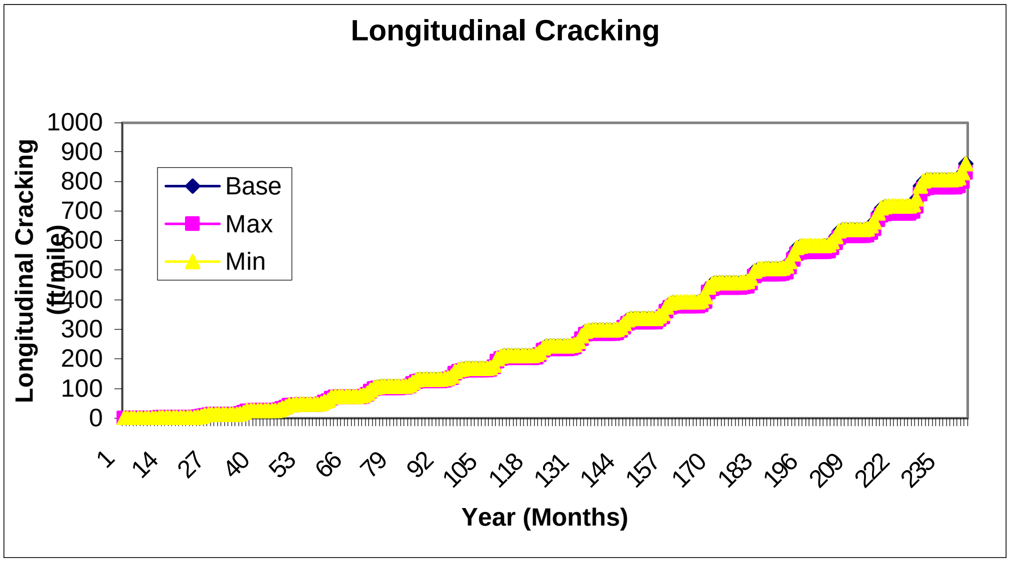


Figure D -162 0901 – HeatCapacity – ACLayer - I

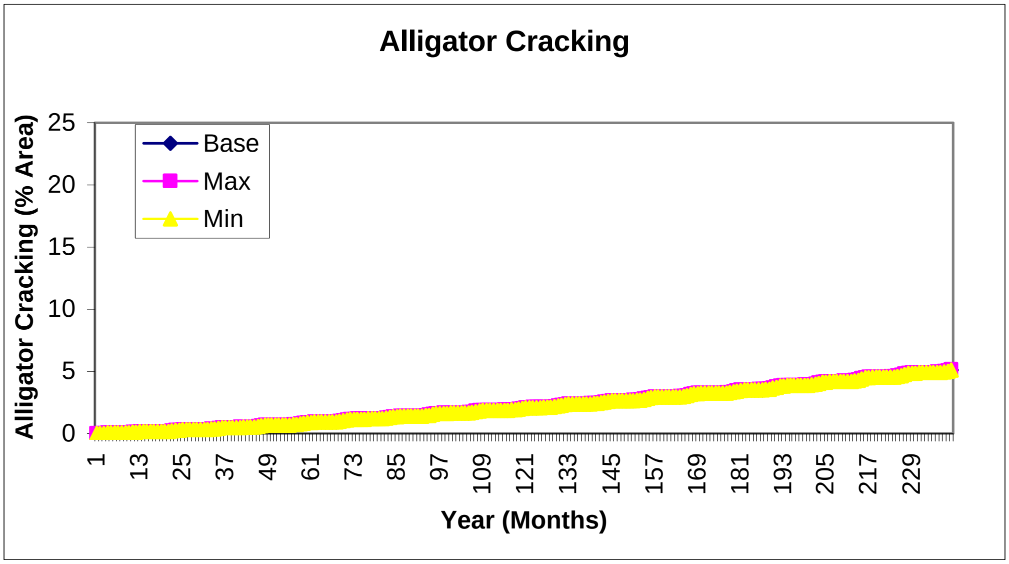


Figure D -163 0901 – HeatCapacity – ACLayer - I

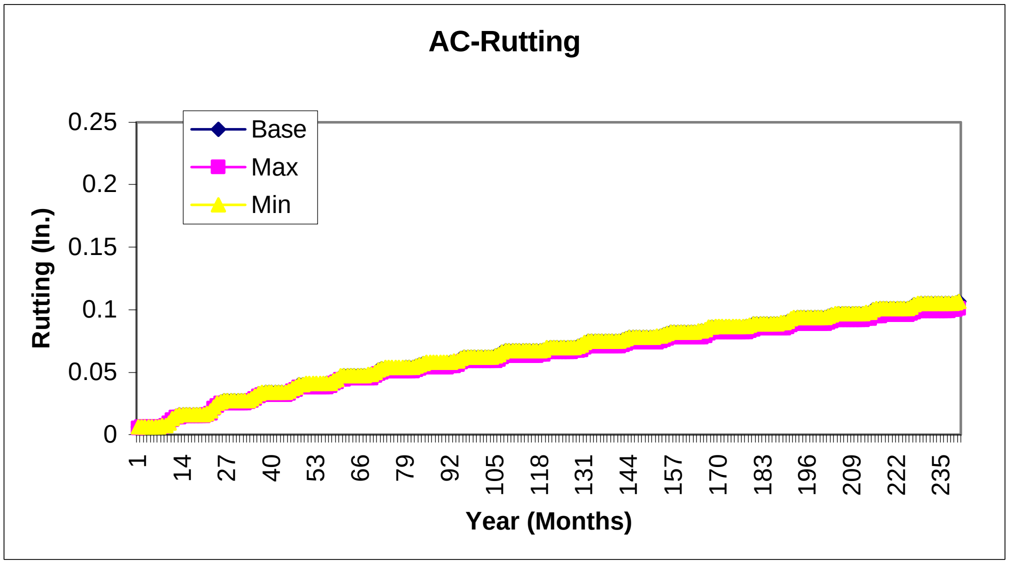


Figure D -164 0901 – HeatCapacity – ACLayer - I

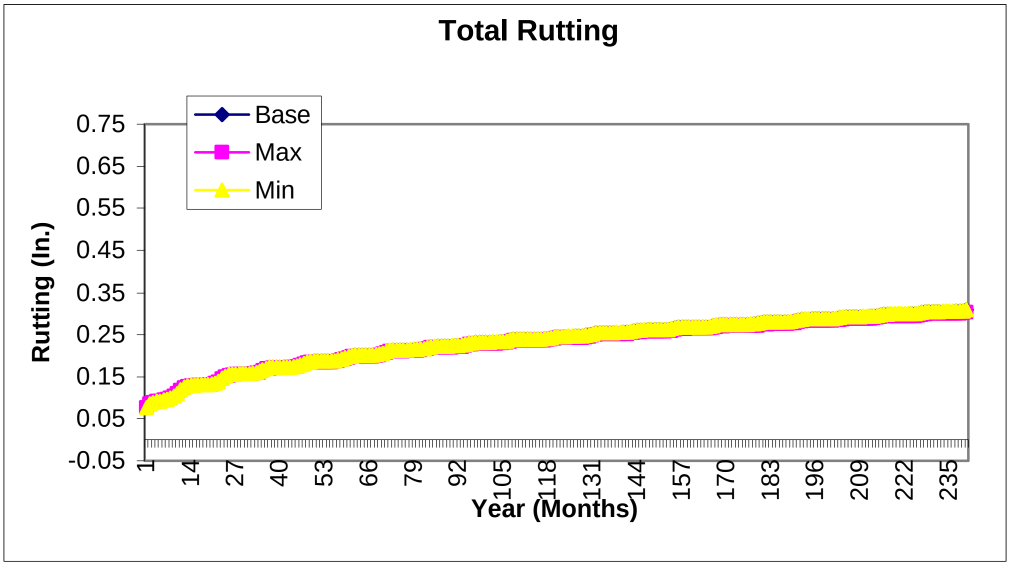


Figure D -165 0901 – HeatCapacity – ACLayer - I

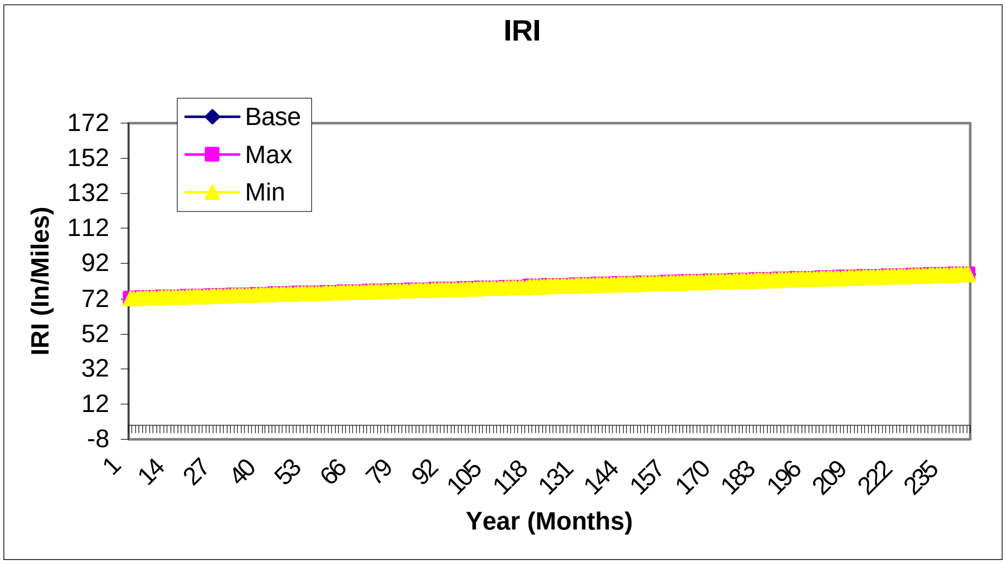


Figure D -166 0901 – ThermalConductivity – ACLayer - I

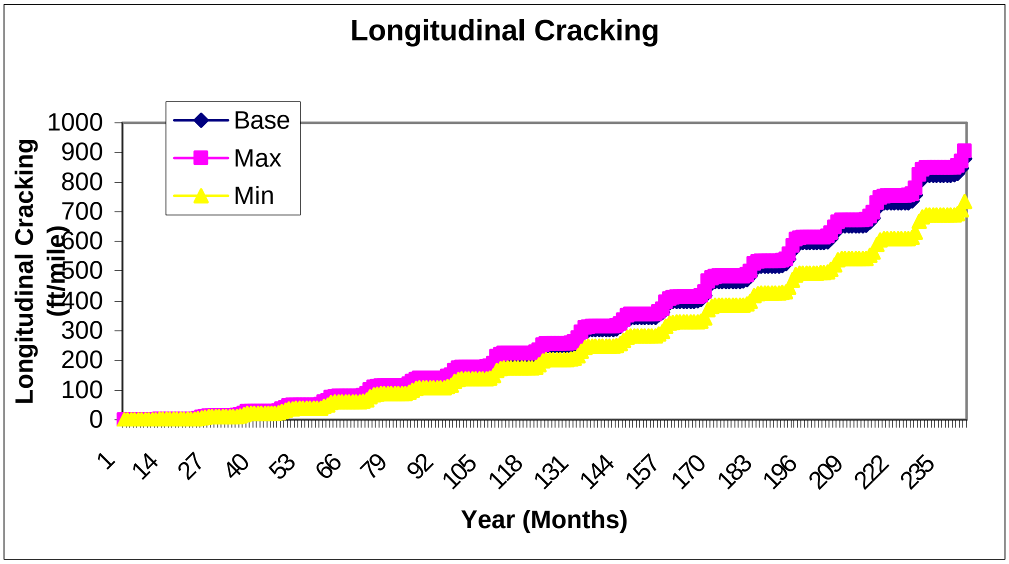


Figure D -167 0901 – ThermalConductivity – ACLayer - I

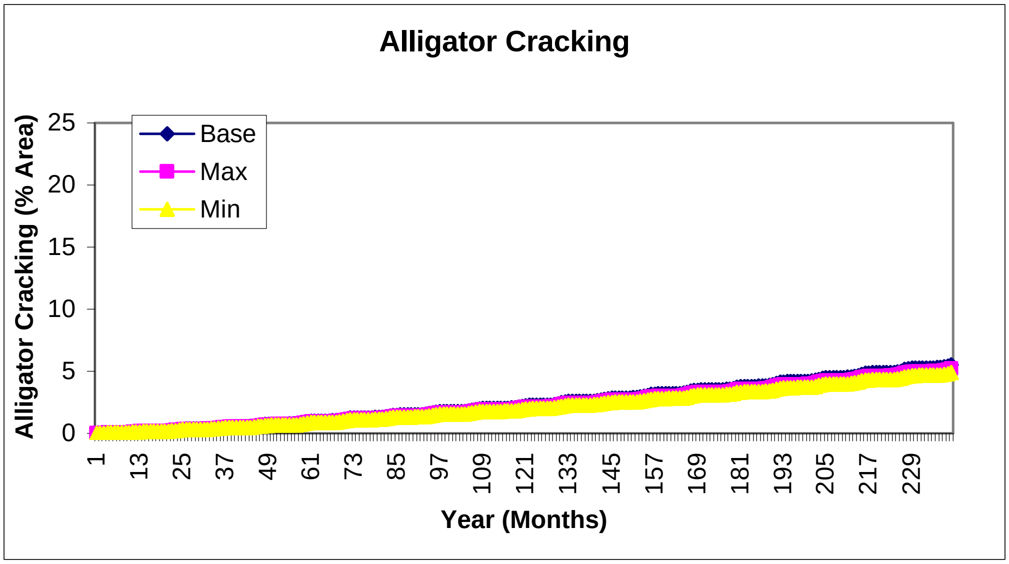


Figure D -168 0901 – ThermalConductivity – ACLayer - I

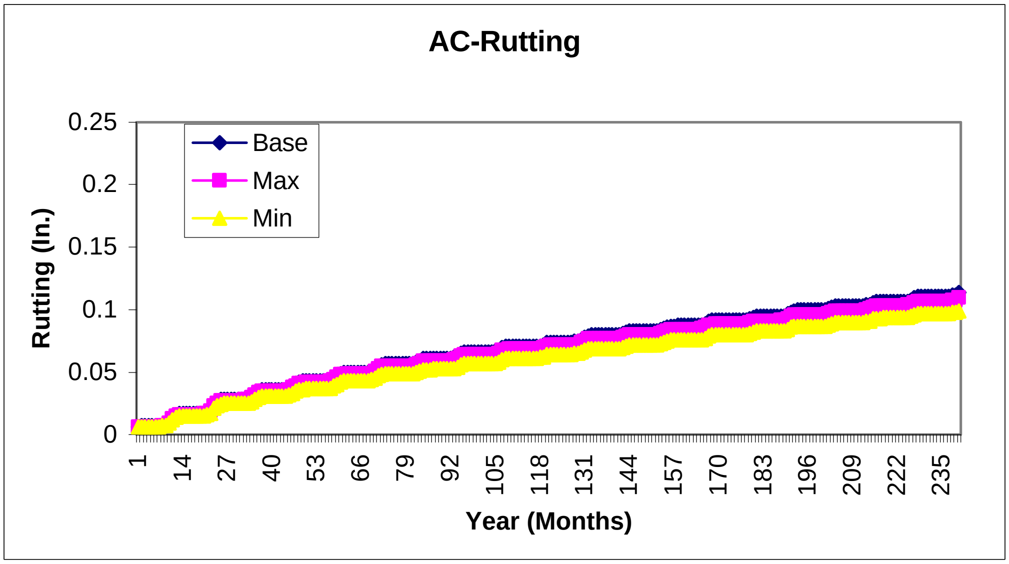


Figure D -169 0901 – ThermalConductivity – ACLayer - I

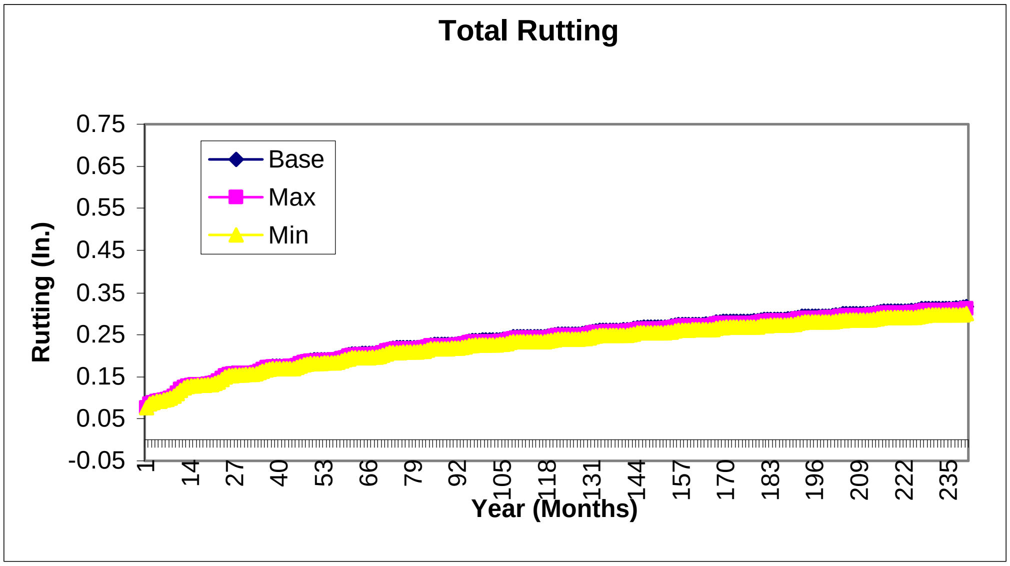


Figure D -170 0901 – ThermalConductivity – ACLayer - I

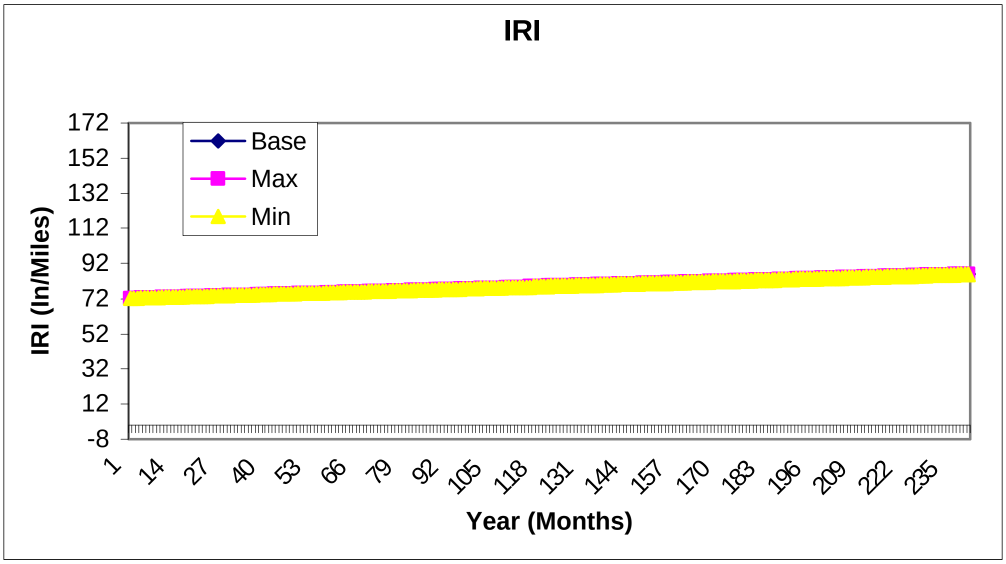


Figure D -171 0901 – Airvoids – ACLayer - II

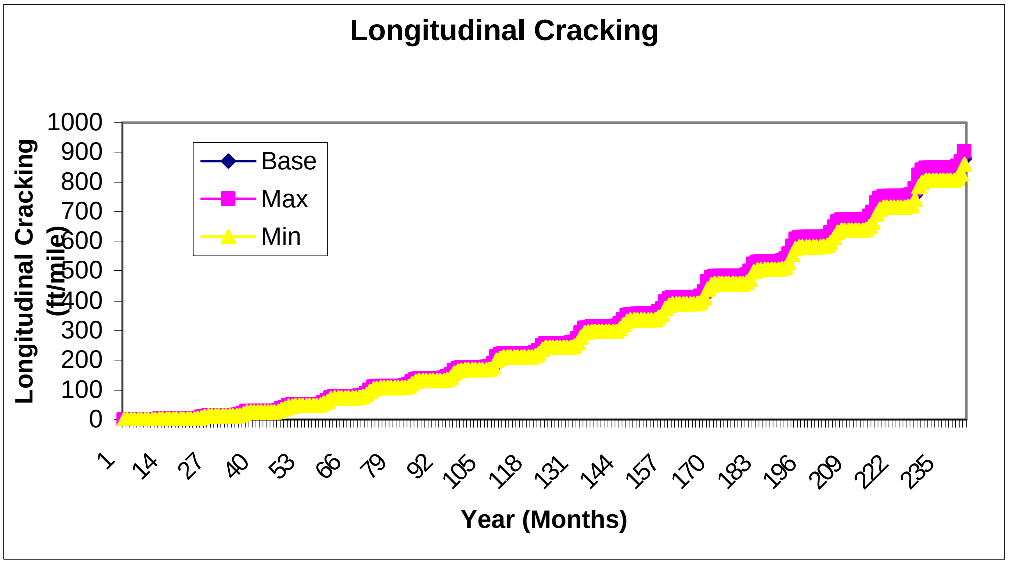


Figure D -172 0901 – Airvoids – ACLayer - II

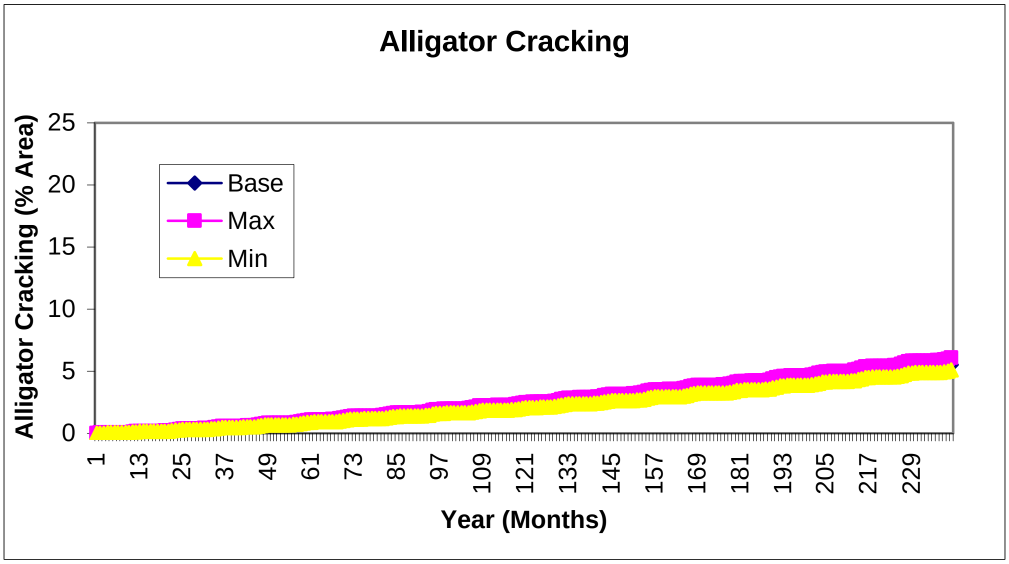


Figure D -173 0901 – Airvoids – ACLayer - II

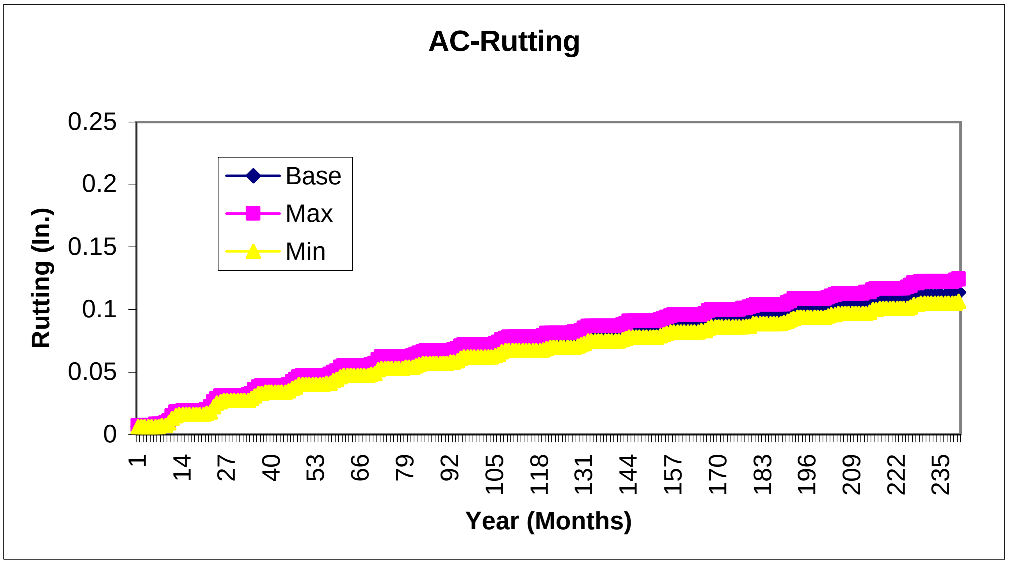


Figure D -174 0901 – Airvoids – ACLayer - II

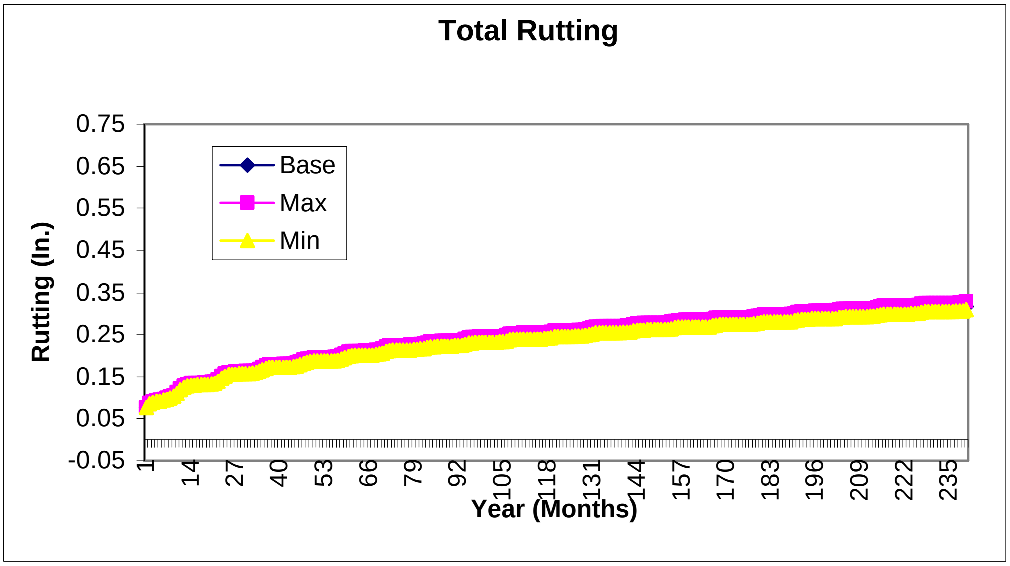


Figure D -175 0901 – Airvoids – ACLayer - II

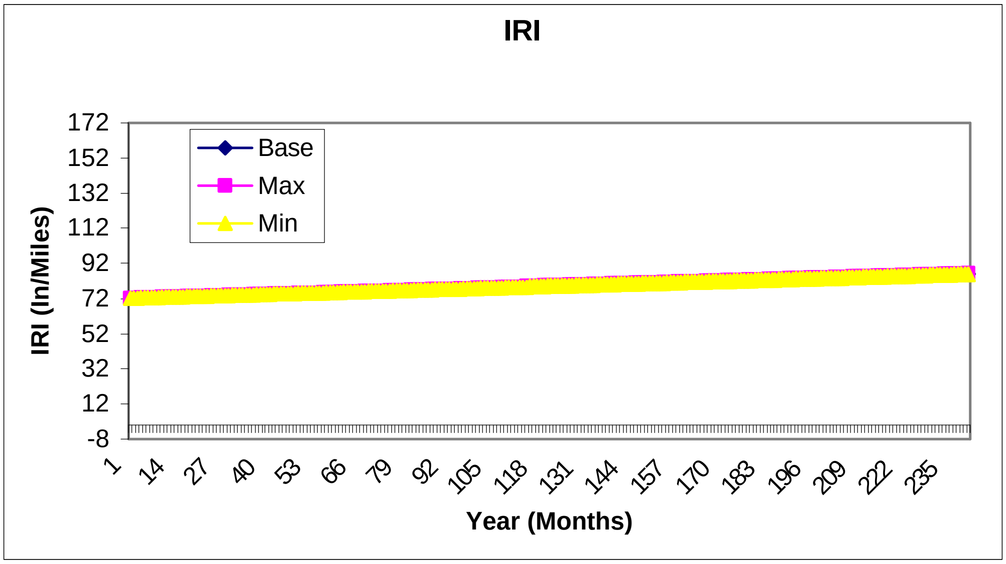


Figure D -176 0901 – HeatCapacity – ACLayer - II

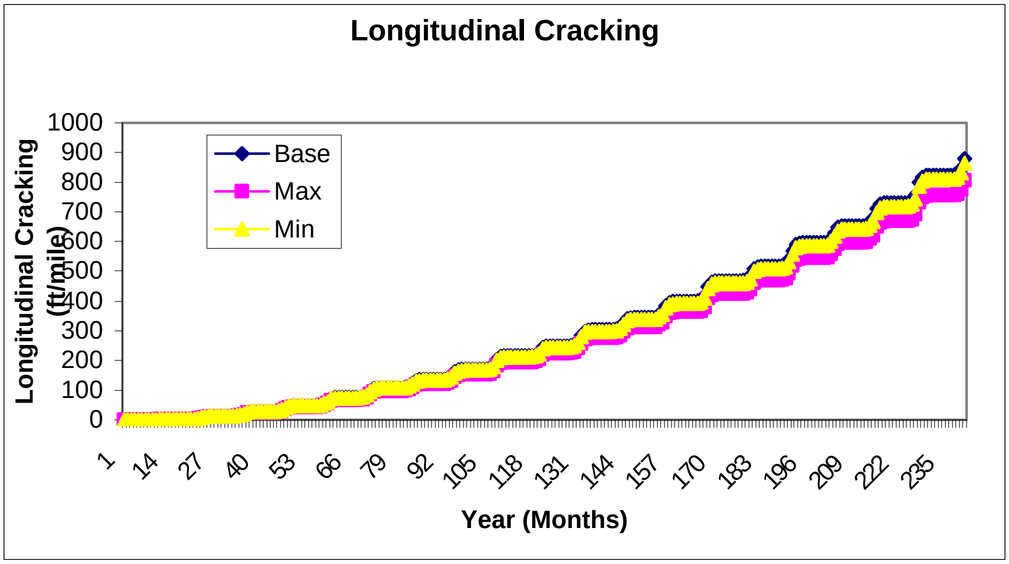


Figure D -177 0901 – HeatCapacity – ACLayer - II

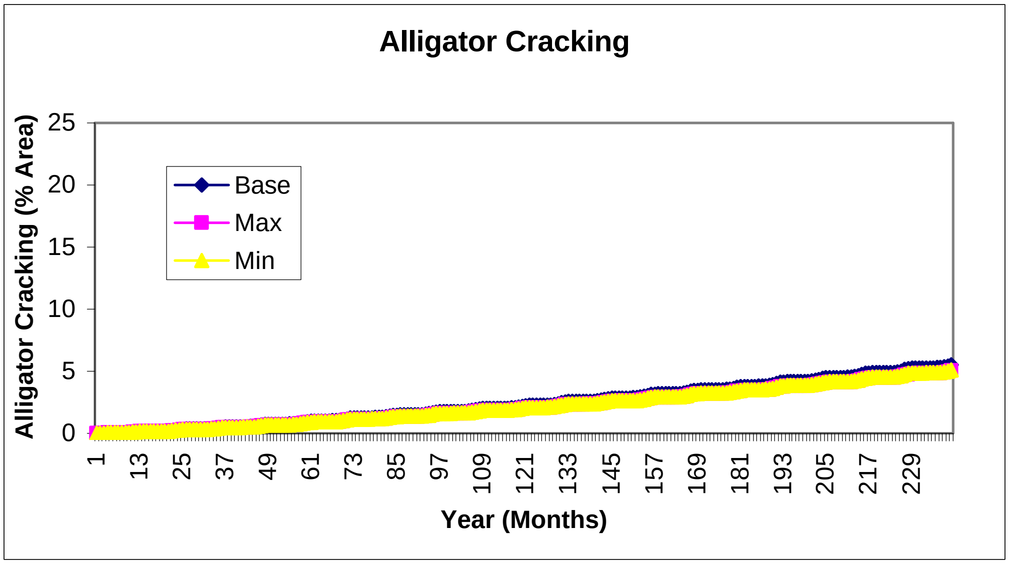


Figure D -178 0901 – HeatCapacity – ACLayer - II

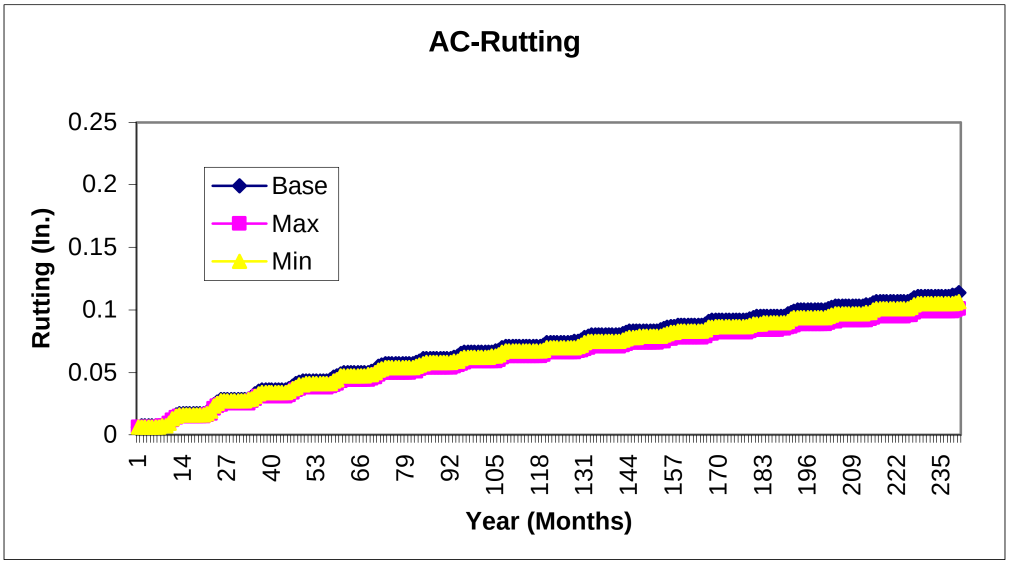


Figure D -179 0901 – HeatCapacity – ACLayer - II

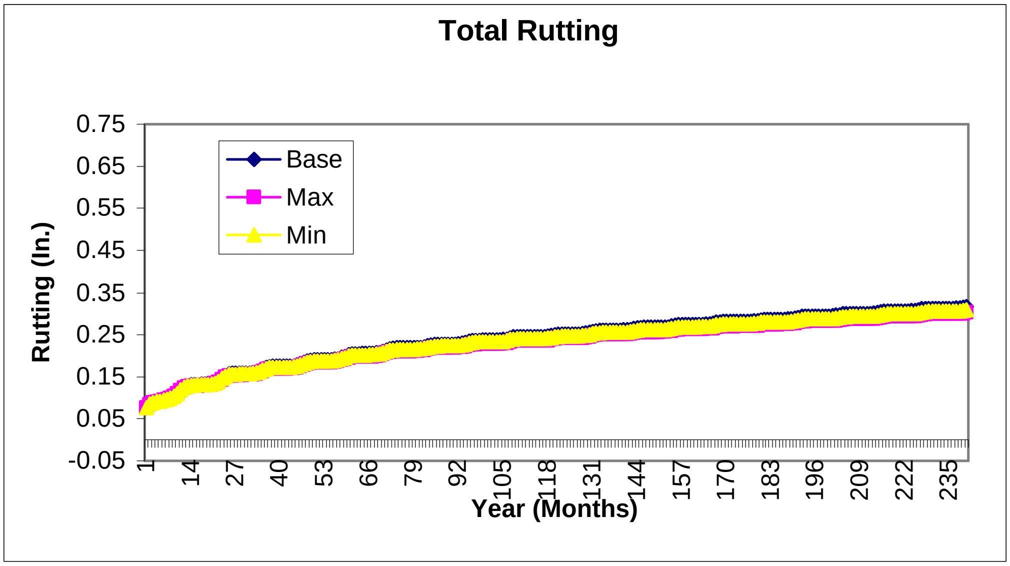


Figure D -180 0901 – HeatCapacity – ACLayer - II

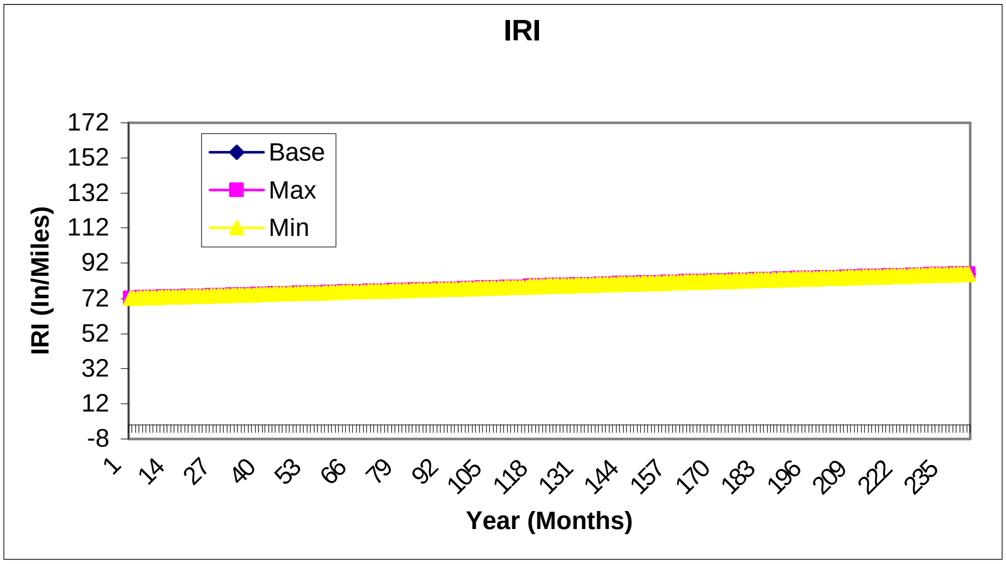


Figure D -181 0901 – ThermalConductivity – ACLayer - II

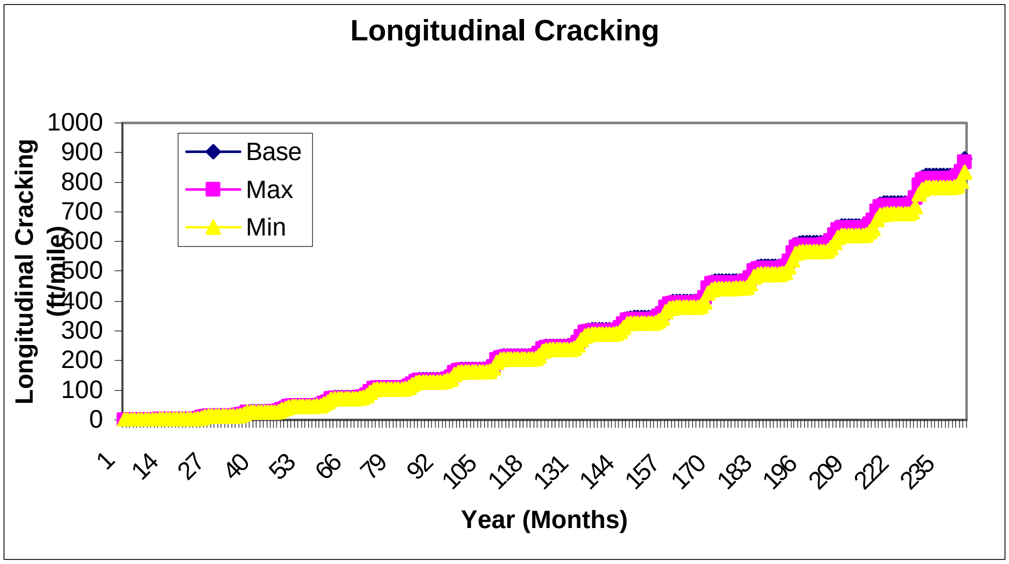


Figure D -182 0901 – ThermalConductivity – ACLayer - II

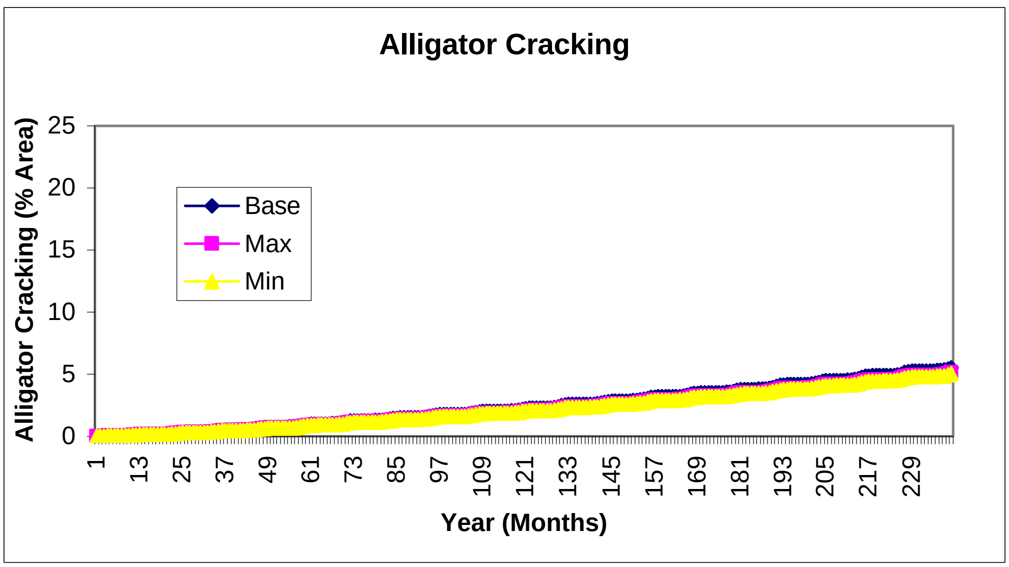


Figure D -183 0901 – ThermalConductivity – ACLayer - II

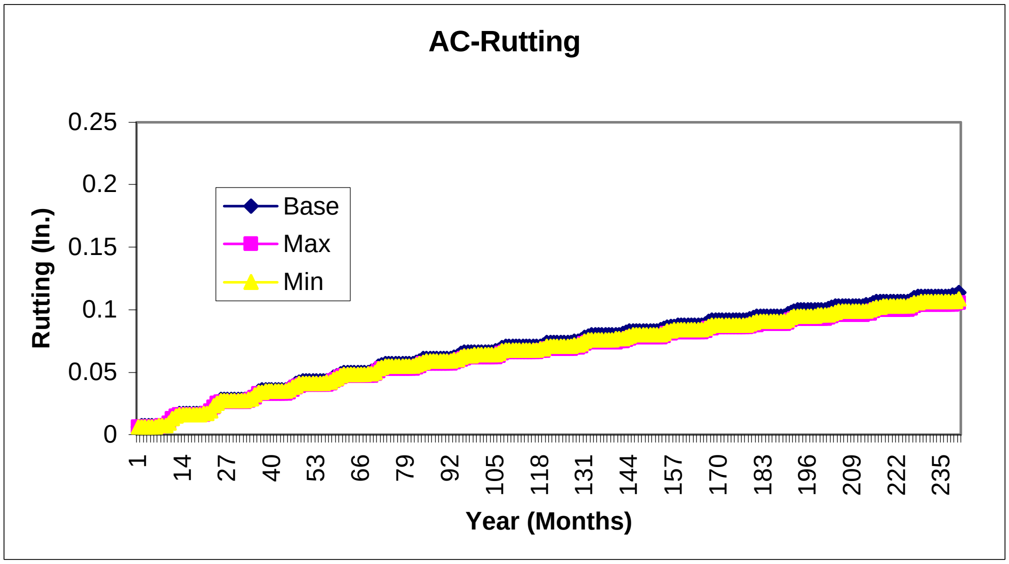


Figure D -184 0901 – ThermalConductivity – ACLayer - II

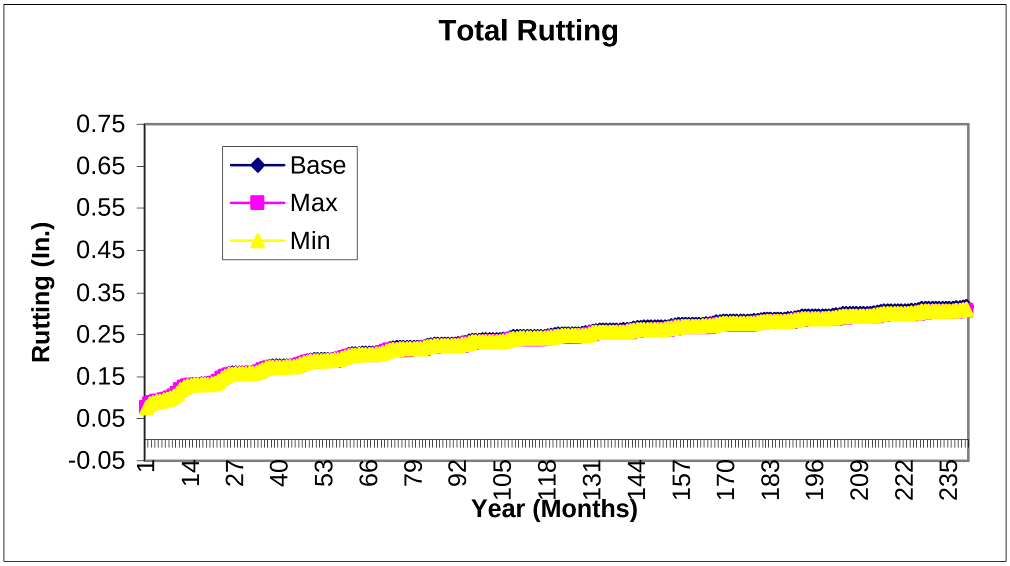


Figure D -185 0901 – ThermalConductivity – ACLayer - II

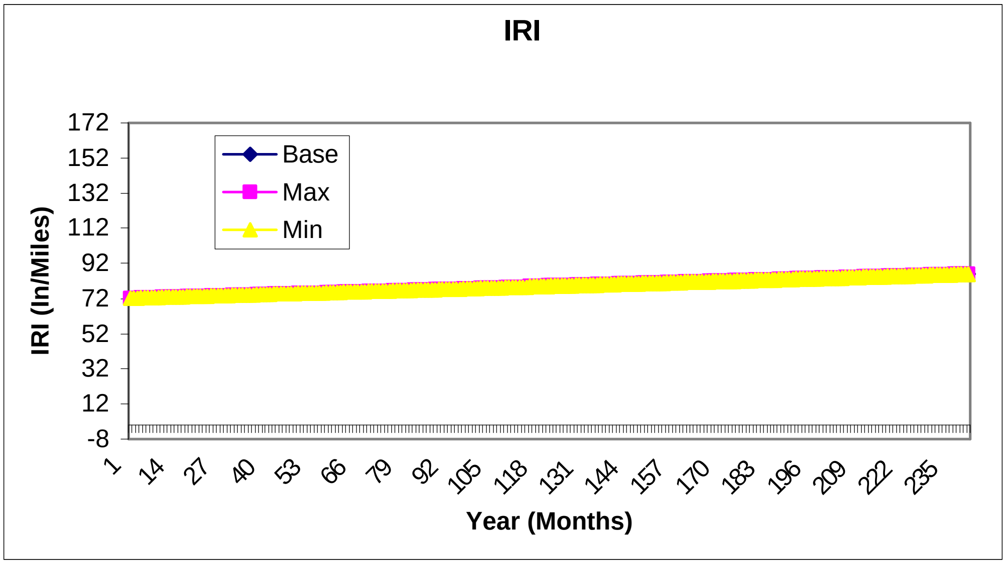


Figure D -186 0901 – Airvoids – Treated Base

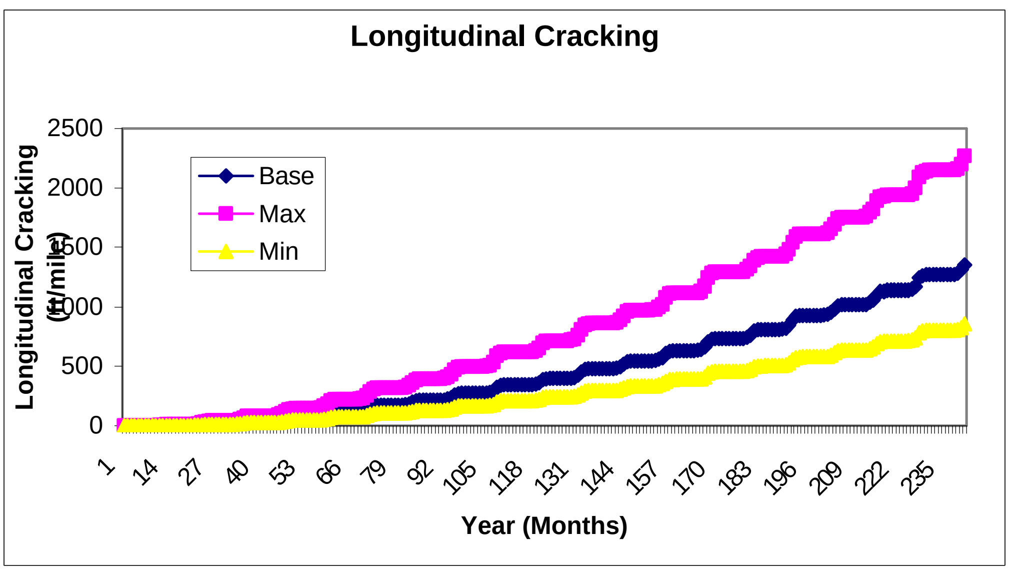


Figure D -187 0901 – Airvoids – Treated Base

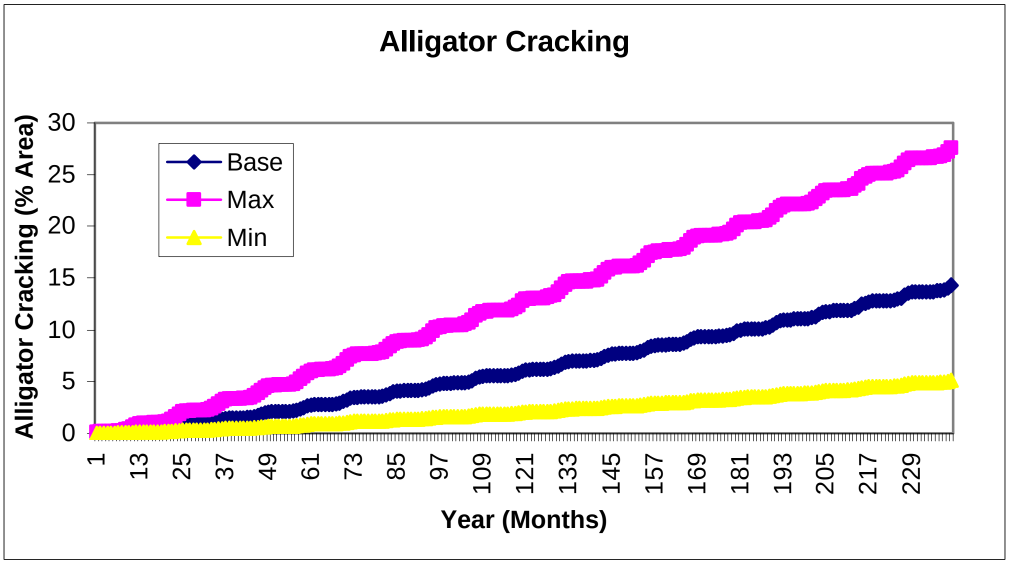


Figure D -188 0901 – Airvoids – Treated Base

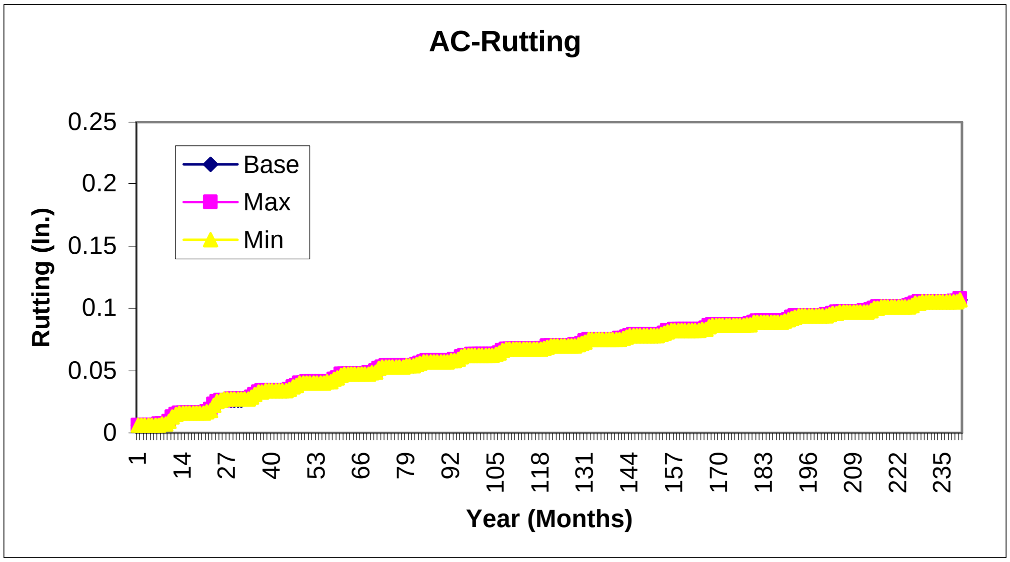


Figure D -189 0901 – Airvoids – Treated Base

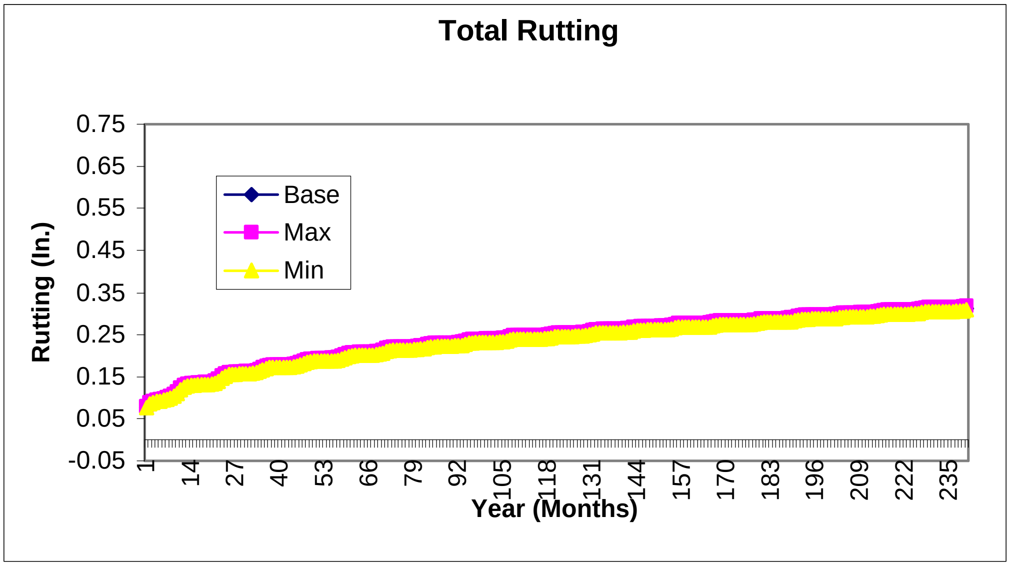


Figure D -190 0901 – Airvoids – Treated Base

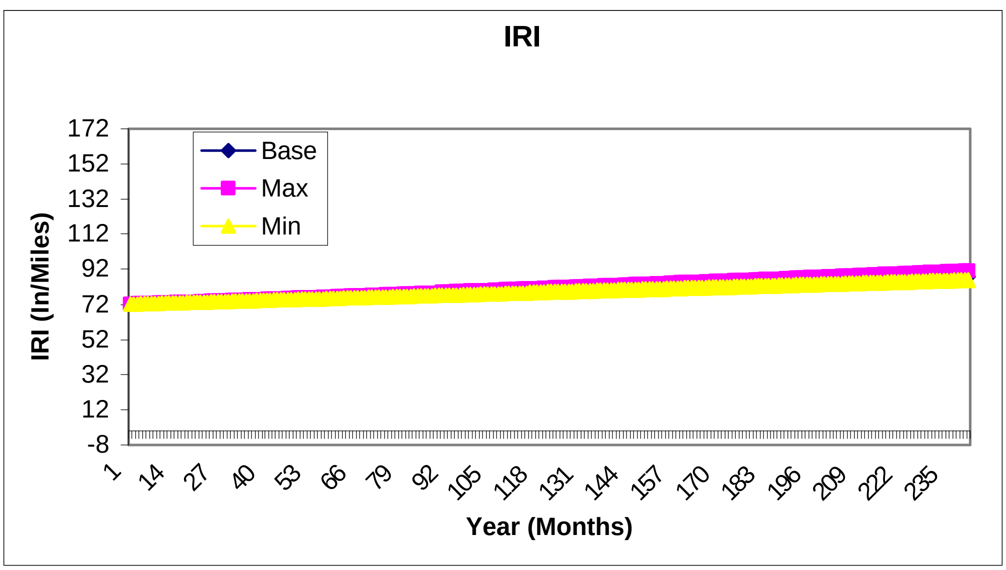


Figure D -191 0901 – HeatCapacity – Treated Base

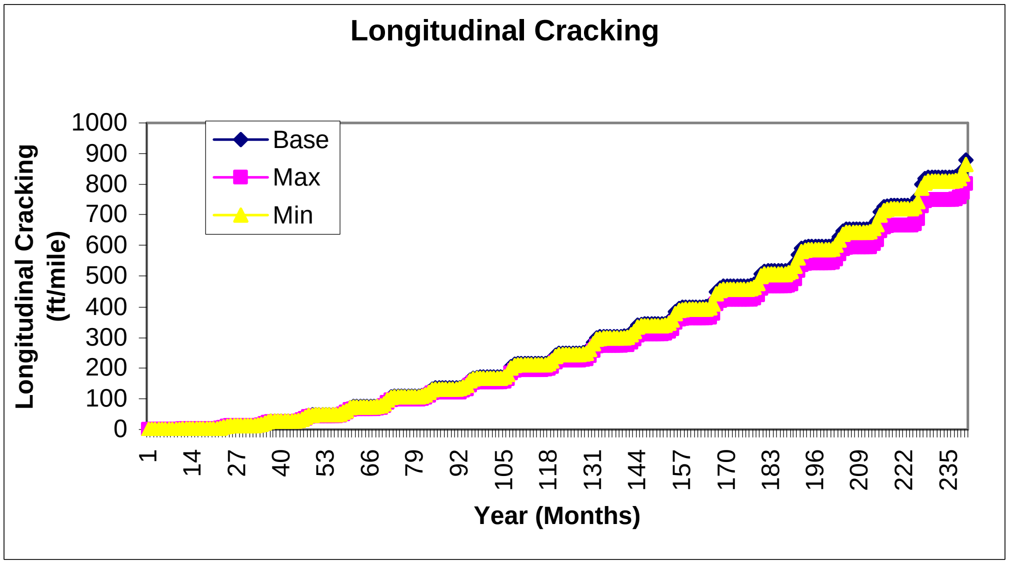


Figure D -192 0901 – HeatCapacity – Treated Base

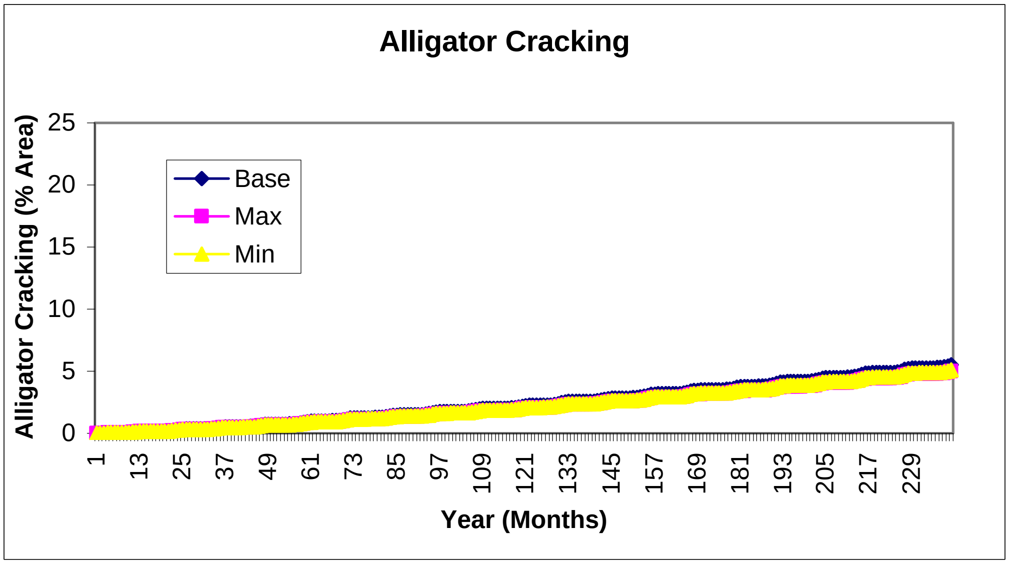


Figure D -193 0901 – HeatCapacity – Treated Base

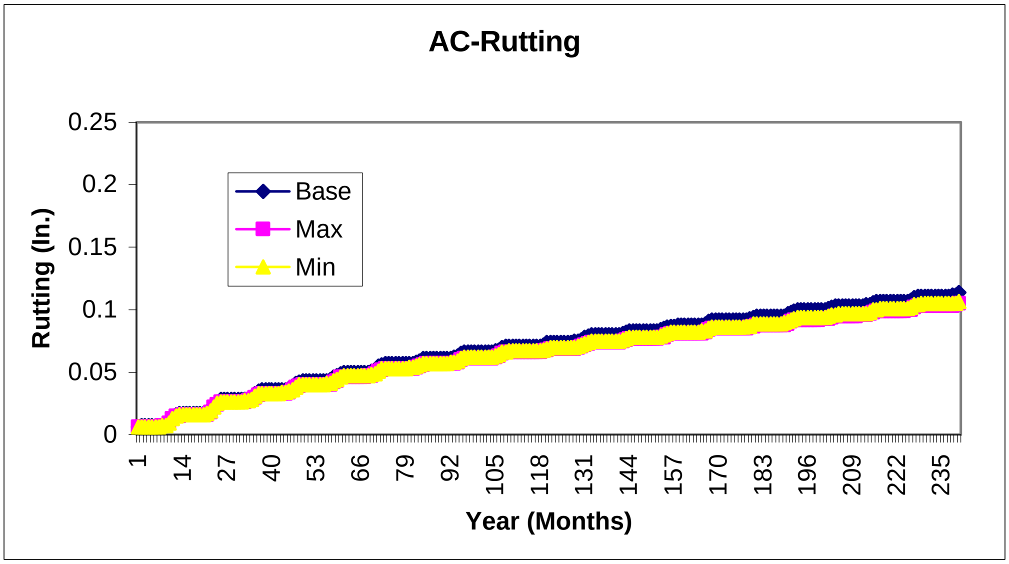


Figure D -194 0901 – HeatCapacity – Treated Base

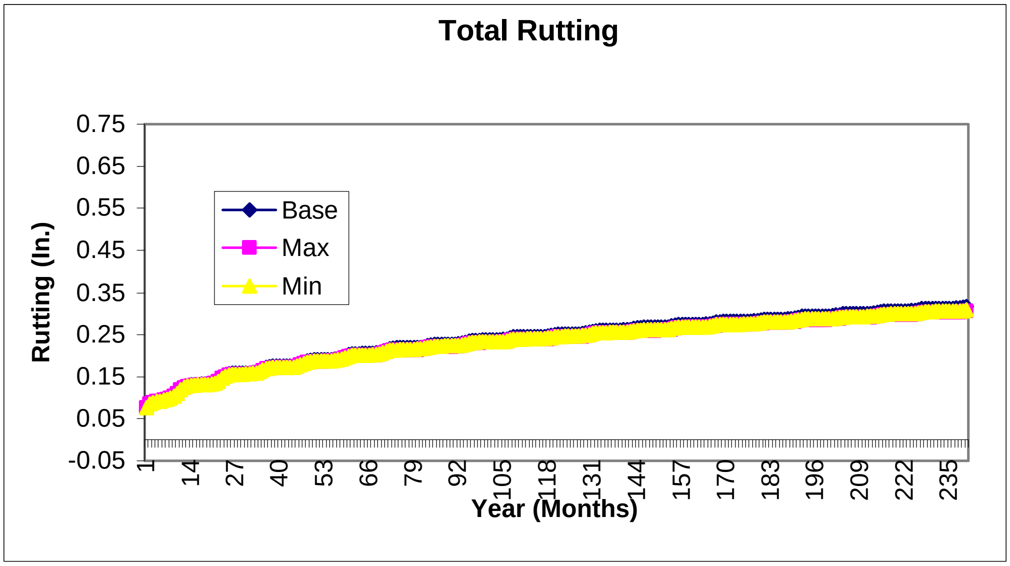


Figure D -195 0901 – HeatCapacity – Treated Base

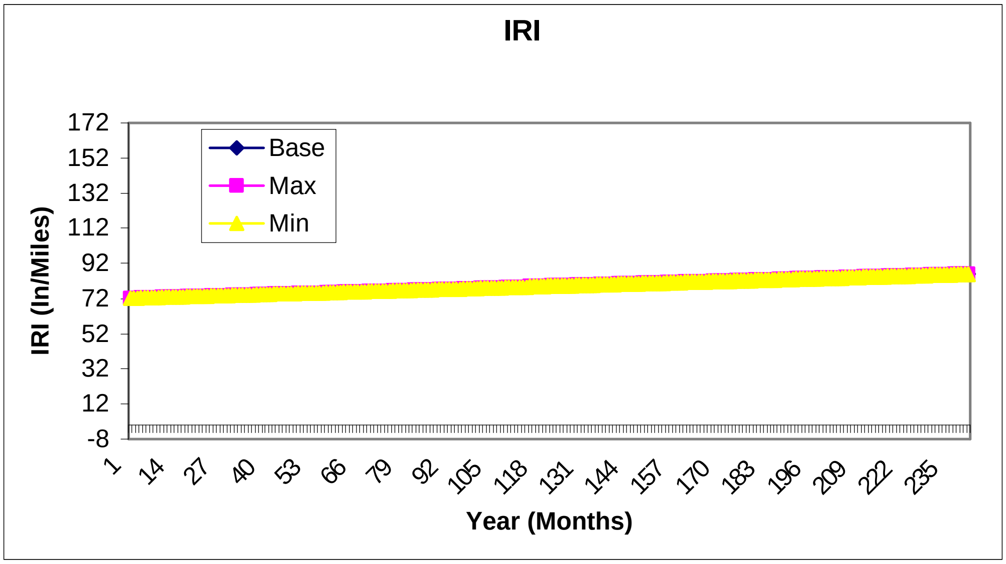


Figure D -196 0901 – ThermalConductivity – Treated Base

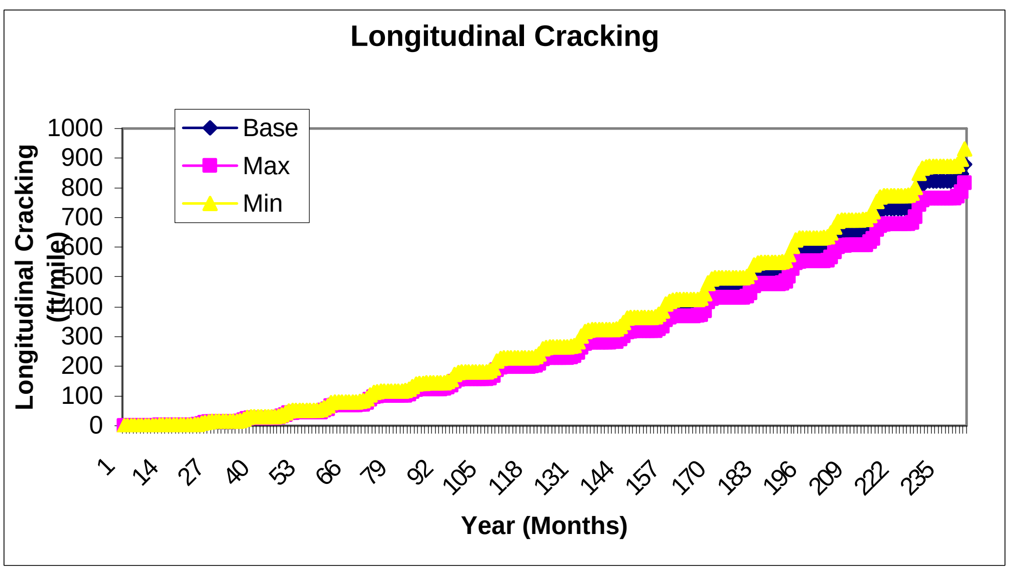


Figure D -197 0901 – ThermalConductivity – Treated Base

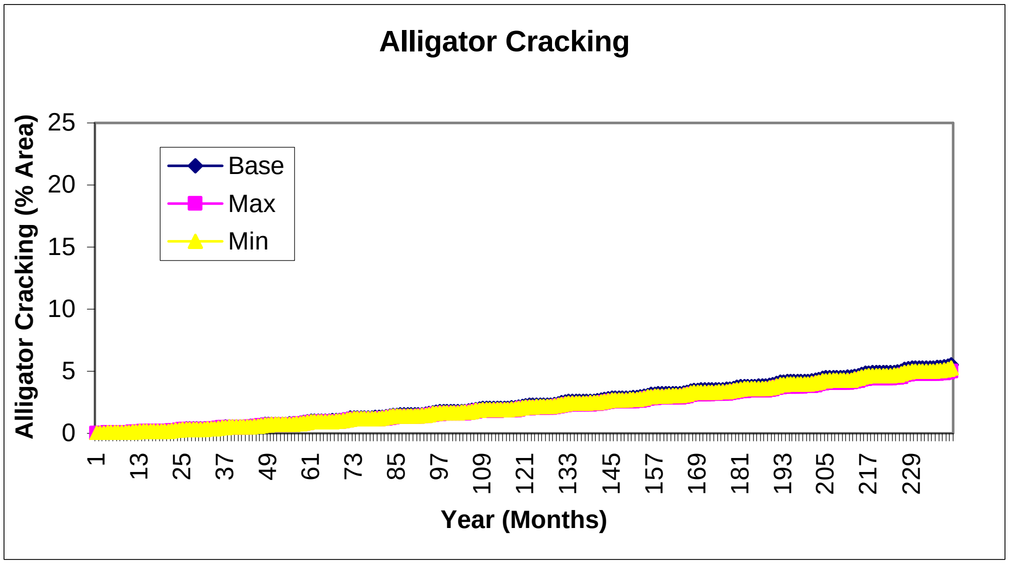


Figure D -198 0901 – ThermalConductivity – Treated Base

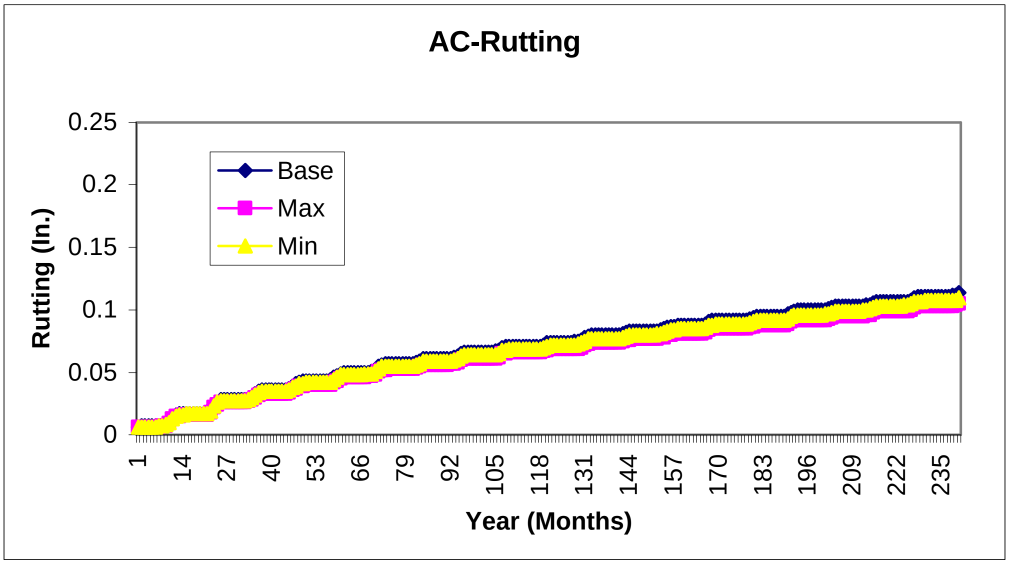


Figure D -199 0901 – ThermalConductivity – Treated Base

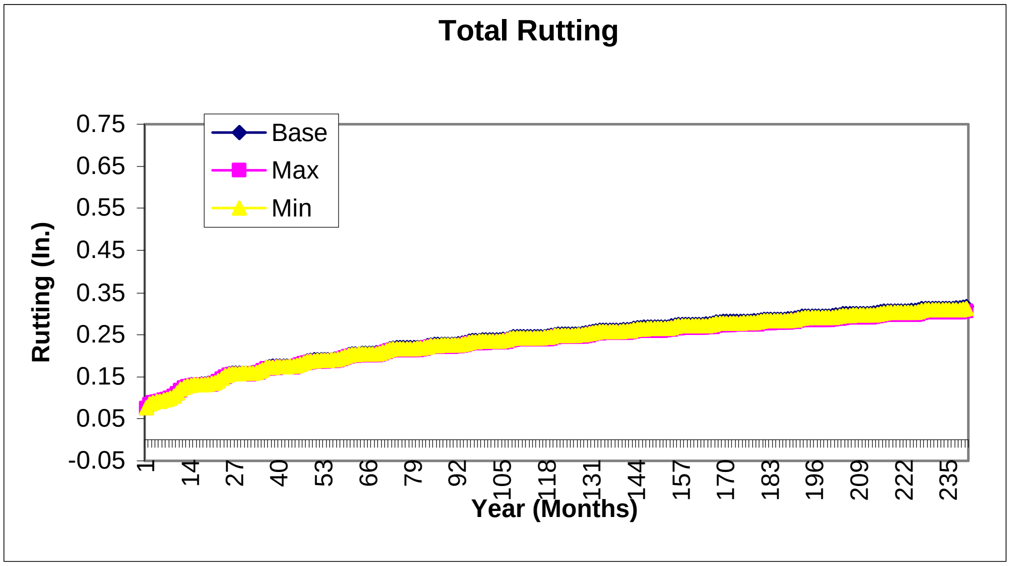


Figure D -200 0901 – ThermalConductivity – Treated Base

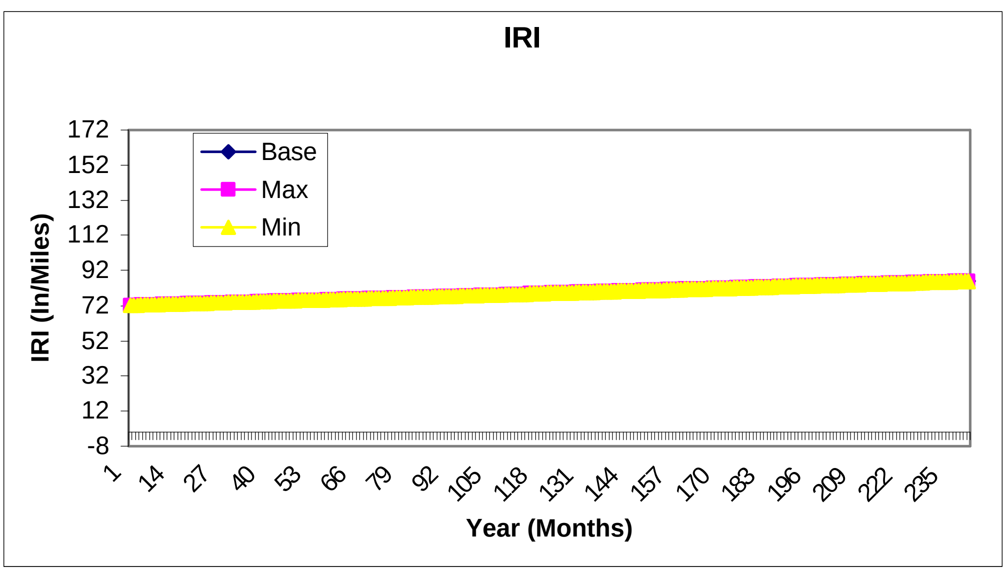


Figure D -201 0901 – Granular Base Modulus

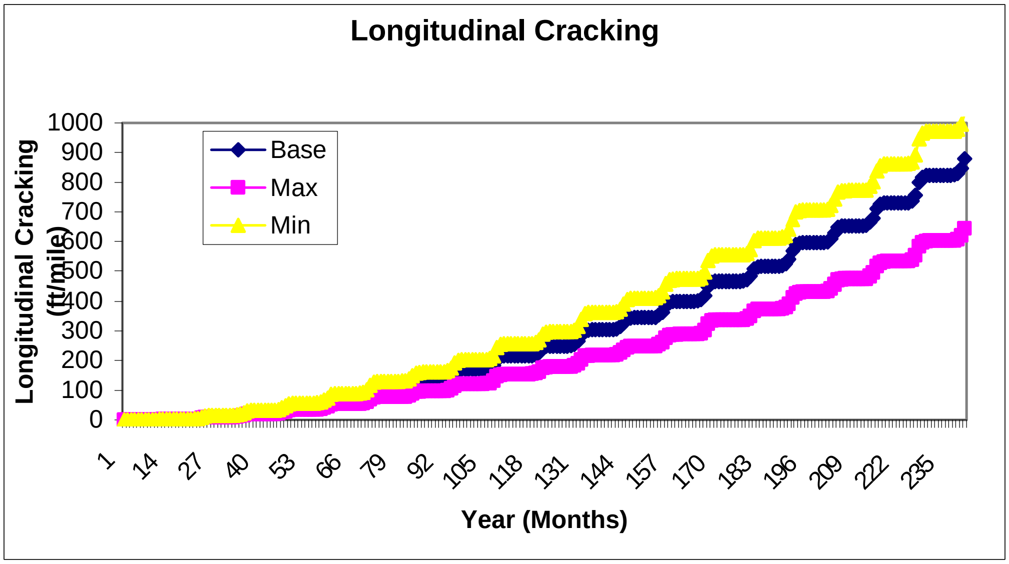


Figure D -202 0901 – Granular Base Modulus

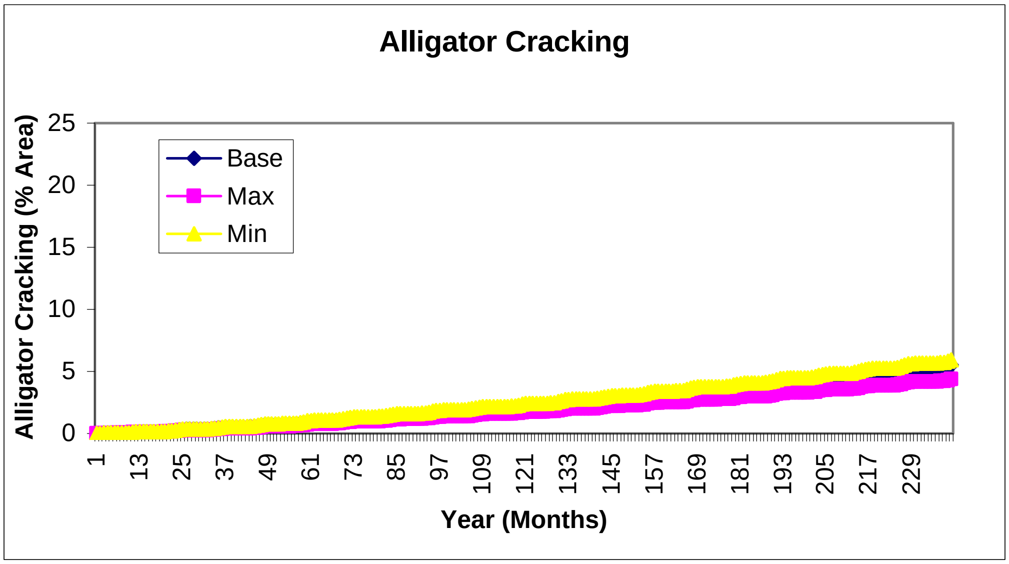


Figure D -203 0901 – Granular Base Modulus

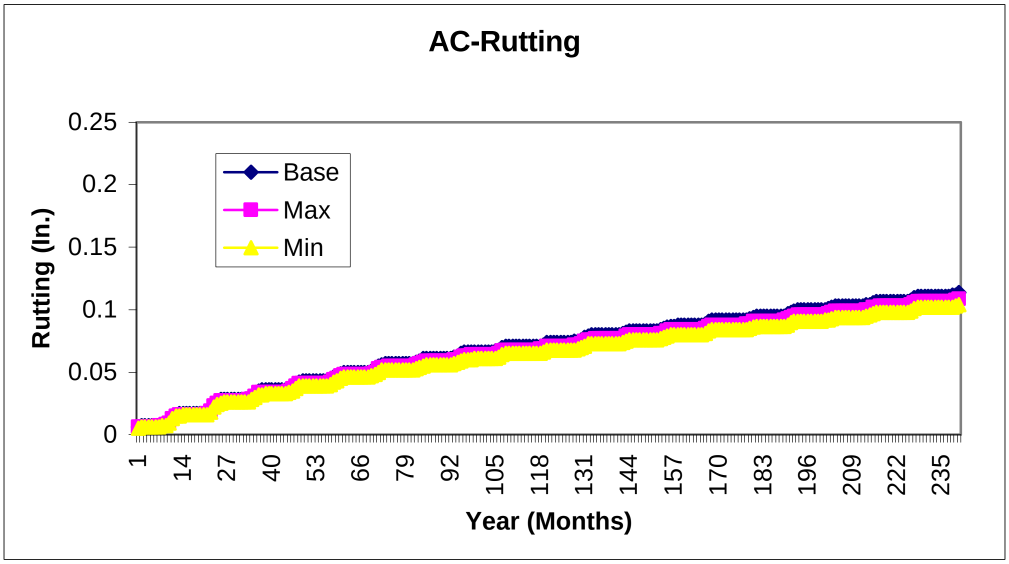


Figure D -204 0901 – Granular Base Modulus

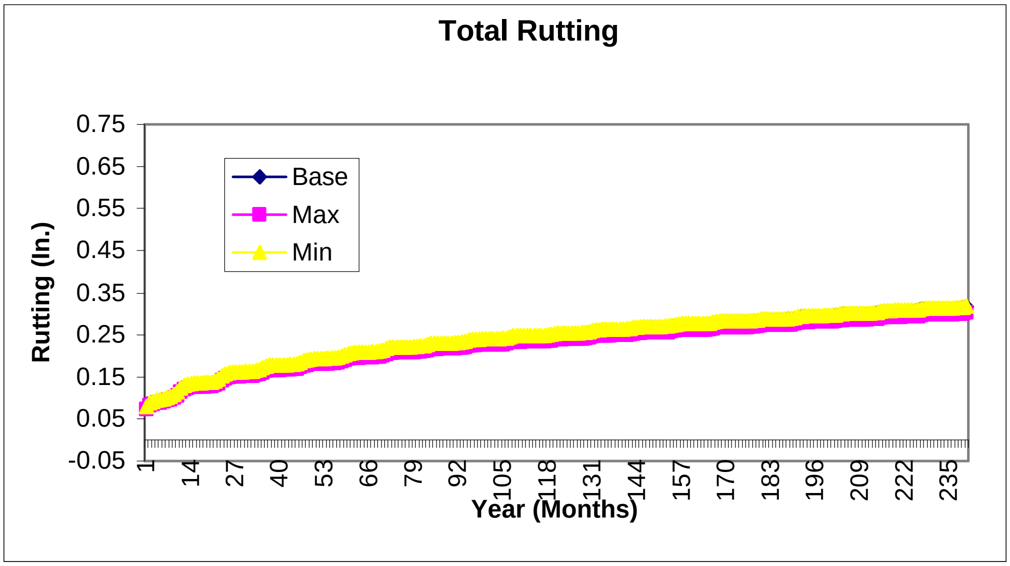


Figure D -205 0901 – Granular Base Modulus

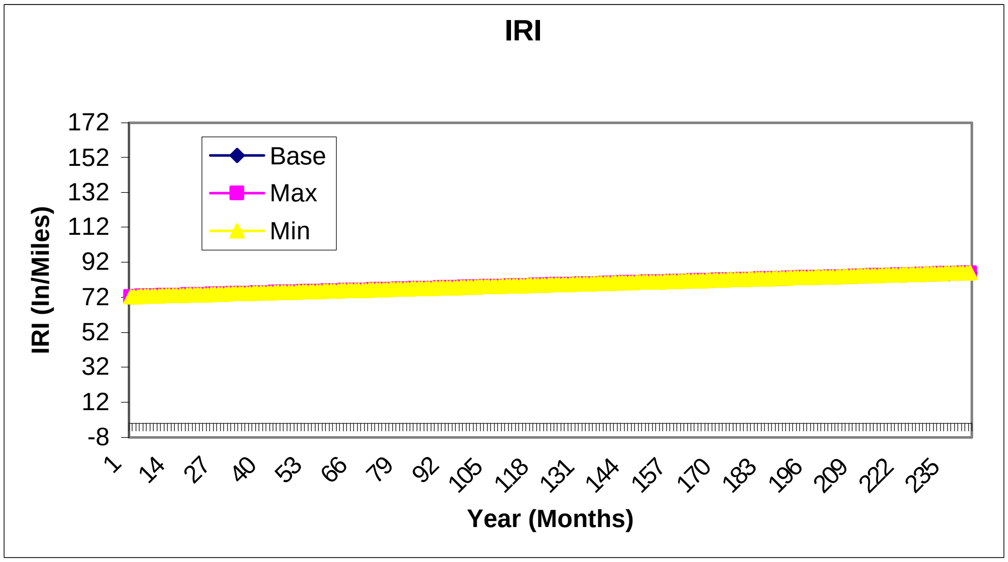


Figure D -206 0901 – Subgrade Modulus

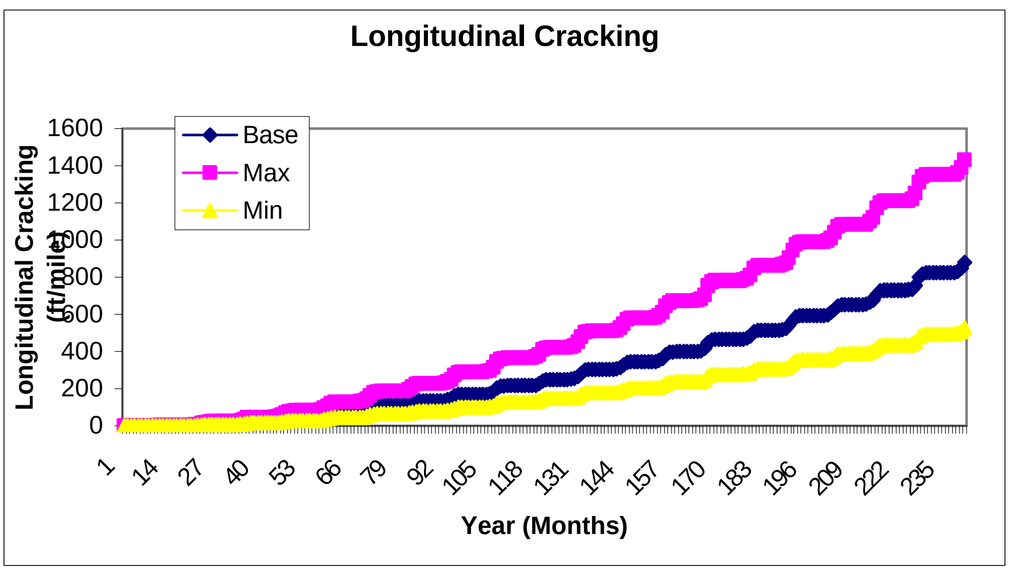


Figure D -207 0901 – Subgrade Modulus

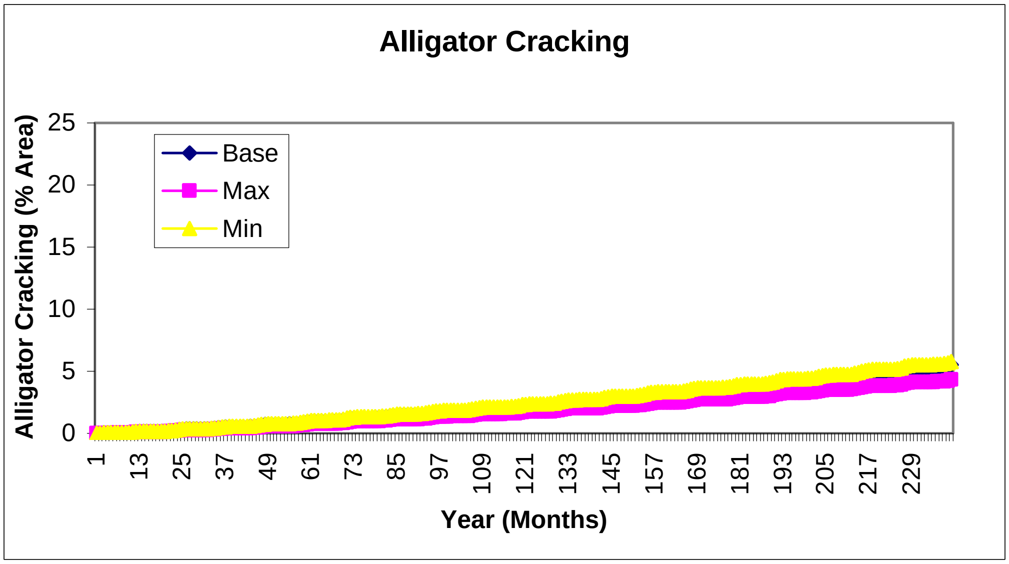


Figure D -208 0901 – Subgrade Modulus

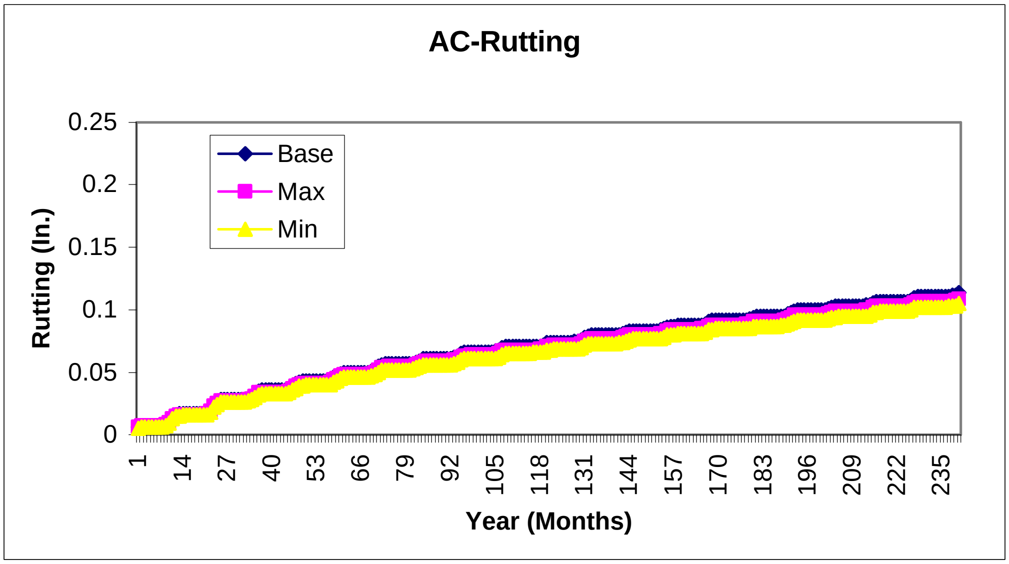


Figure D -209 0901 – Subgrade Modulus

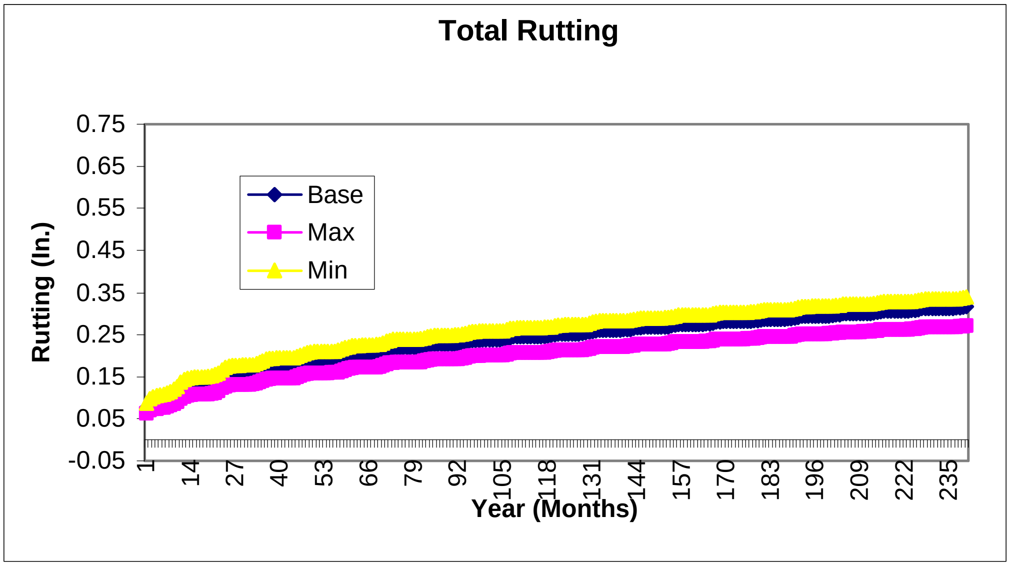


Figure D -210 0901 – Subgrade Modulus

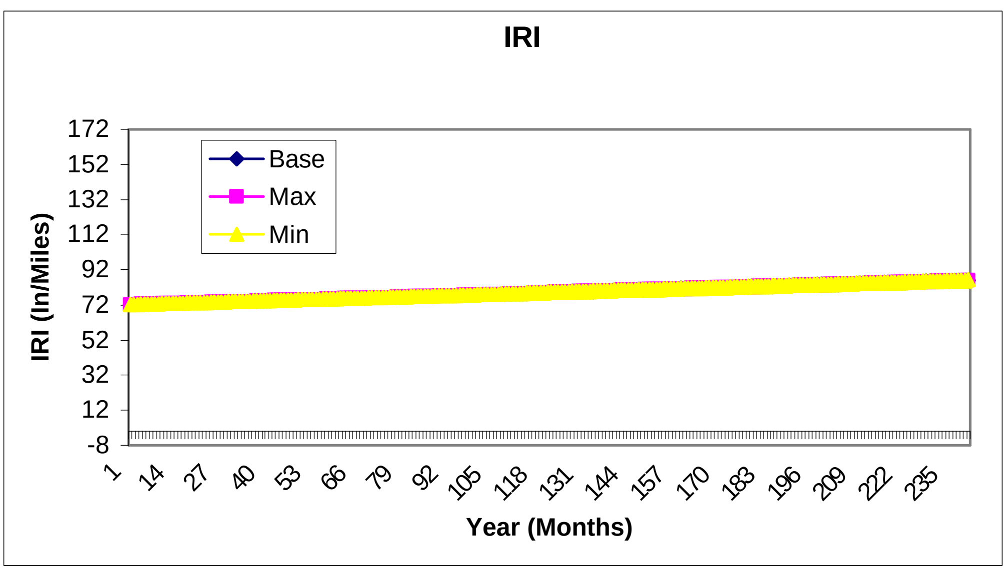


Figure D -211 0901 – Surface Shortwave Absorptivity

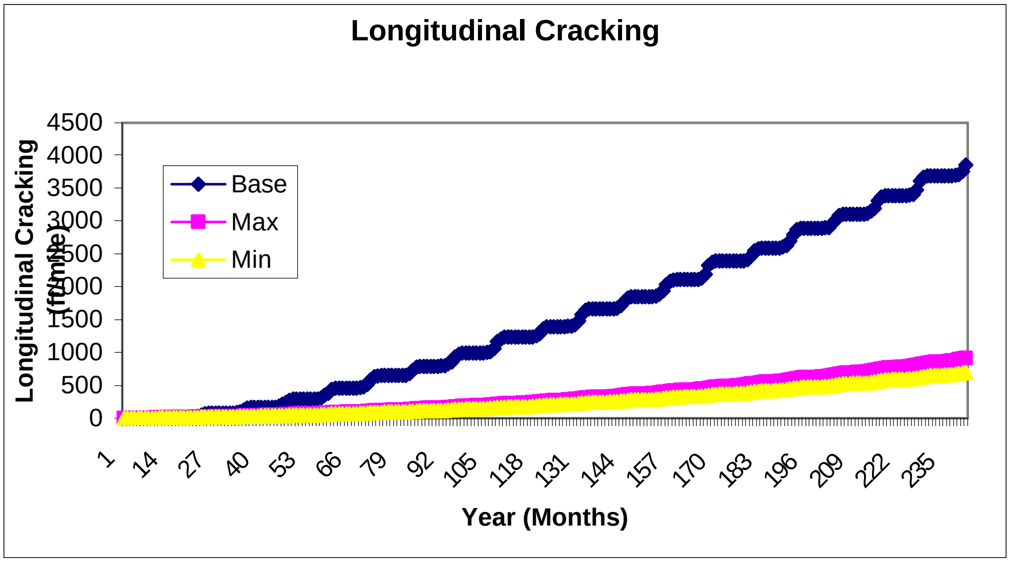


Figure D -212 0901 – Surface Shortwave Absorptivity

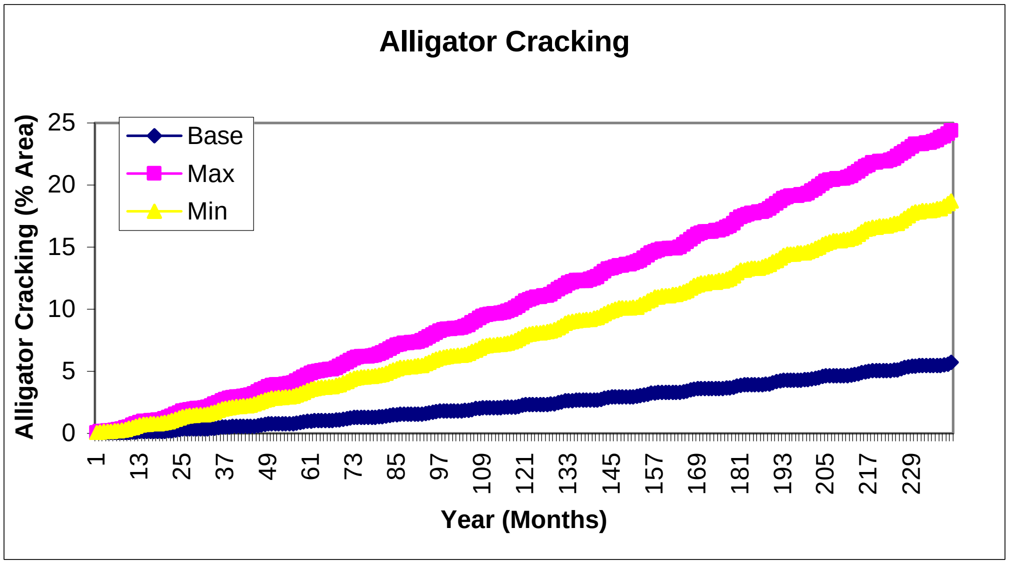


Figure D -213 0901 – Surface Shortwave Absorptivity

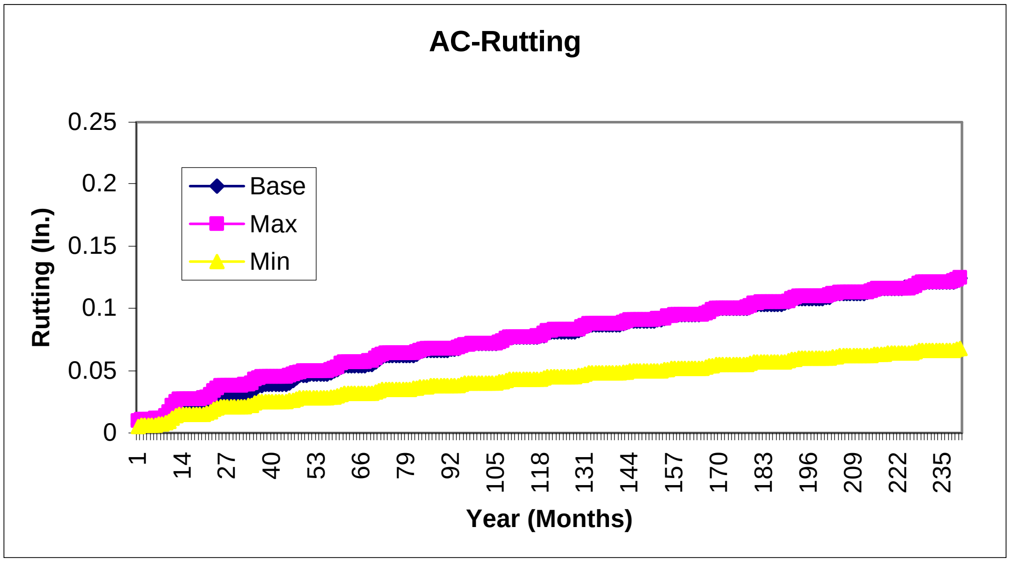


Figure D -214 0901 – Surface Shortwave Absorptivity

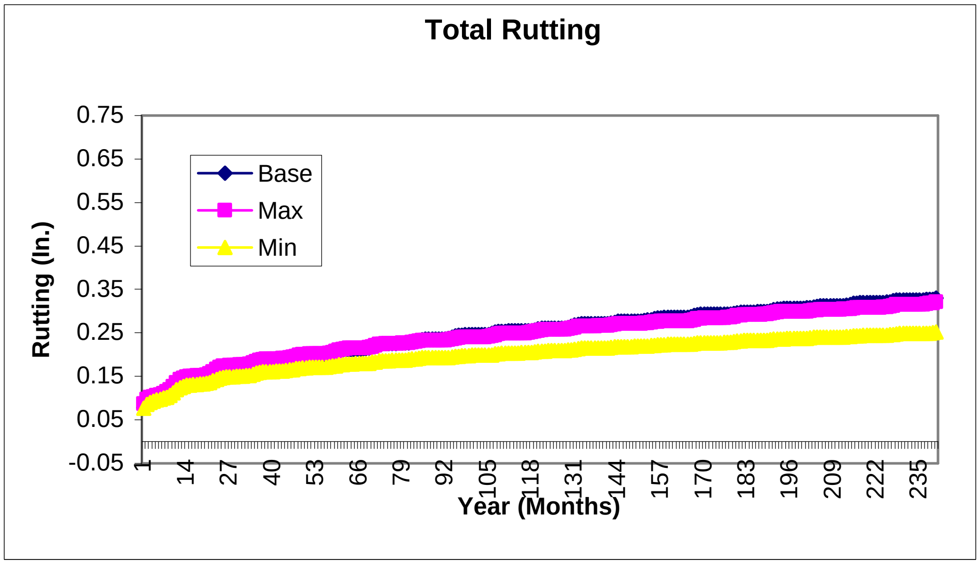


Figure D -215 0901 – Surface Shortwave Absorptivity

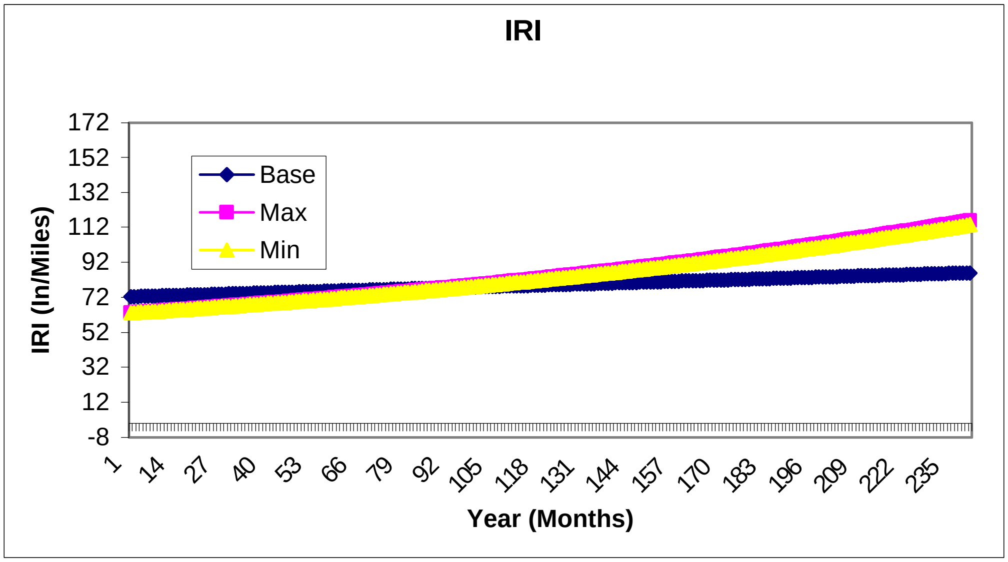


Figure D -216 0901 – |E*| – S9.5BC

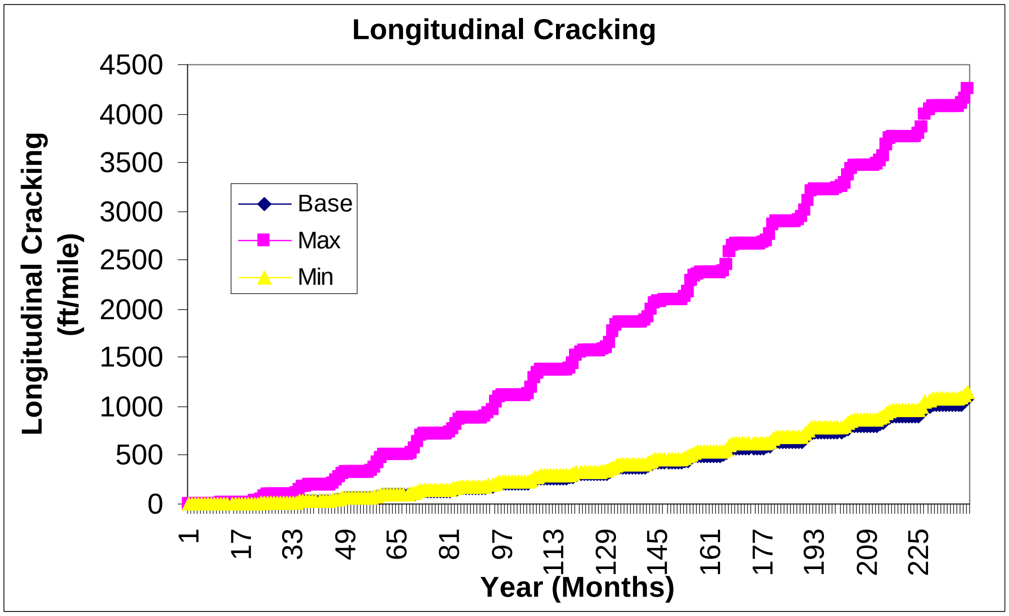


Figure D -217 0901 – |E*| – S9.5BC

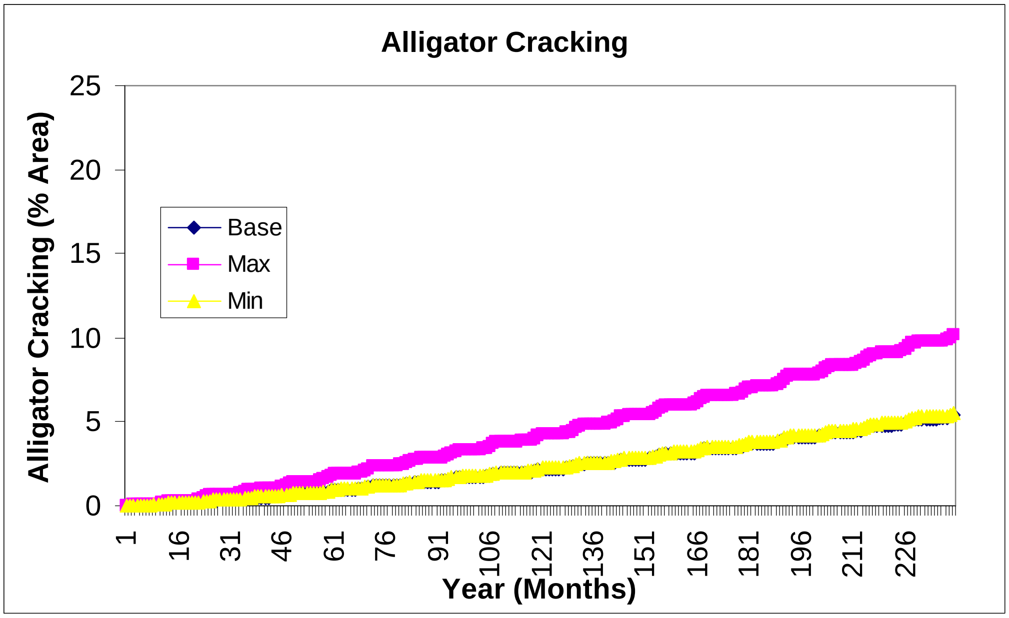


Figure D -218 0901 – |E*| – S9.5BC

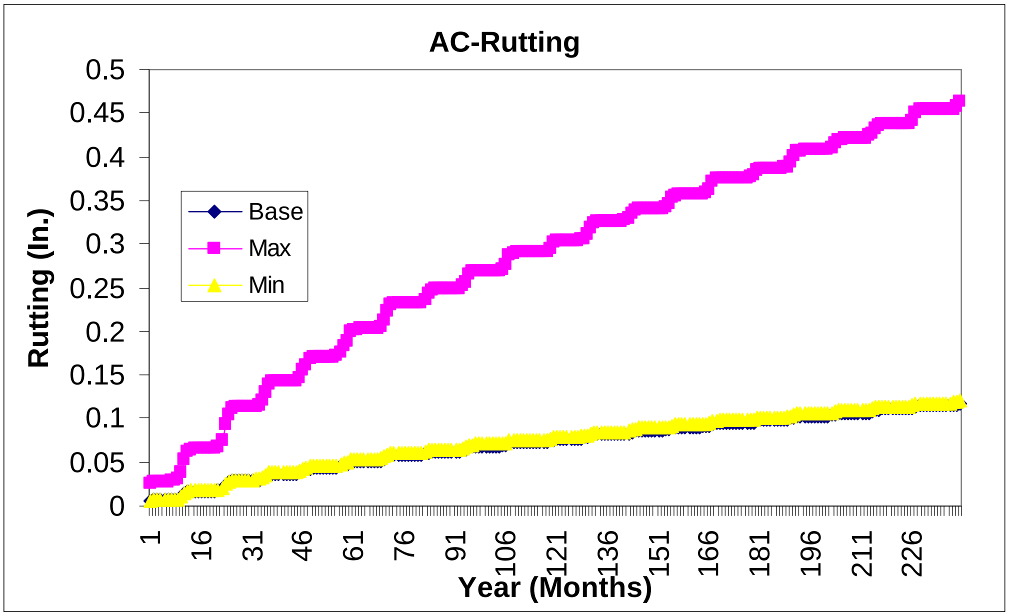


Figure D -219 0901 – |E*| – S9.5BC

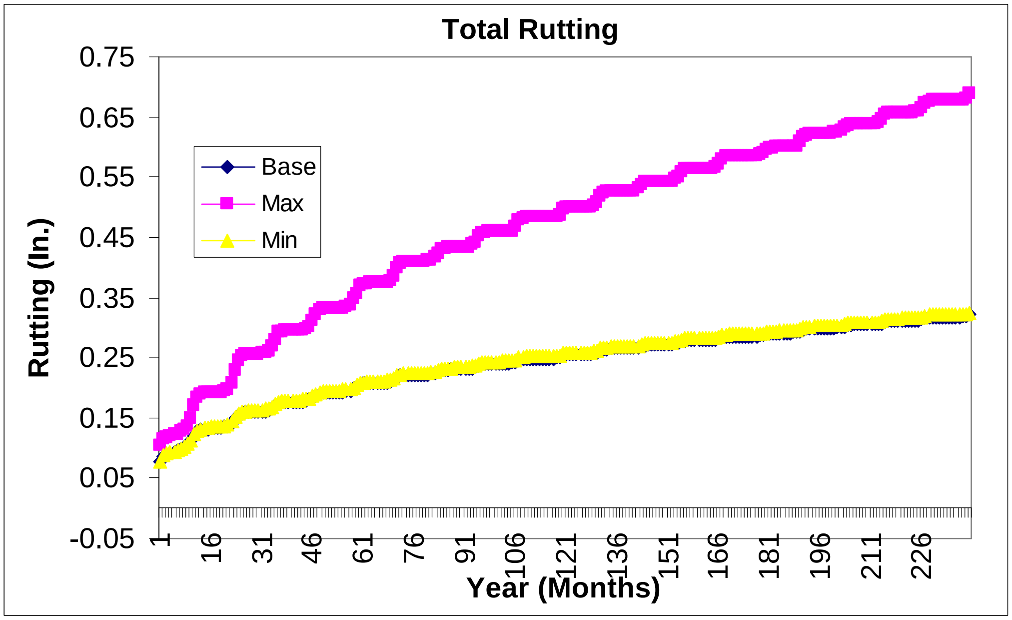


Figure D -220 0901 – |E*| – S9.5BC

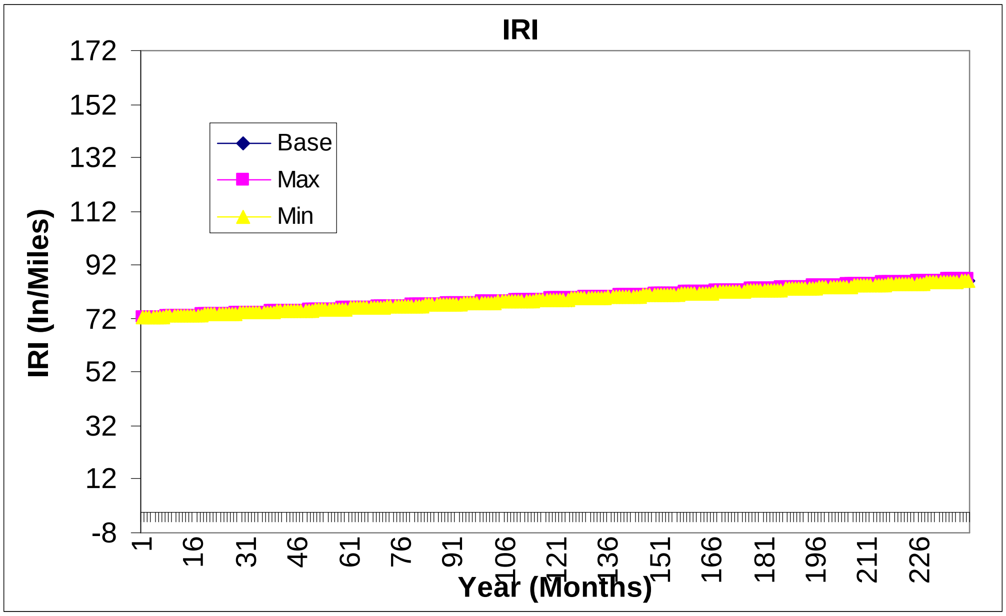


Figure D -221 0901 – |E*| – I19BC

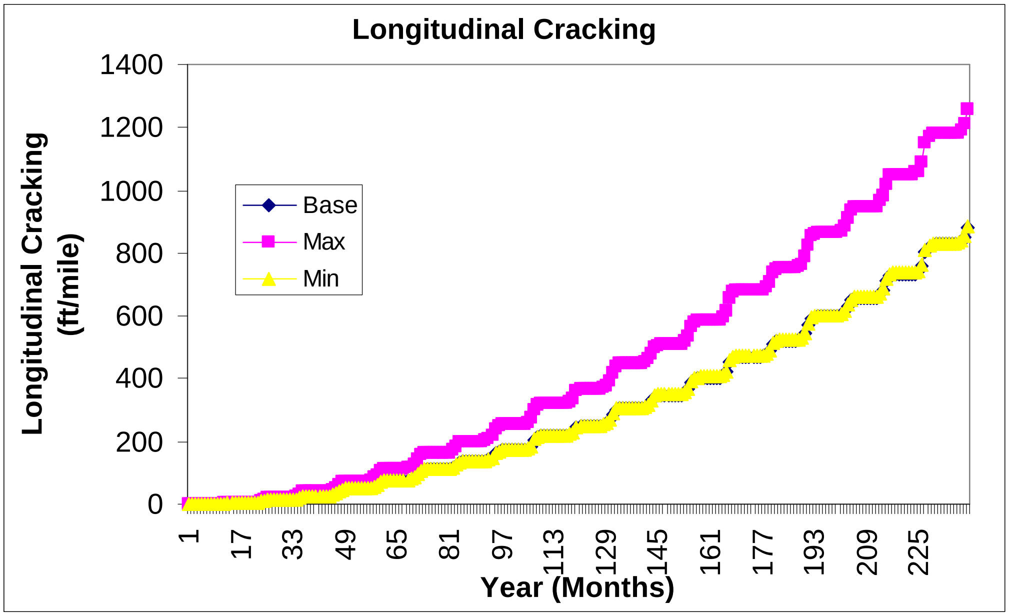


Figure D -222 0901 – |E*| – I19BC

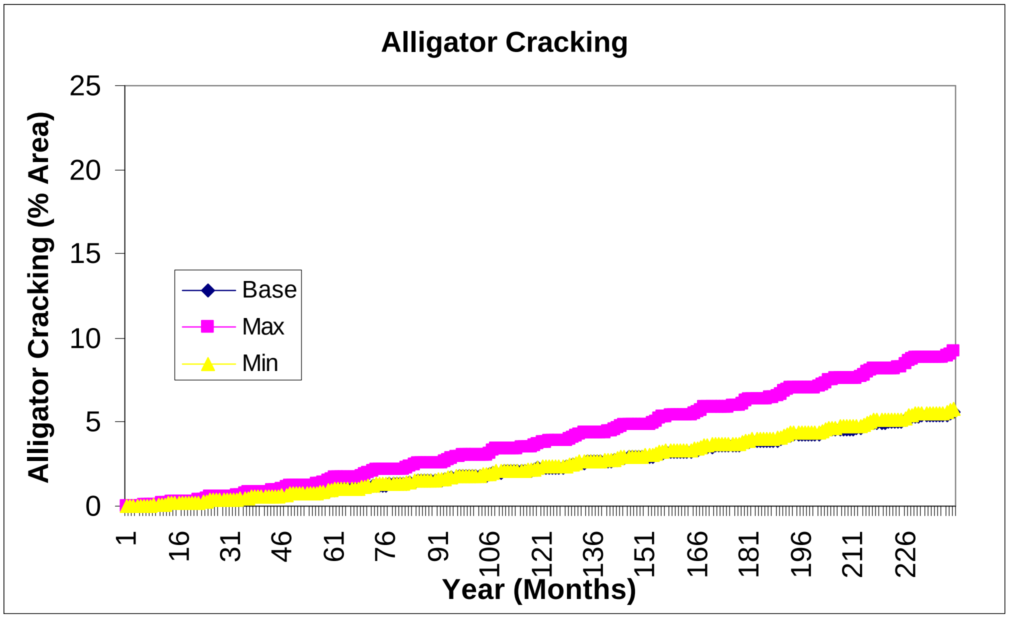


Figure D -223 0901 – |E*| – I19BC

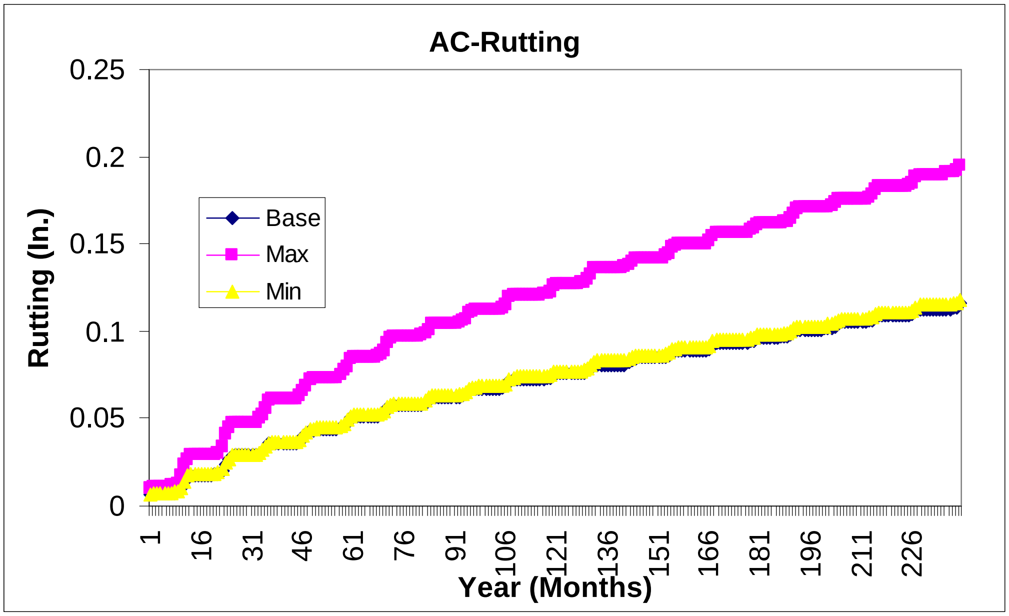


Figure D -224 0901 – |E*| – I19BC

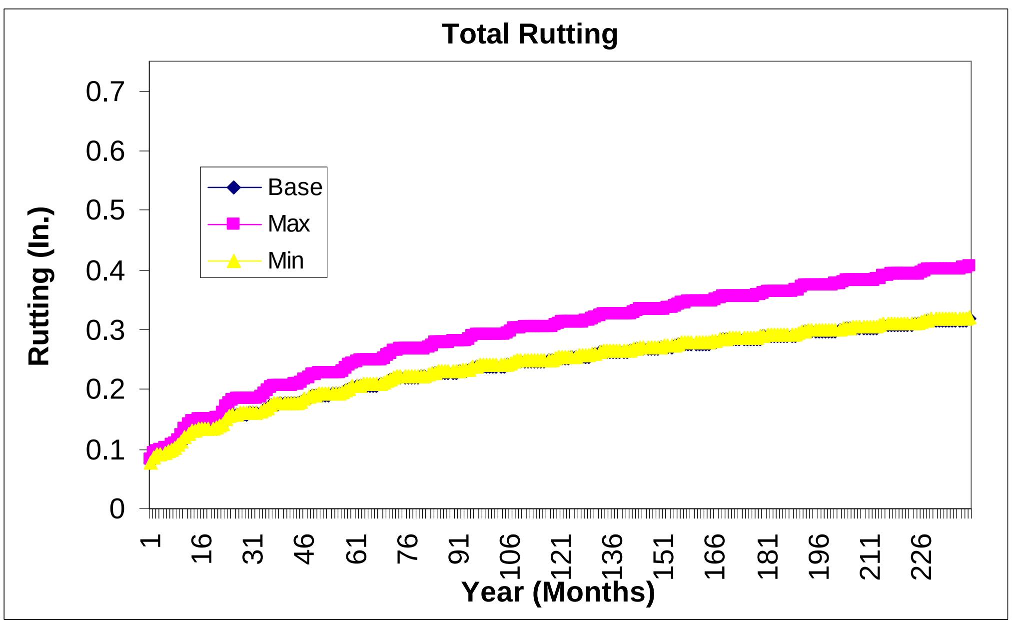


Figure D -225 0901 – |E*| – I19BC

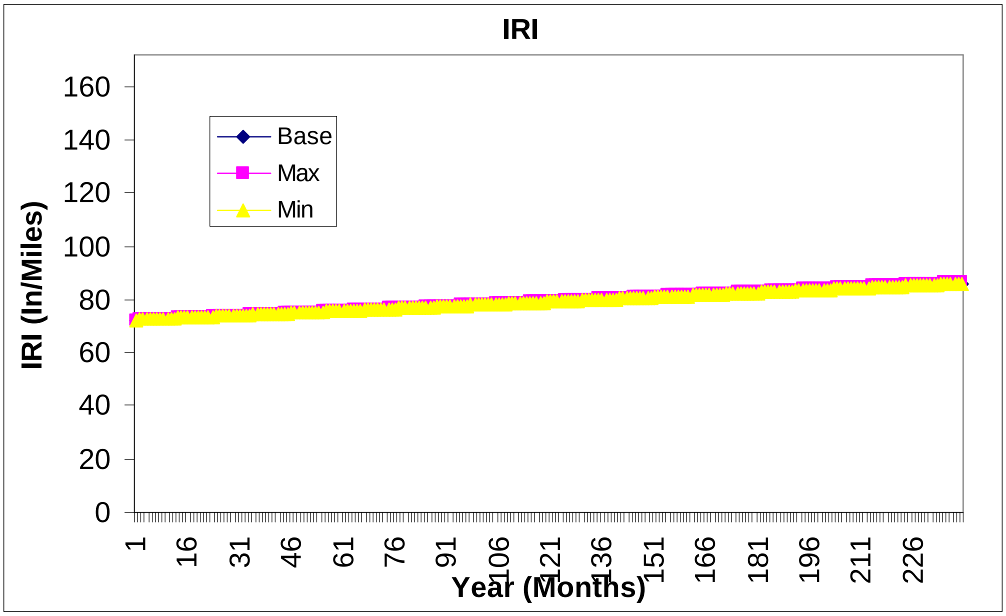


Figure D -226 0901 – |E*| – B25BC

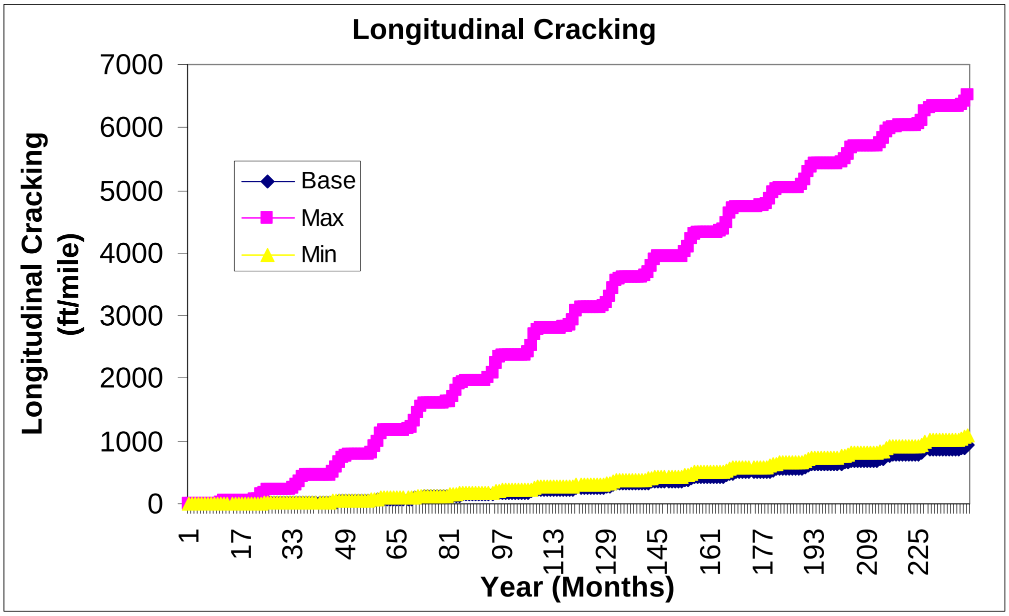


Figure D -227 0901 – |E*| – B25BC

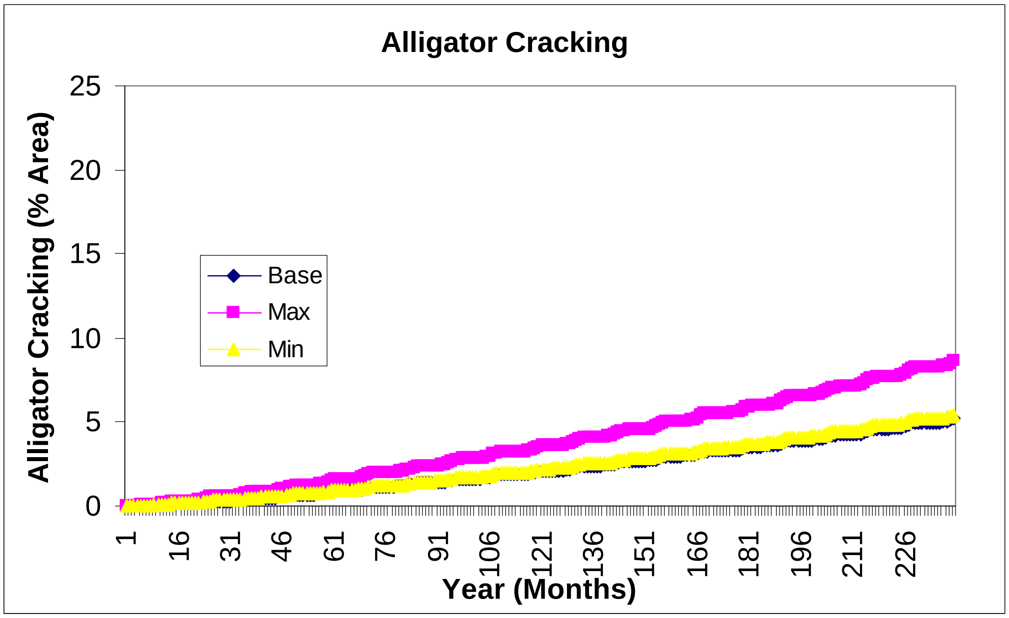


Figure D -228 0901 – |E*| – B25BC

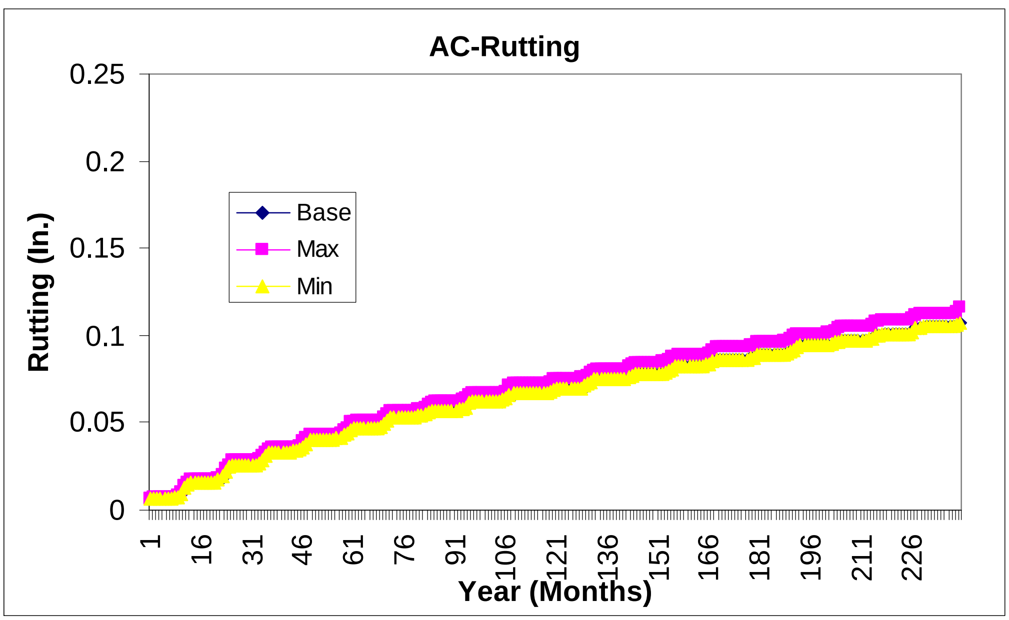


Figure D -229 0901 – |E*| – B25BC

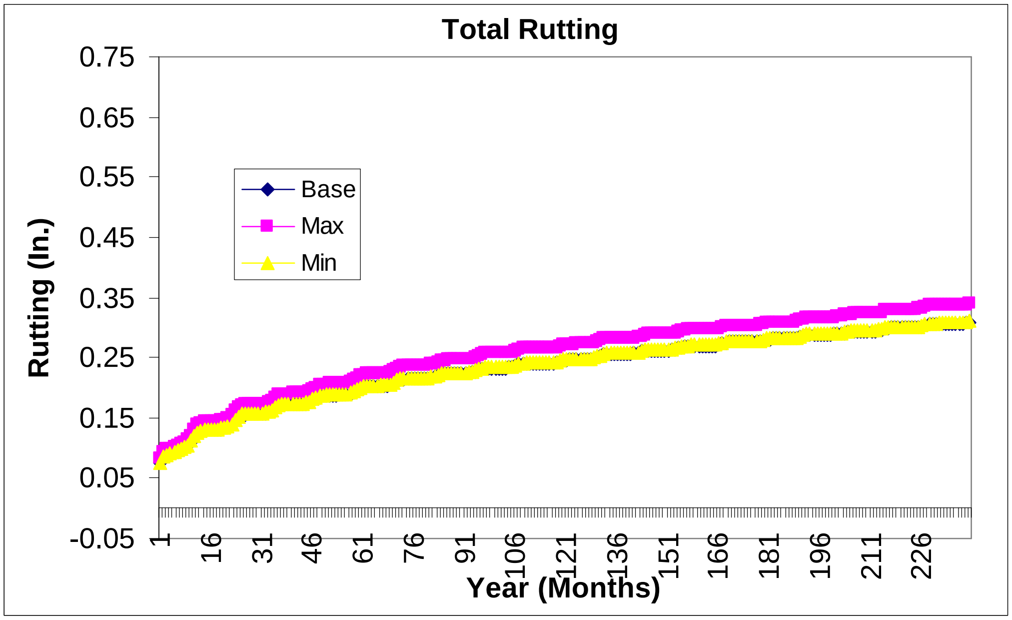


Figure D -230 0901 – |E*| – B25BC

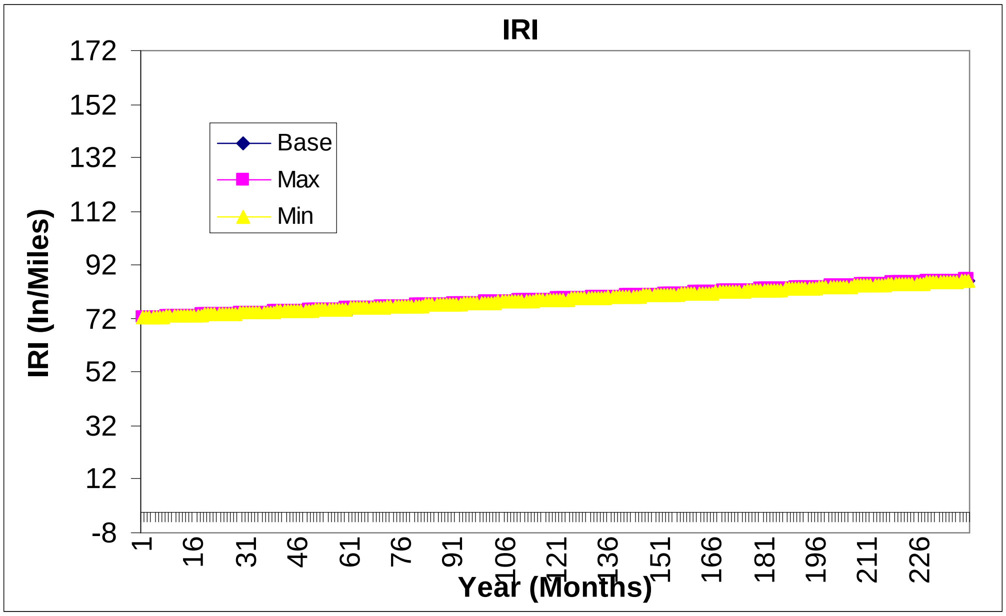


Figure D -231 0901 – Base Vs Feb/Mar

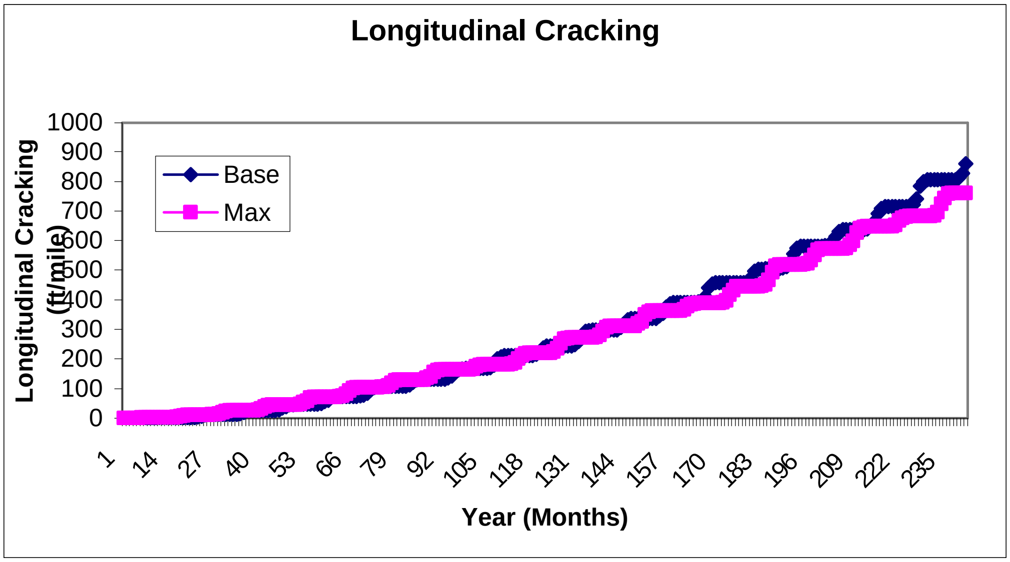


Figure D -232 0901 – Base Vs Feb/Mar

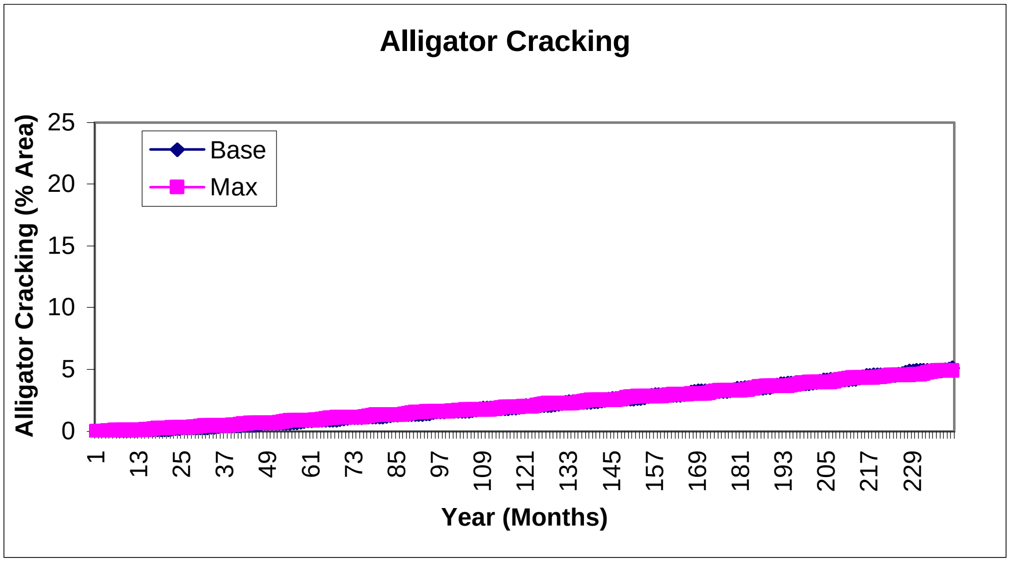


Figure D -233 0901 – Base Vs Feb/Mar

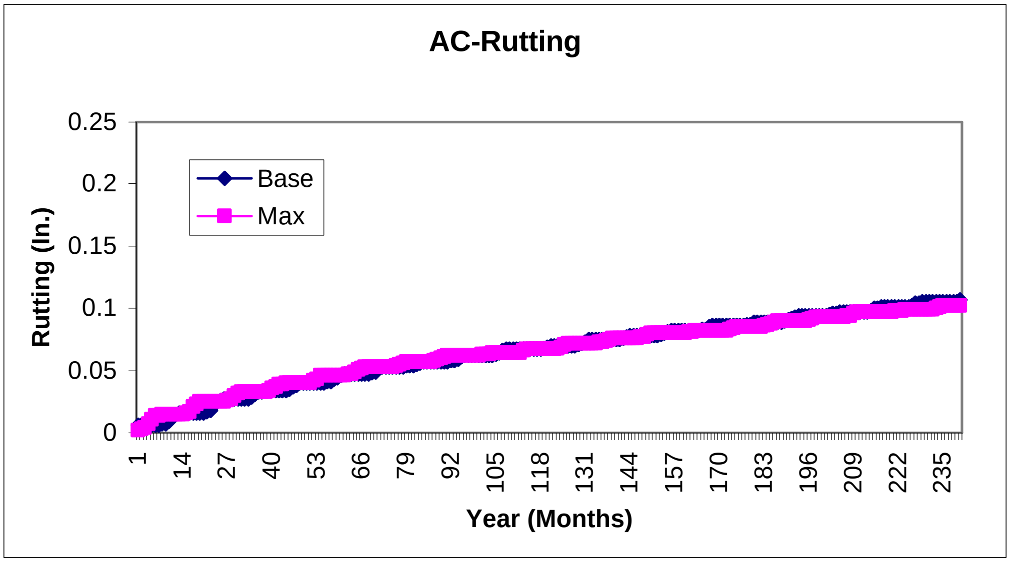


Figure D -234 0901 – Base Vs Feb/Mar

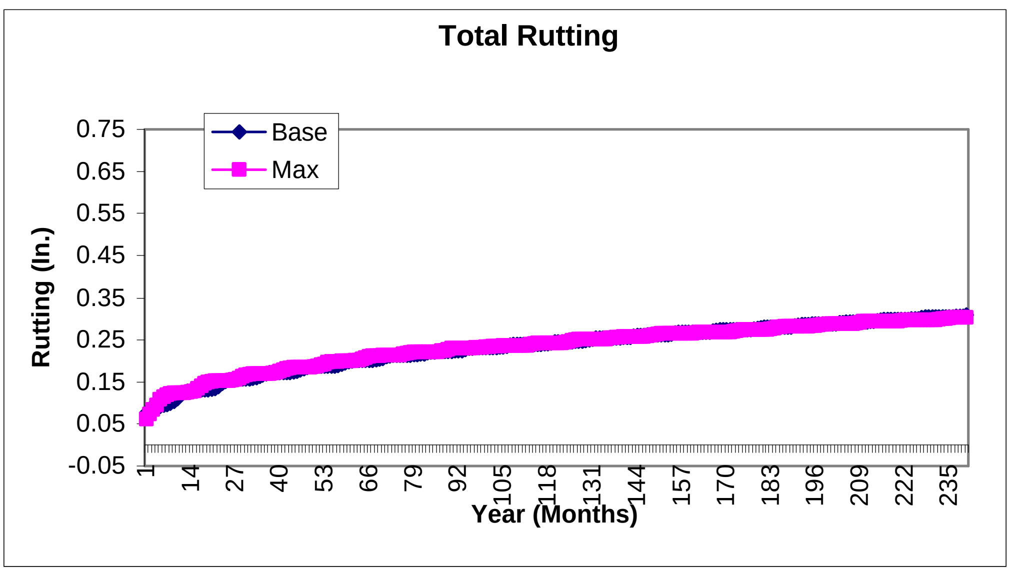


Figure D -235 0901 – Base Vs Feb/Mar

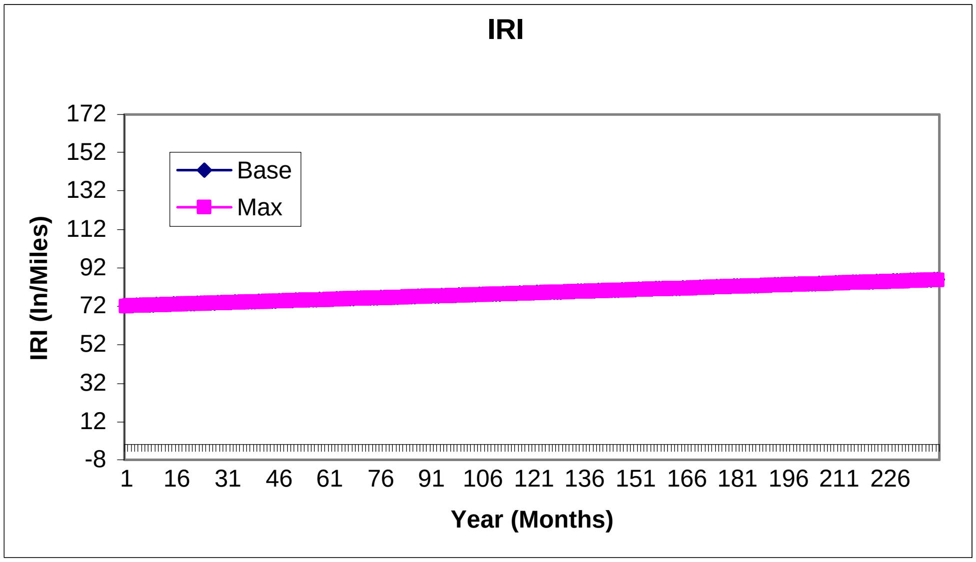


Figure D -236 0901 – Base Vs May/Jun

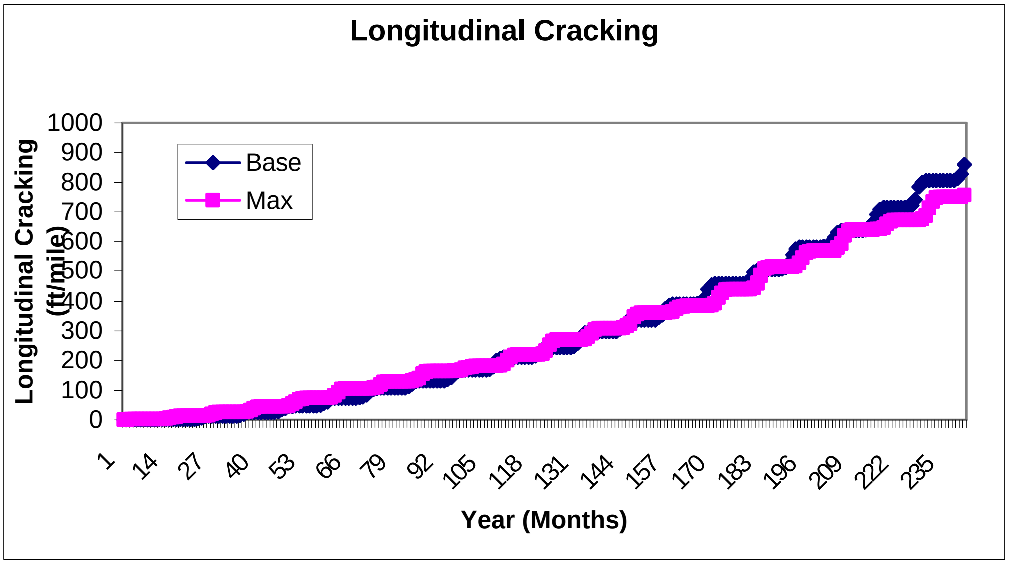


Figure D -237 0901 – Base Vs May/Jun

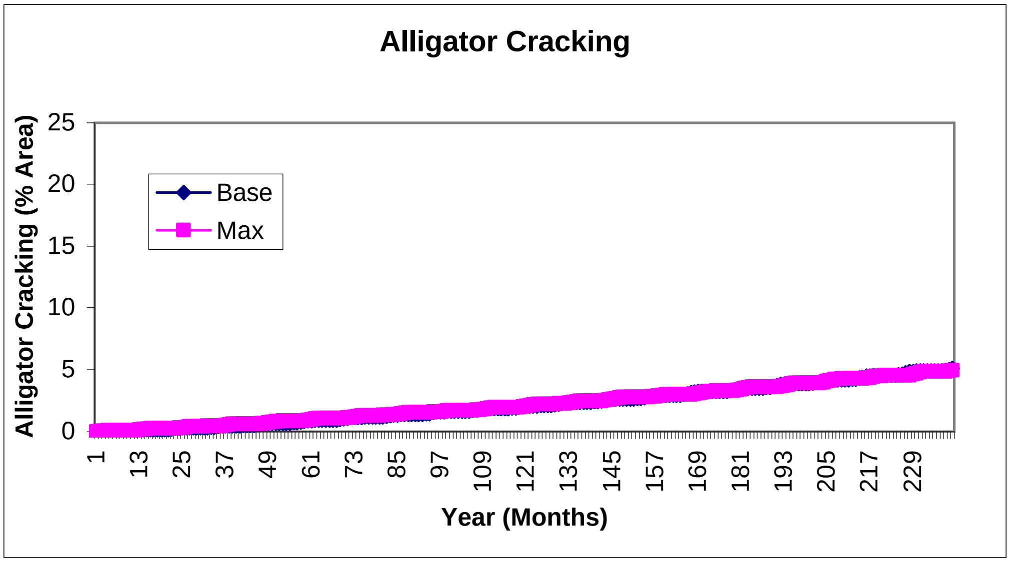


Figure D -238 0901 – Base Vs May/Jun

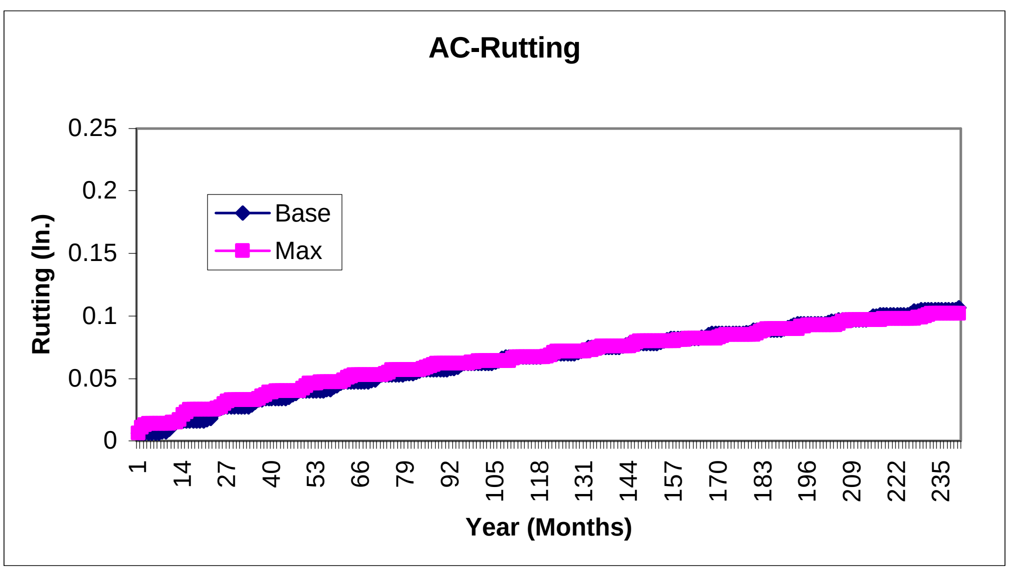


Figure D -239 0901 – Base Vs May/Jun

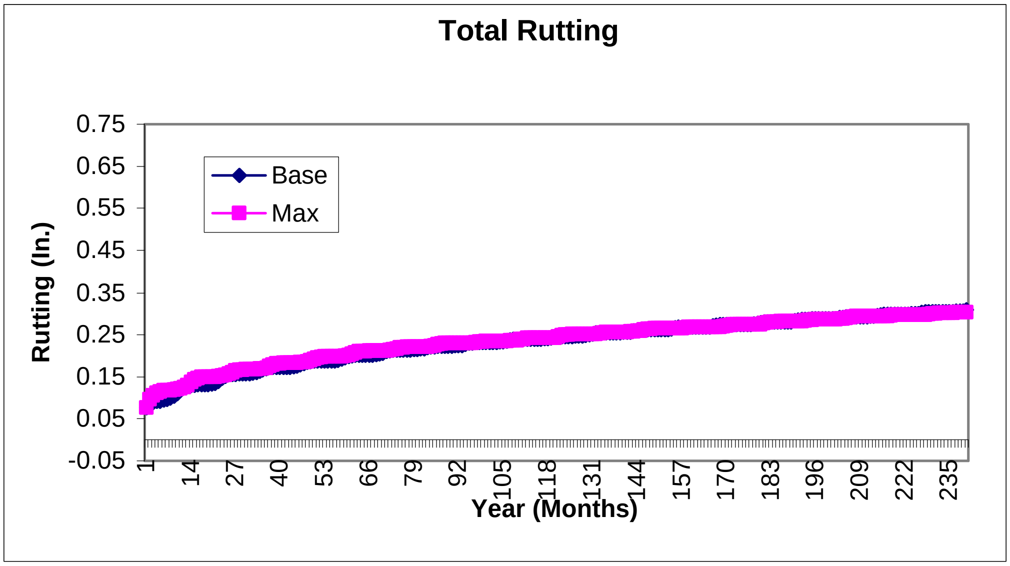


Figure D -240 0901 – Base Vs May/Jun

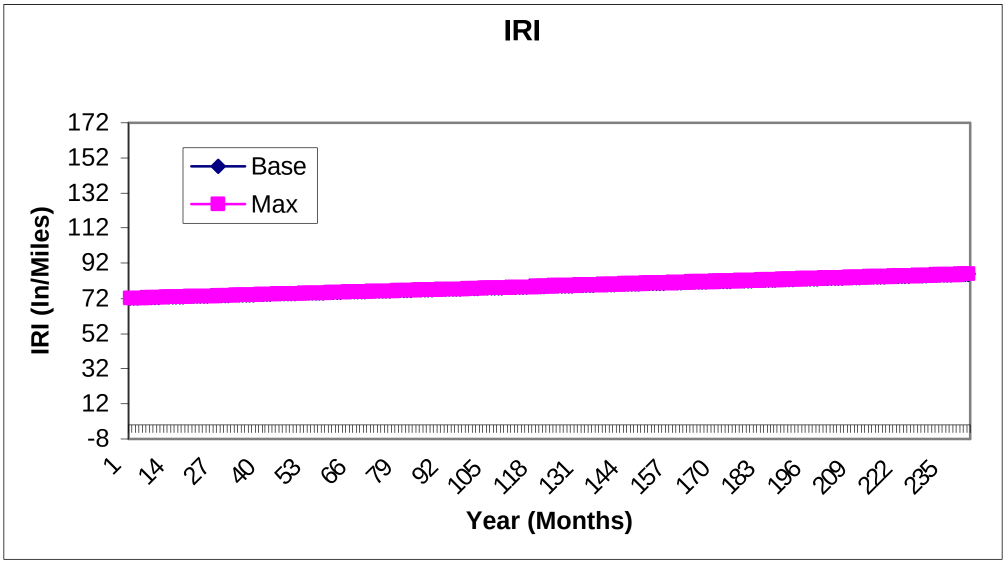


Figure D -241 0901 – Base Vs. Nov/Dec

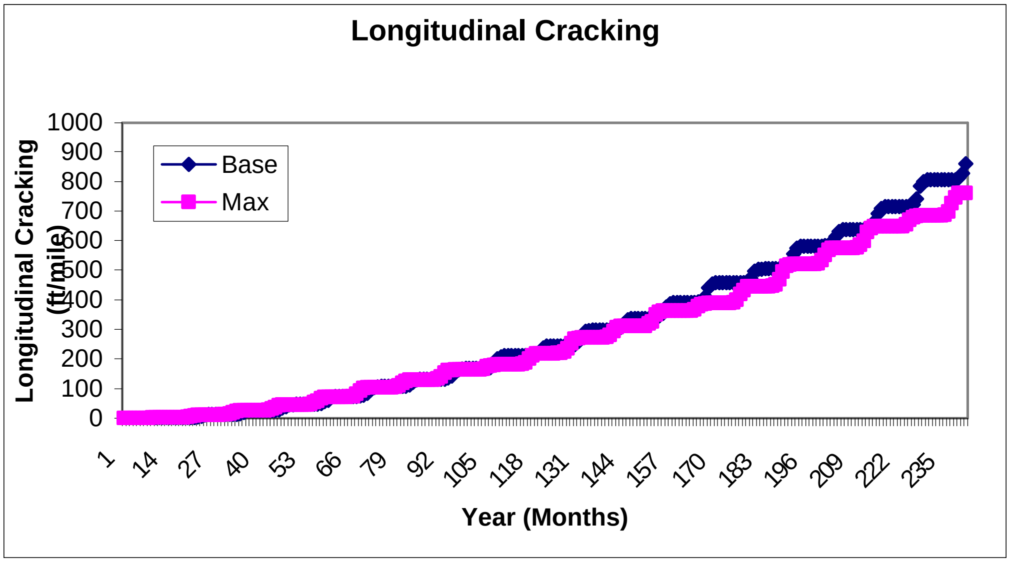


Figure D -242 0901 – Base Vs. Nov/Dec

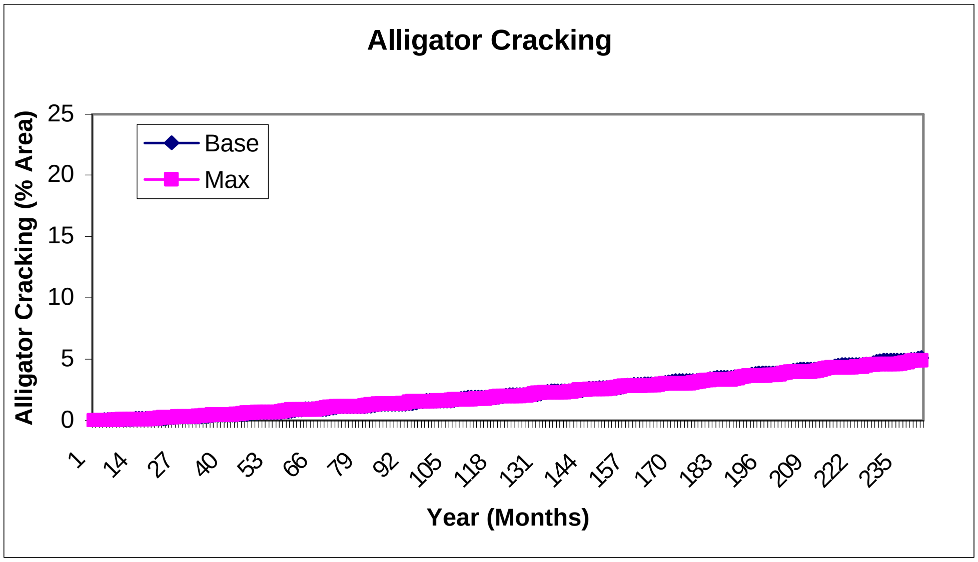


Figure D -243 0901 – Base Vs. Nov/Dec

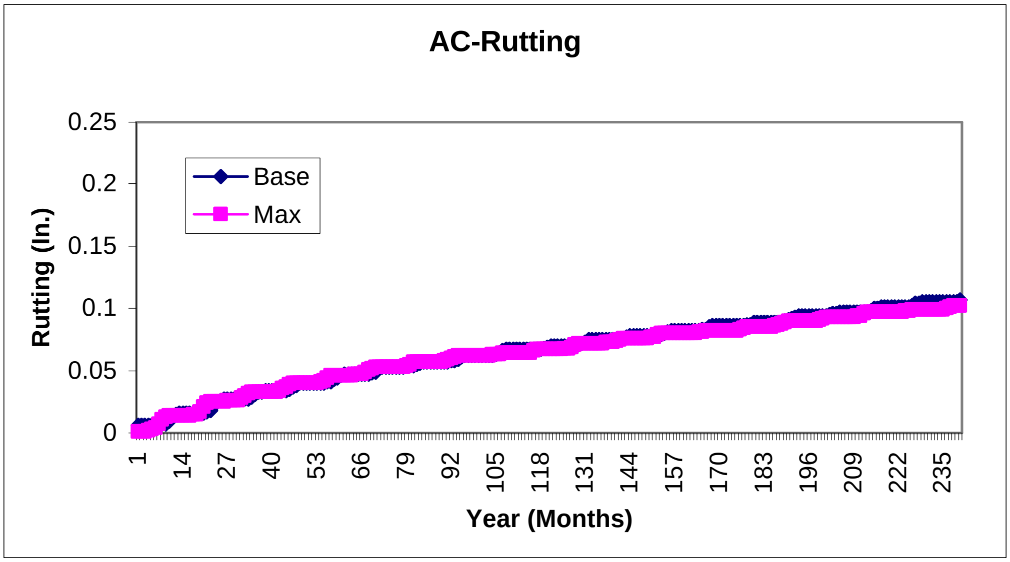


Figure D -244 0901 – Base Vs. Nov/Dec

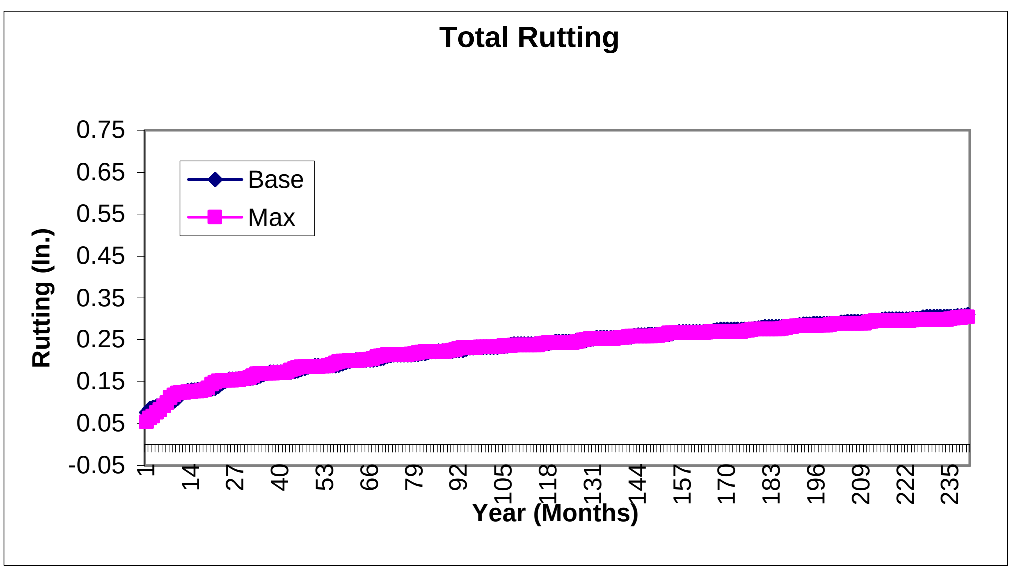


Figure D -245 0901 – Base Vs. Nov/Dec

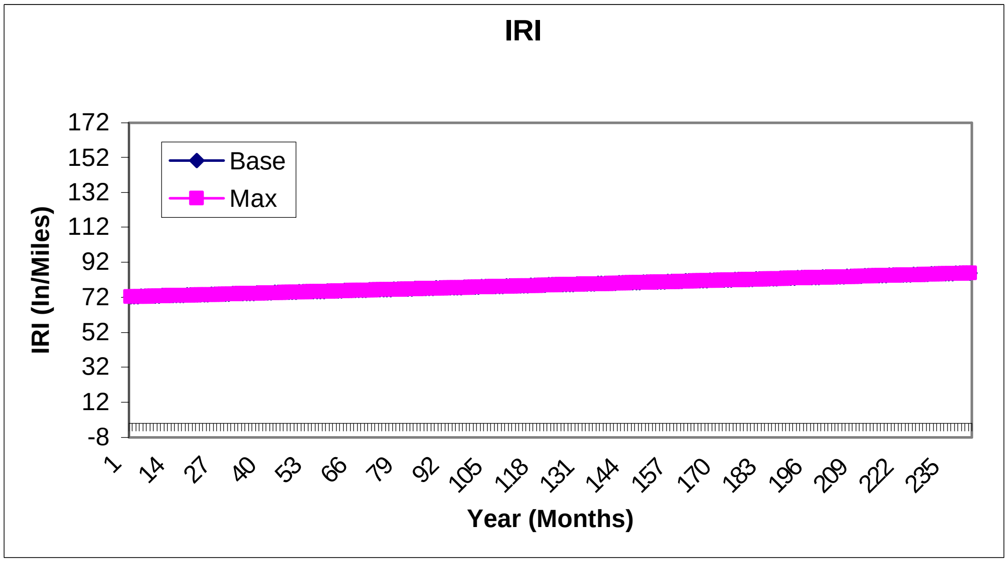


Figure D -246 0901 – Truck Growth Factor

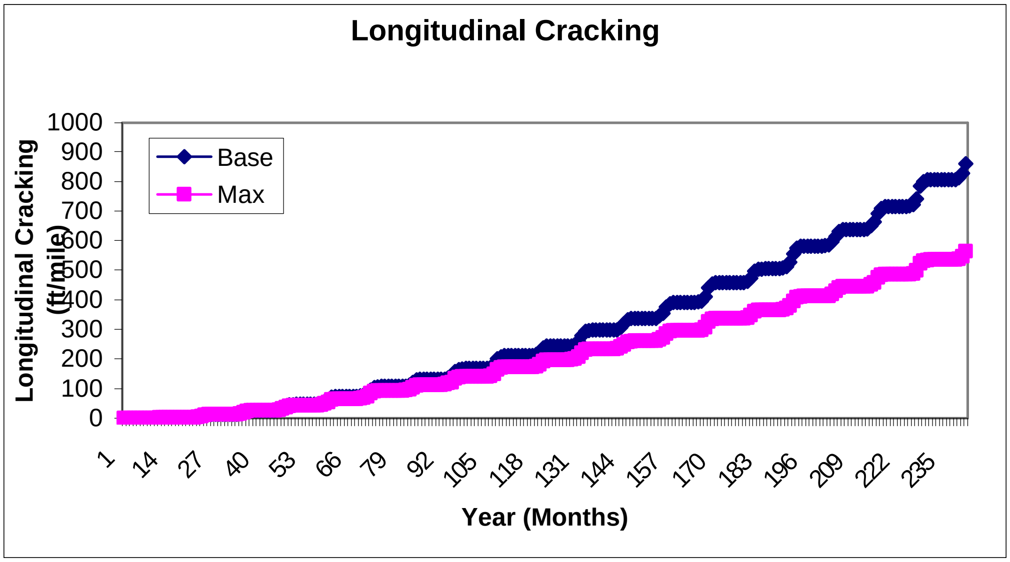


Figure D -247 0901 – Truck Growth Factor

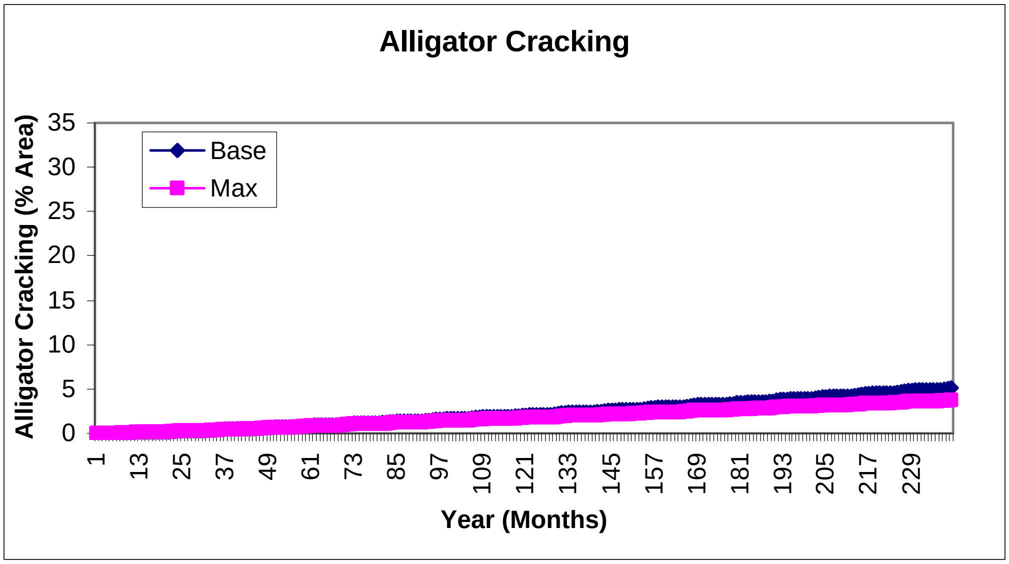


Figure D -248 0901 – Truck Growth Factor

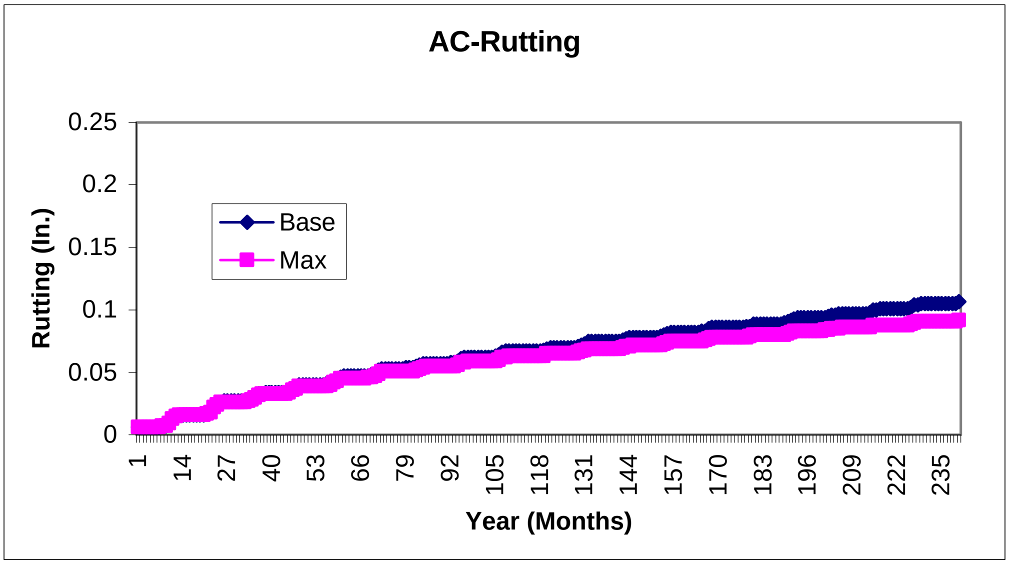


Figure D -249 0901 – Truck Growth Factor

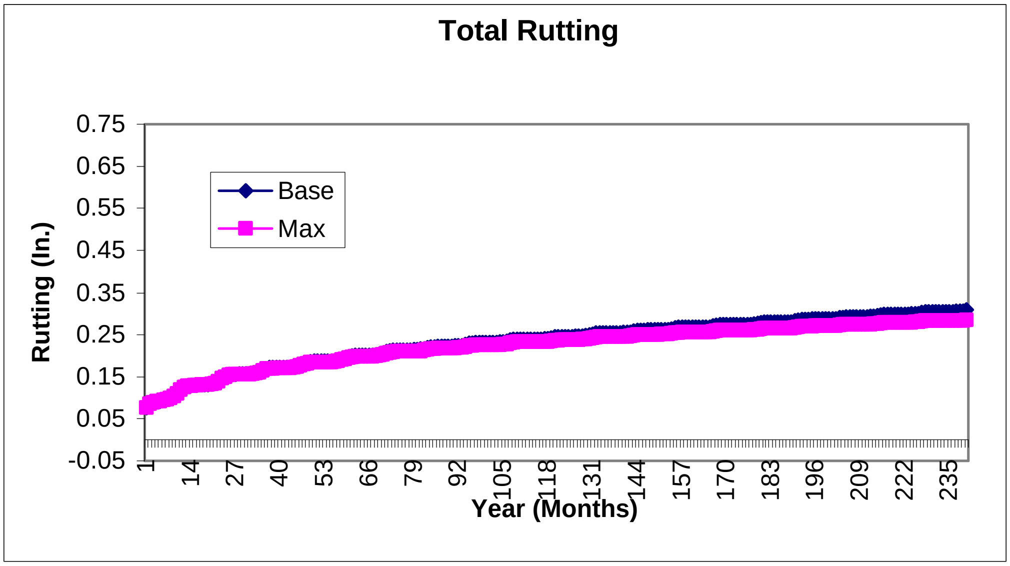


Figure D -250 0901 – Truck Growth Factor

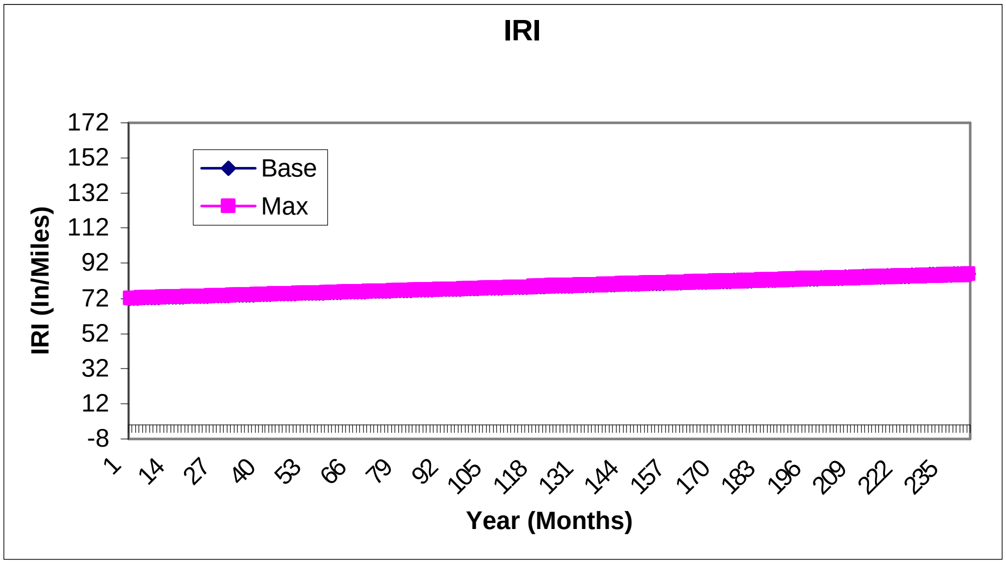


Figure D -251 1028 Airvoids – ACLayer - I

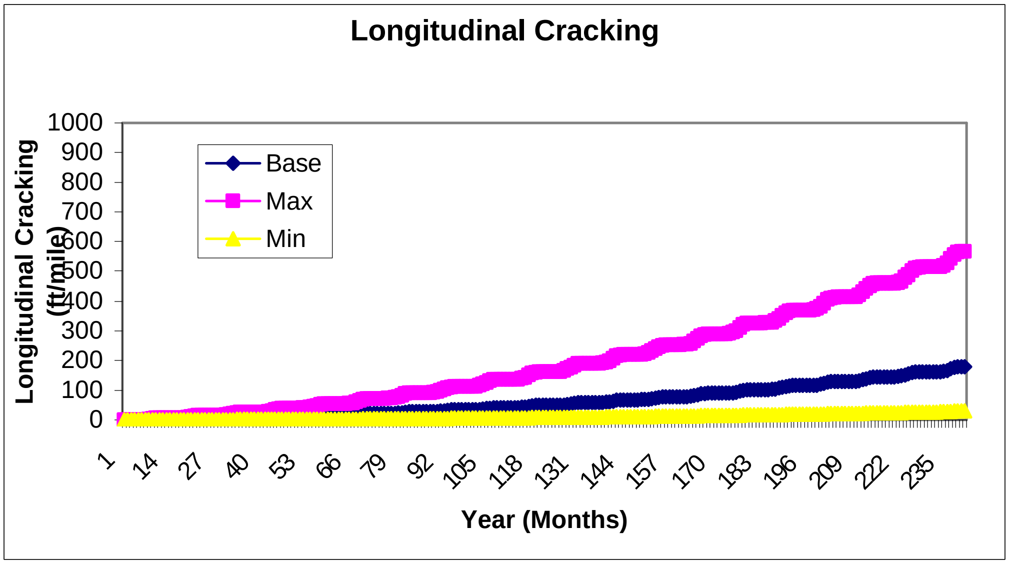


Figure D -252 1028 Airvoids – ACLayer - I

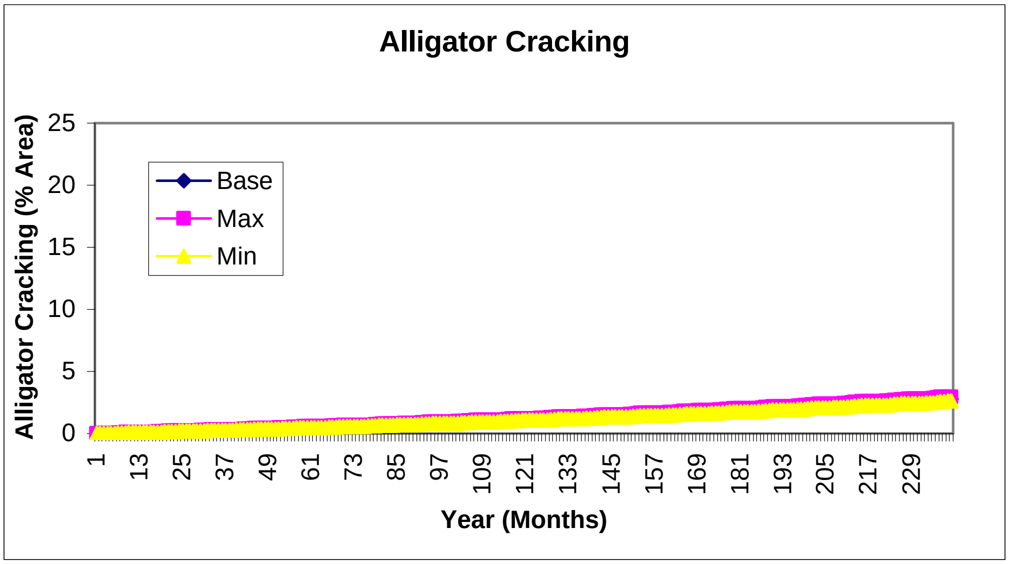


Figure D -253 1028 Airvoids – ACLayer - I

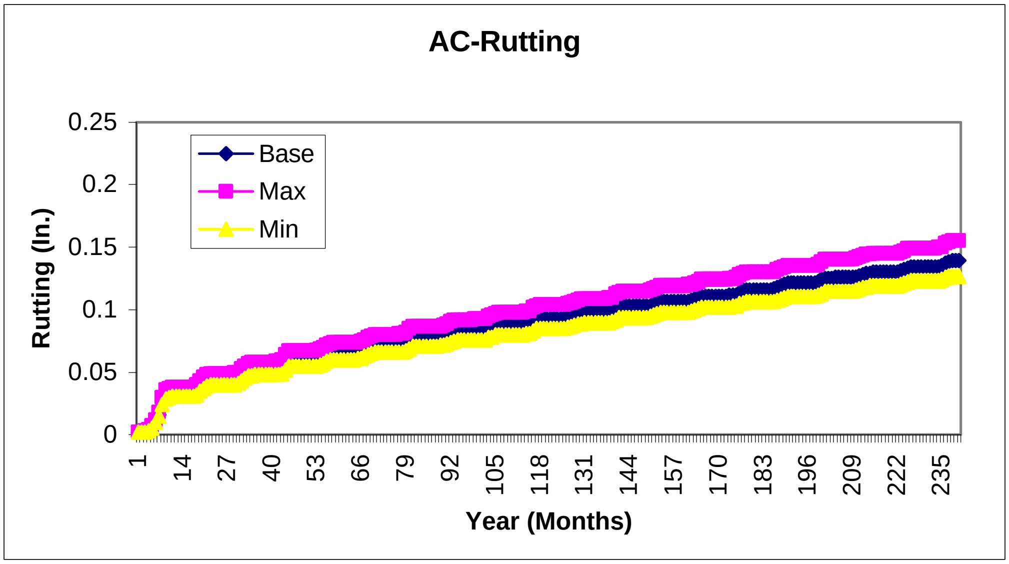


Figure D -254 1028 Airvoids – ACLayer - I

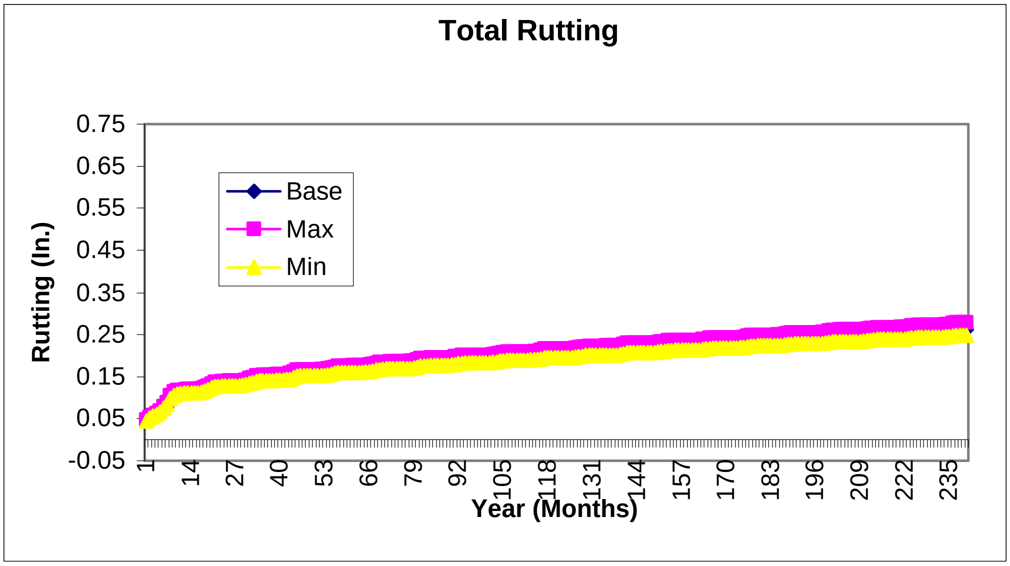


Figure D -255 1028 Airvoids – ACLayer - I

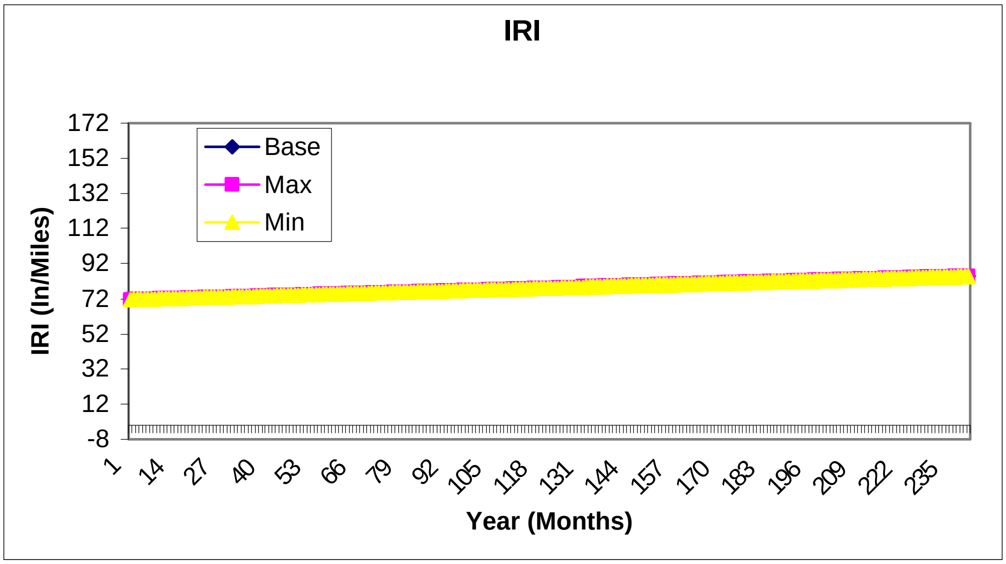


Figure D -256 1028 HeatCapacity – ACLayer - I

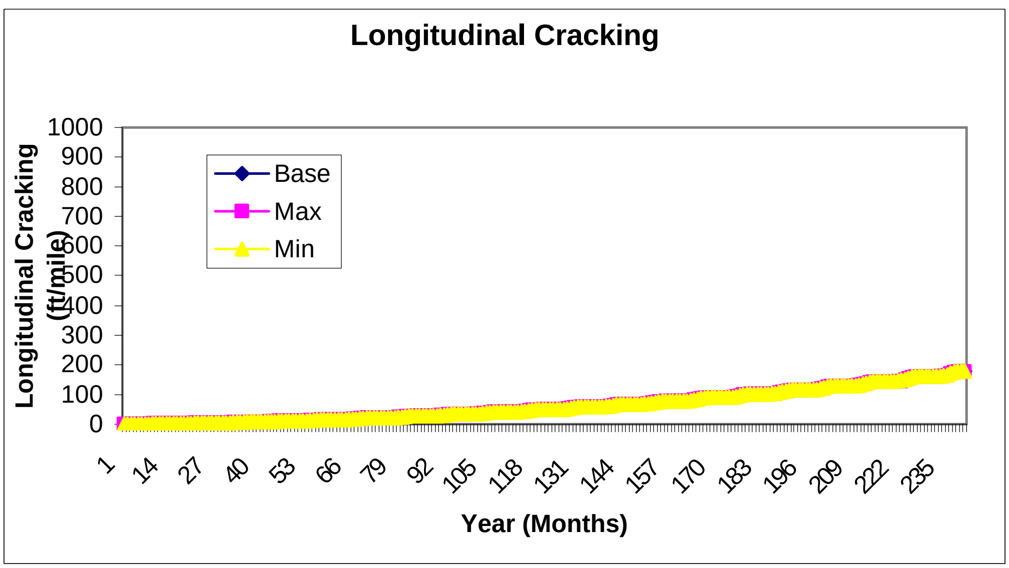


Figure D -257 1028 HeatCapacity – ACLayer - I

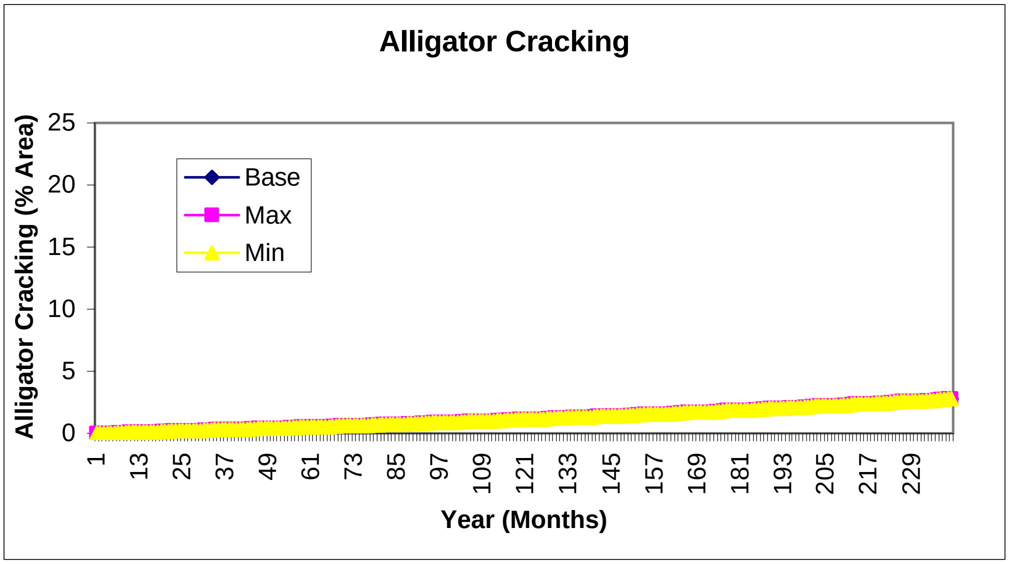


Figure D -258 1028 HeatCapacity – ACLayer - I

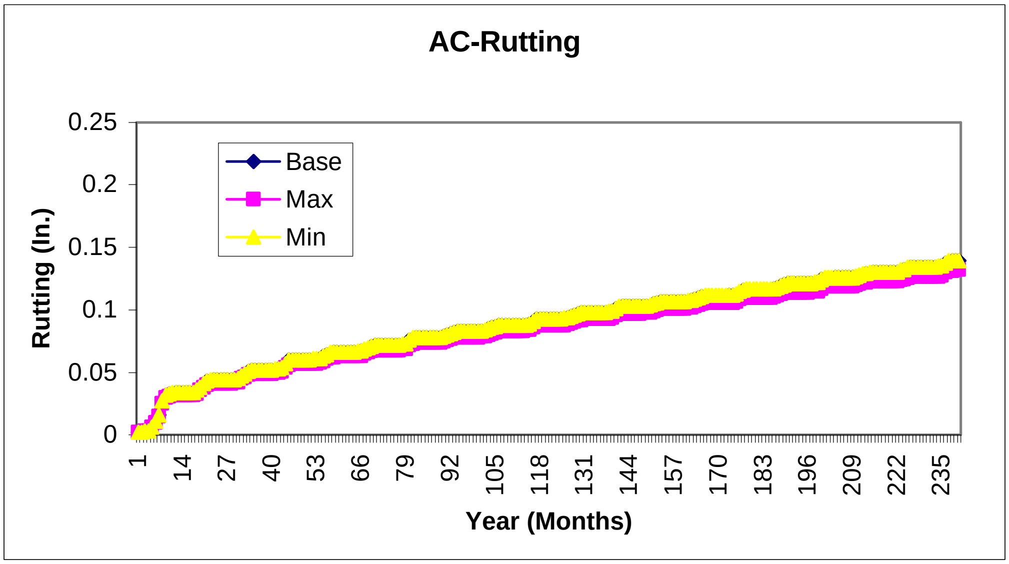


Figure D -259 1028 HeatCapacity – ACLayer - I

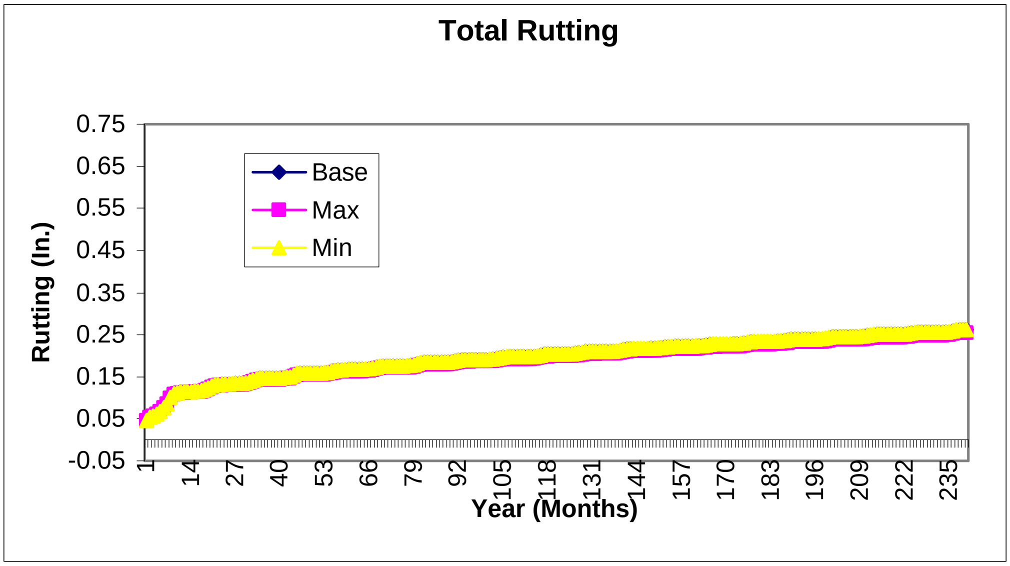


Figure D -260 1028 HeatCapacity – ACLayer - I

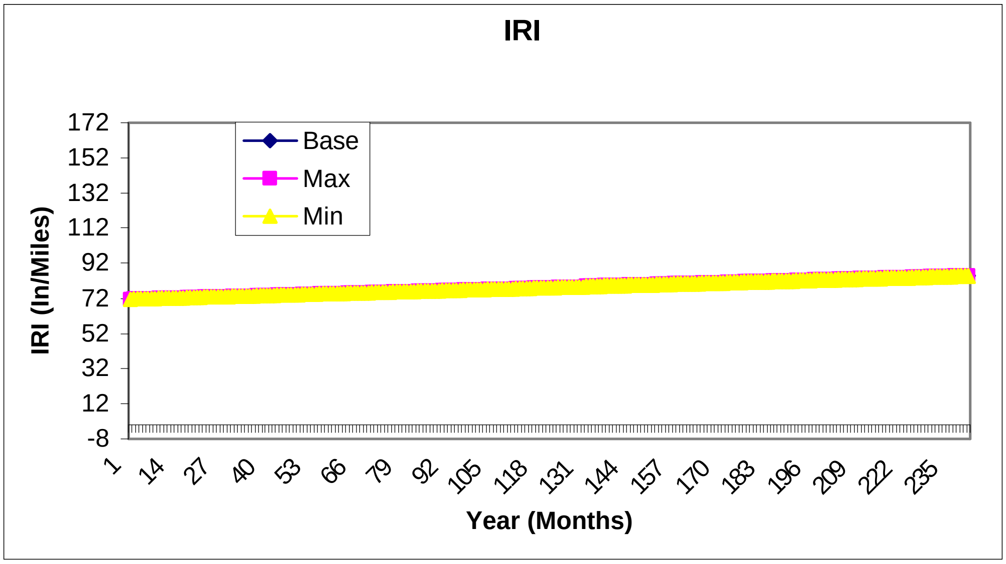


Figure D -261 1028 – ThermalConductivity – ACLayer - I

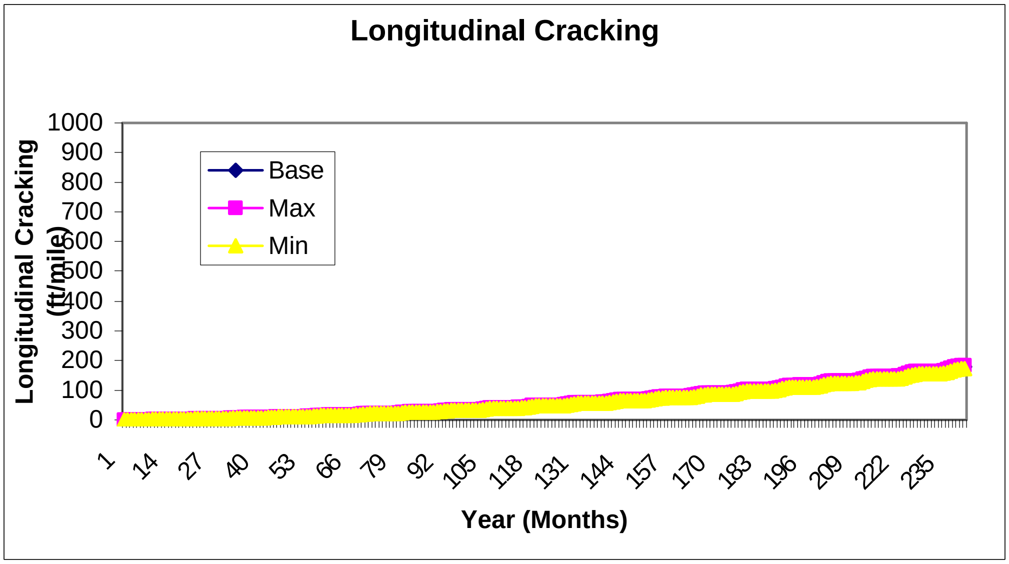


Figure D -262 1028– ThermalConductivity – ACLayer - I

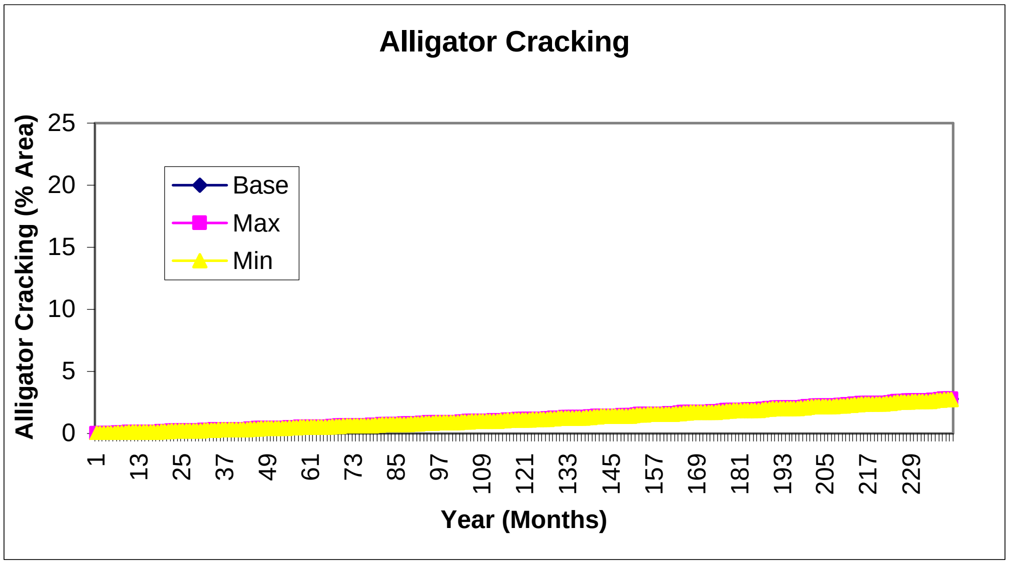


Figure D -263 1028 – ThermalConductivity – ACLayer - I

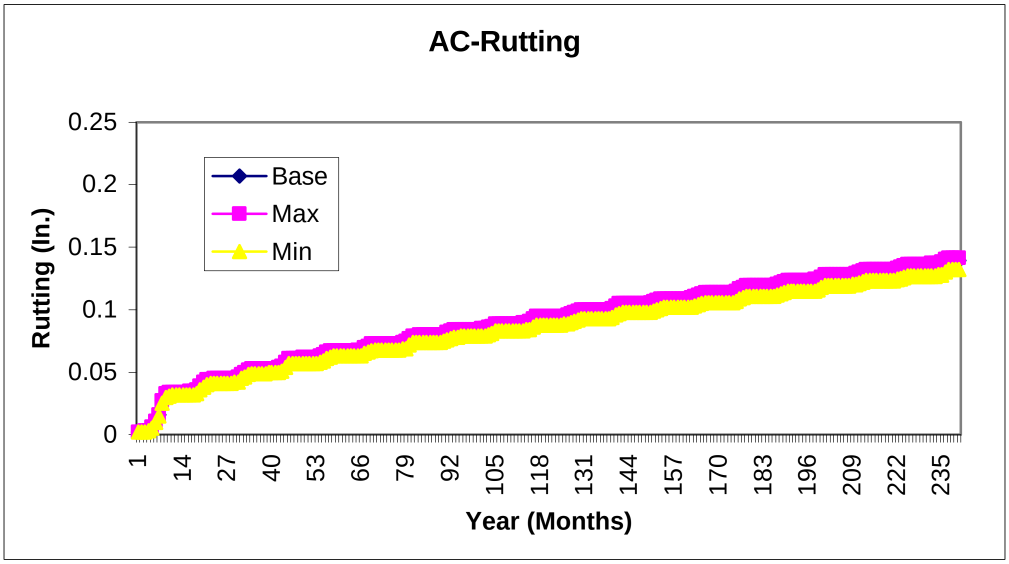


Figure D -264 1028 – ThermalConductivity – ACLayer - I

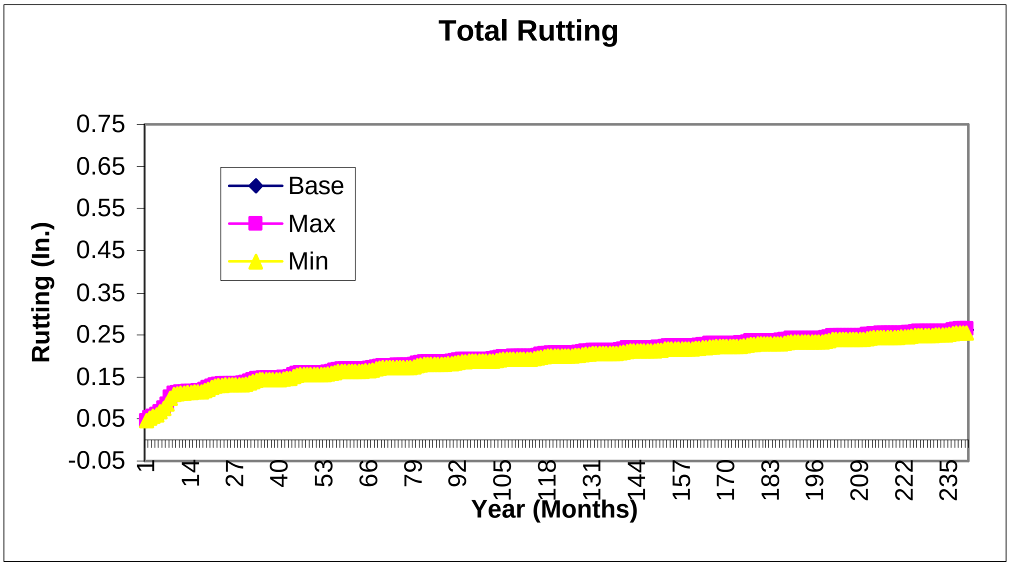


Figure D -265 1028 – ThermalConductivity – ACLayer - I

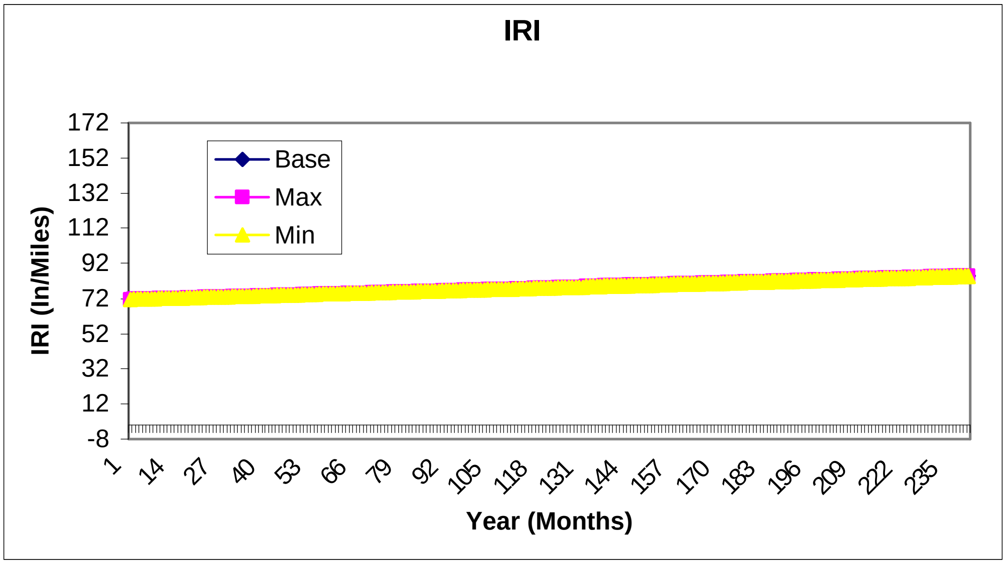


Figure D -2661028 – Airvoids – ACLayer -II

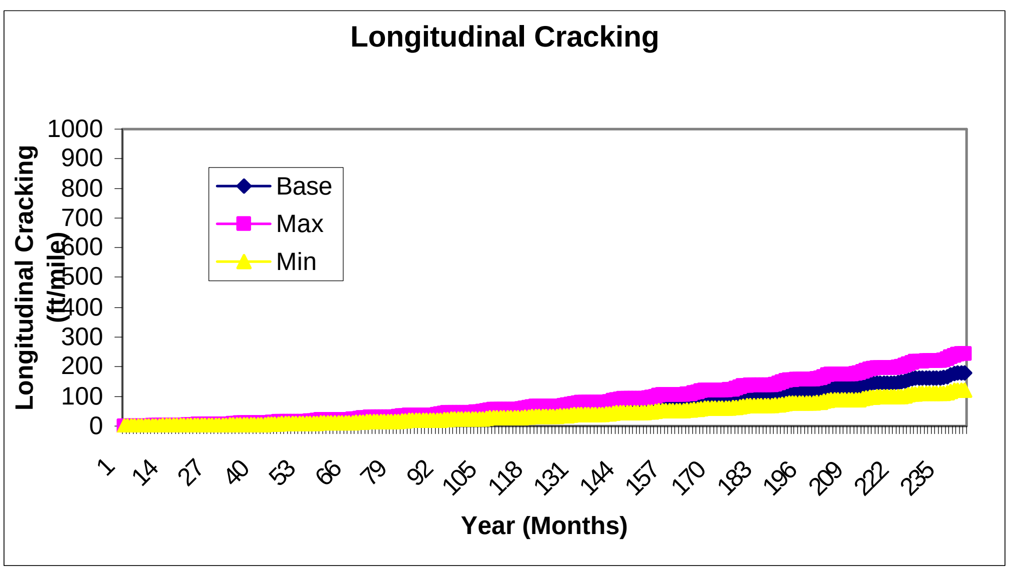


Figure D -267 1028 – Airvoids – ACLayer -II

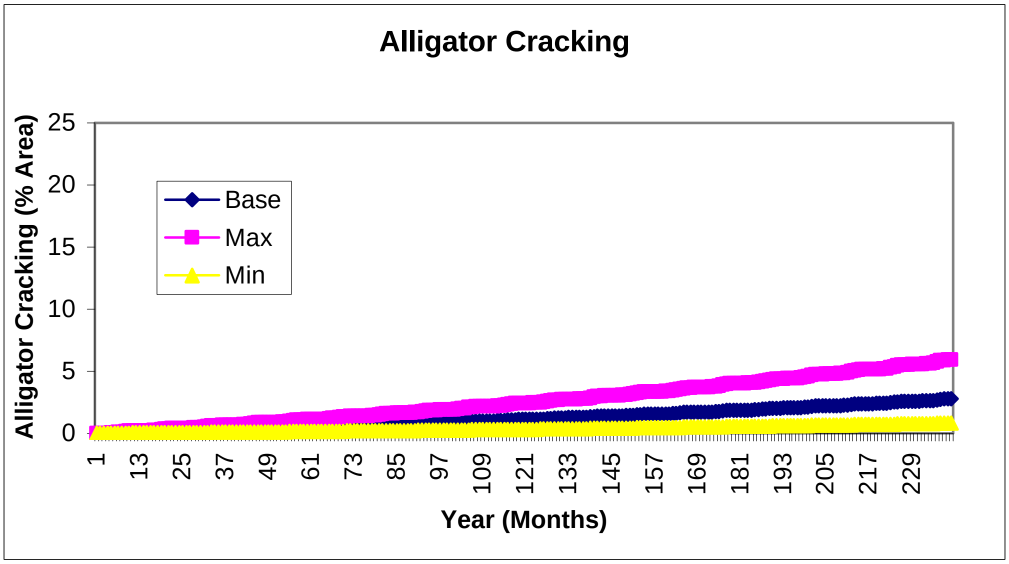


Figure D -268 1028 – Airvoids – ACLayer -II

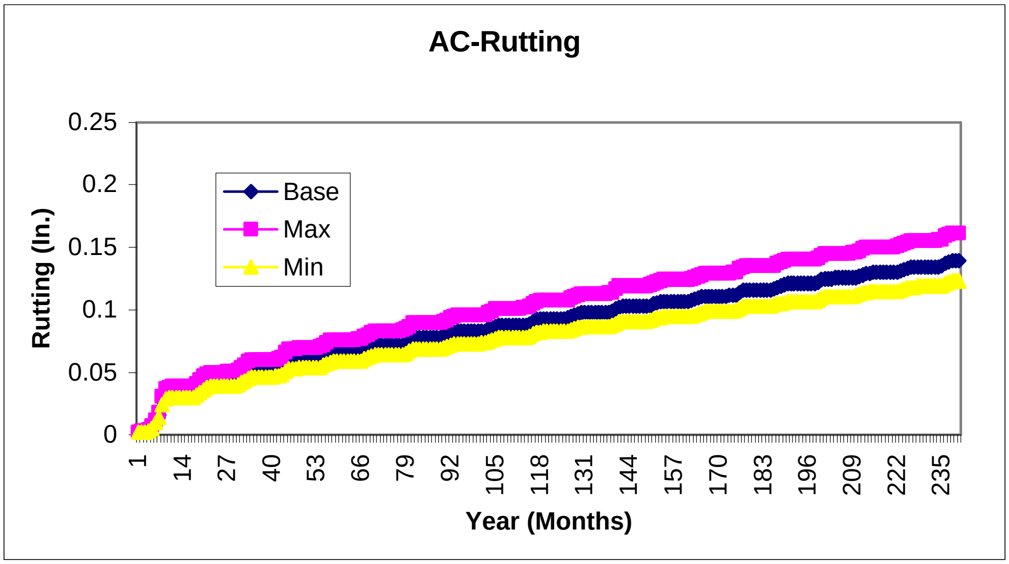


Figure D -269 1028 – Airvoids – ACLayer -II

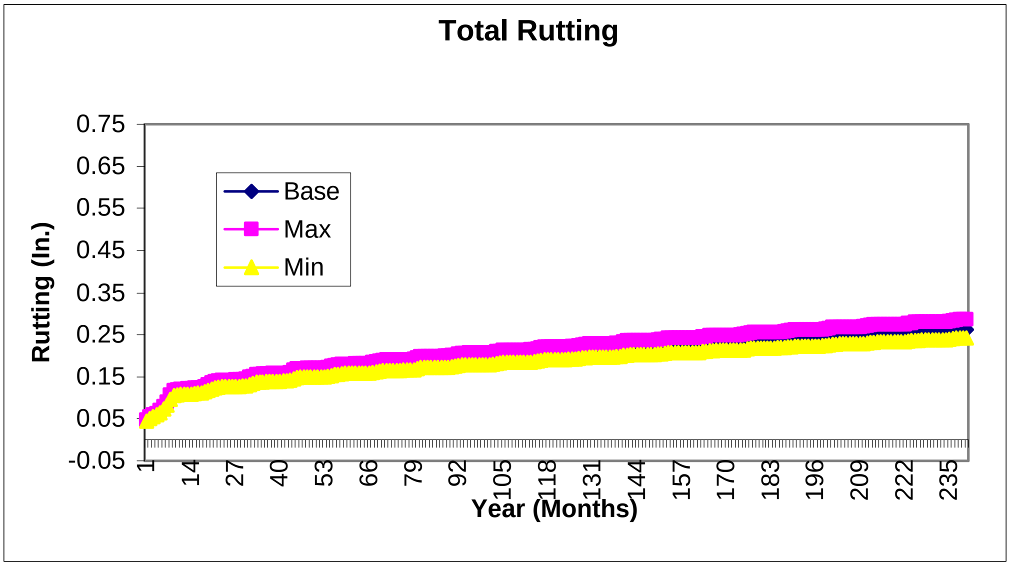


Figure D -270 1028 – Airvoids – ACLayer -II

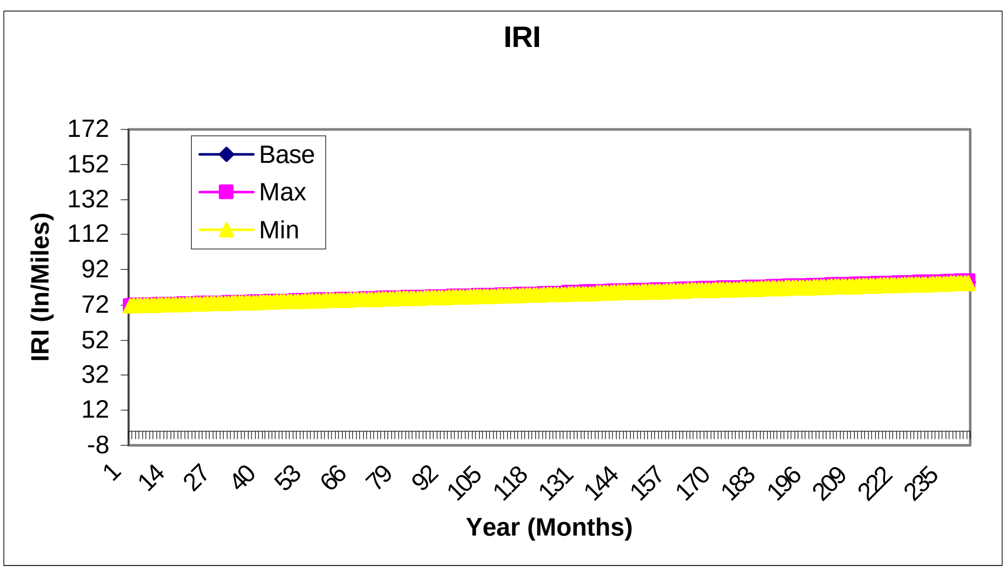


Figure D -2711028 – ThermalConductivity – ACLayer -II

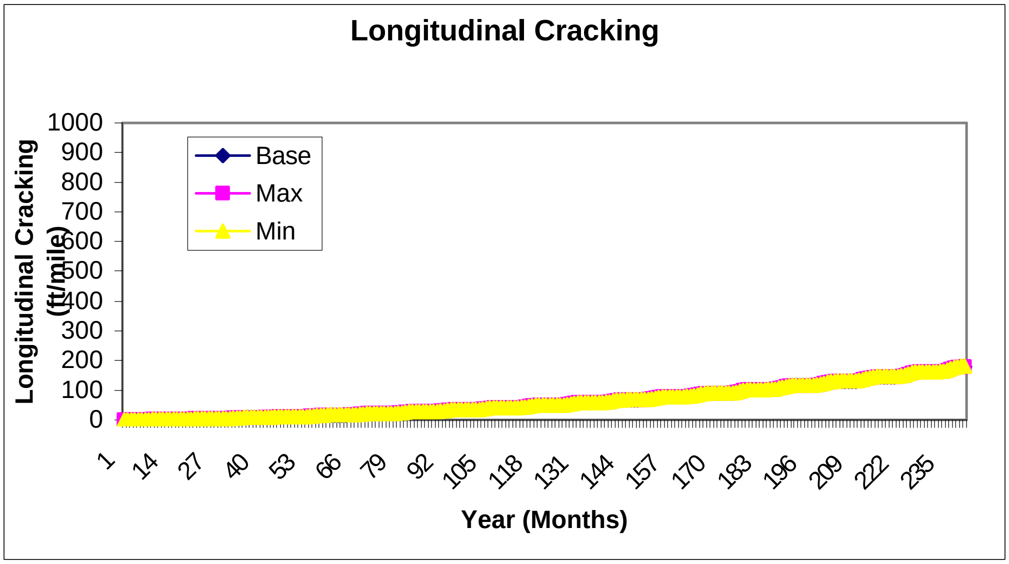


Figure D -272 1028 – ThermalConductivity – ACLayer -II

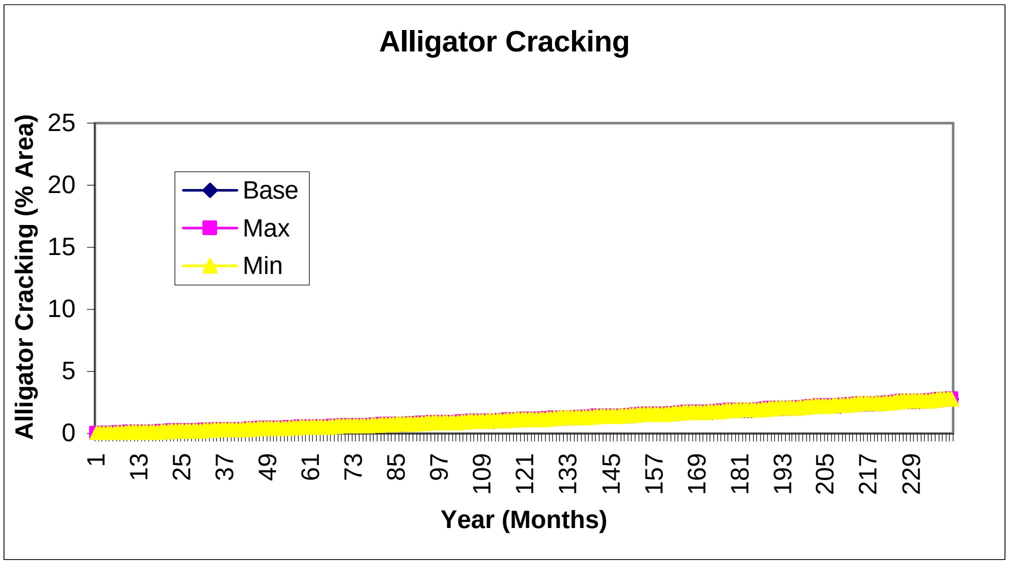


Figure D -273 1028 – ThermalConductivity – ACLayer -II

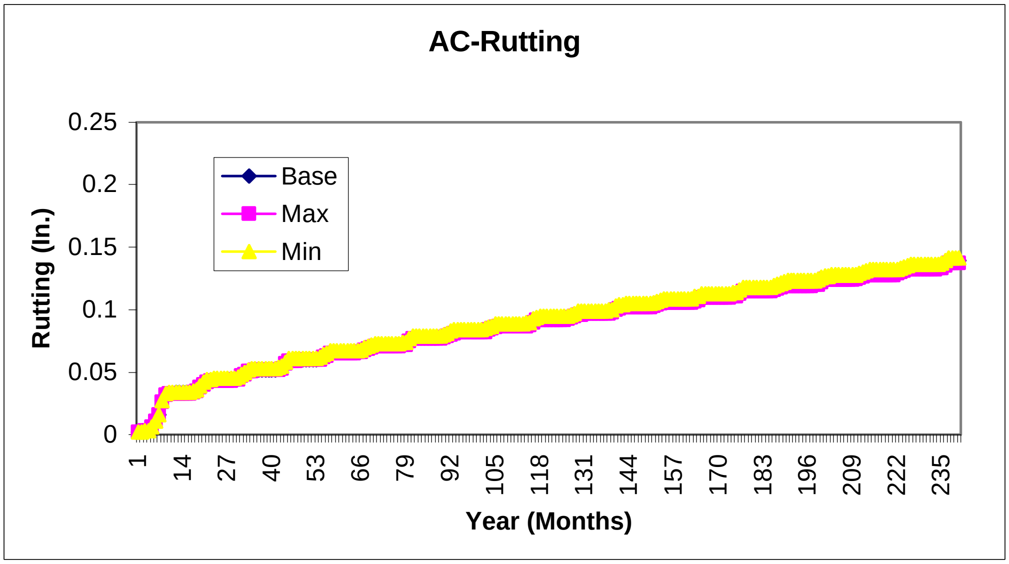


Figure D -274 1028– ThermalConductivity – ACLayer -II

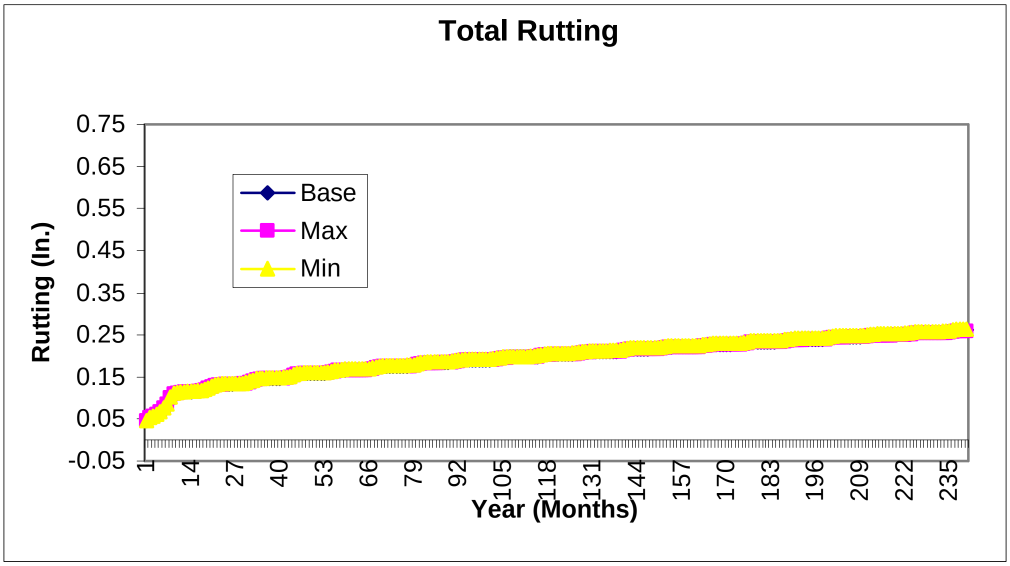


Figure D -275 1028 – ThermalConductivity – ACLayer - II

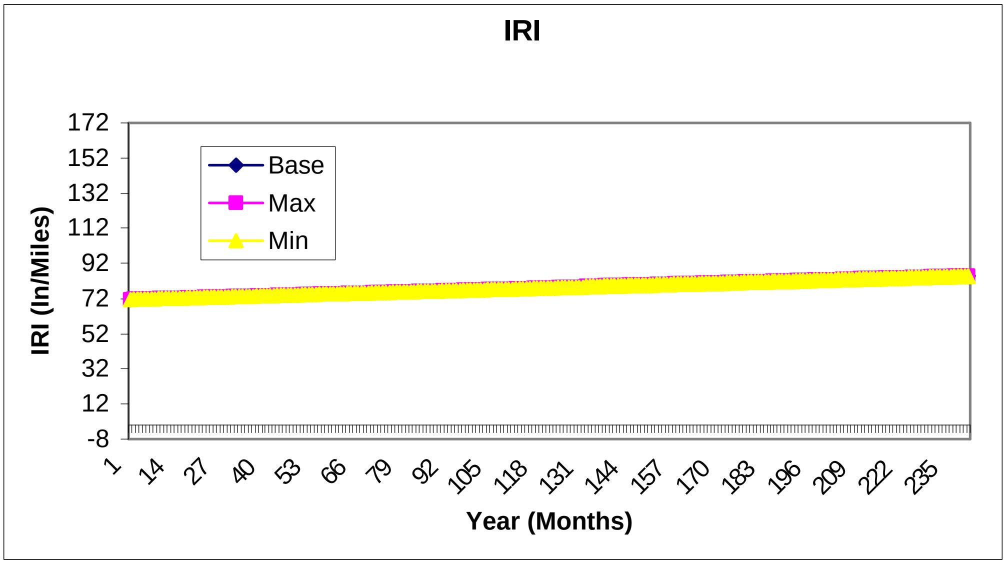


Figure D -276 1028 – HeatCapacity – ACLayer - II

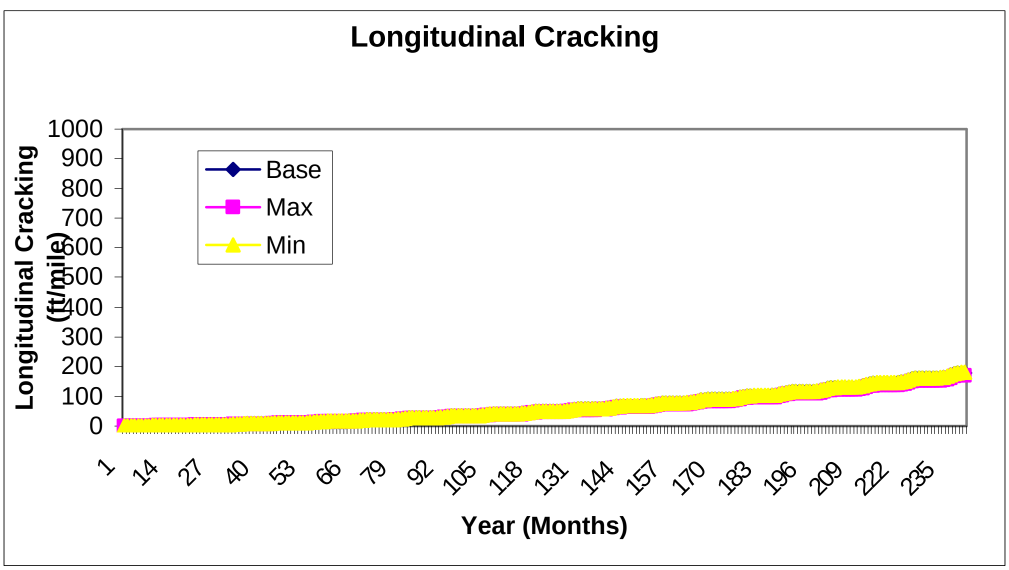


Figure D -277 1028 – HeatCapacity – ACLayer - II

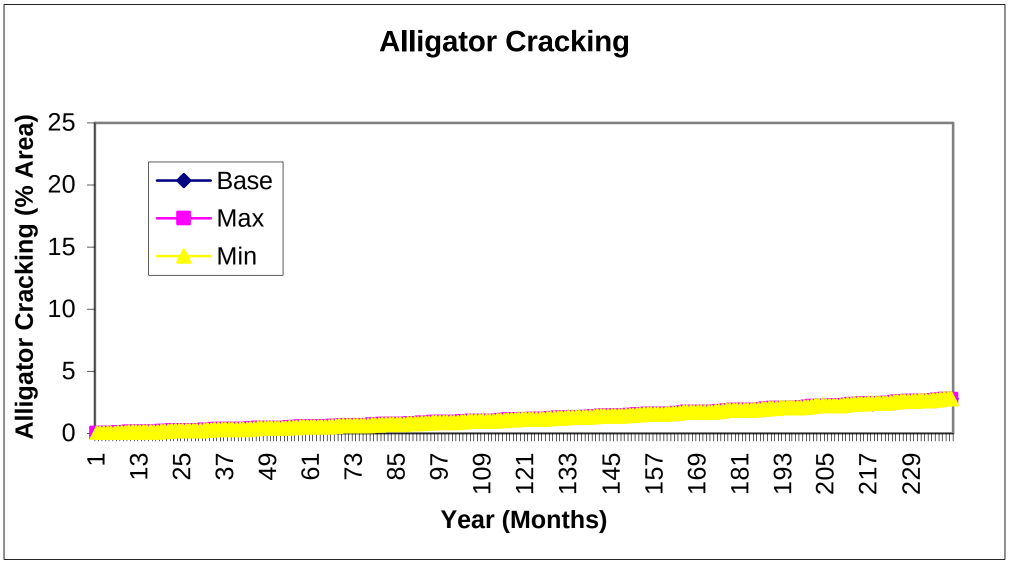


Figure D -278 1028 – HeatCapacity – ACLayer - II

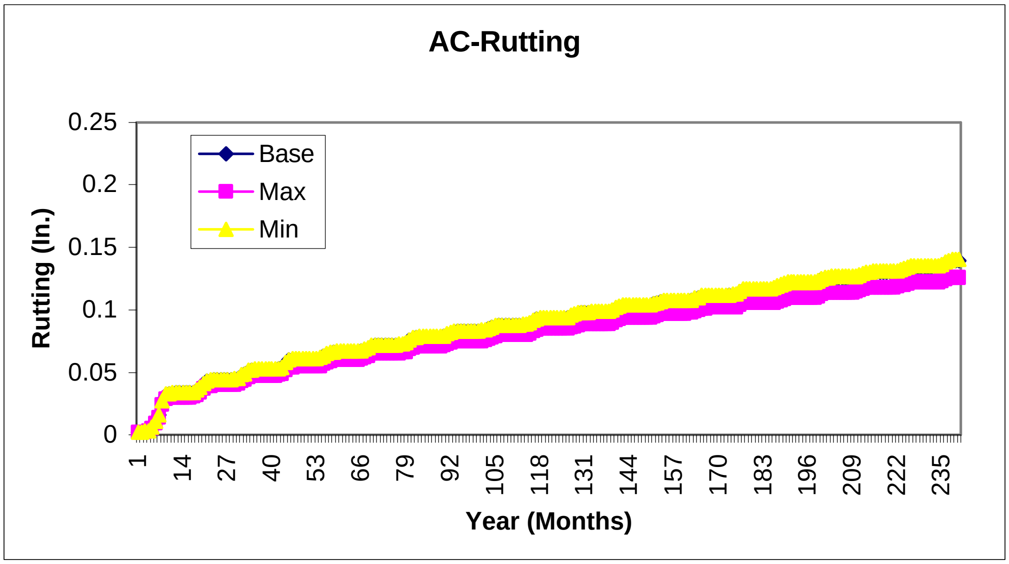


Figure D -279 1028 – HeatCapacity – ACLayer - II

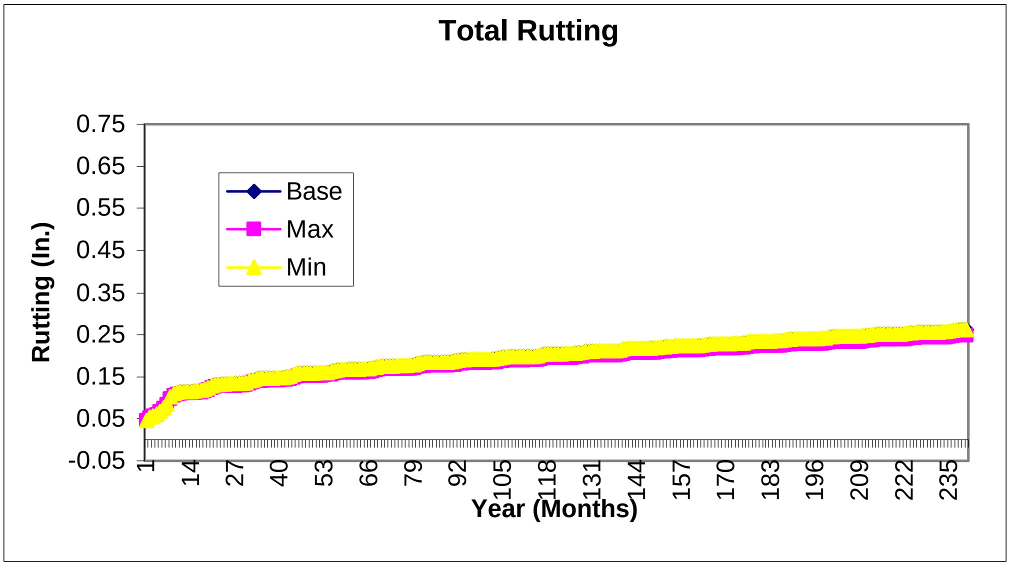


Figure D -280 1028 – HeatCapacity – ACLayer - II

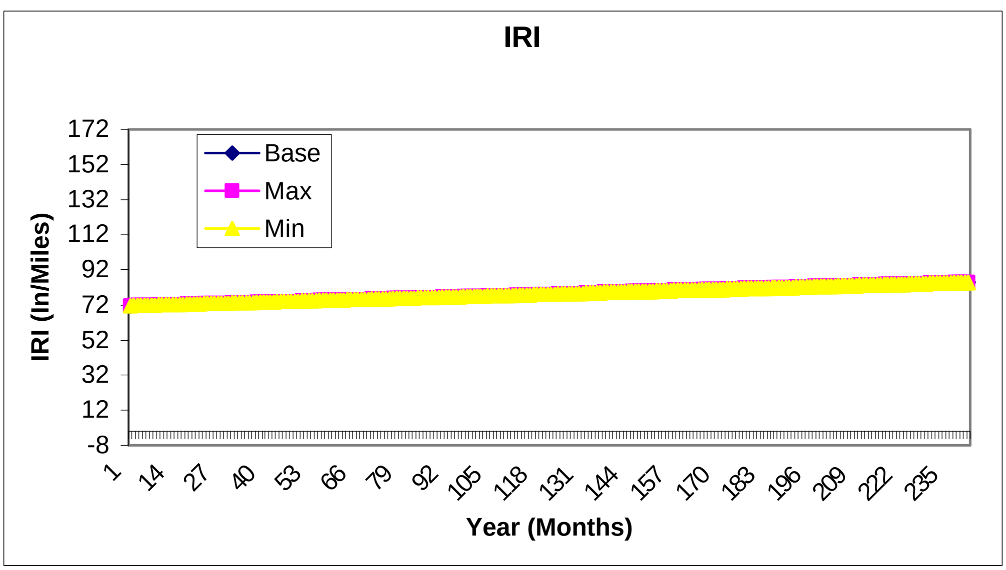


Figure D -281 1028 Surface Shortwave Absorptivity

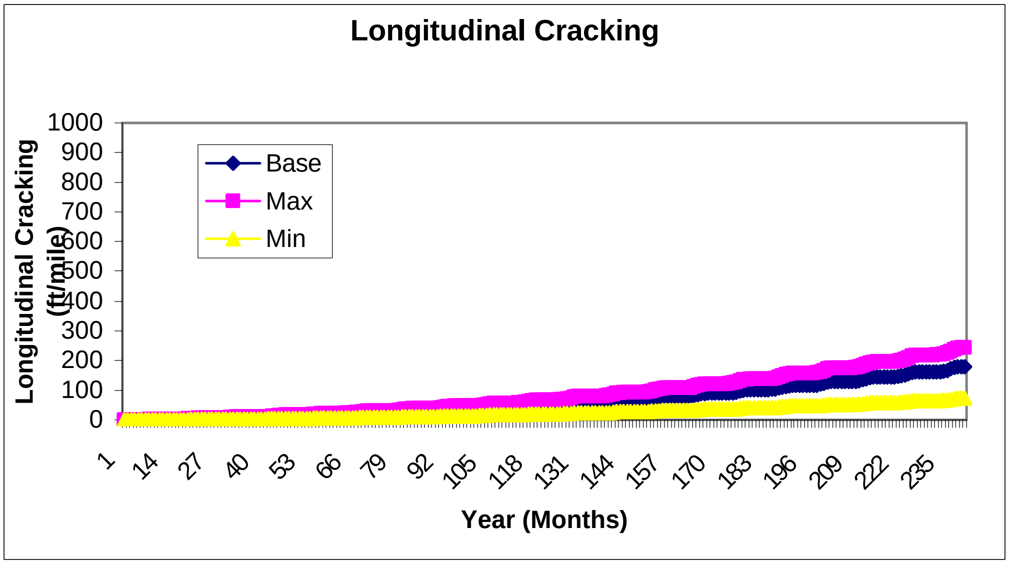


Figure D -282 1028 Surface Shortwave Absorptivity

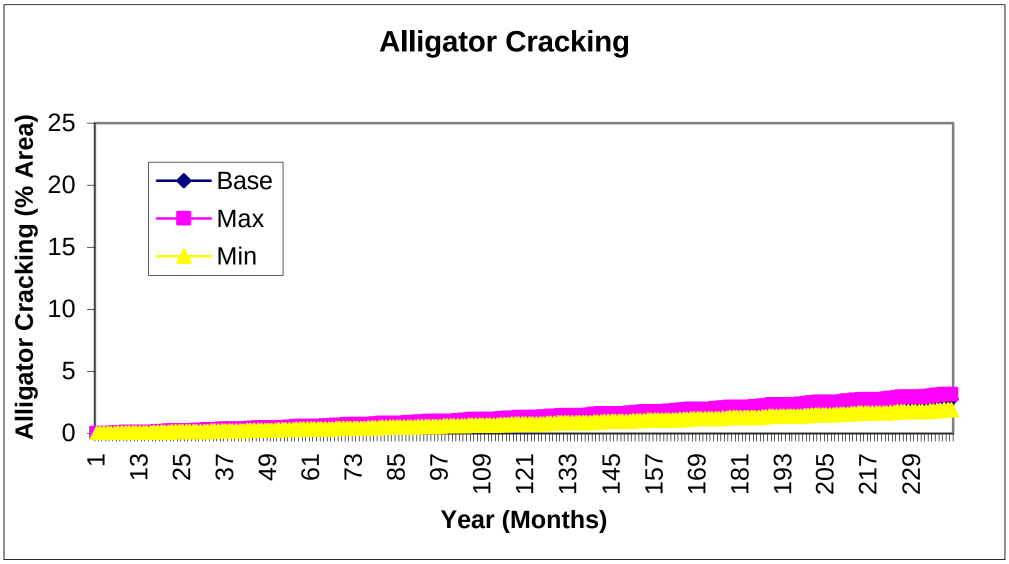


Figure D -283 1028 Surface Shortwave Absorptivity

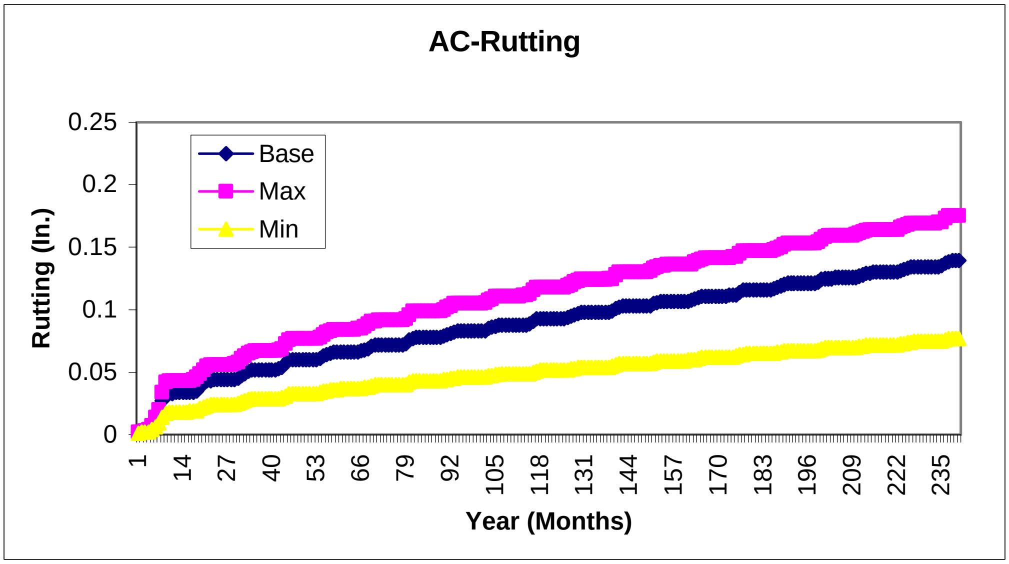


Figure D -284 1028 Surface Shortwave Absorptivity

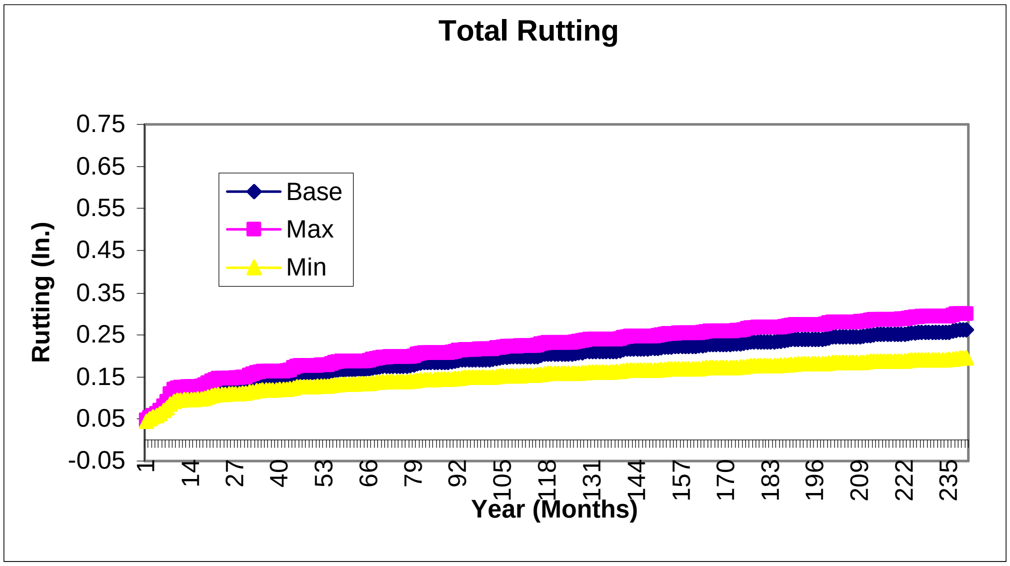


Figure D -285 1028 Surface Shortwave Absorptivity

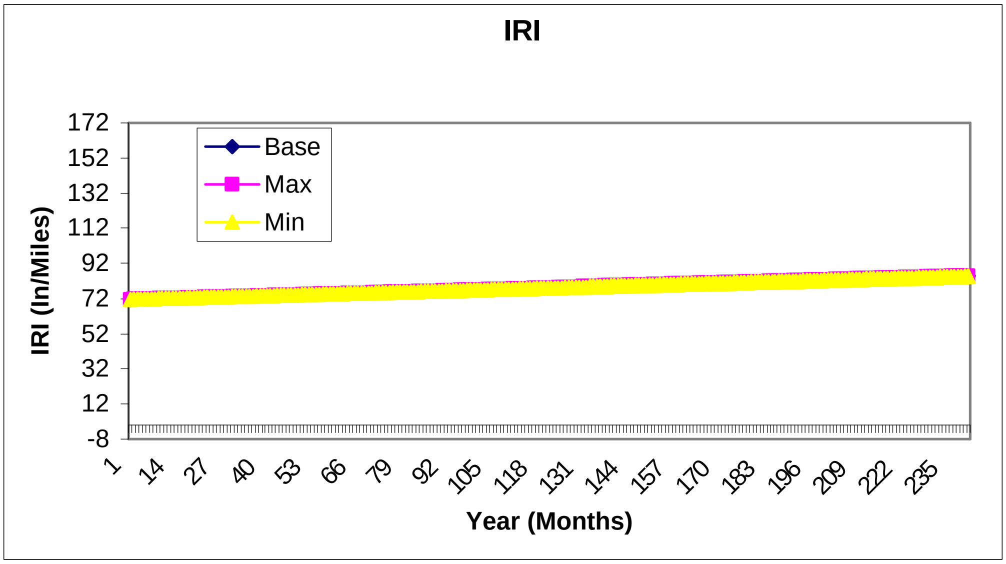


Figure D -286 1028 |E*| – S9.5C

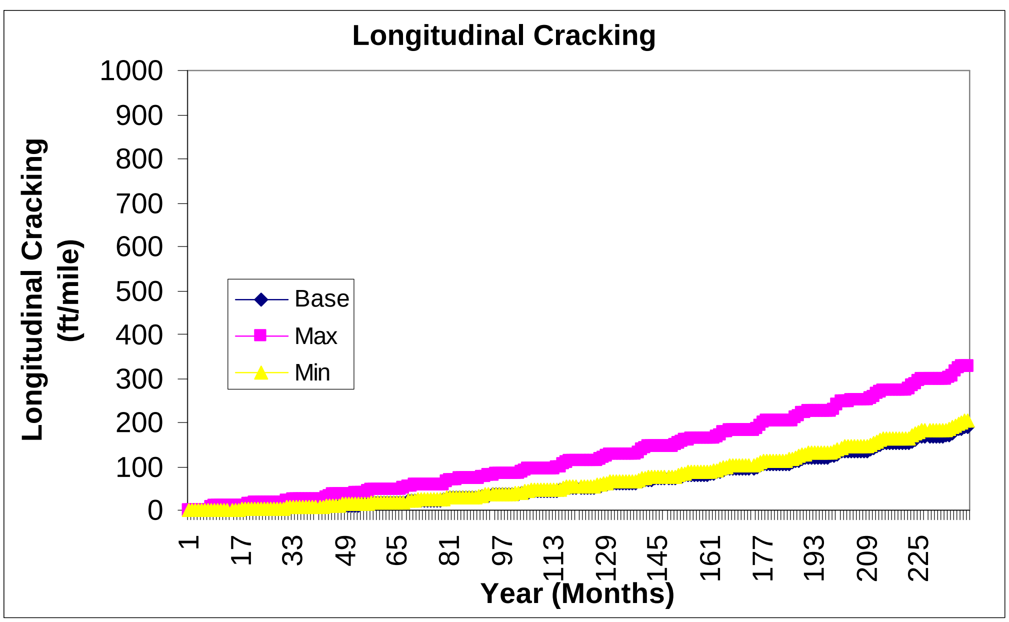


Figure D -287 1028 |E*| – S9.5C

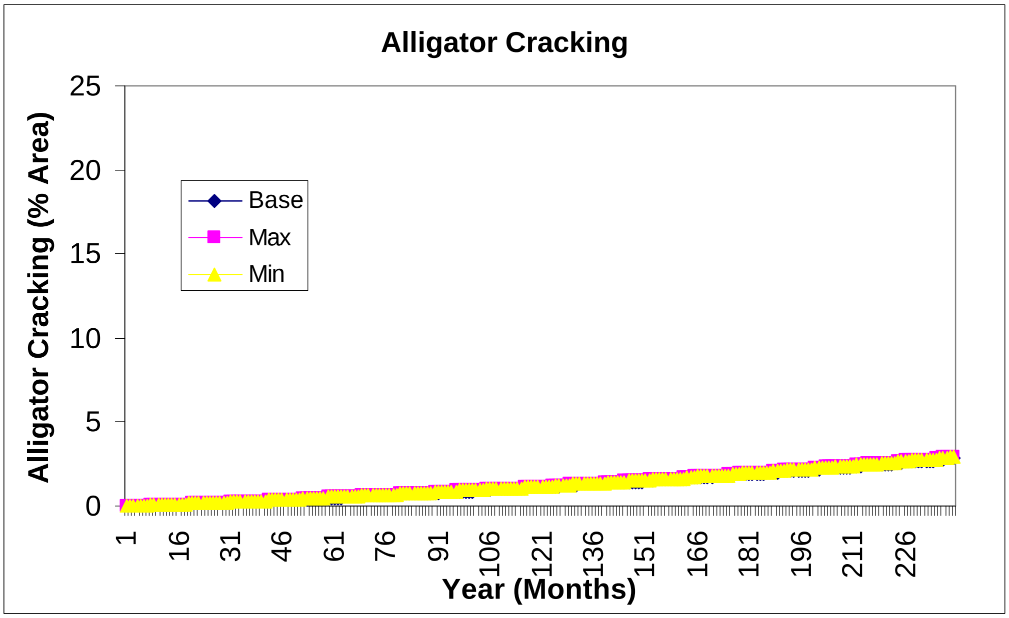


Figure D -288 1028 |E*| – S9.5C

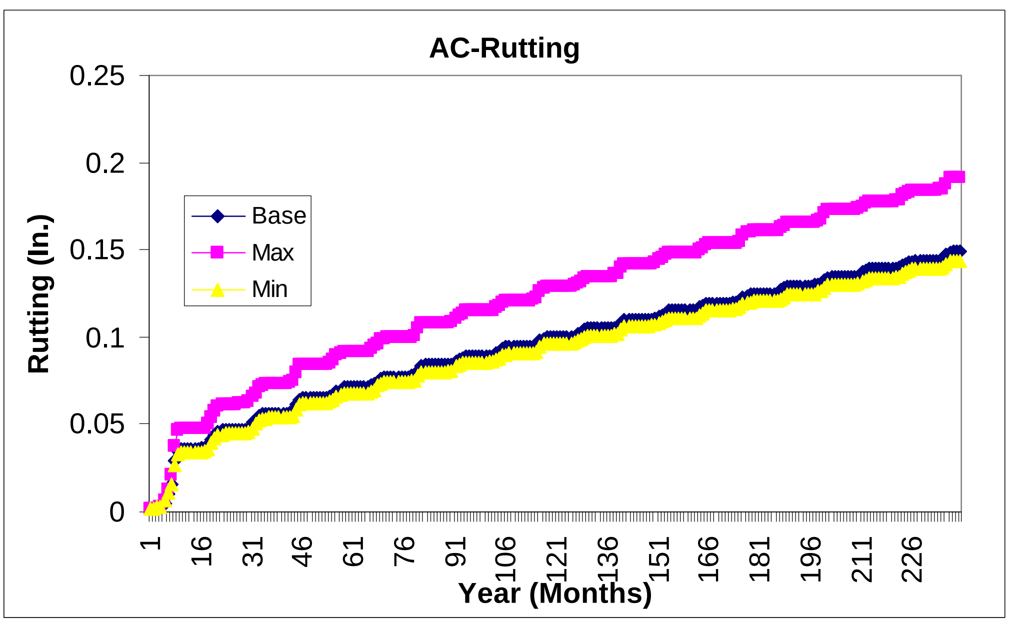


Figure D -289 1028 |E*| – S9.5C

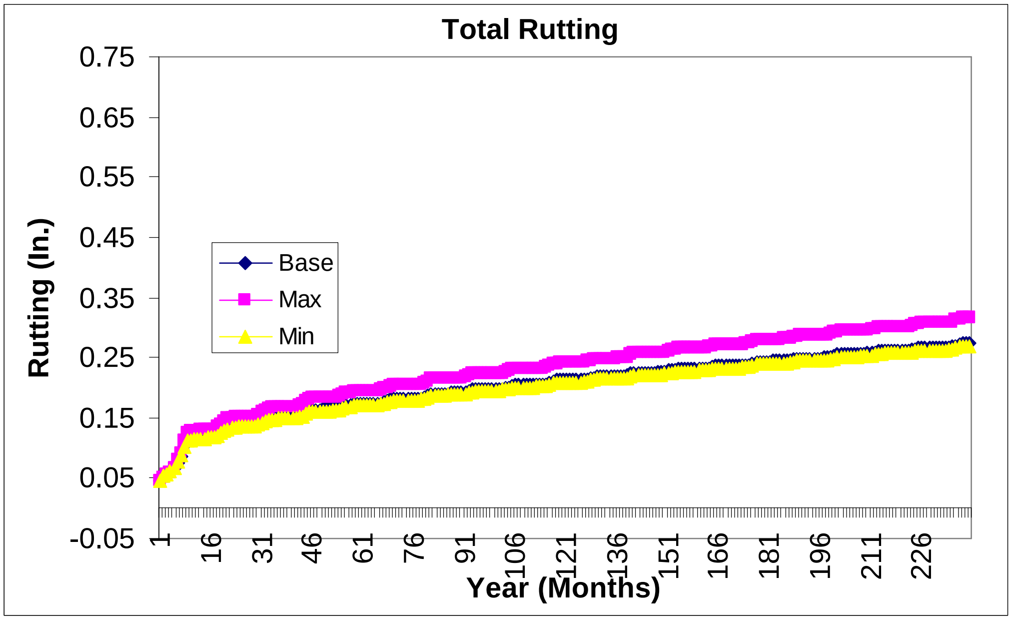


Figure D -290 1028 |E*| – S9.5C

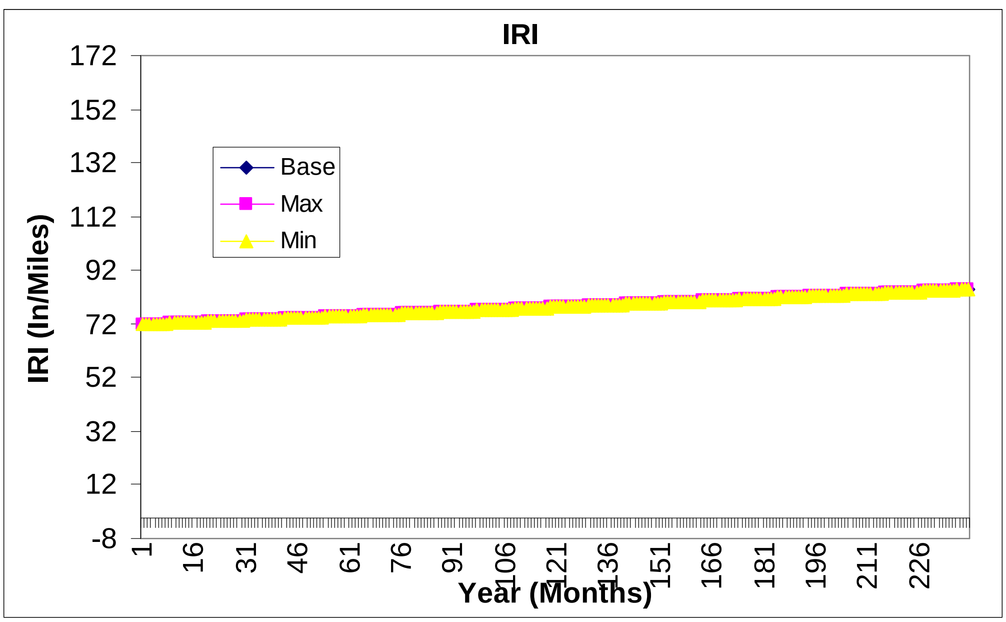


Figure D -291 1028 |E*| – S12.5C

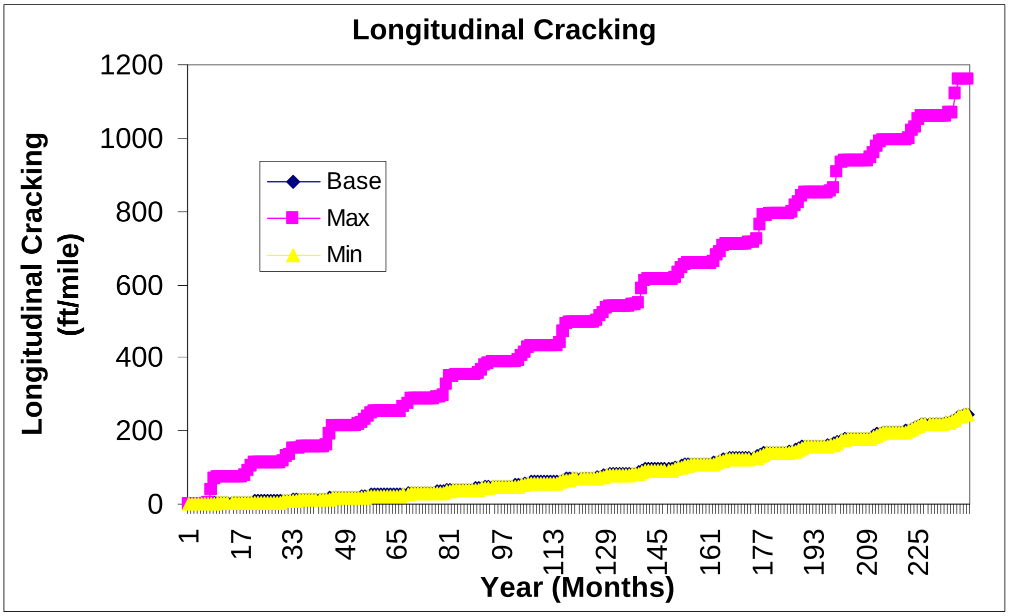


Figure D -292 1028 |E*| – S12.5C

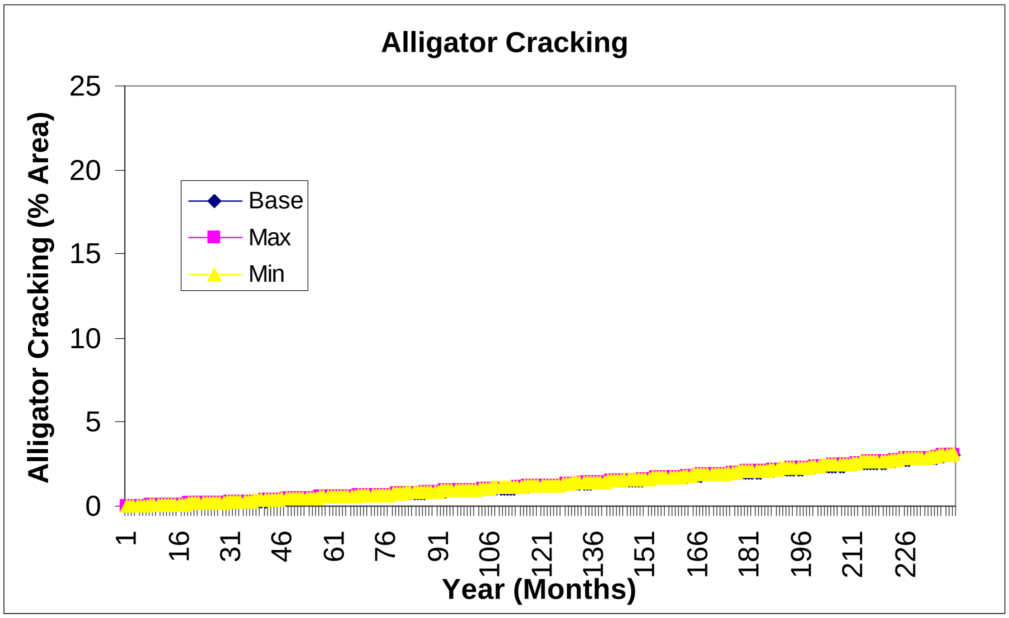


Figure D -293 1028 |E*| – S12.5C

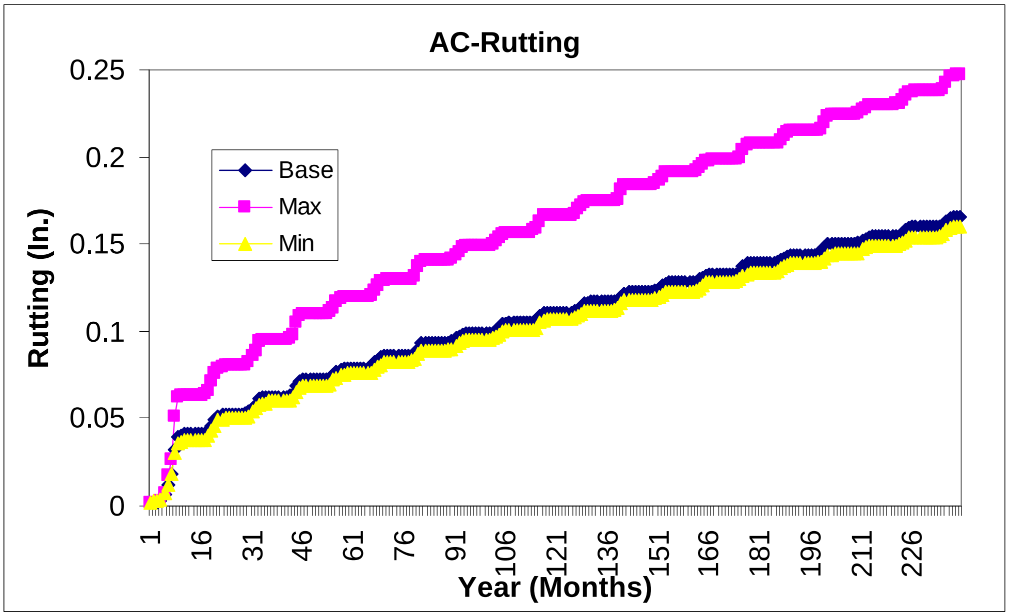


Figure D -294 1028 |E*| – S12.5C

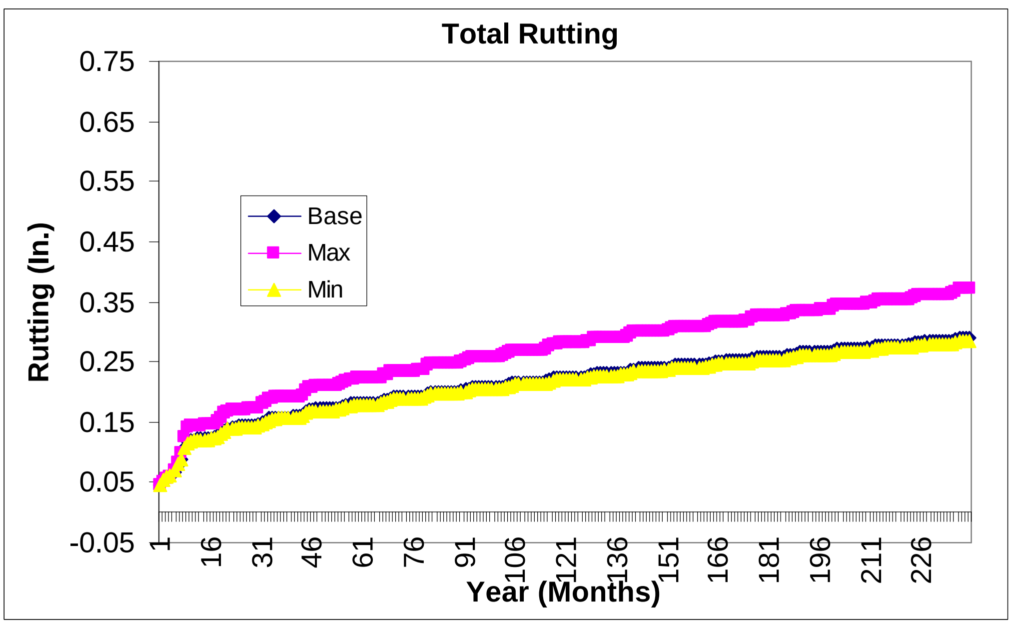


Figure D -295 1028 |E*| – S12.5C

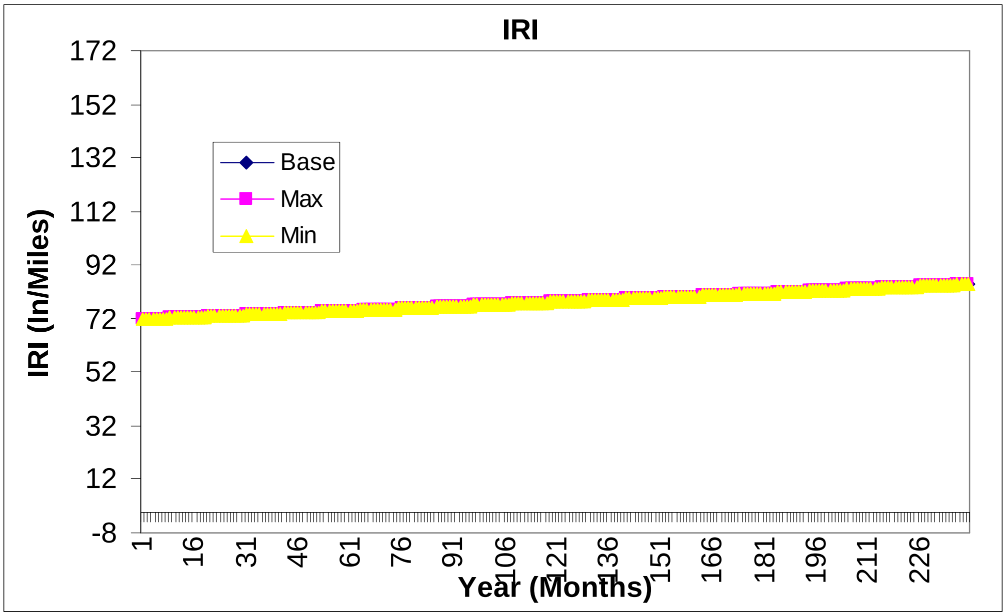


Figure D -296 1028 - |E*| – B25C

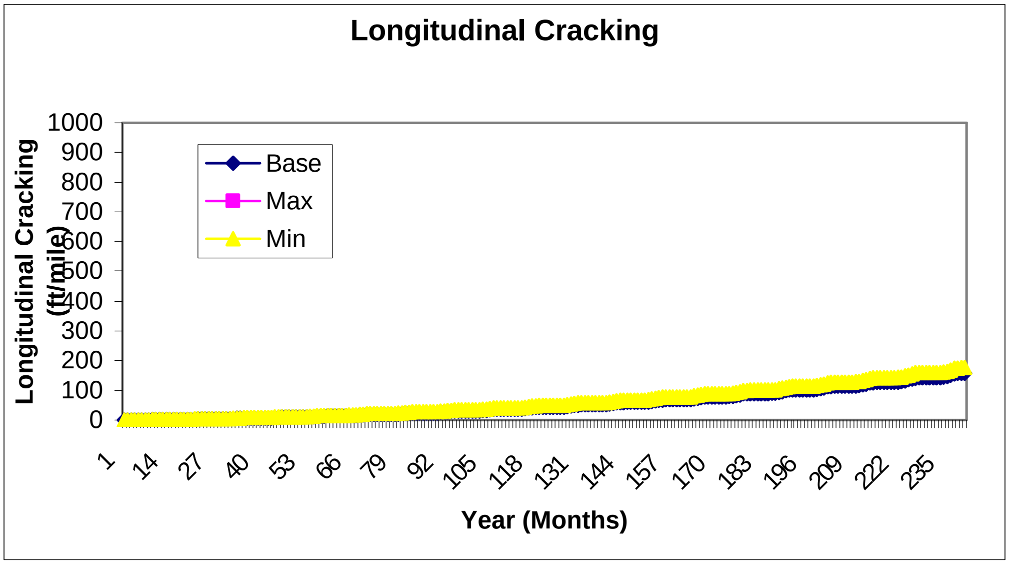


Figure D -297 1028 - |E*| – B25C

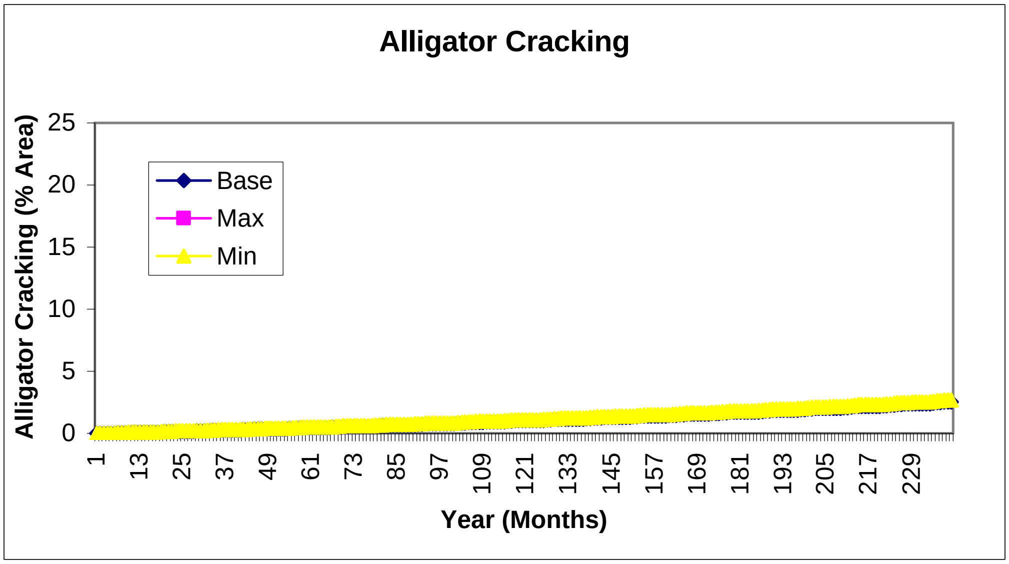


Figure D -298 1028 - |E*| – B25C

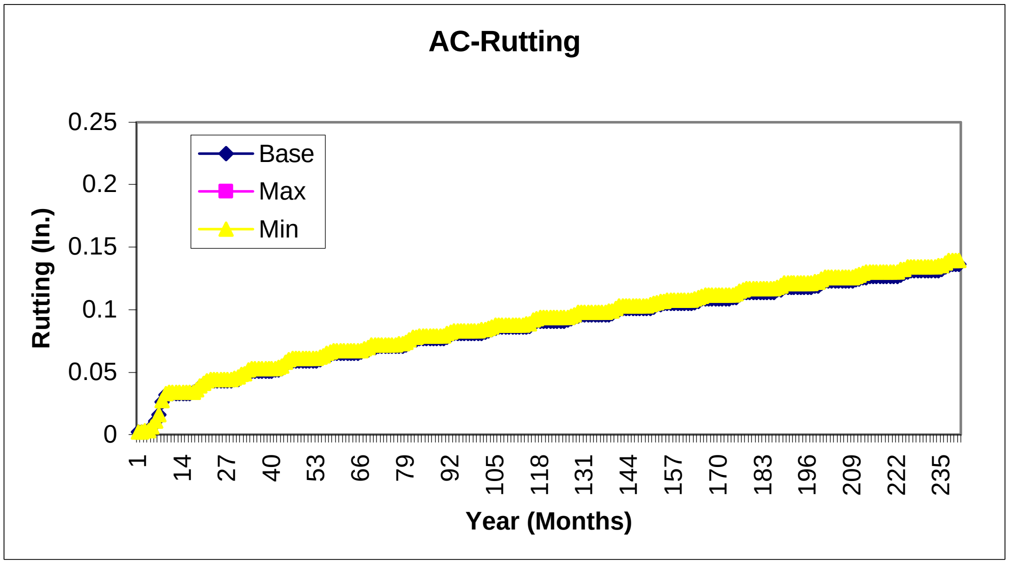


Figure D -299 1028 - |E*| – B25C

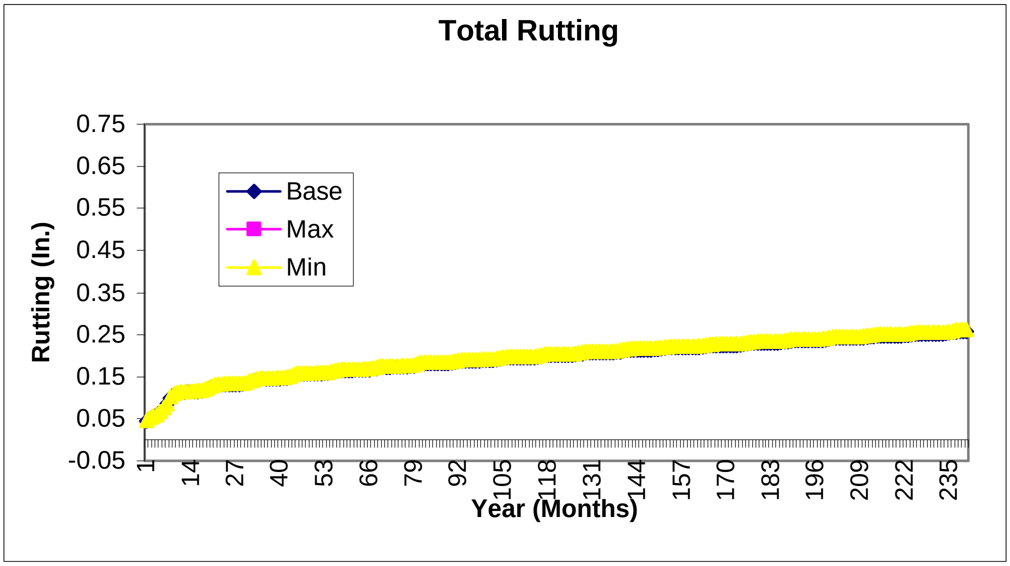


Figure D -300 1028 - |E*| – B25C

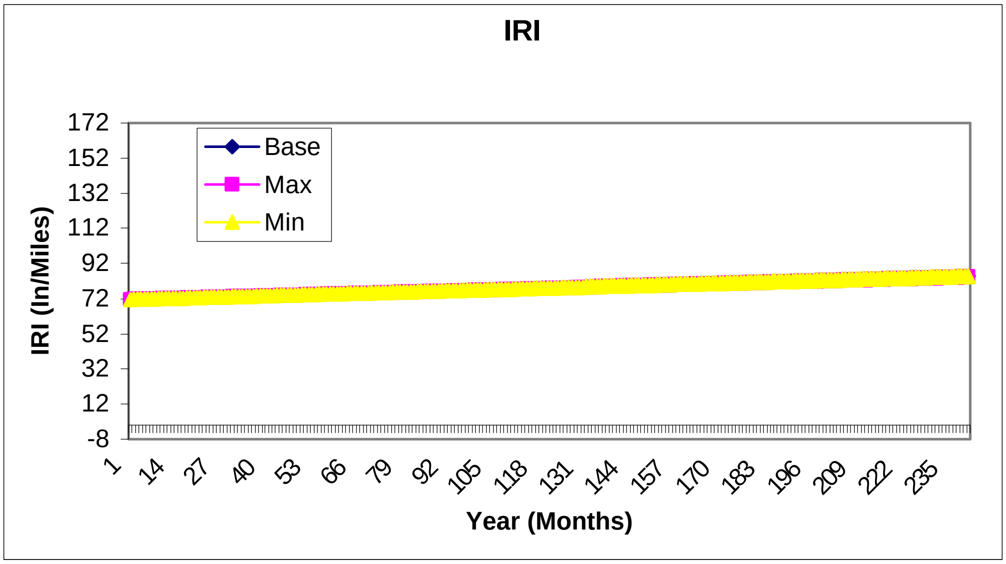


Figure D -301 1028 - CreepCompliance

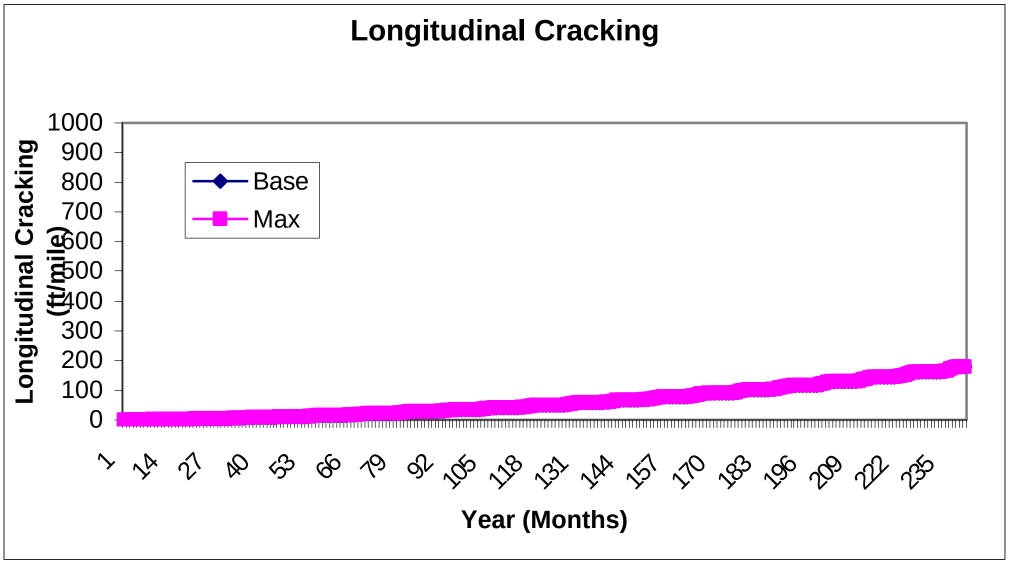


Figure D -302 1028 - CreepCompliance

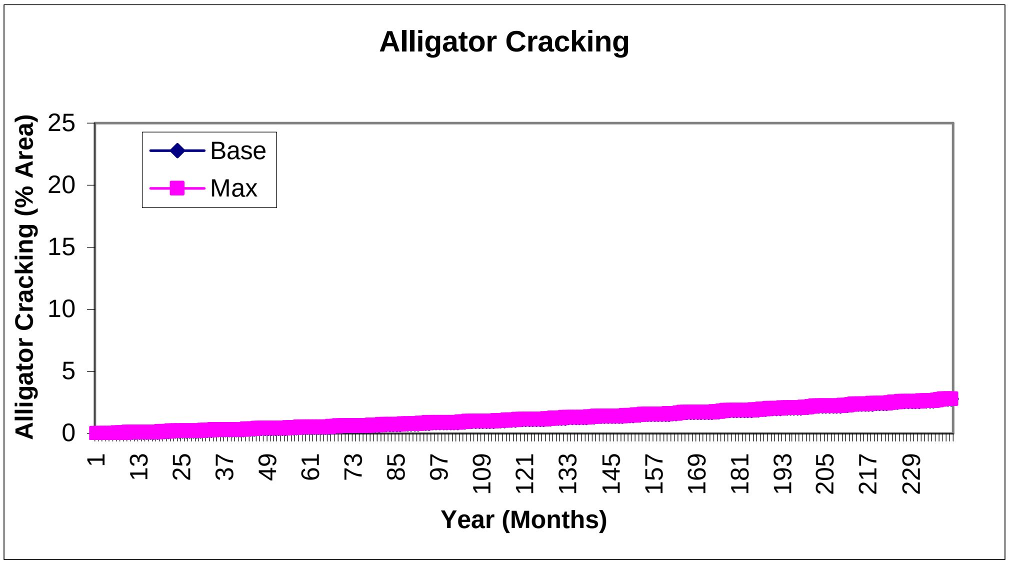


Figure D -303 1028 - CreepCompliance

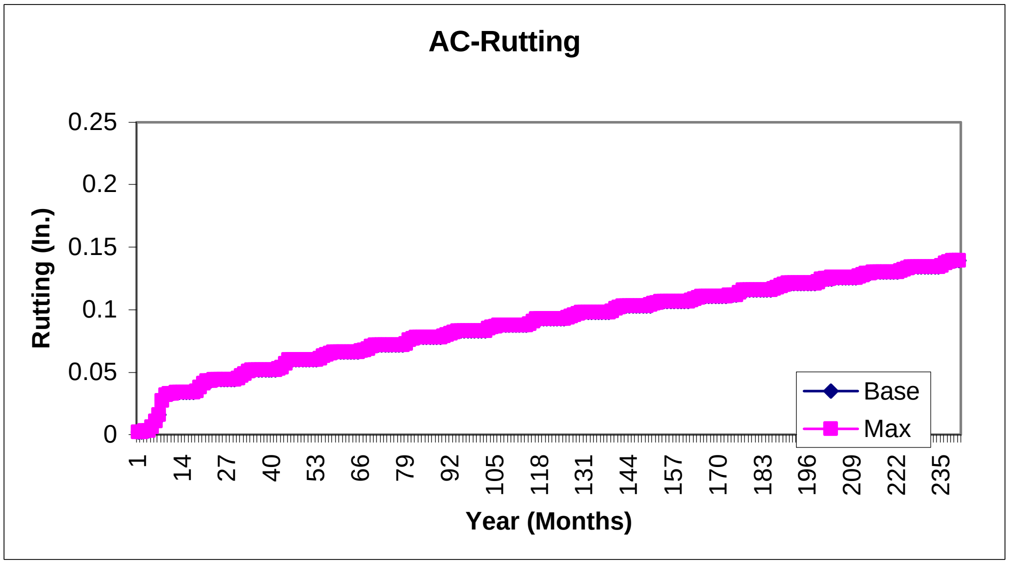


Figure D -304 1028 - CreepCompliance

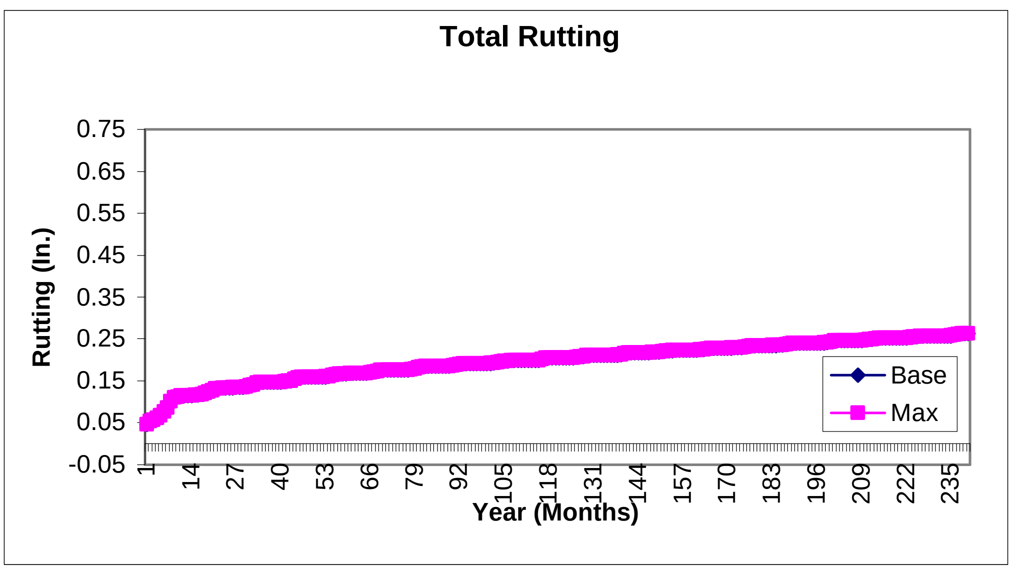


Figure D -305 1028 - CreepCompliance

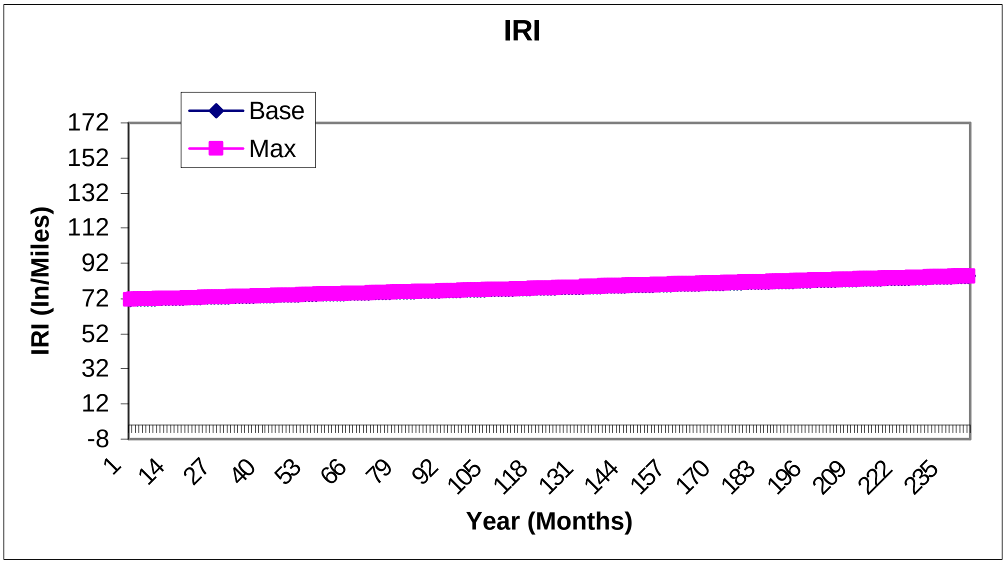


Figure D -306 1028 Base Vs Feb/Mar

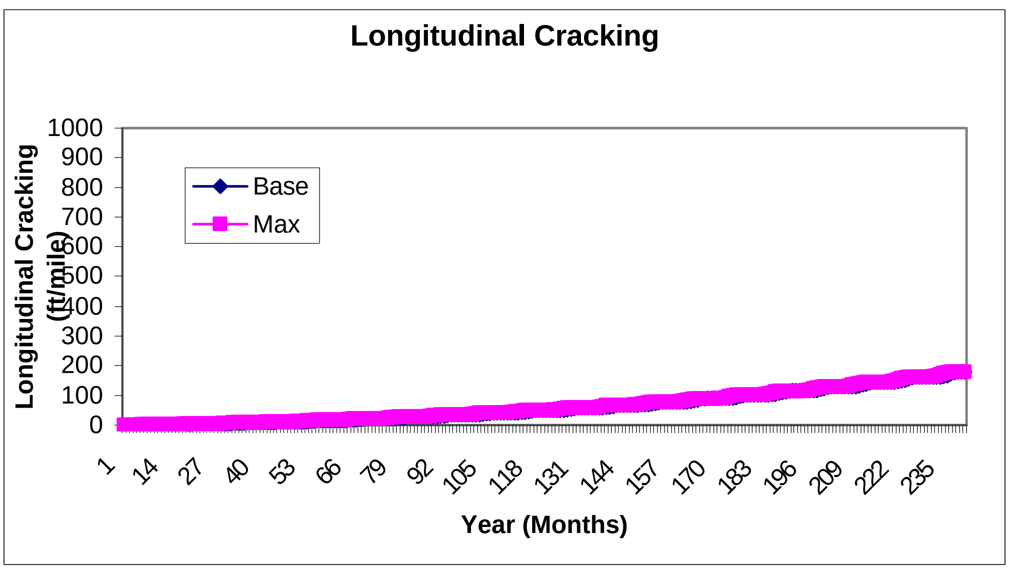


Figure D -307 1028 Base Vs Feb/Mar

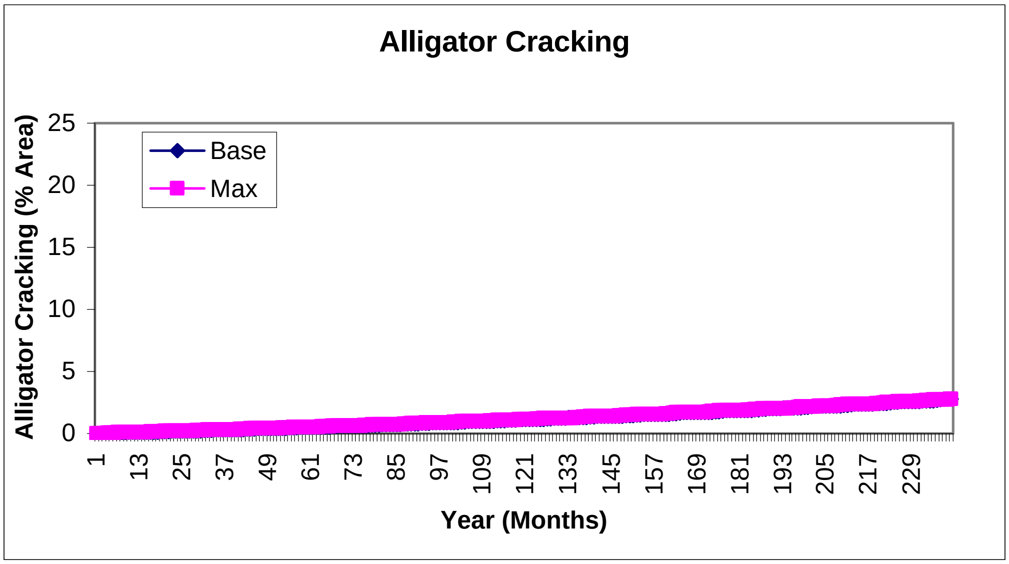


Figure D -308 1028 Base Vs Feb/Mar

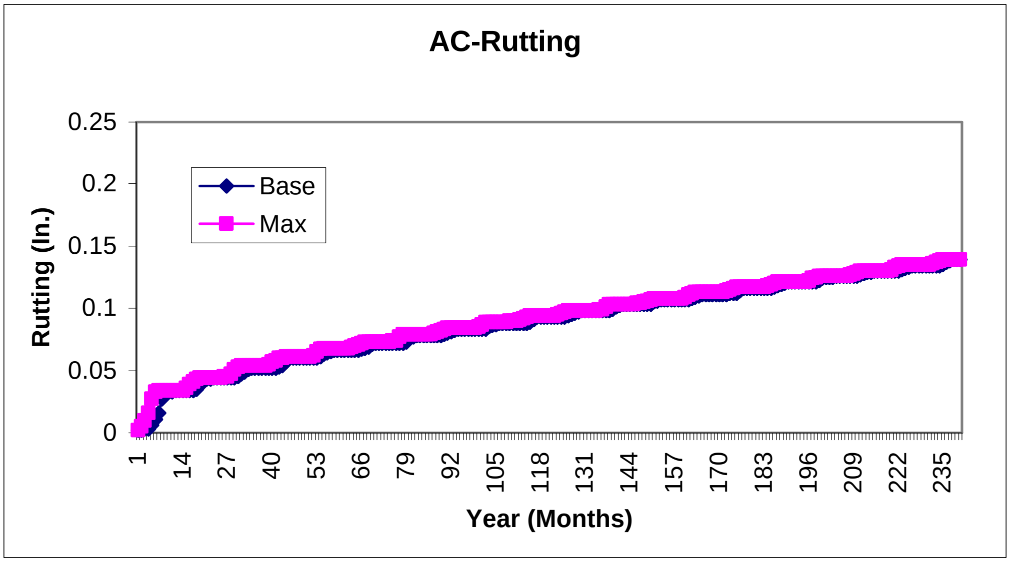


Figure D -309 1028 Base Vs Feb/Mar

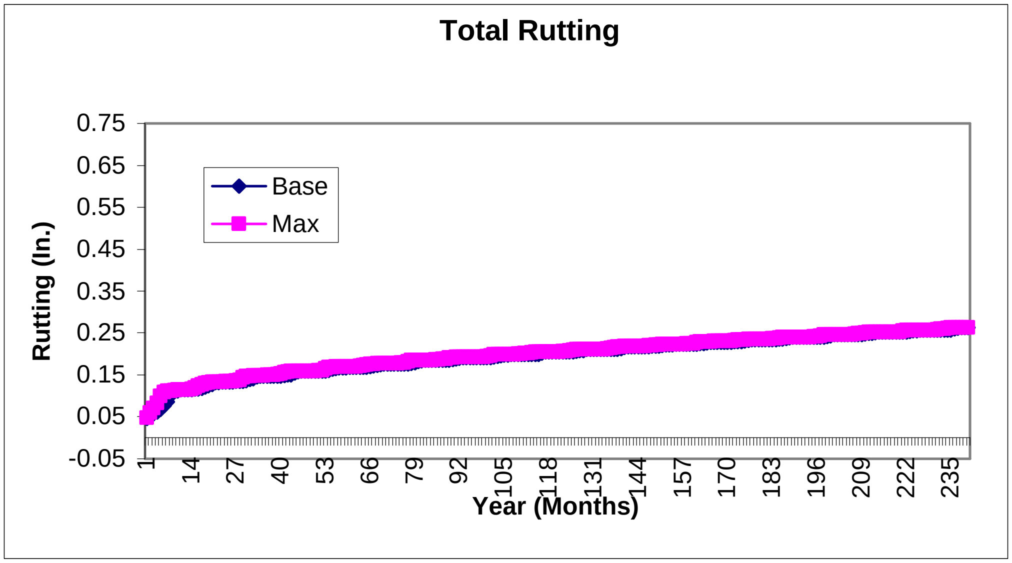


Figure D -310 1028 Base Vs Feb/Mar

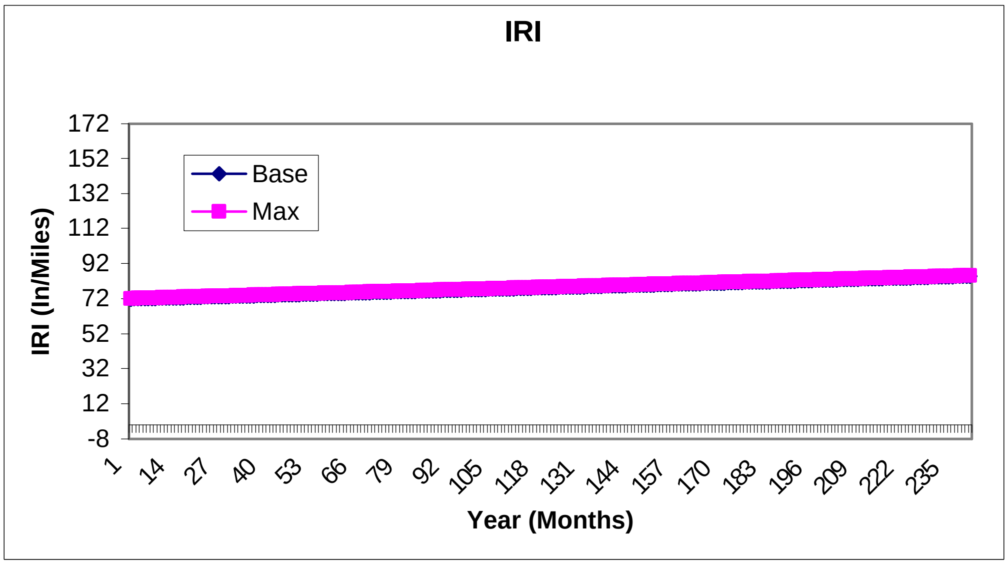


Figure D -311 1028 Base Vs May/Jun

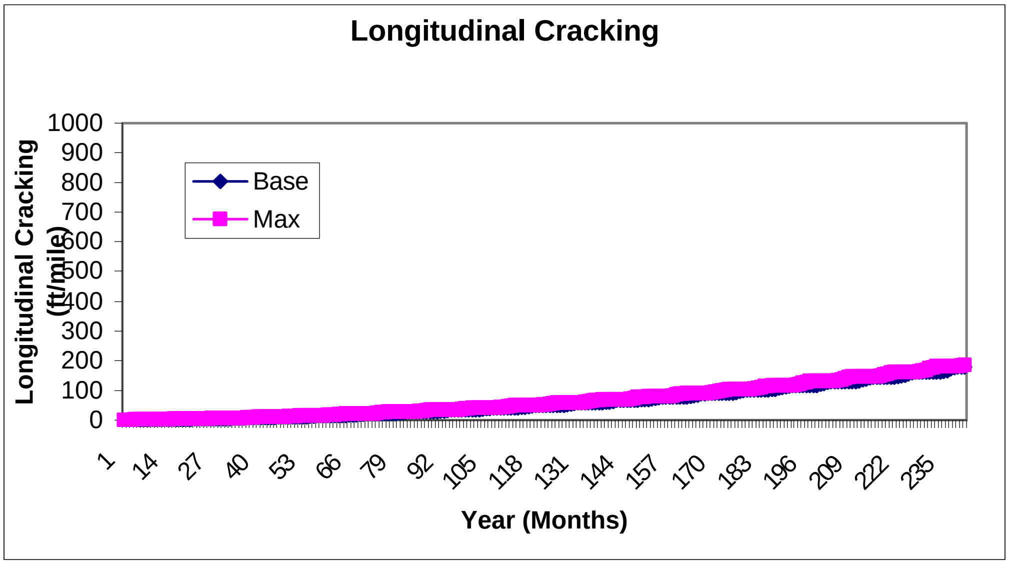


Figure D -312 1028 Base Vs May/Jun

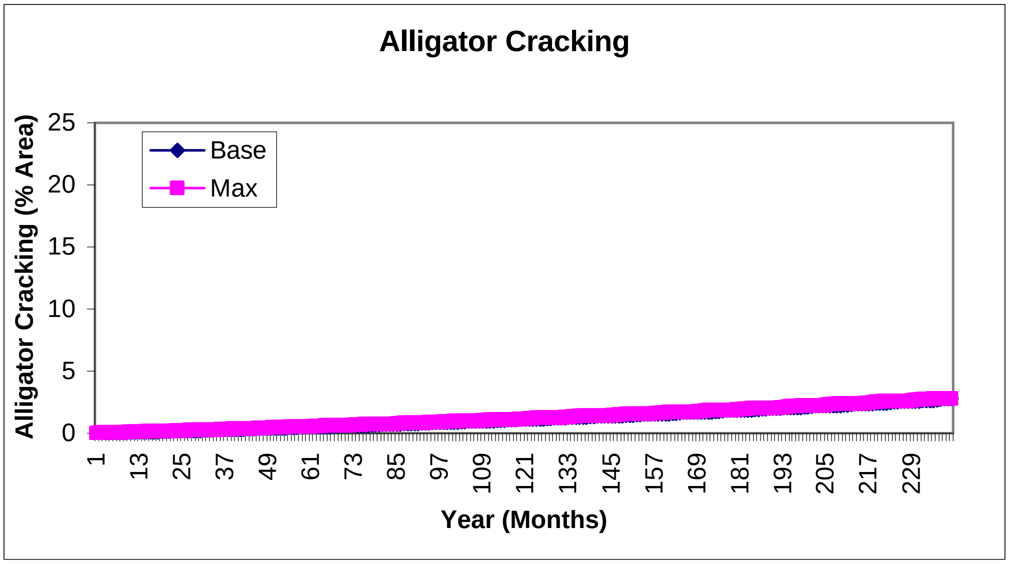


Figure D -313 1028 Base Vs May/Jun

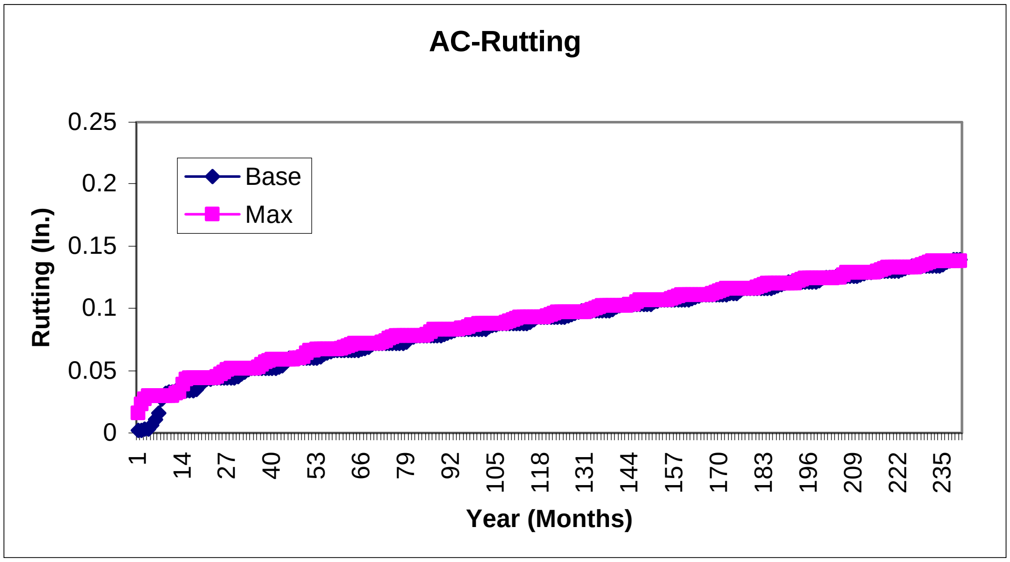


Figure D -314 1028 Base Vs May/Jun

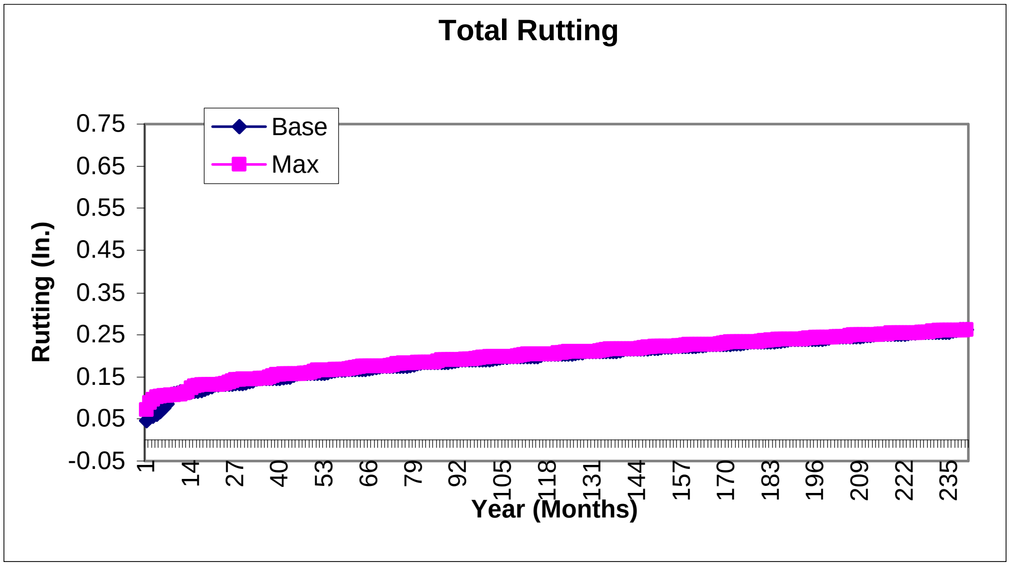


Figure D -315 1028 Base Vs May/Jun

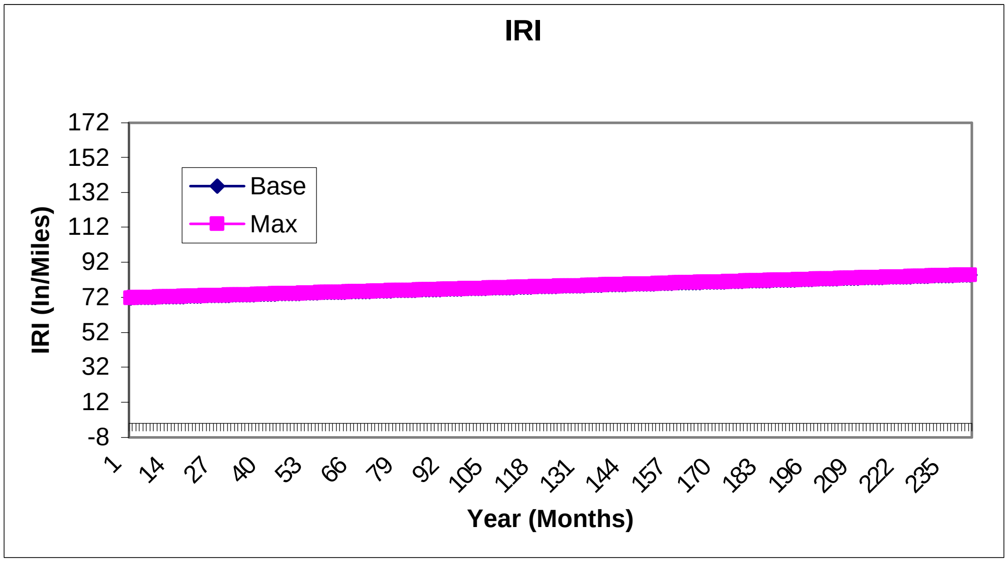


Figure D -316 1028 Base Vs Aug/Sep

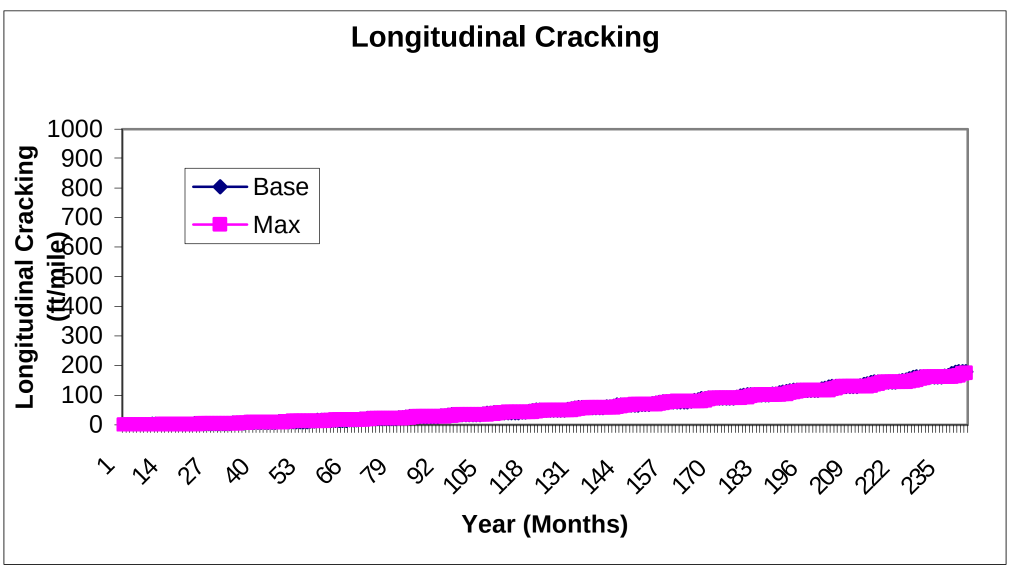


Figure D -317 1028 Base Vs Aug/Sep

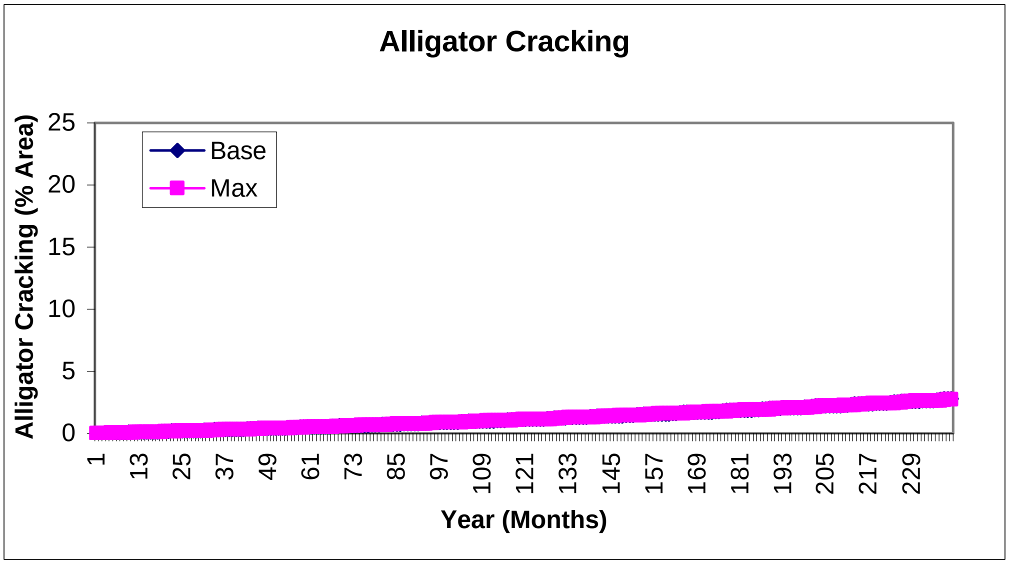


Figure D -318 1028 Base Vs Aug/Sep

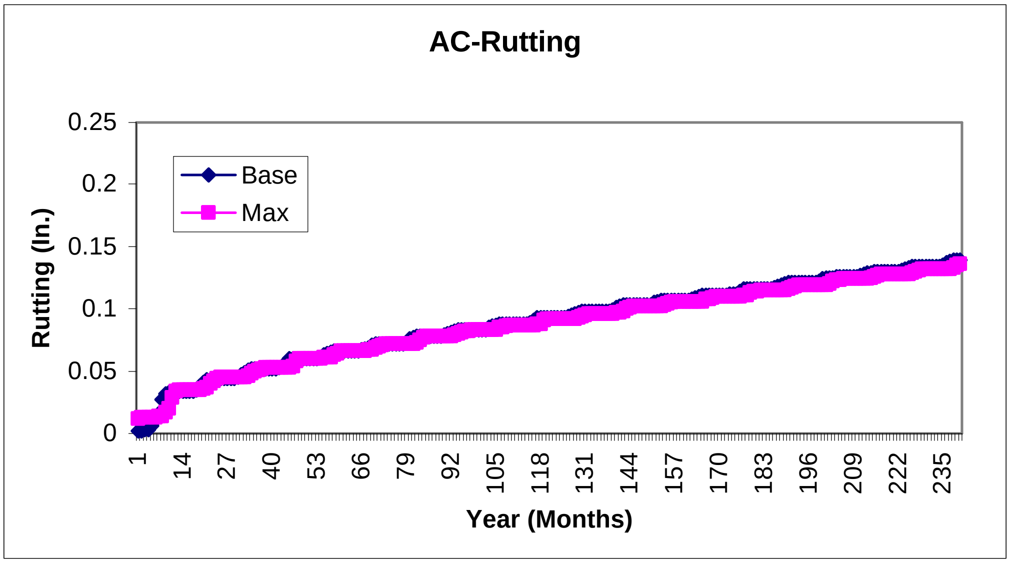


Figure D -319 1028 Base Vs Aug/Sep

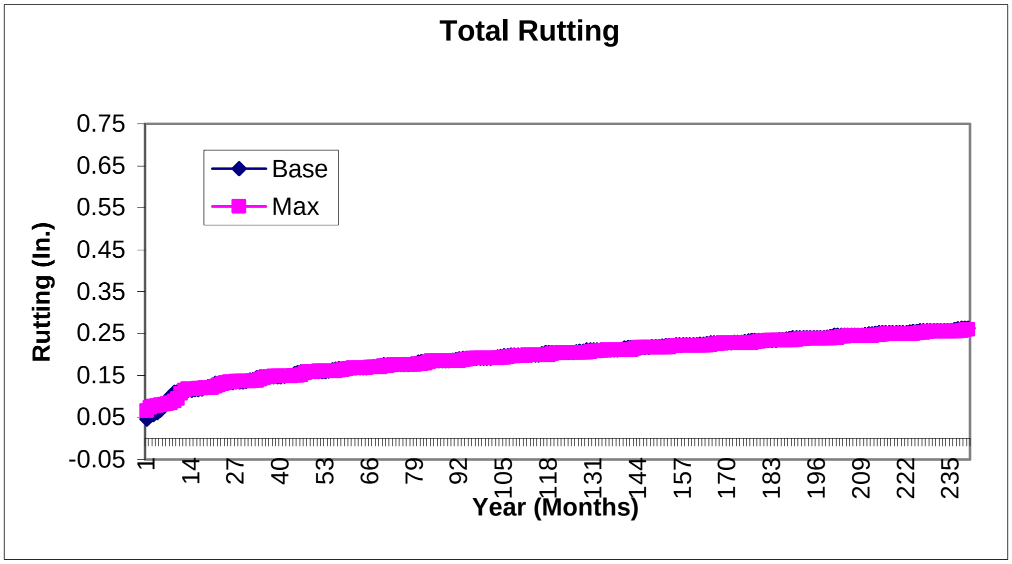


Figure D -320 1028 Base Vs Aug/Sep

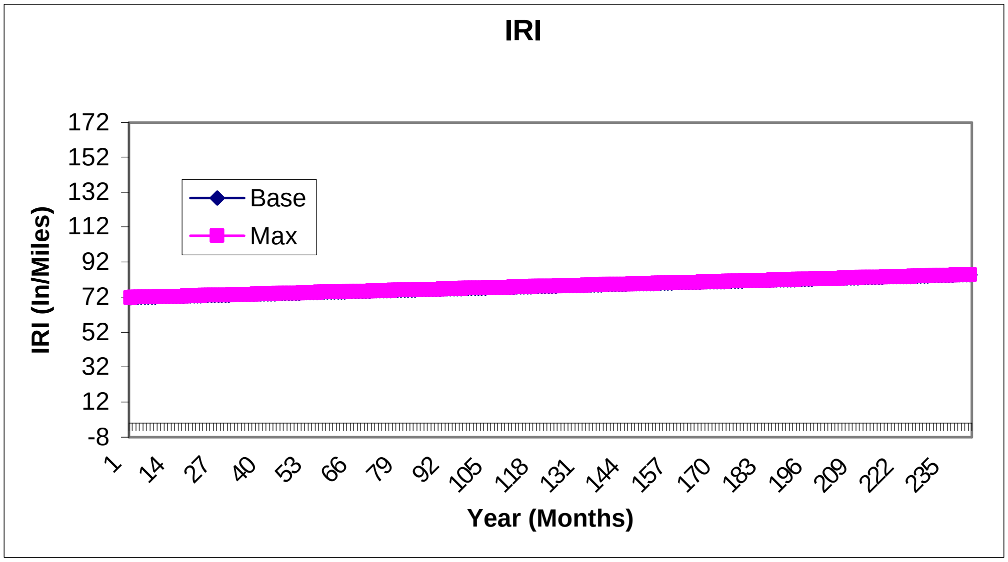


Figure D -321 1028 Truck Growth Factor

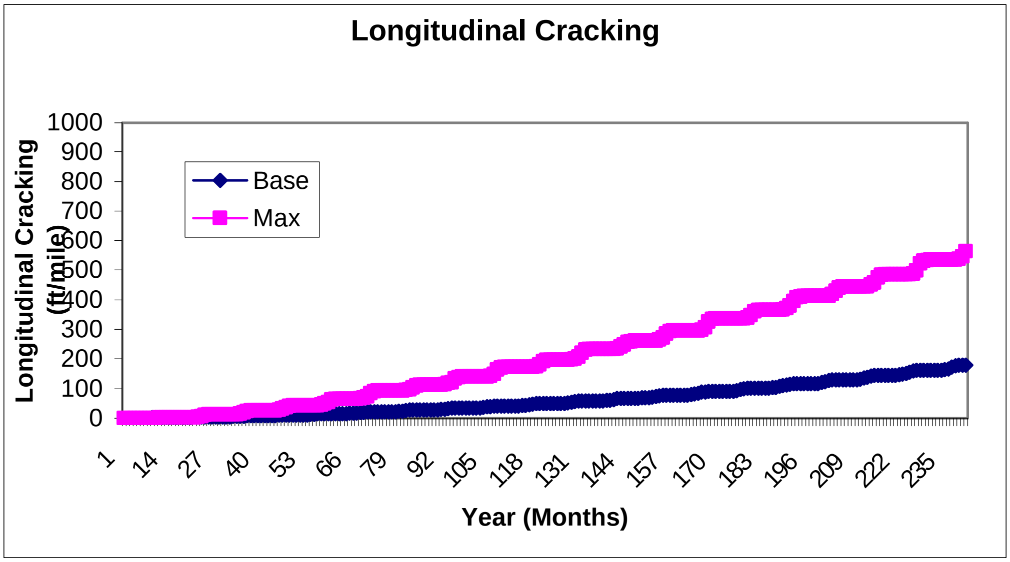


Figure D -322 1028 Truck Growth Factor

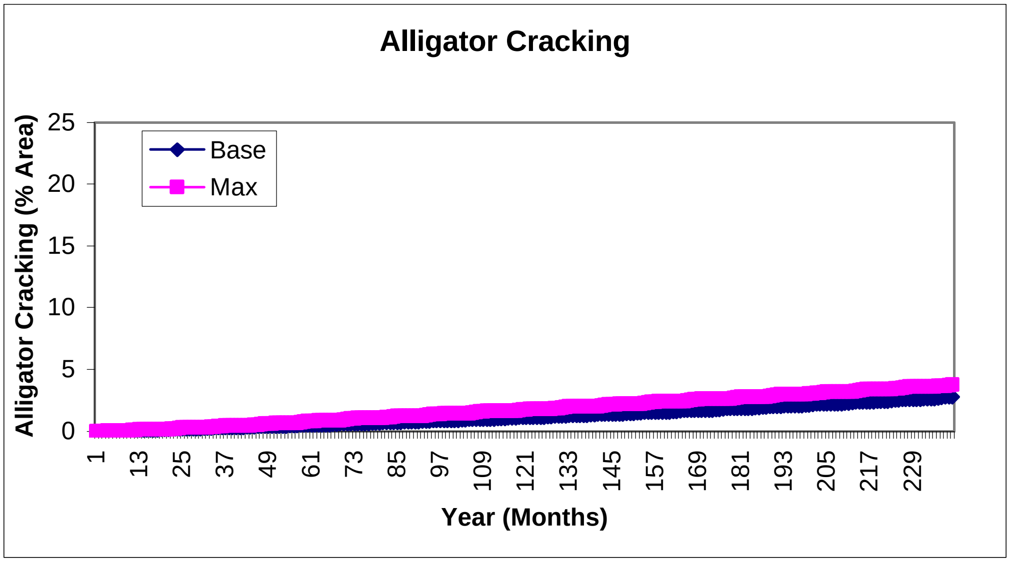


Figure D -323 1028 Truck Growth Factor

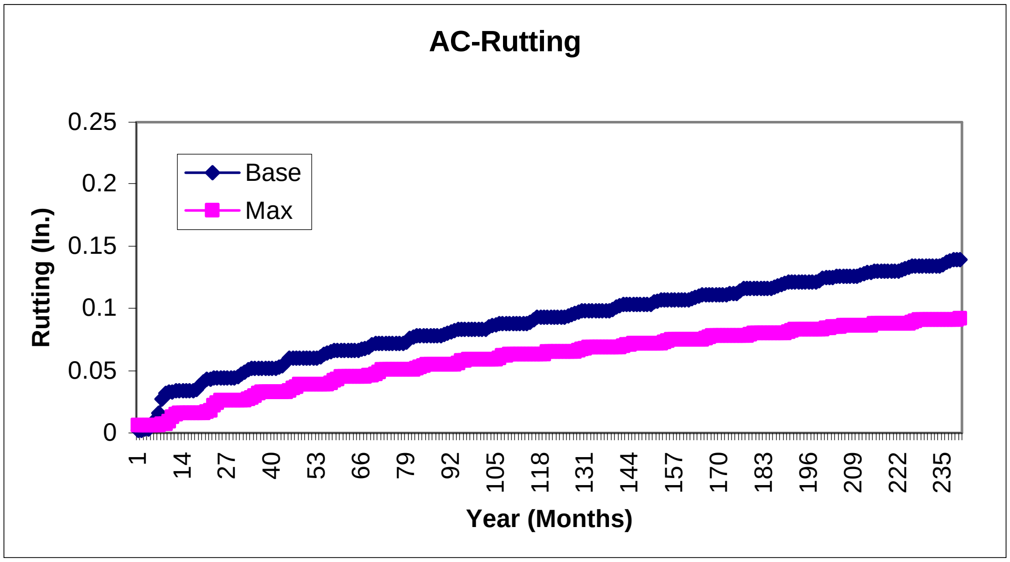


Figure D -324 1028 Truck Growth Factor

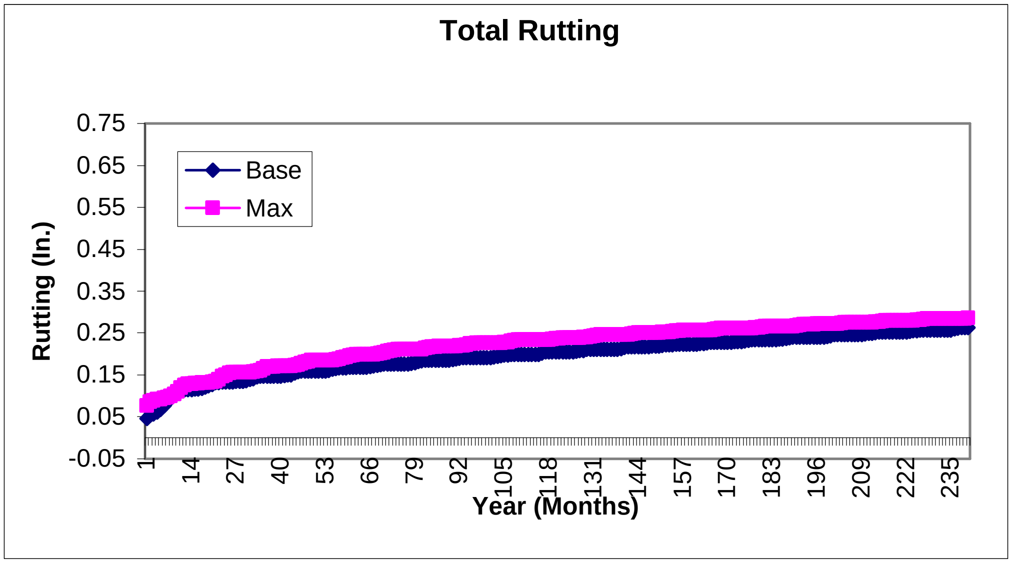


Figure D -325 1028 Truck Growth Factor

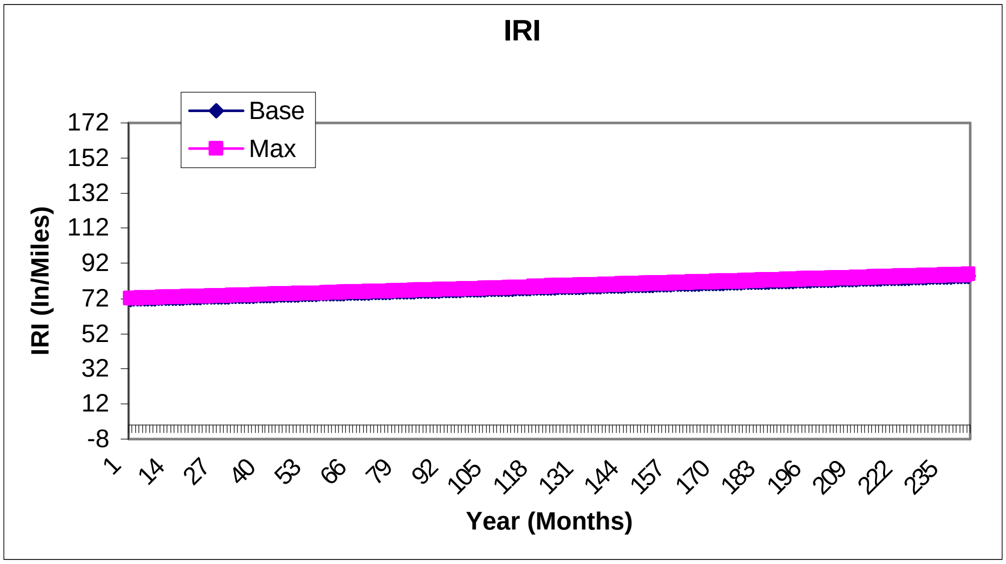


Figure D -326 0201 Coefficient of Thermal Expansion - JPCP

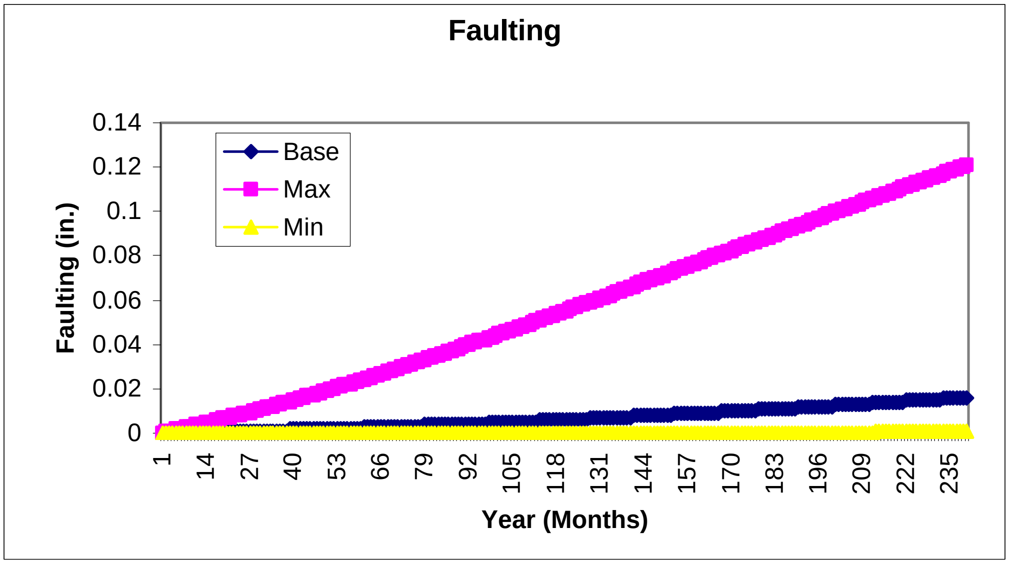


Figure D -327 0201 Coefficient of Thermal Expansion- JPCP

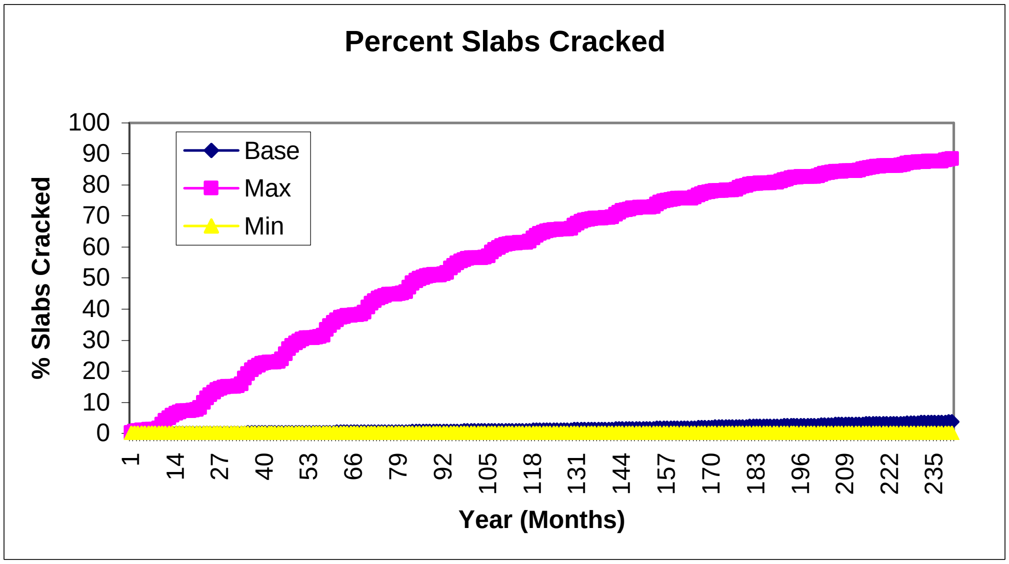


Figure D -328 0201 Coefficient of Thermal Expansion- JPCP

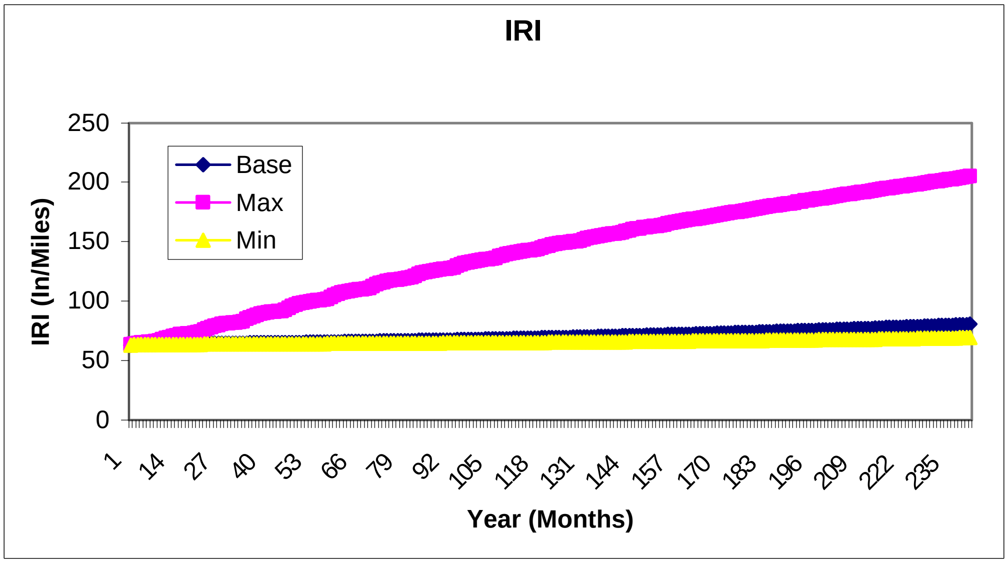


Figure D -329 0201 Heat Capacity - JPCP

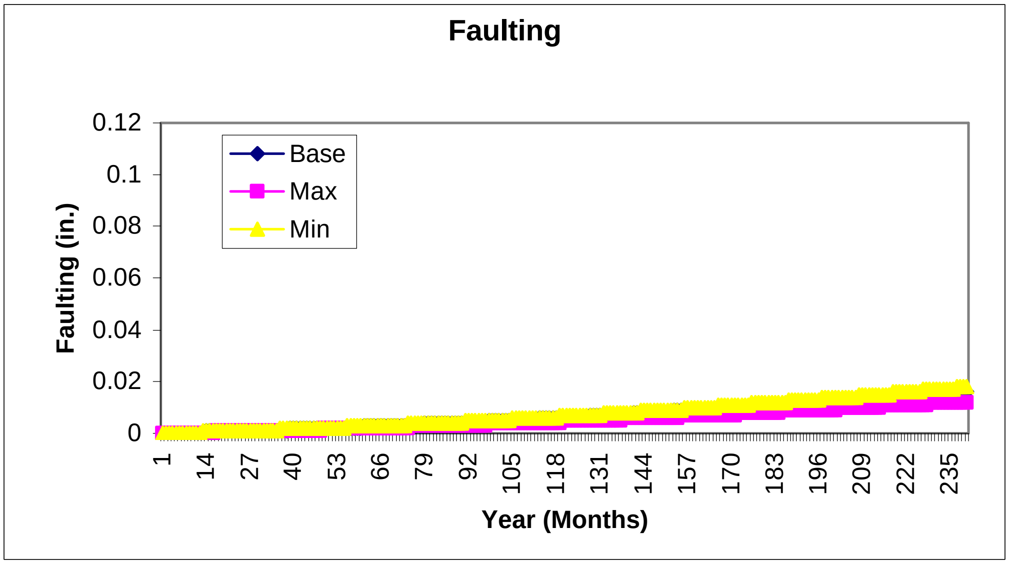


Figure D -330 0201 Heat Capacity - JPCP

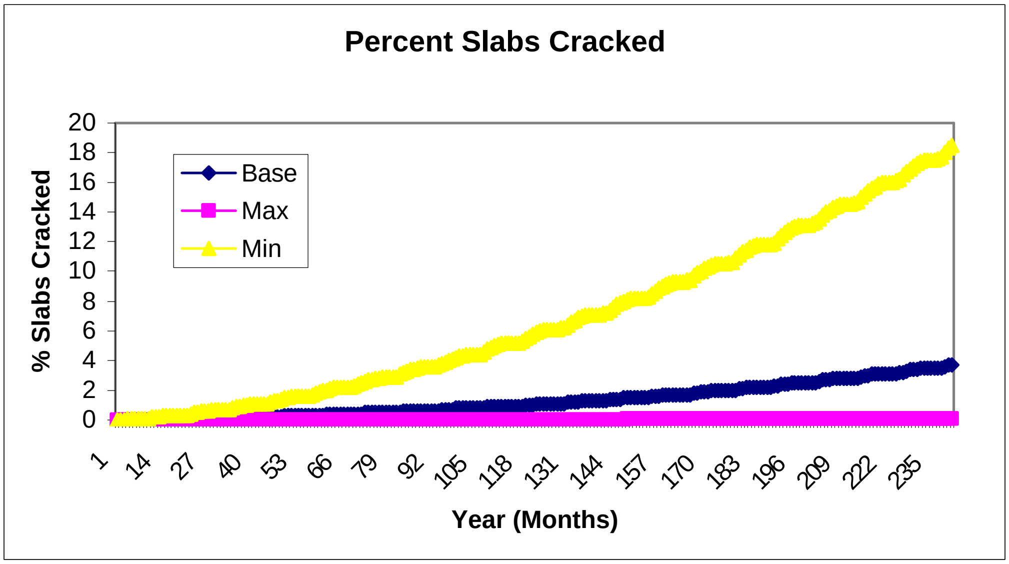


Figure D -331 0201 Heat Capacity - JPCP

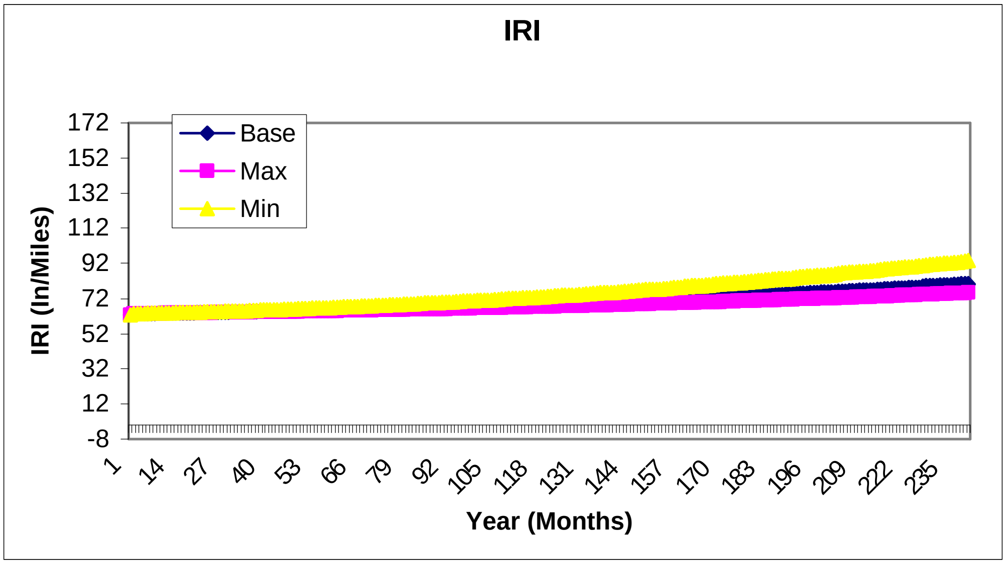


Figure D -332 0201 ThermalConductivity - JPCP

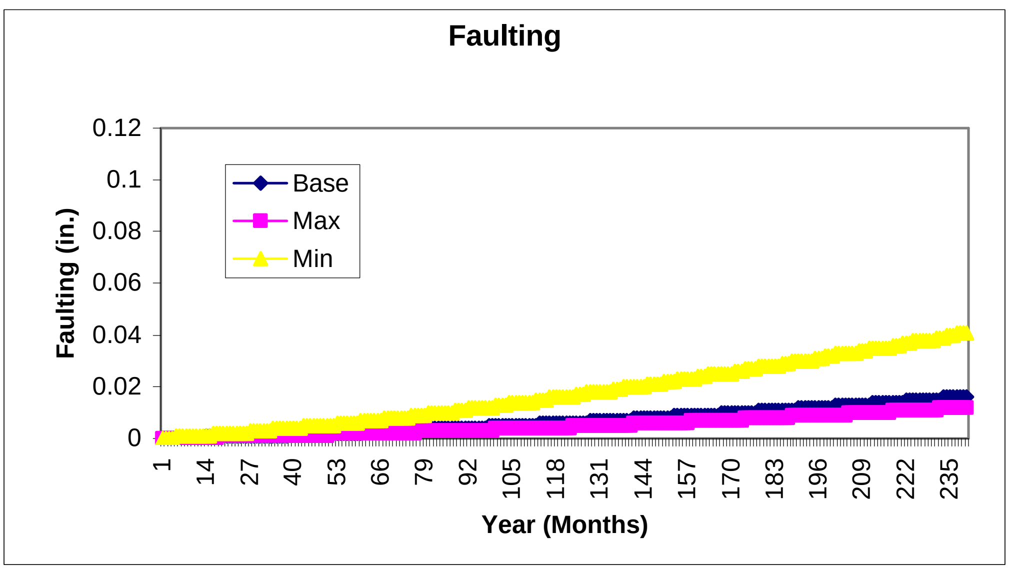


Figure D -333 0201 ThermalConductivity - JPCP

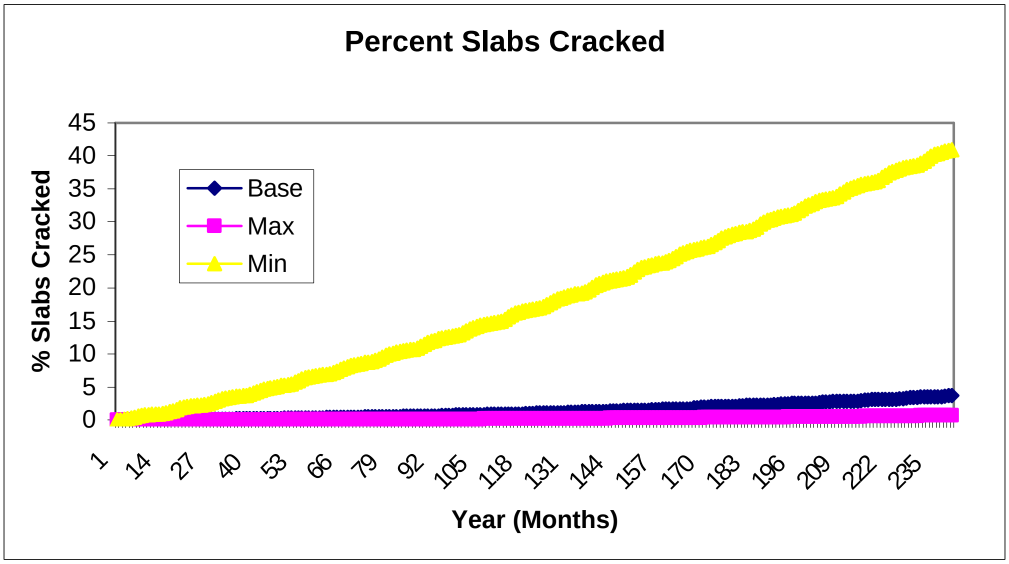


Figure D -334 0201 ThermalConductivity - JPCP

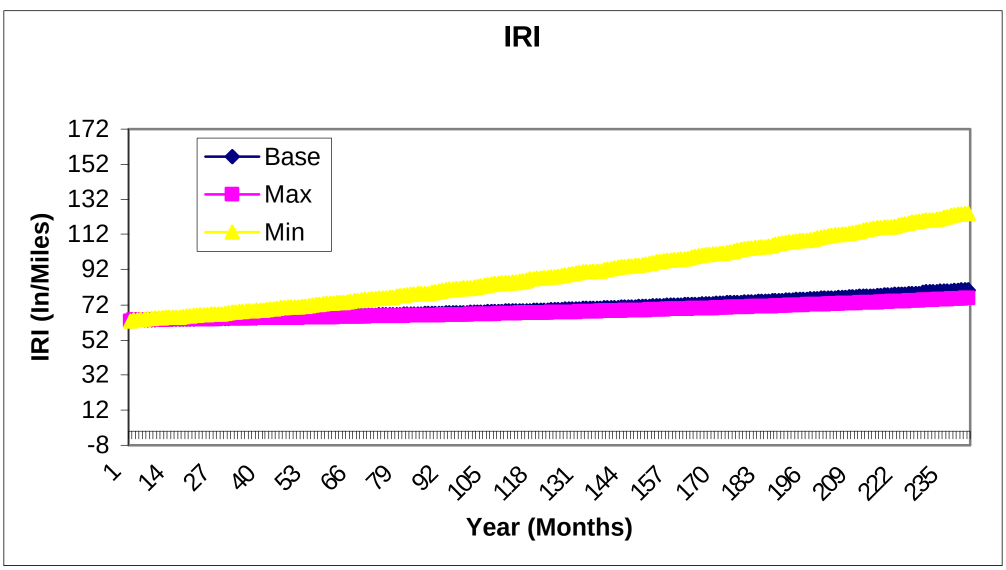


Figure D -335 0201 Unit Weight - JPCP

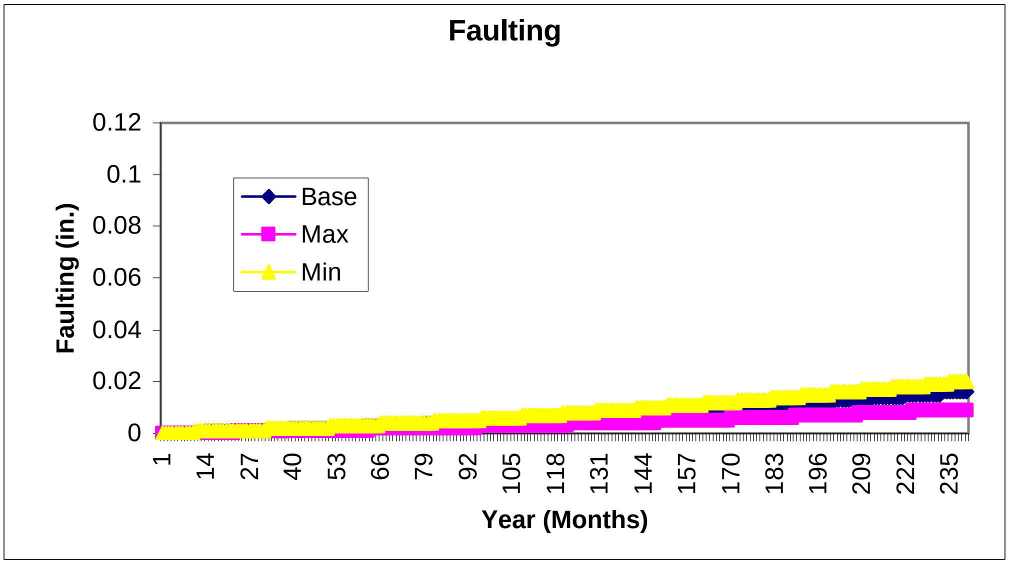


Figure D -336 0201 Unit Weight - JPCP

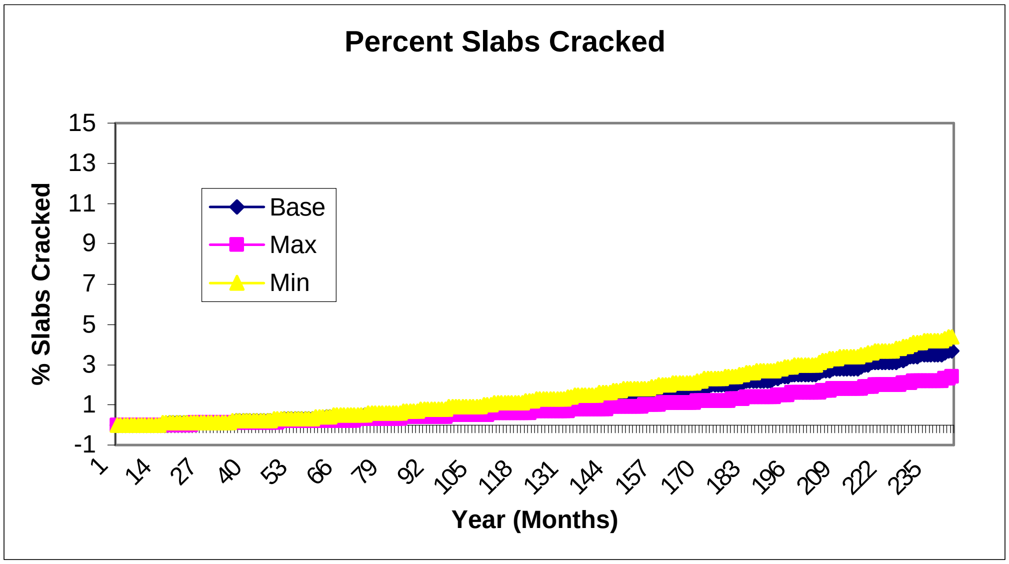


Figure D -337 0201 Unit Weight - JPCP

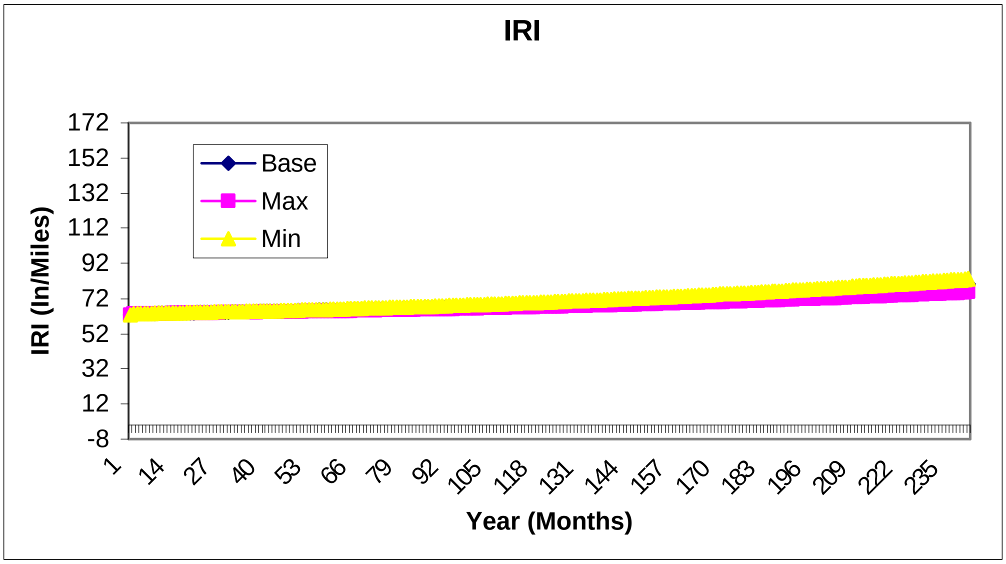


Figure D -338 0201 HeatCapacity – Chemically StaCilized Material

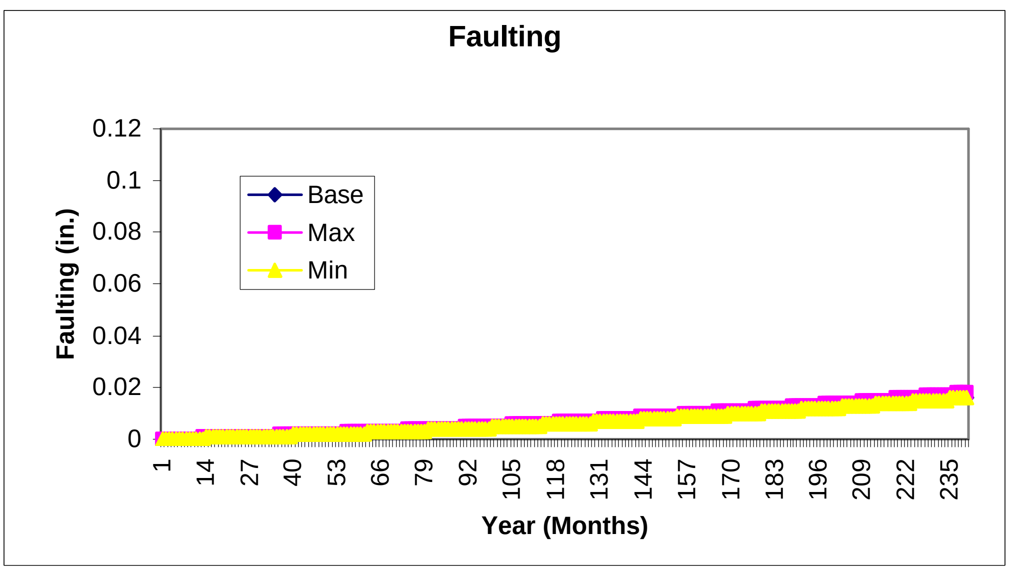


Figure D -339 0201 HeatCapacity – Chemically StaCilized Material

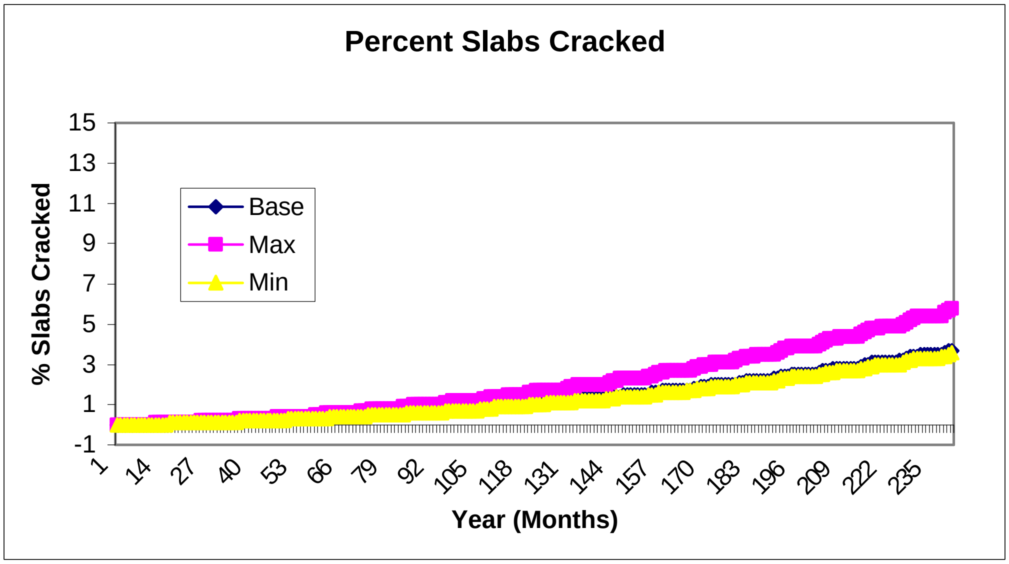


Figure D -340 0201 HeatCapacity – Chemically StaCilized Material

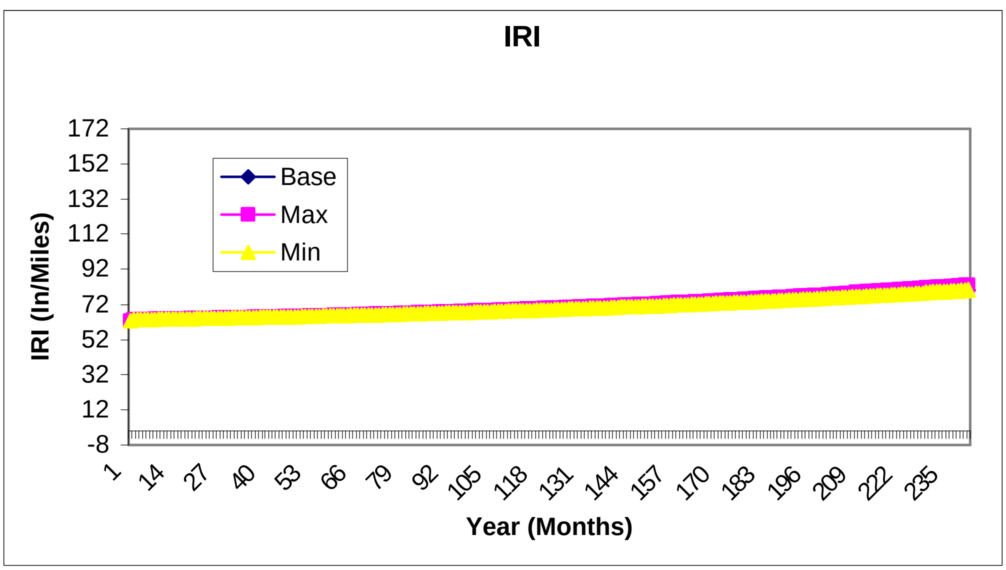


Figure D -341 0201 ThermalConductivity - CSM

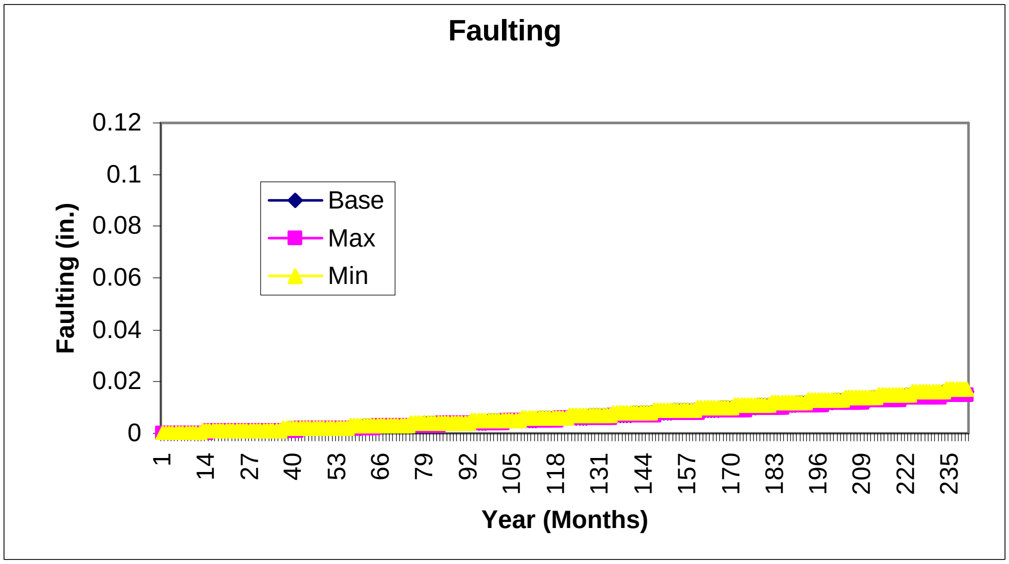


Figure D -342 0201 ThermalConductivity - CSM

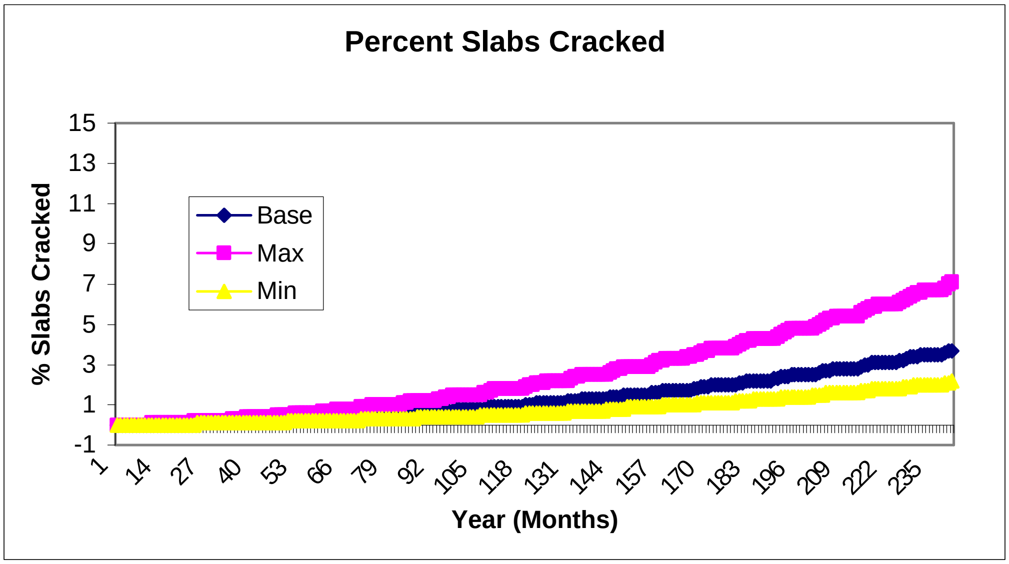


Figure D -343 0201 ThermalConductivity - CSM

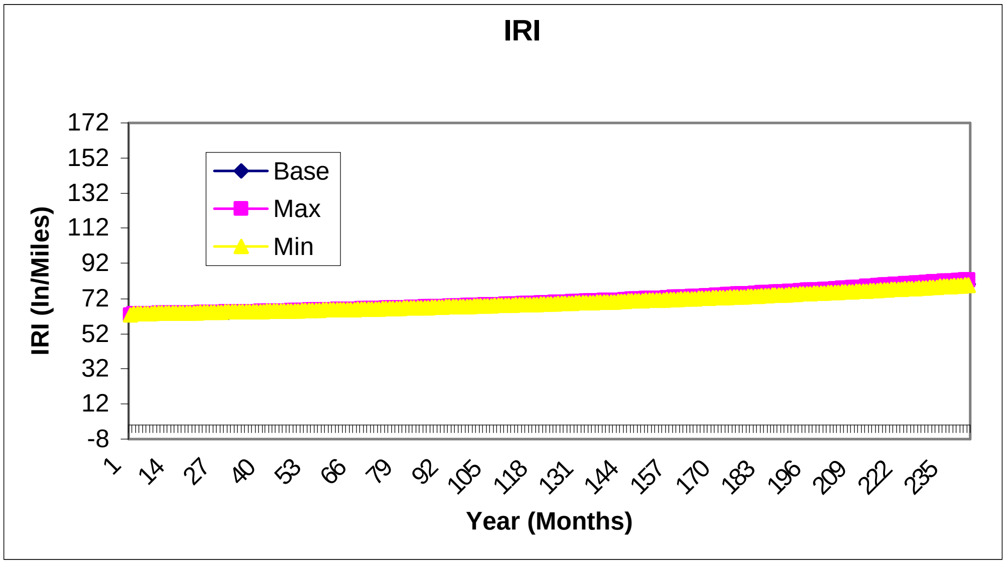


Figure D -344 0201 Granular Base Modulus

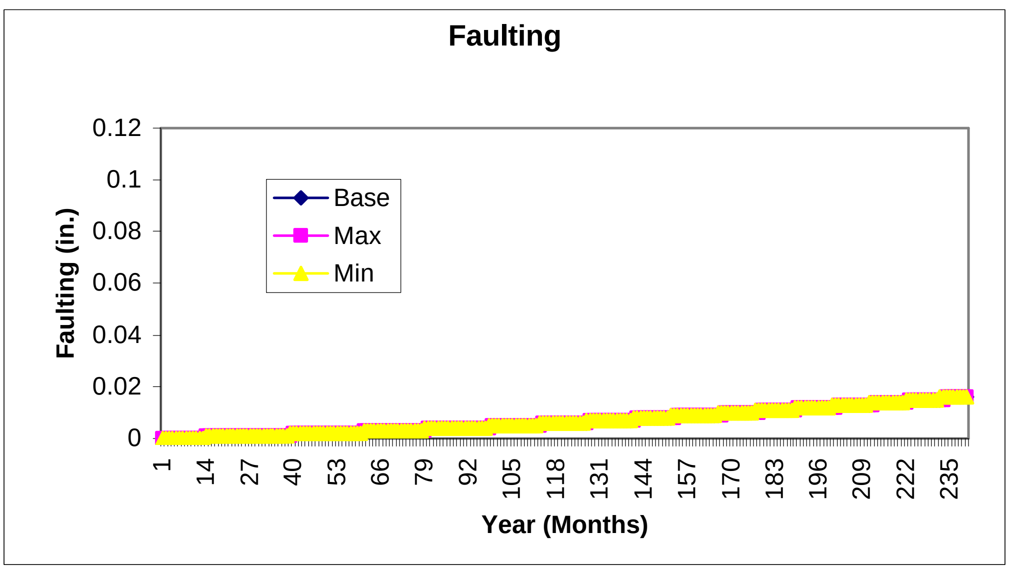


Figure D -345 0201 Granular Base Modulus

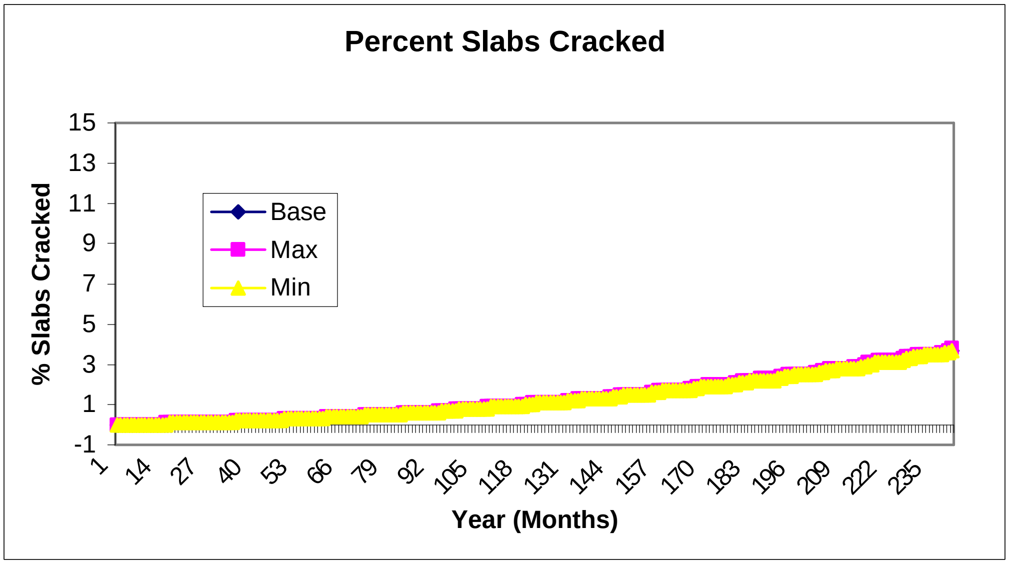


Figure D -346 0201 Granular Base Modulus

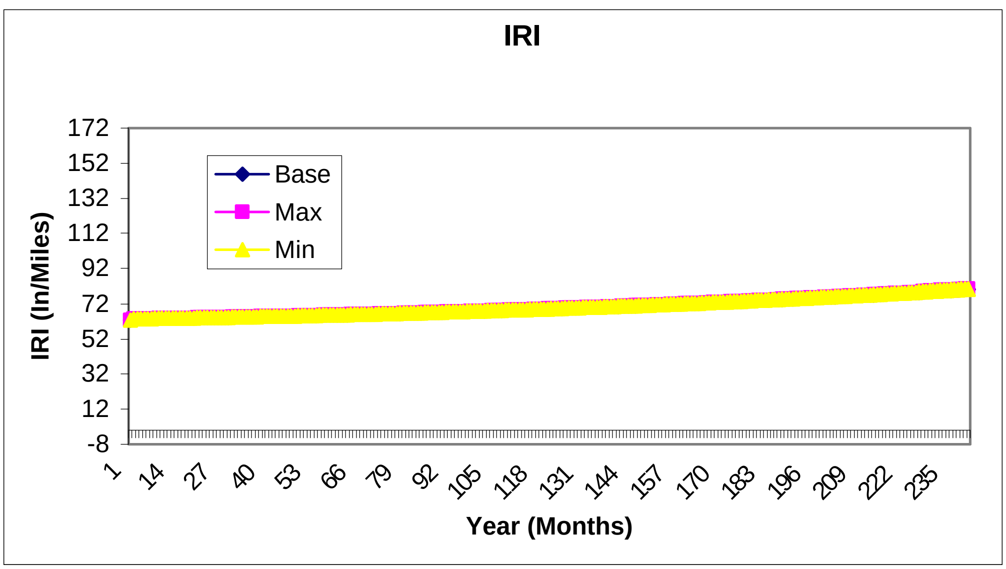


Figure D -347 0201 Subgrade Modulus

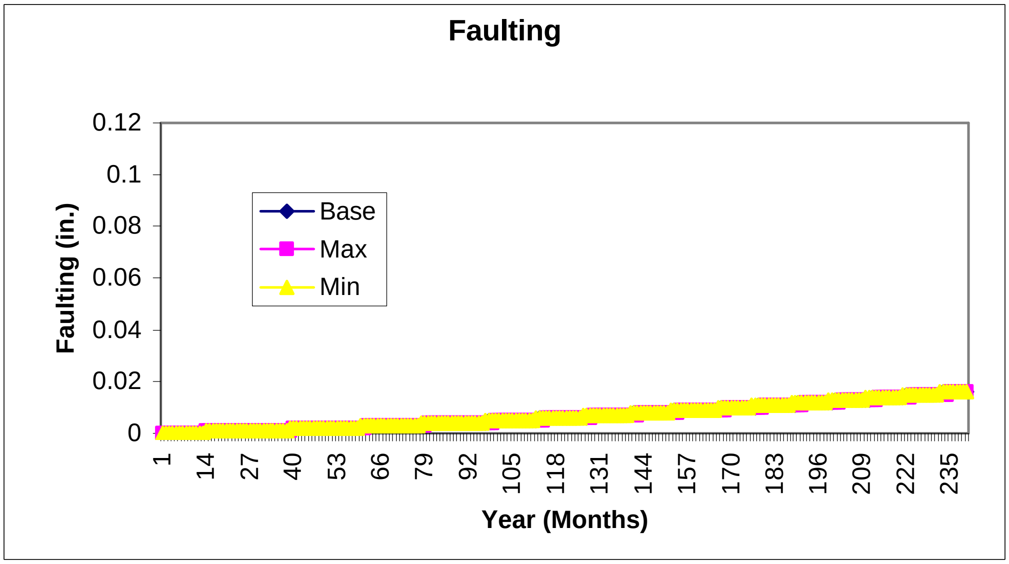


Figure D -348 0201 Subgrade Modulus

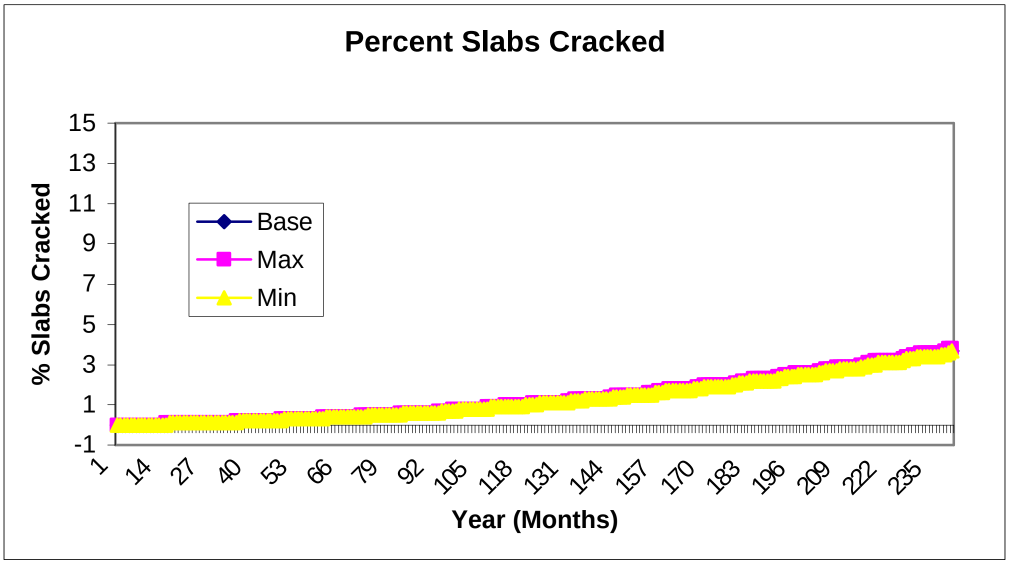


Figure D -349 0201 Subgrade Modulus

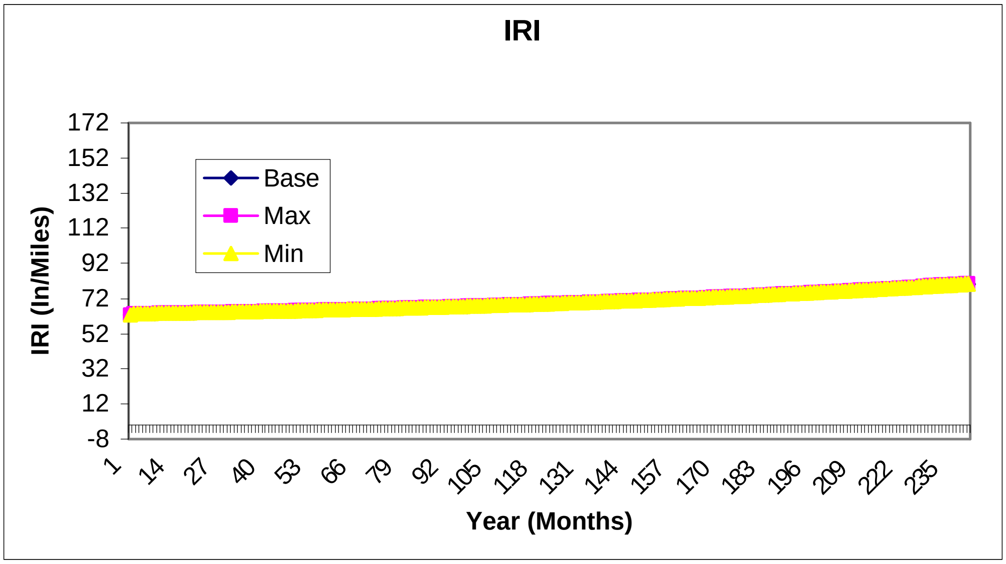


Figure D -350 0201 Surface Shortwave Absorptivity

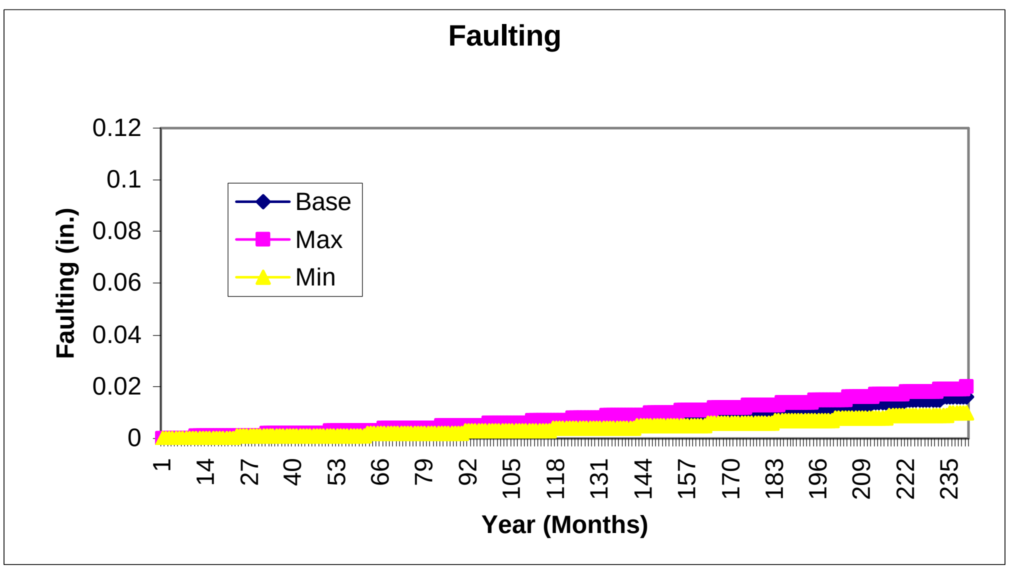


Figure D -351 0201 Surface Shortwave Absorptivity

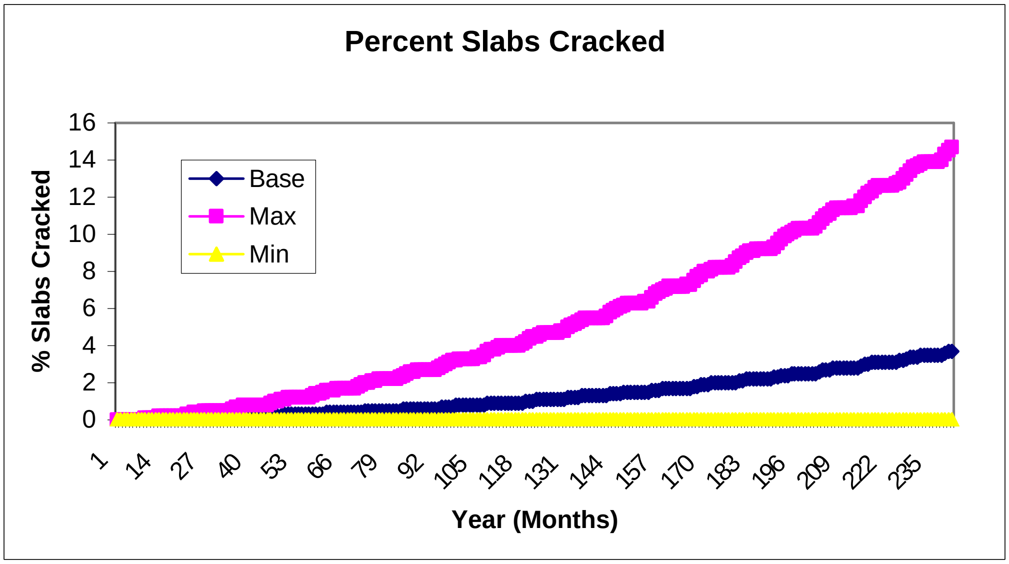


Figure D -352 0201 Surface Shortwave Absorptivity

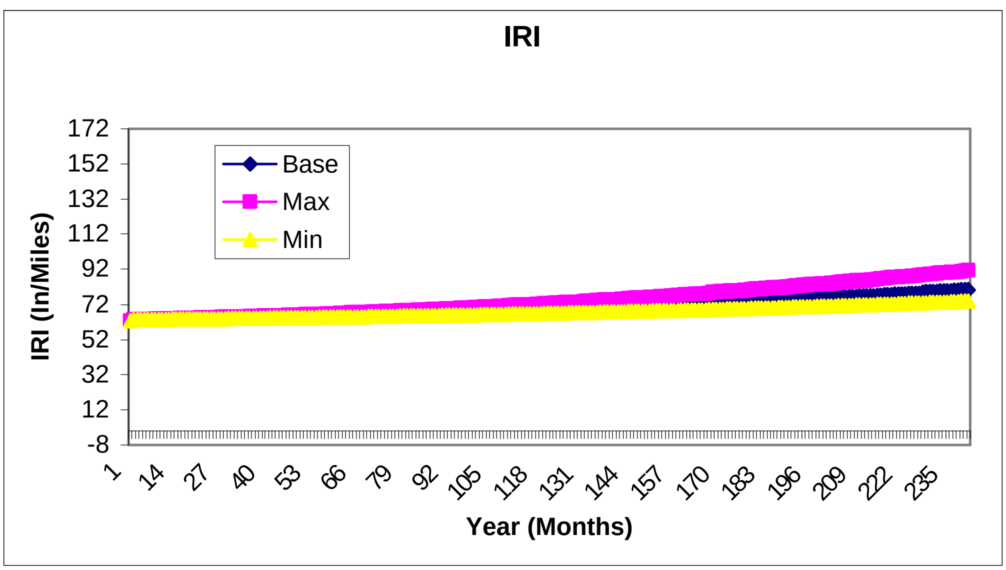


Figure D -353 0201 Load Transfer Efficiency

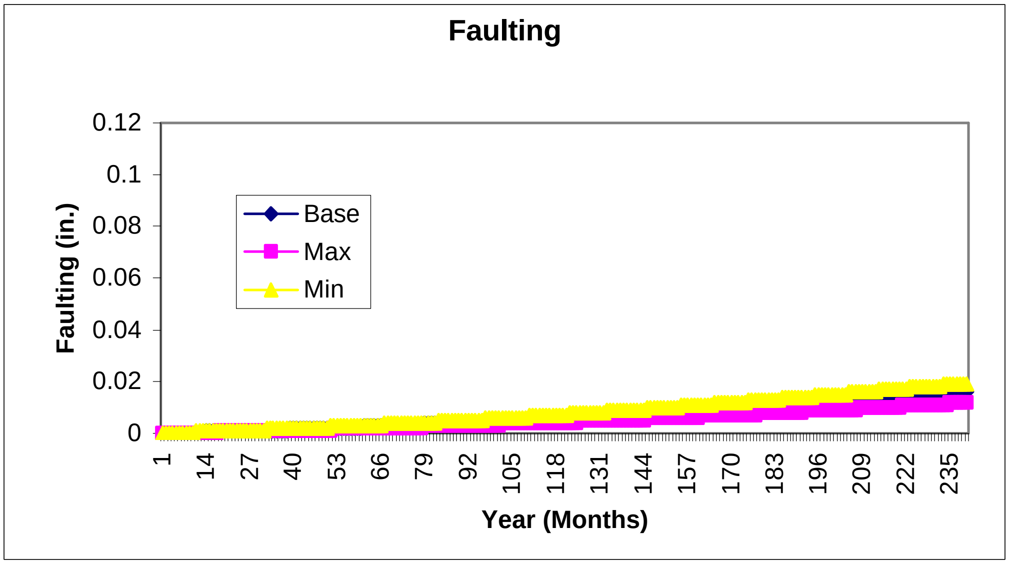


Figure D -354 0201 Load Transfer Efficiency

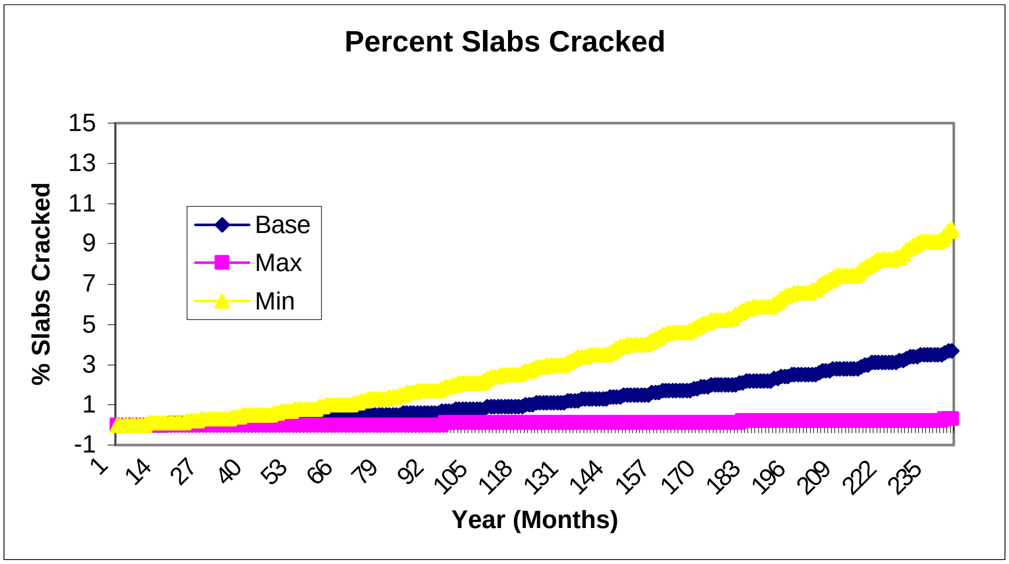


Figure D -355 0201 Load Transfer Efficiency

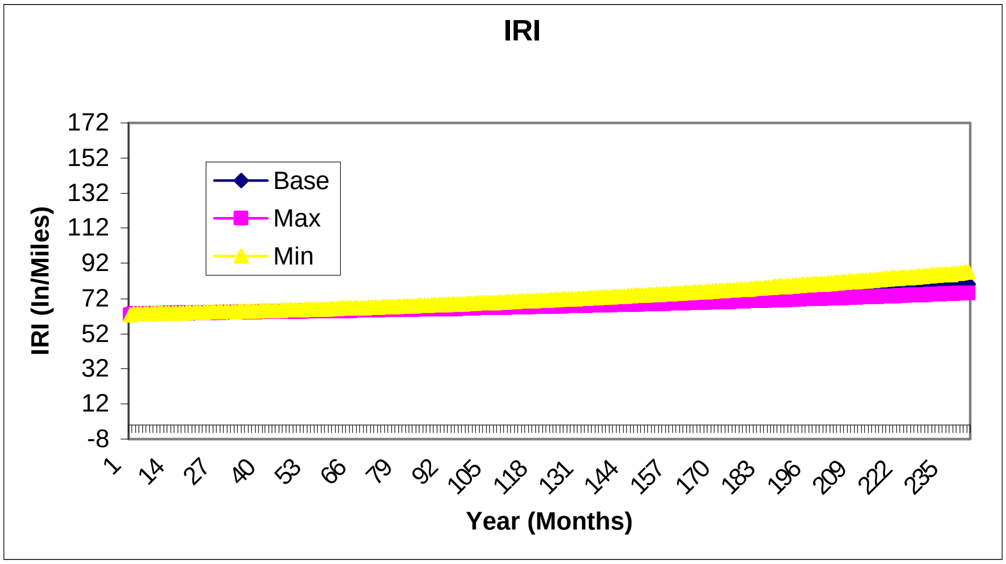


Figure D -356 0201 Joint Spacing

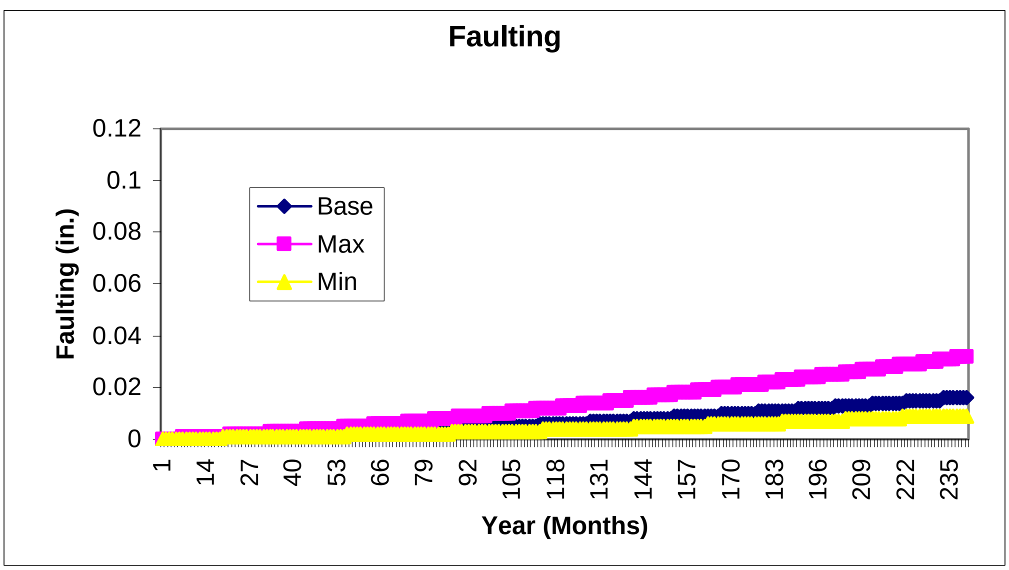


Figure D -357 0201 Joint Spacing

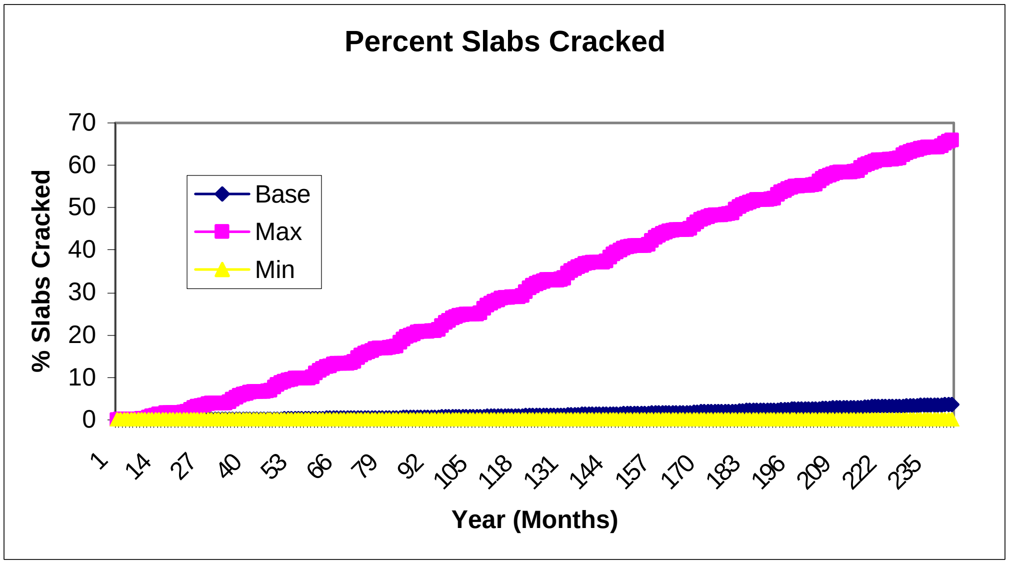


Figure D -358 0201 Joint Spacing

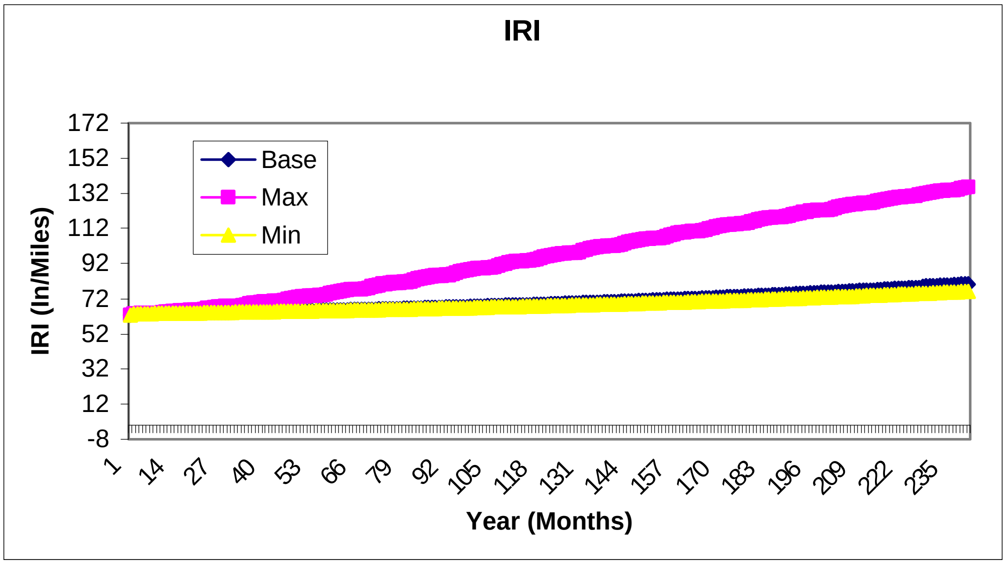


Figure D -359 0201 Dowell Diameter

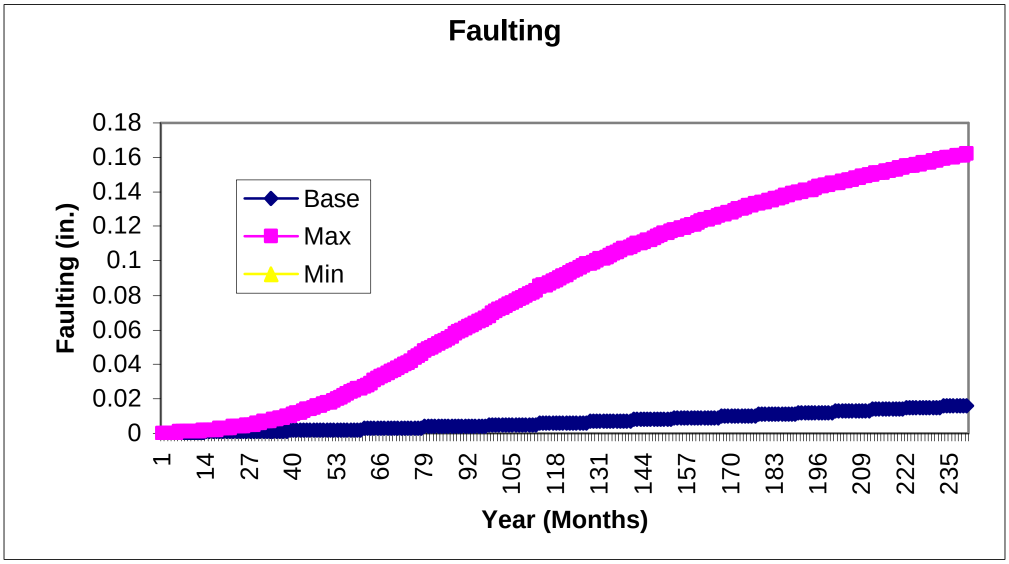


Figure D -360 0201 Dowell Diameter

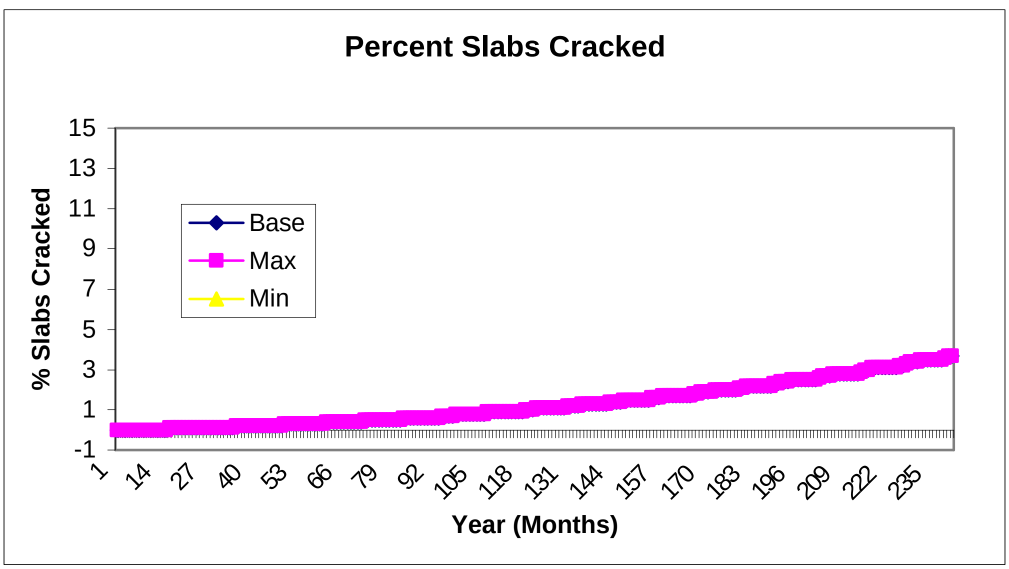


Figure D -361 0201 Dowell Diameter

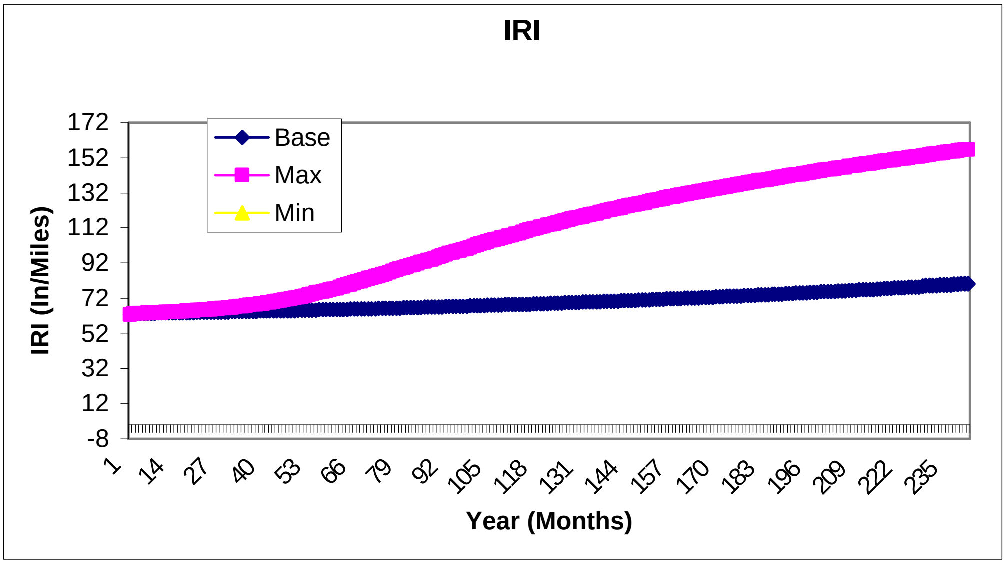


Figure D -362 0201 Base Vs Dec/Jan

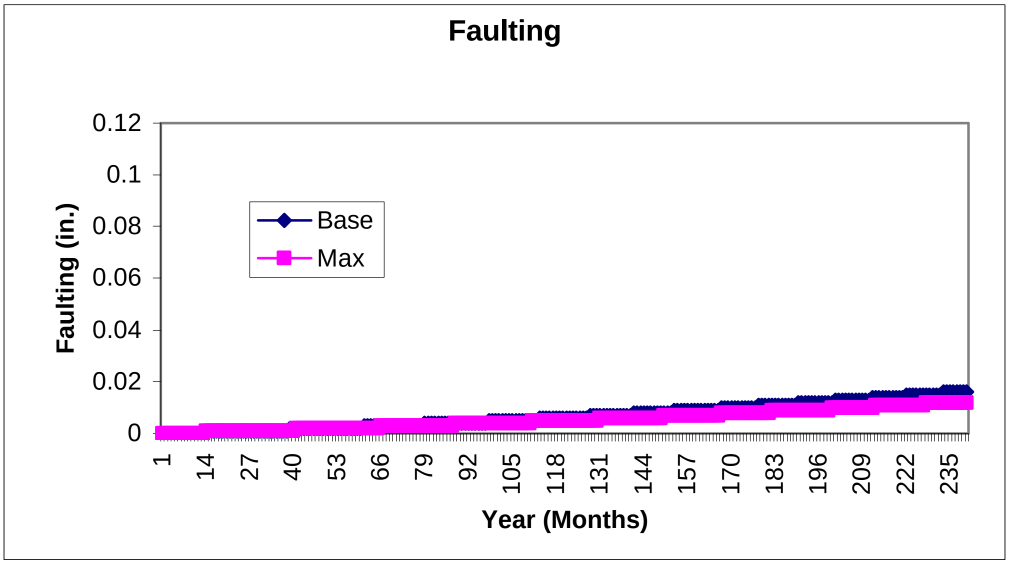


Figure D -363 0201 Base Vs Dec/Jan

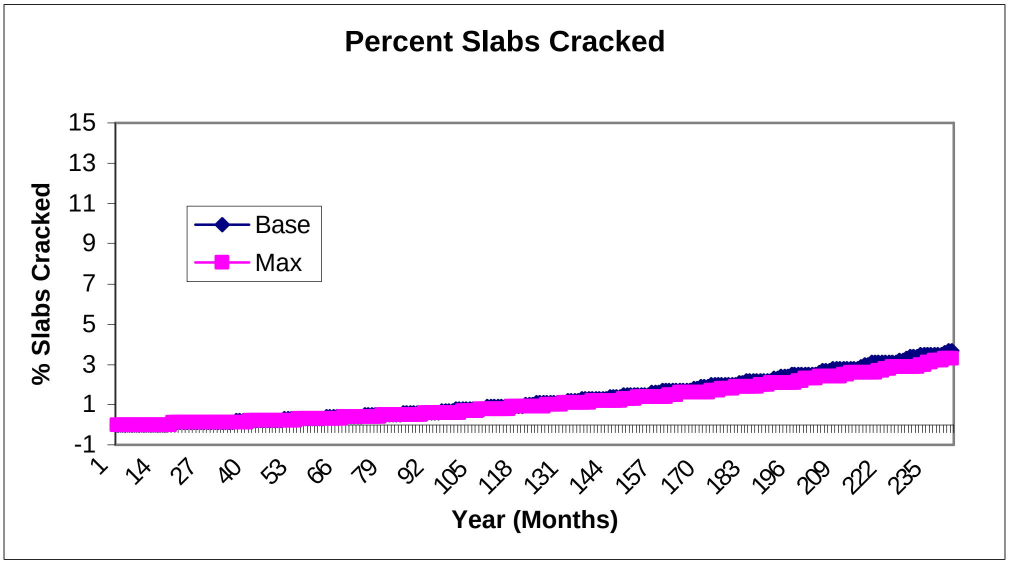


Figure D -364 0201 Base Vs Dec/Jan

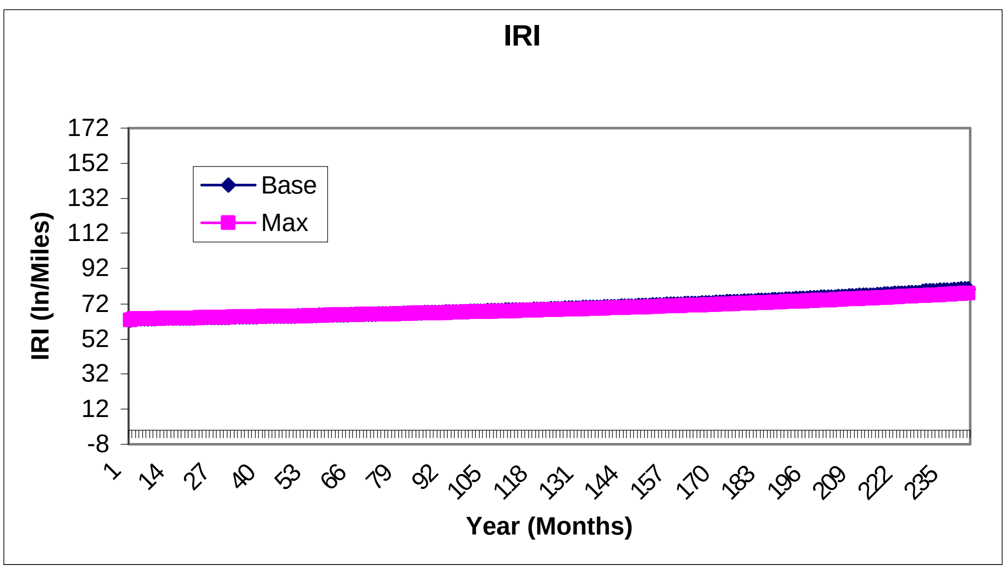


Figure D -365 0201 Base Vs Mar/Apr

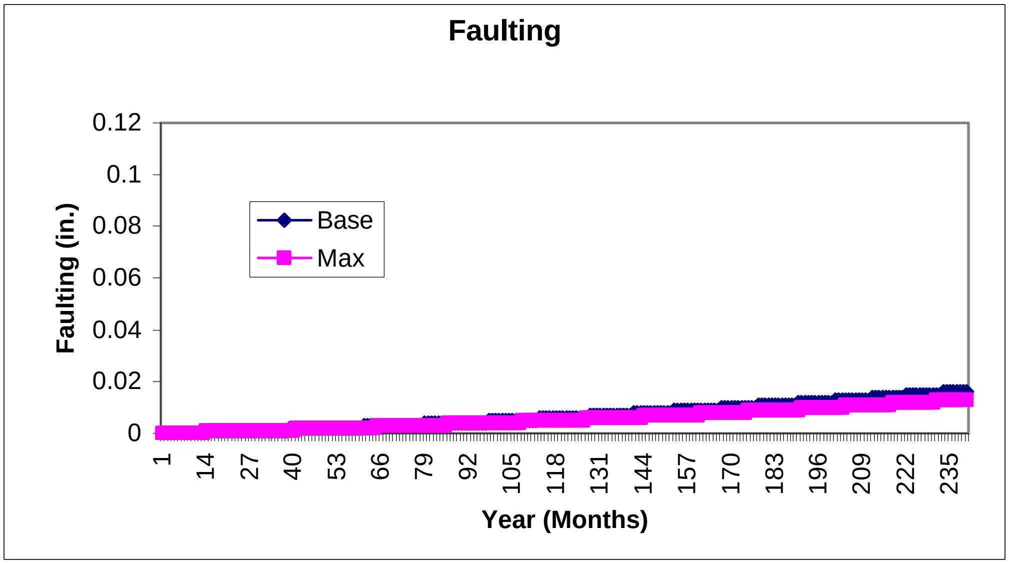


Figure D -366 0201 Base Vs Mar/Apr

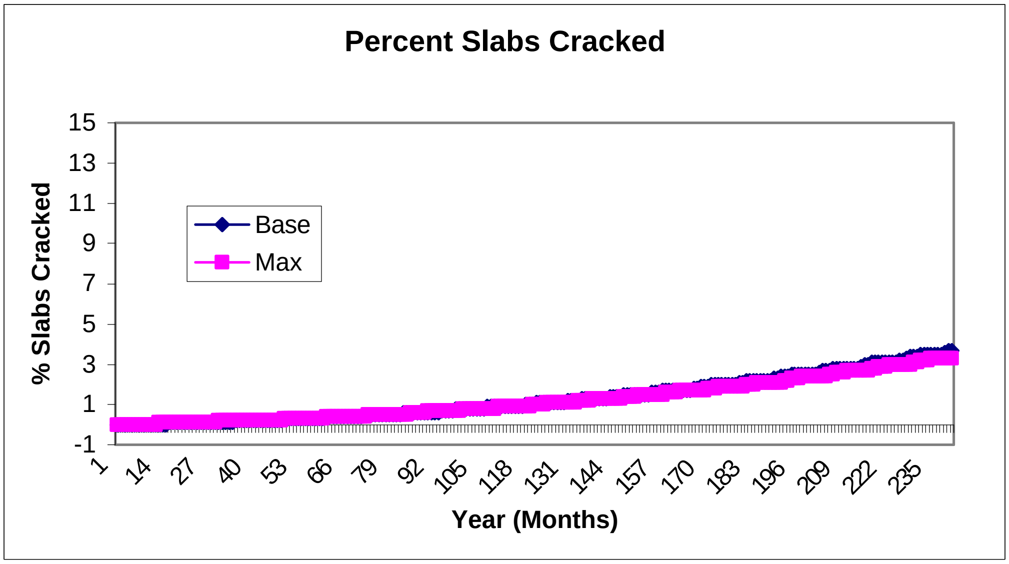


Figure D -367 0201 Base Vs Mar/Apr

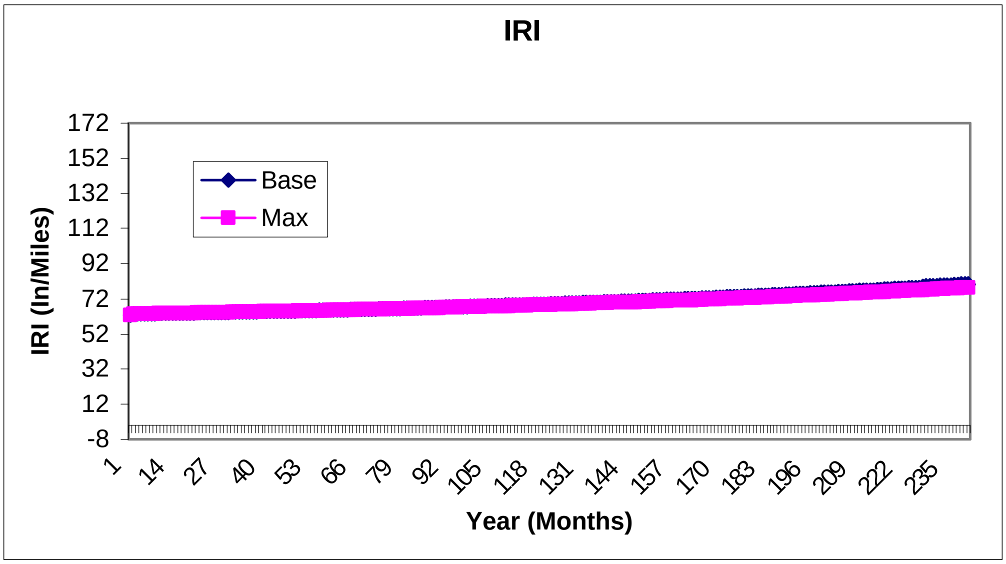


Figure D -368 0201 Base Vs Sep/Oct

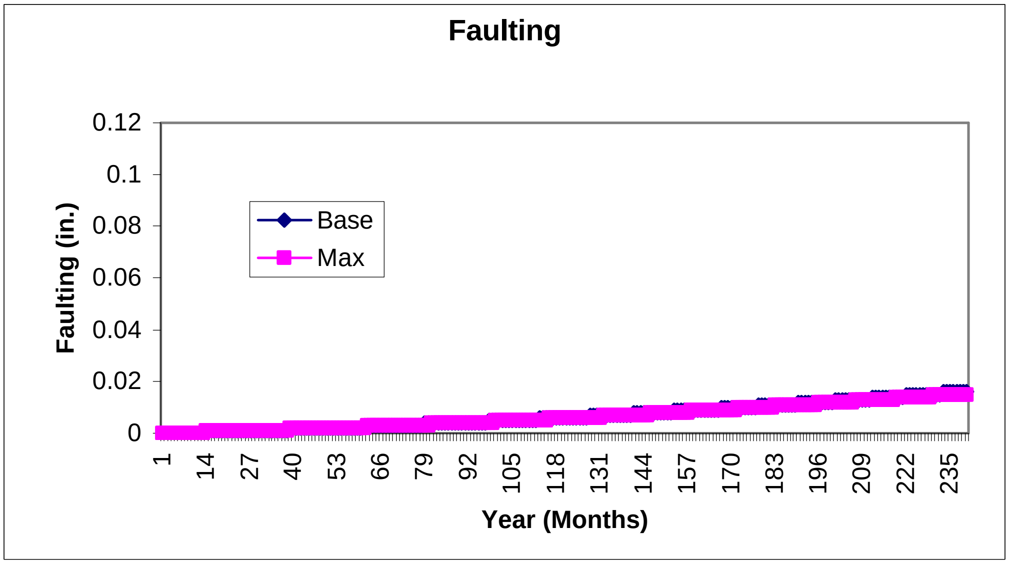


Figure D -369 0201 Base Vs Sep/Oct

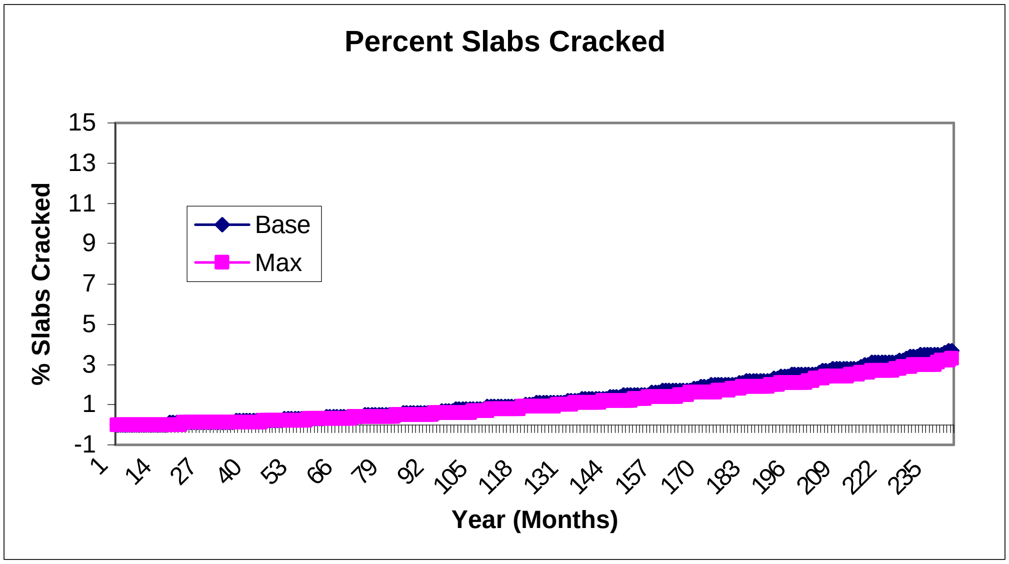


Figure D -370 0201 Base Vs Sep/Oct

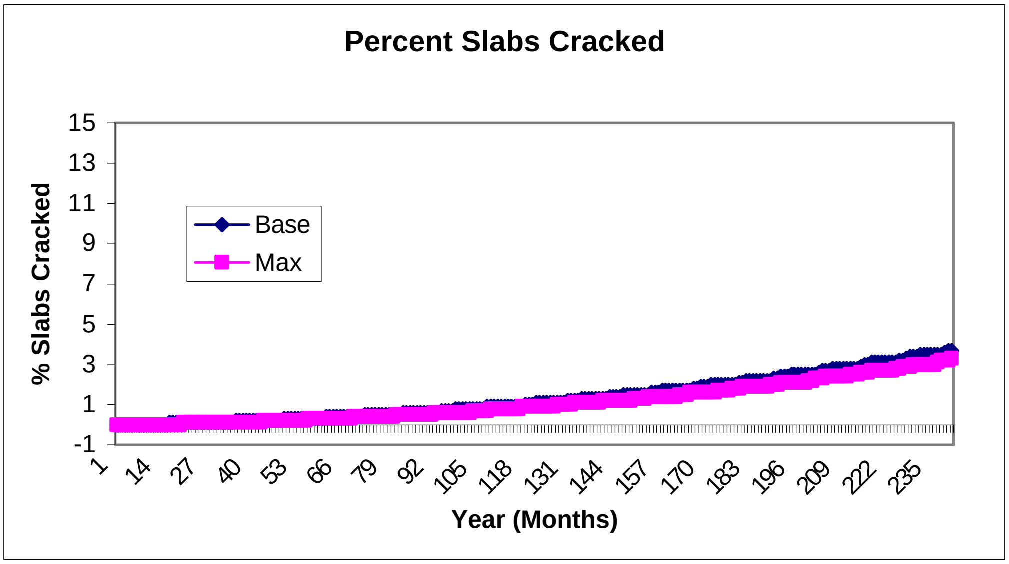


Figure D -371 0209 Coefficient of Thermal Expansion - JPCP

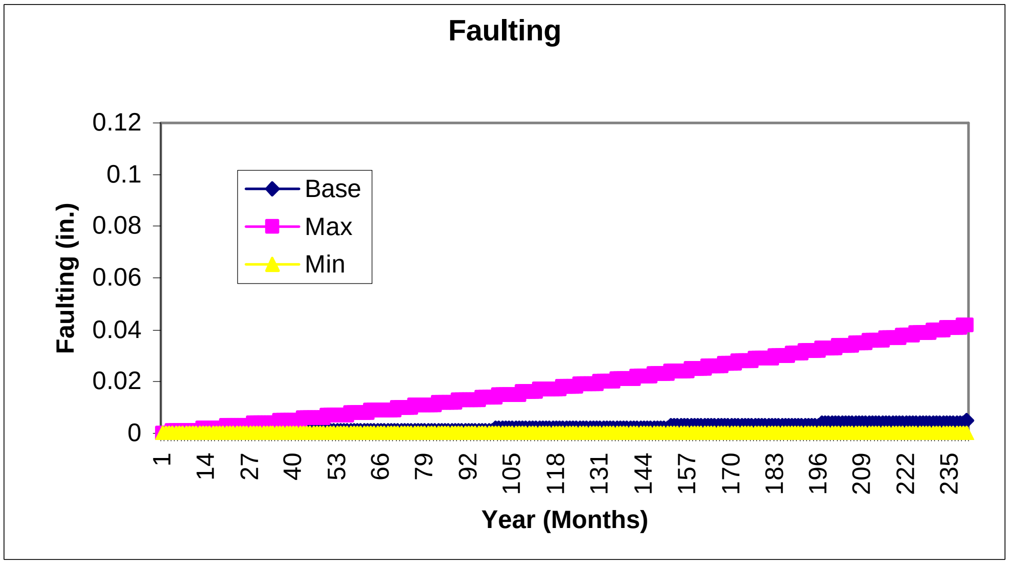


Figure D -372 0209 Coefficient of Thermal Expansion - JPCP

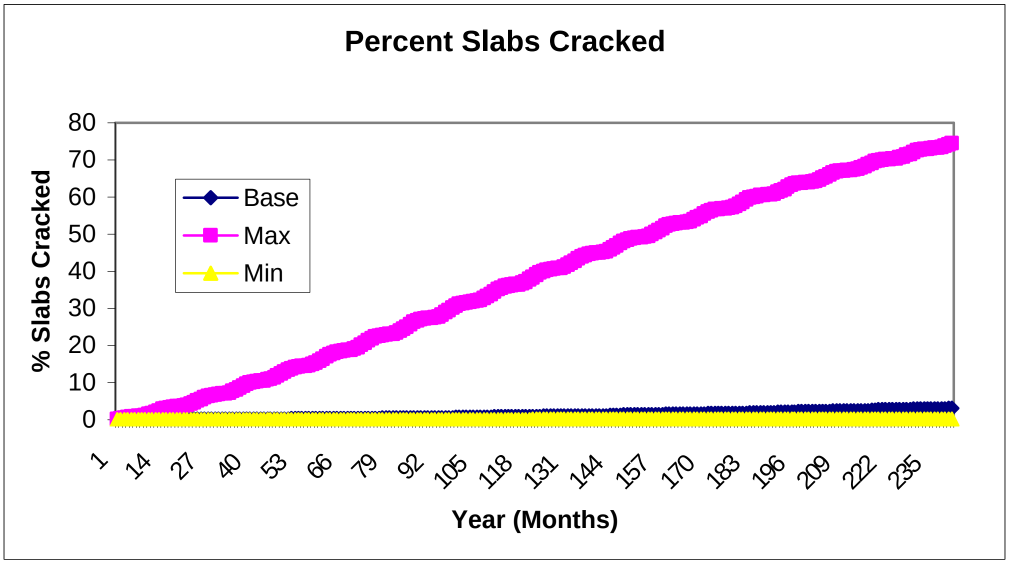


Figure D -373 0209 Coefficient of Thermal Expansion - JPCP

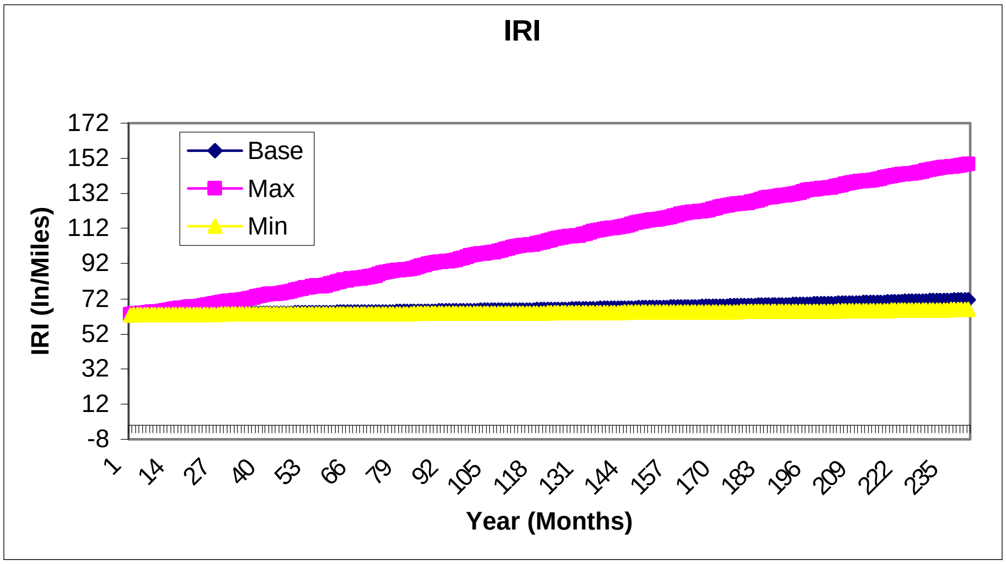


Figure D -374 0209 Heat Capacity - JPCP

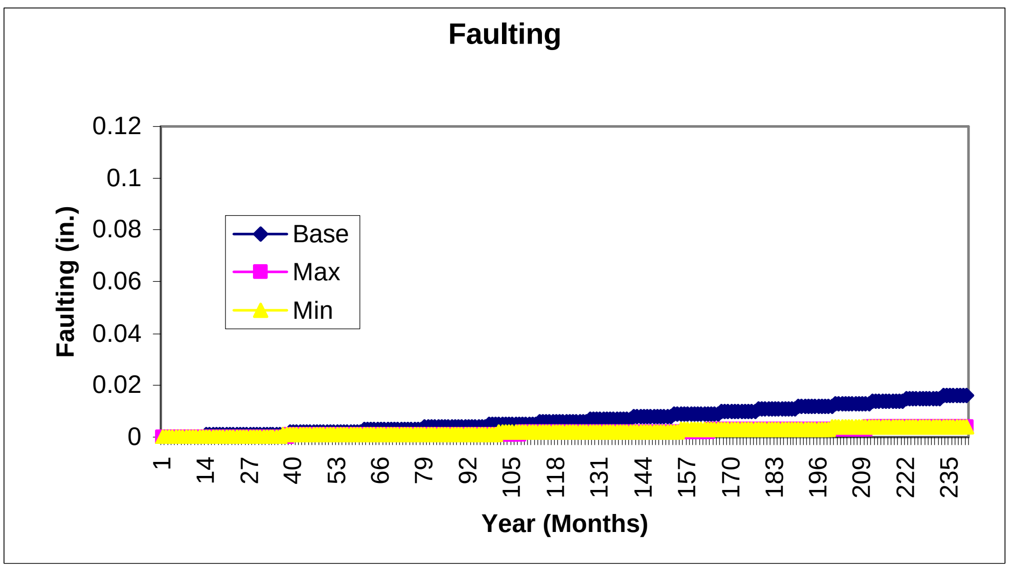


Figure D -375 0209 Heat Capacity - JPCP

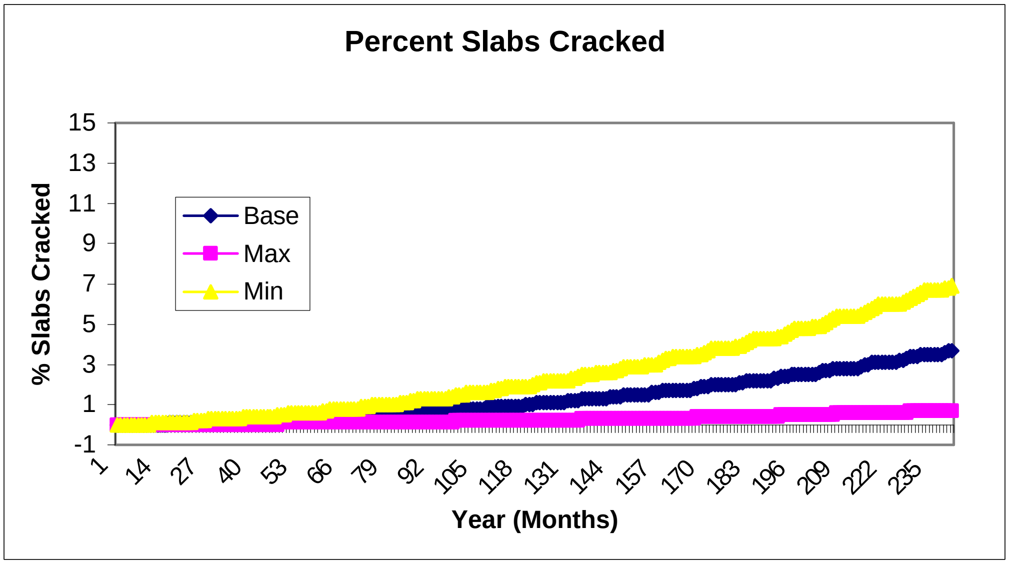


Figure D -376 0209 Heat Capacity - JPCP

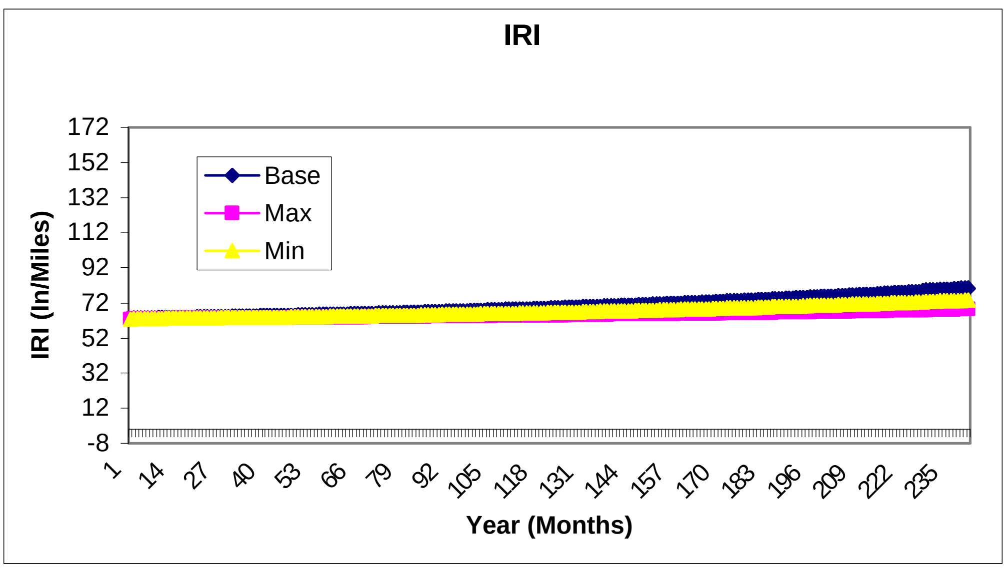


Figure D -377 0209 ThermalConductivity - JPCP

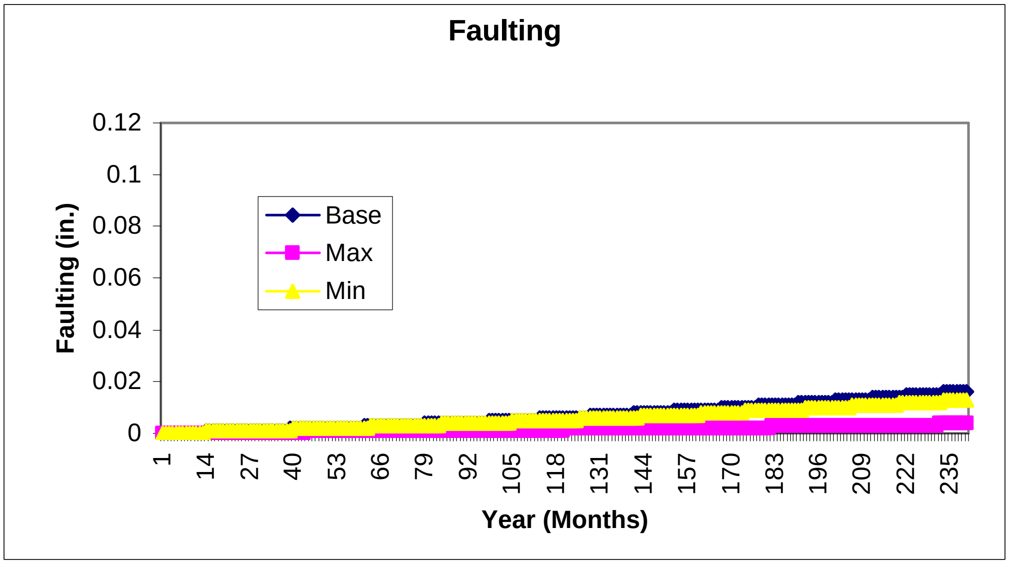


Figure D -378 0209 ThermalConductivity - JPCP

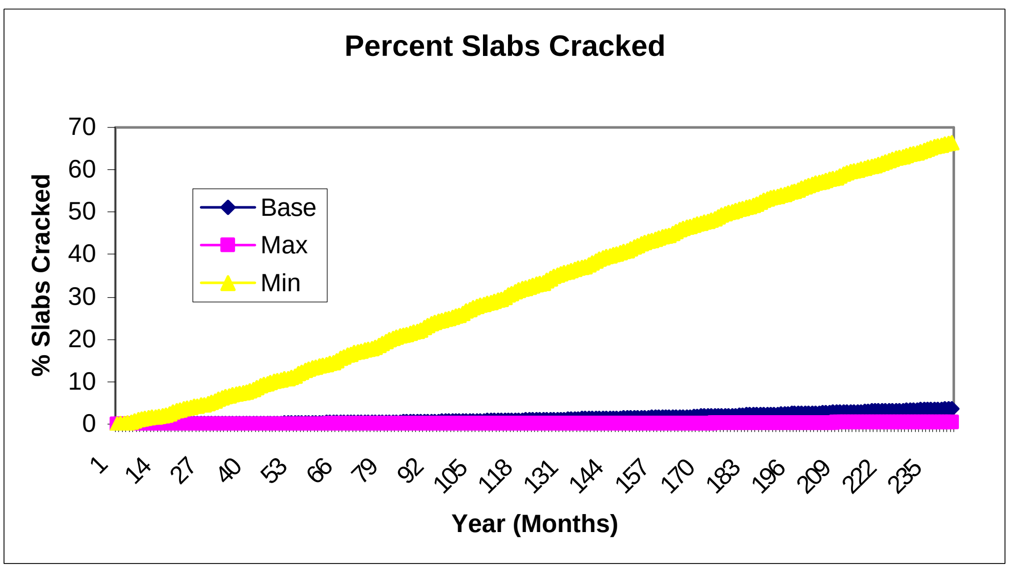


Figure D -379 0209 ThermalConductivity - JPCP

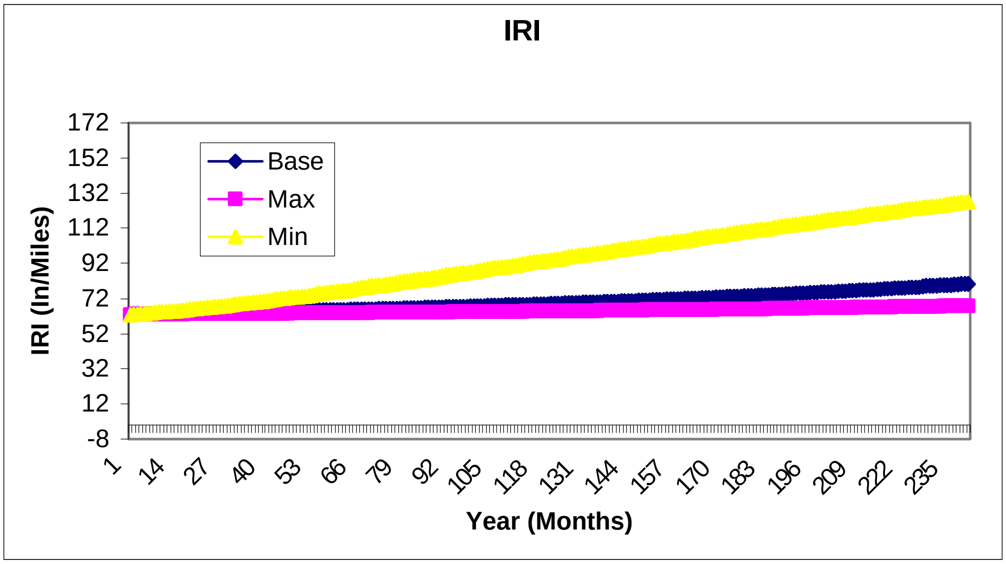


Figure D -380 0209 HeatCapacity - CSM

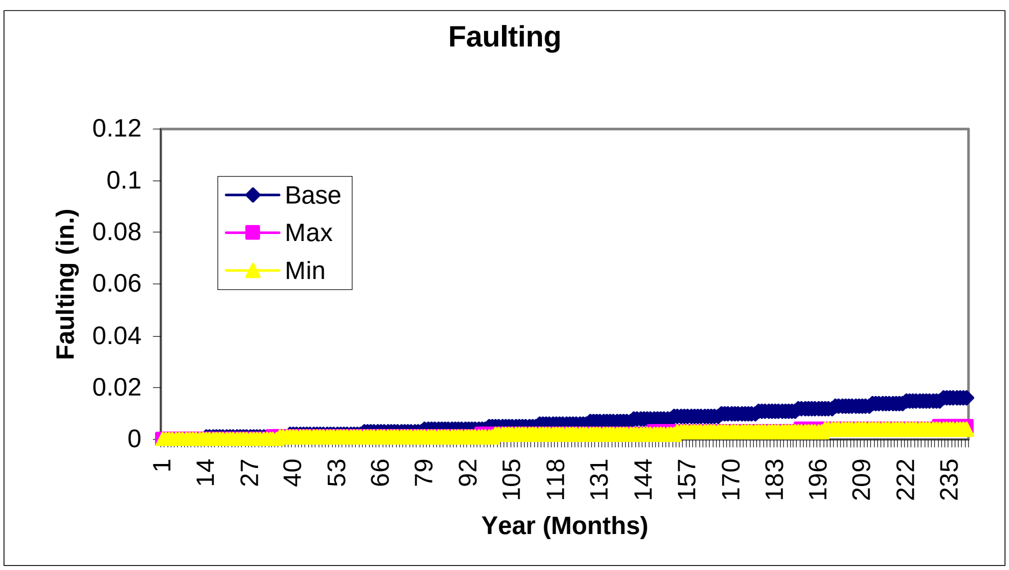


Figure D -381 0209 HeatCapacity - CSM

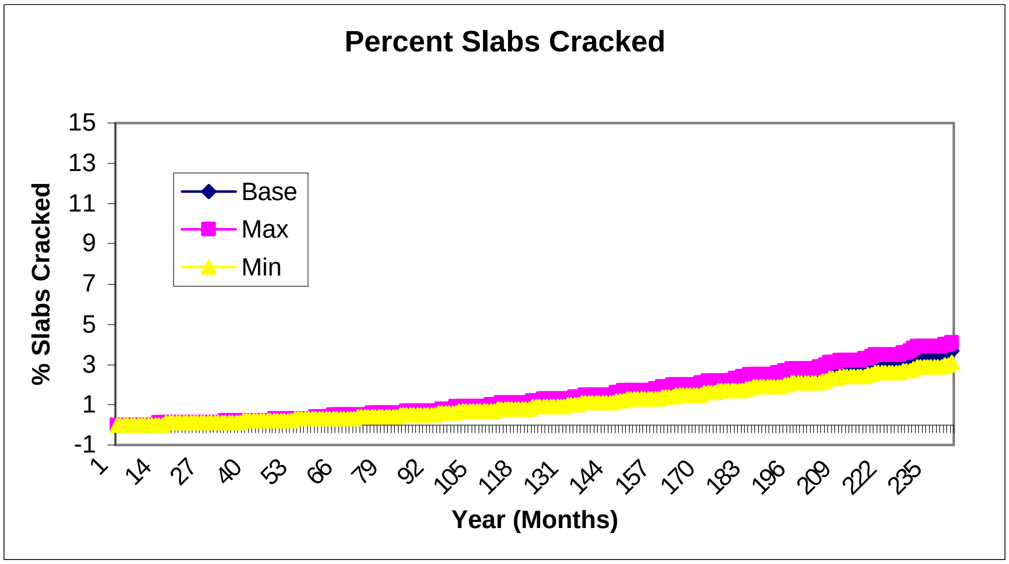


Figure D -382 0209 HeatCapacity - CSM

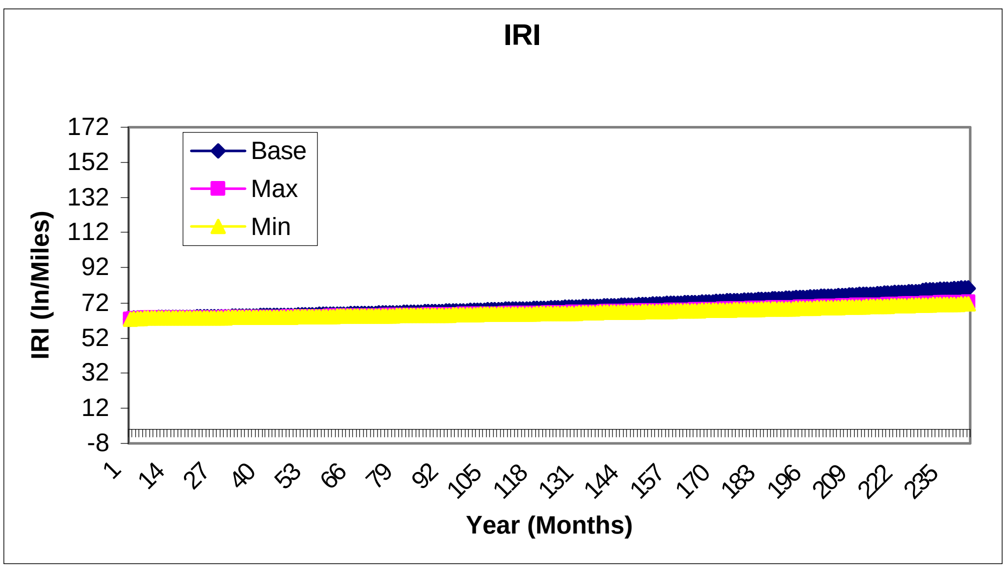


Figure D -383 0209 ThermalConductivity - CSM

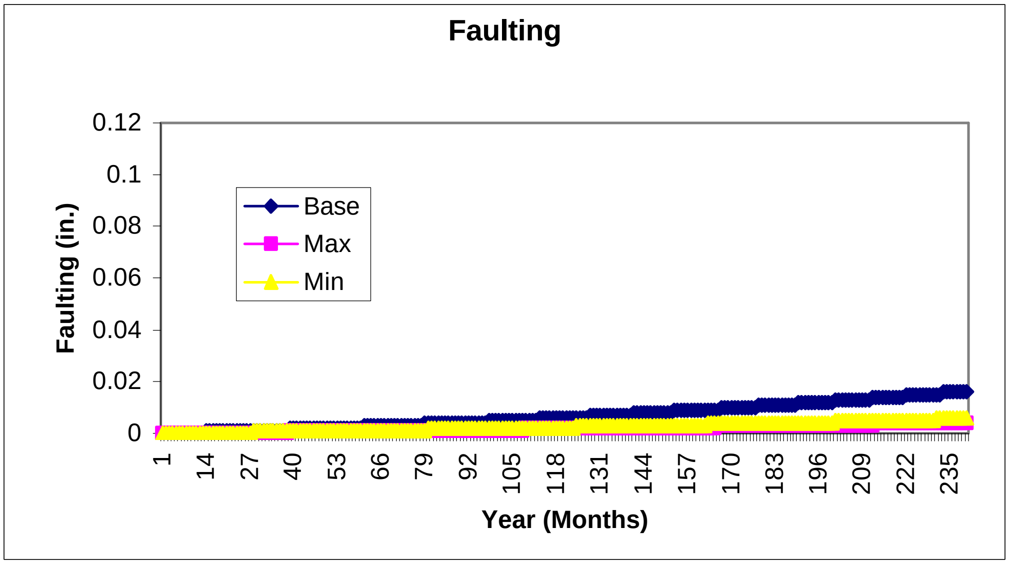


Figure D -384 0209 ThermalConductivity - CSM

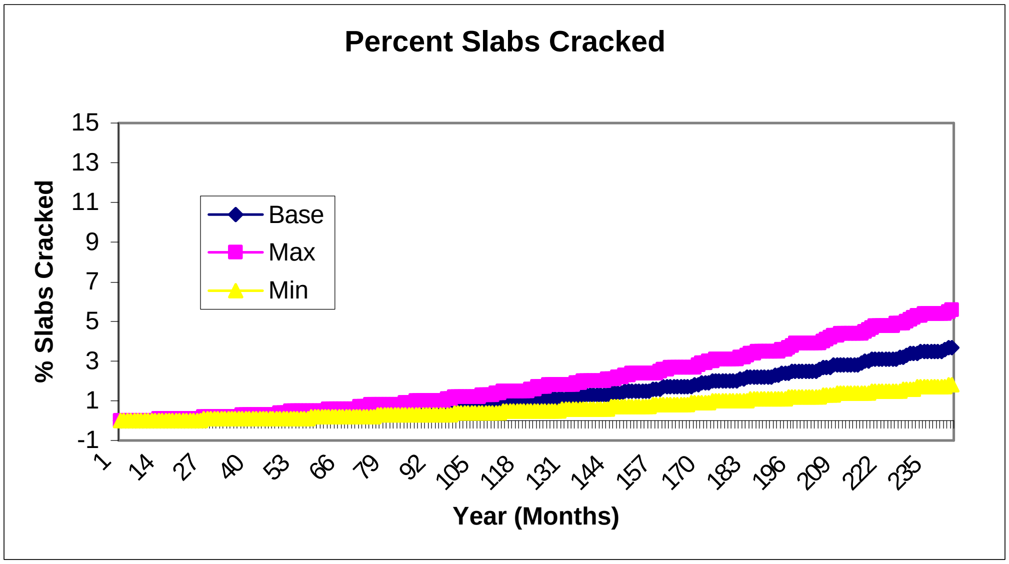


Figure D -385 0209 ThermalConductivity - CSM

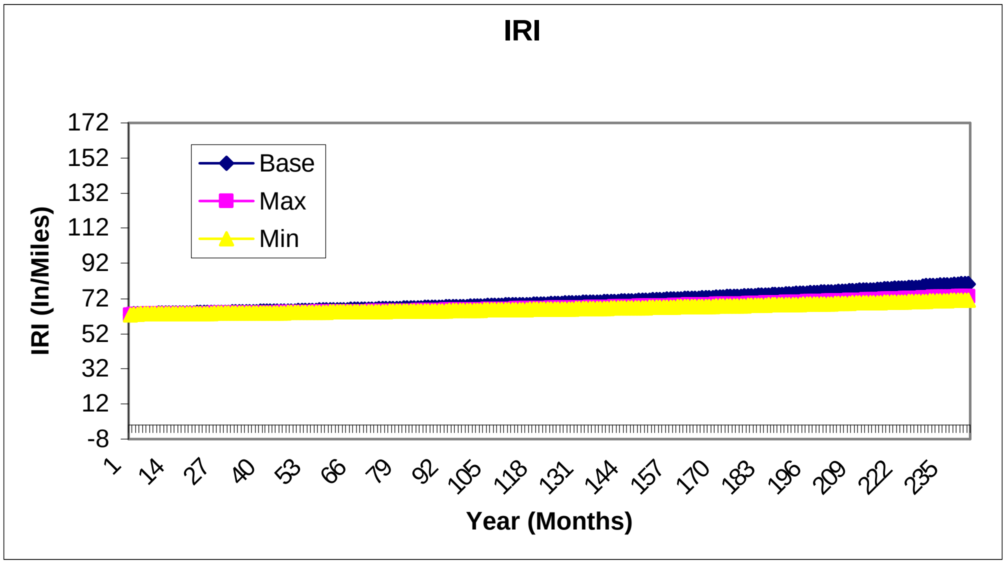


Figure D -386 0209 Airvoids - ATB

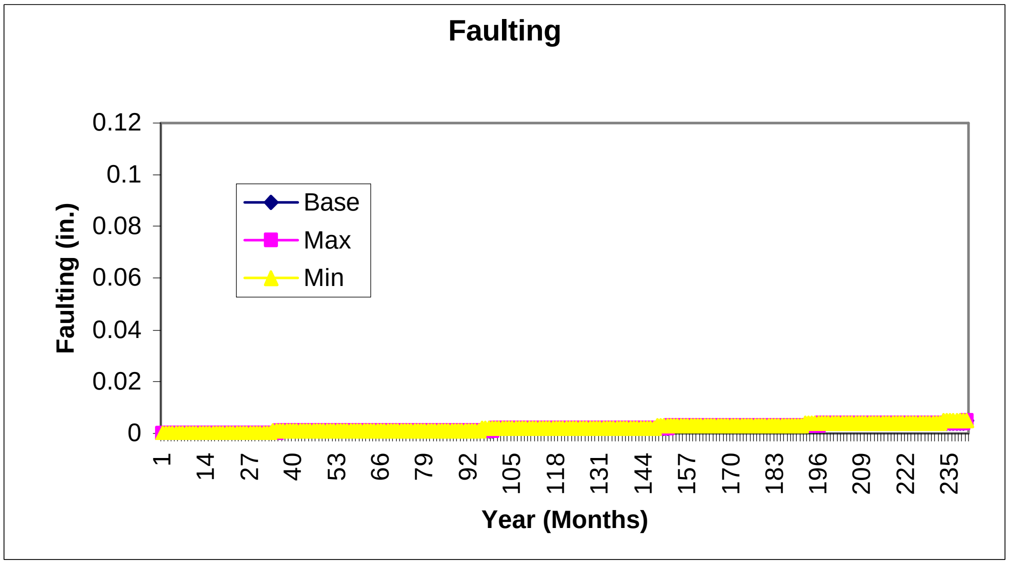


Figure D -387 0209 Airvoids - ATB

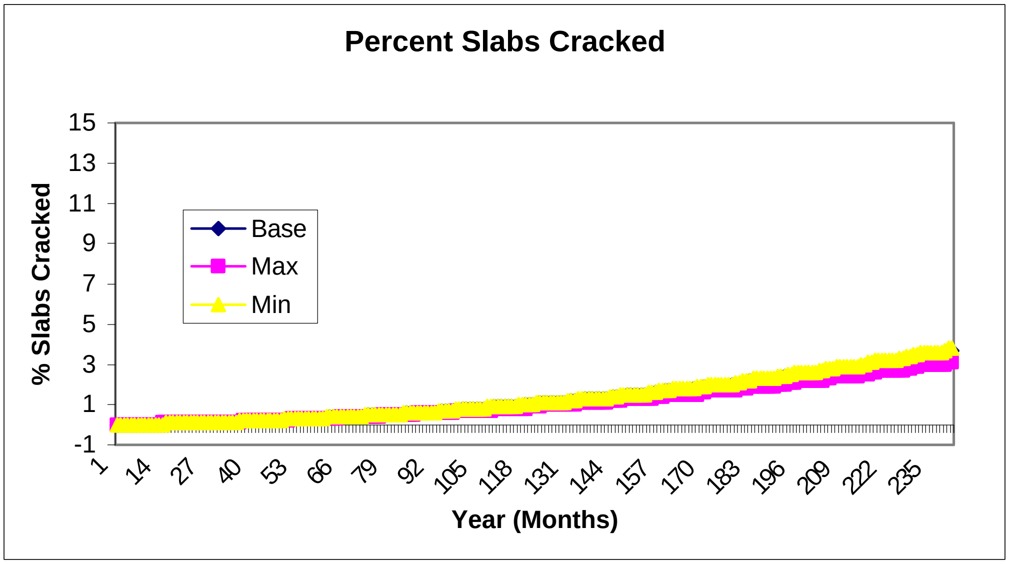


Figure D -388 0209 Airvoids - ATC

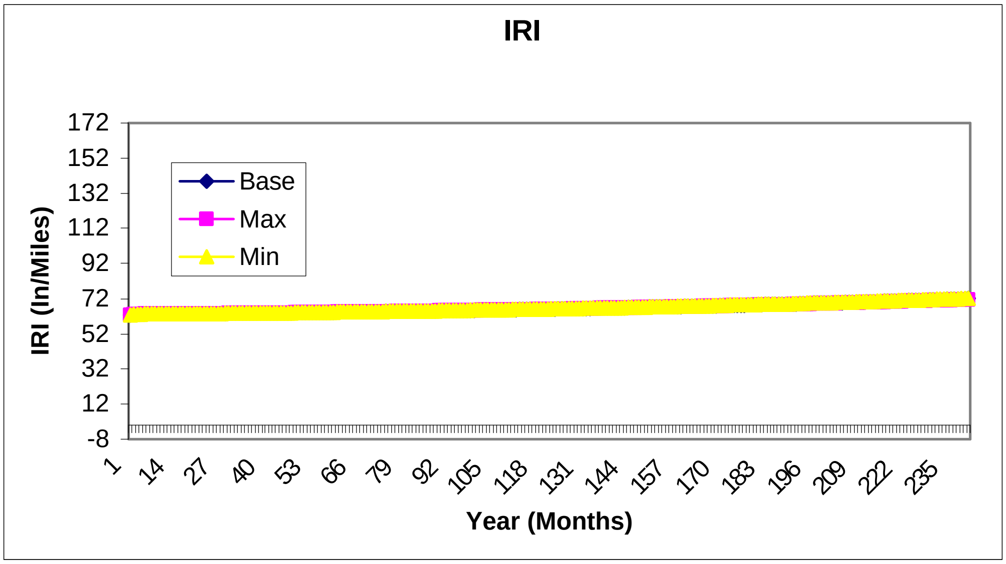


Figure D -389 0209 HeatCapacity - ATB

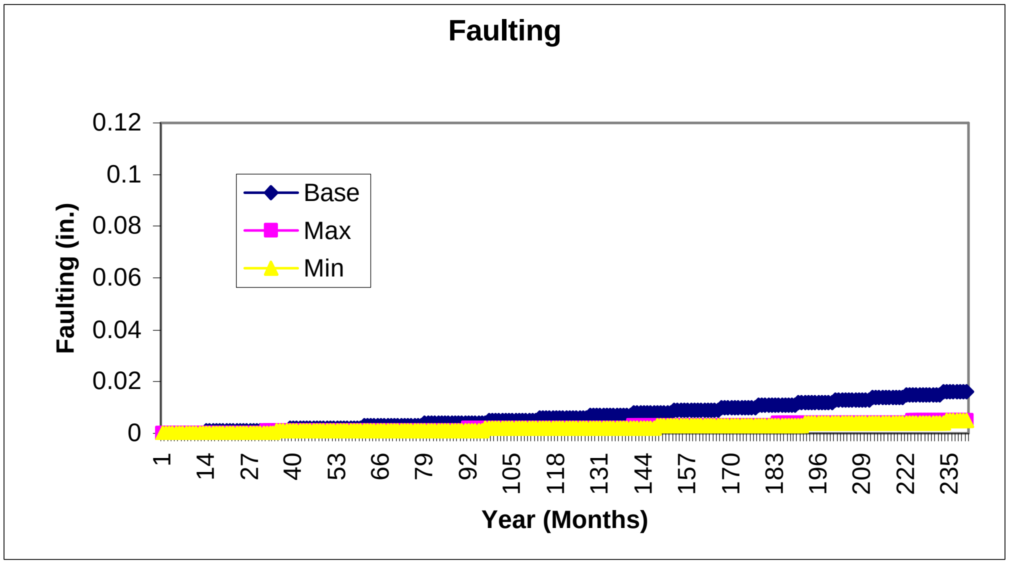


Figure D -390 0209 HeatCapacity - ATB

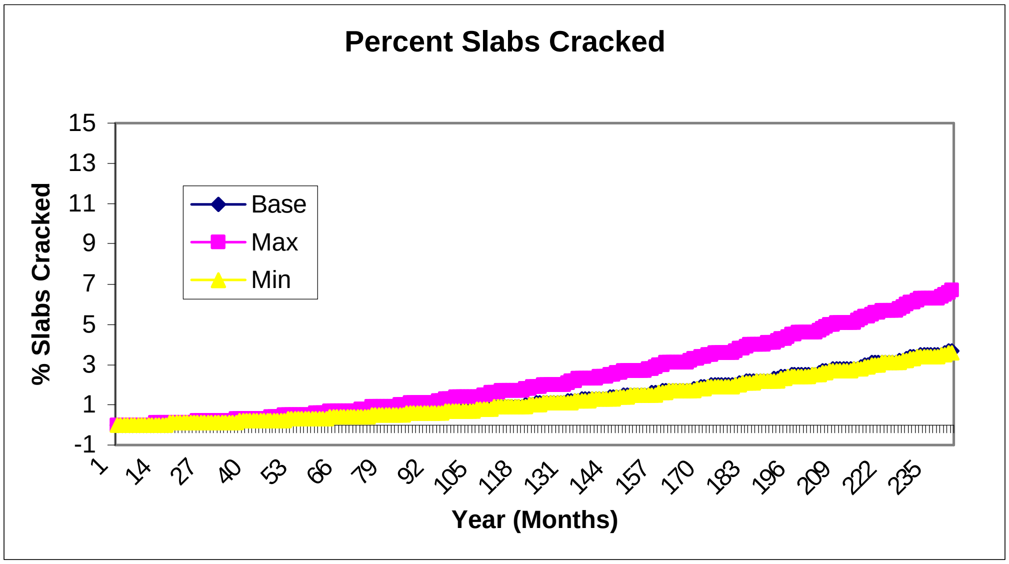


Figure D -391 0209 HeatCapacity - ATB

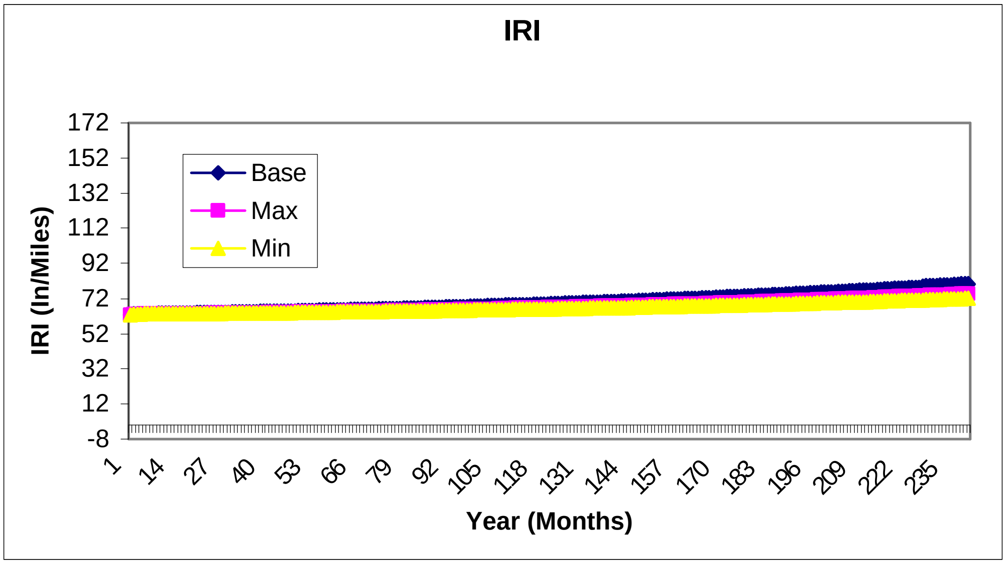


Figure D -392 0209 ThermalConductivity - ATB

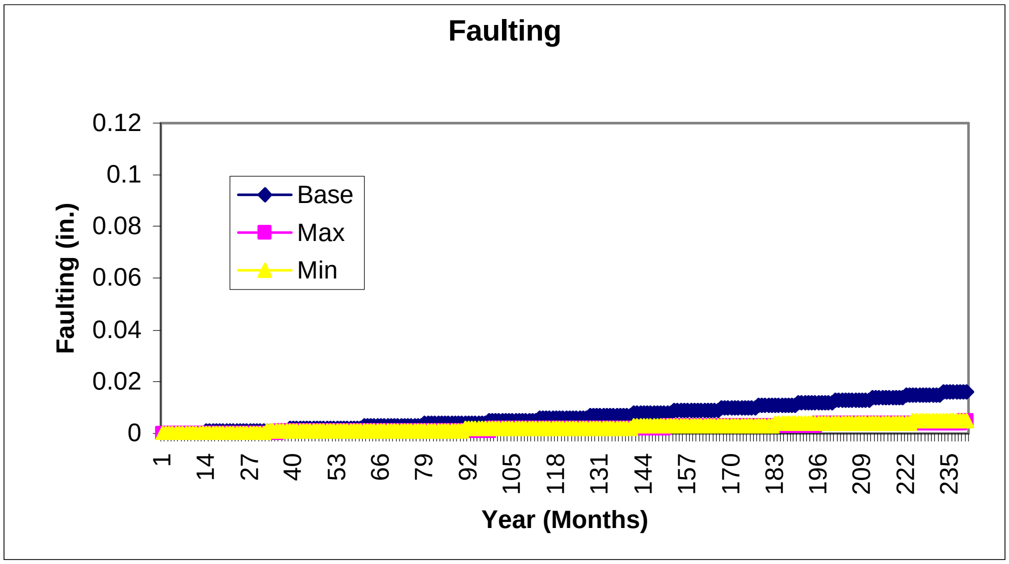


Figure D -393 0209 ThermalConductivity - ATB

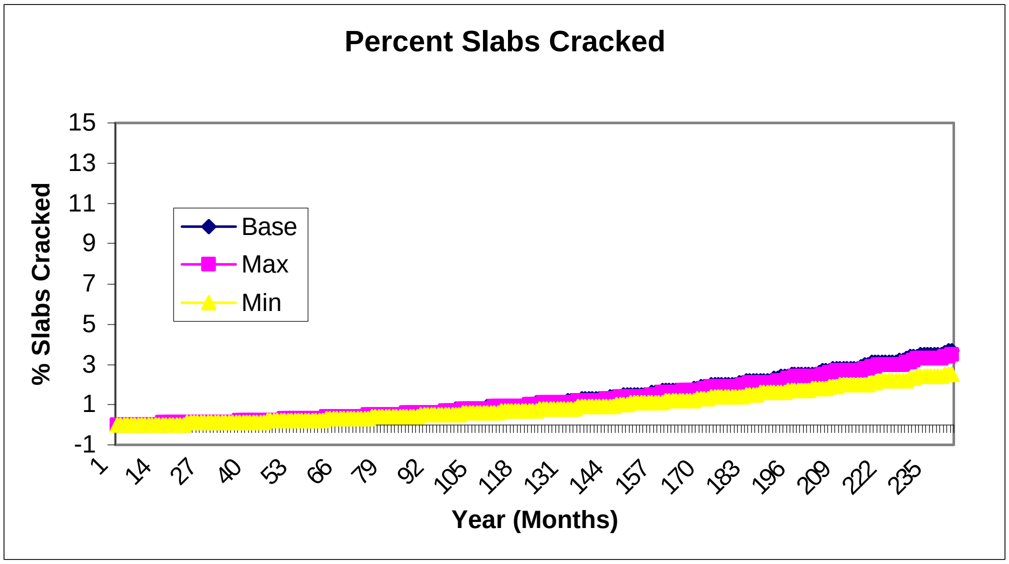


Figure D -394 0209 ThermalConductivity - ATB

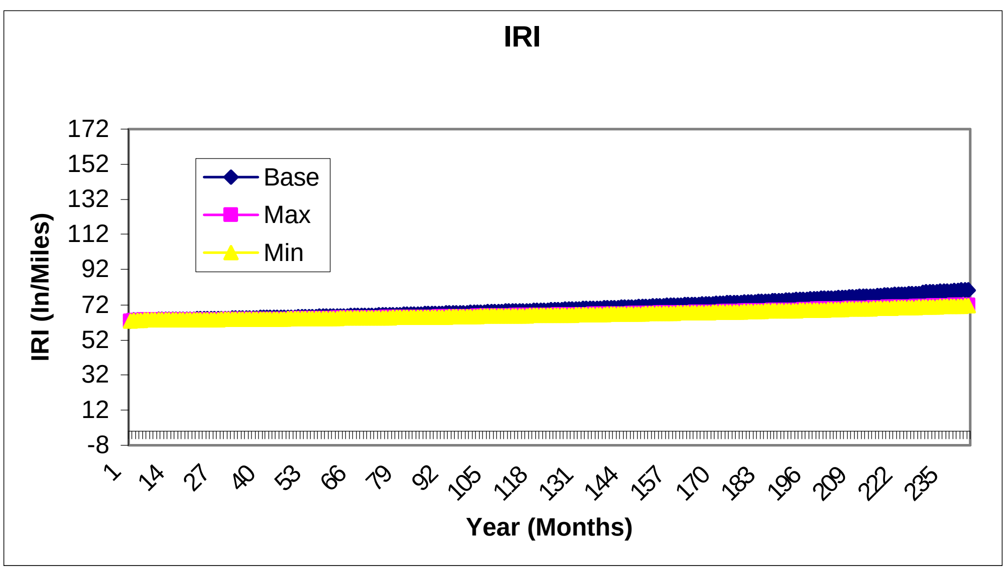


Figure D -395 0209 Granular Base Modulus

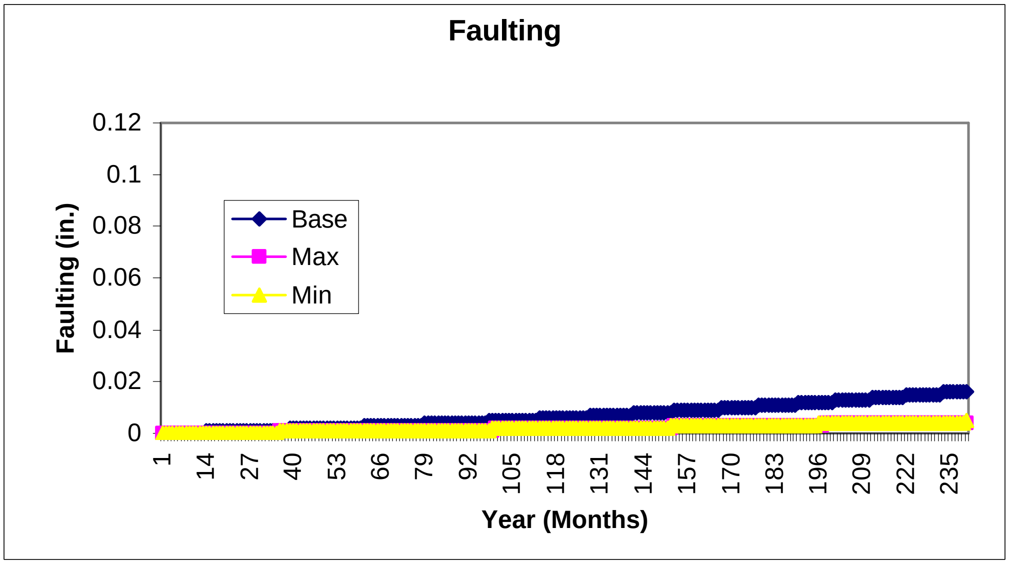


Figure D -396 0209 Granular Base Modulus

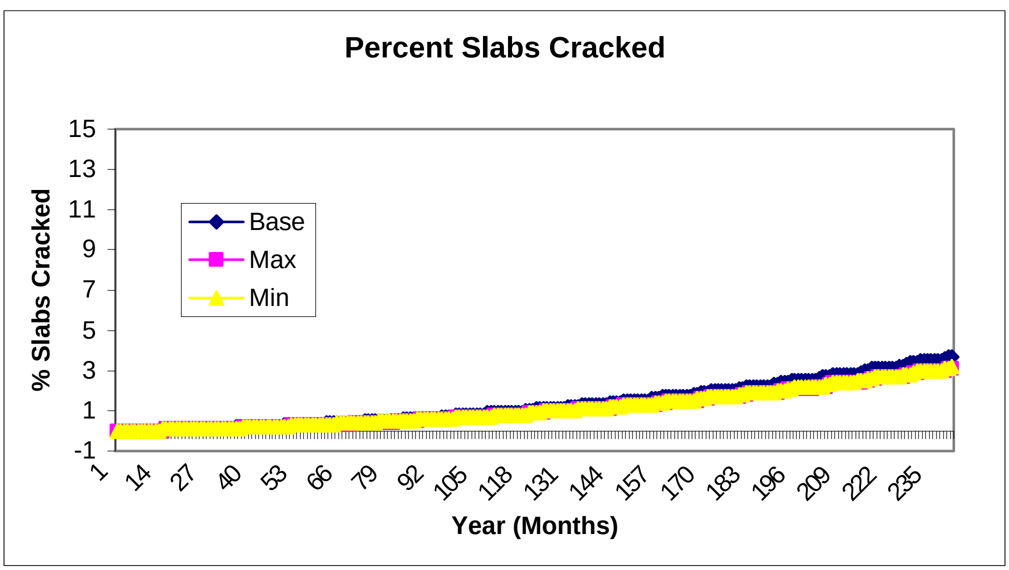


Figure D -397 0209 Granular Base Modulus

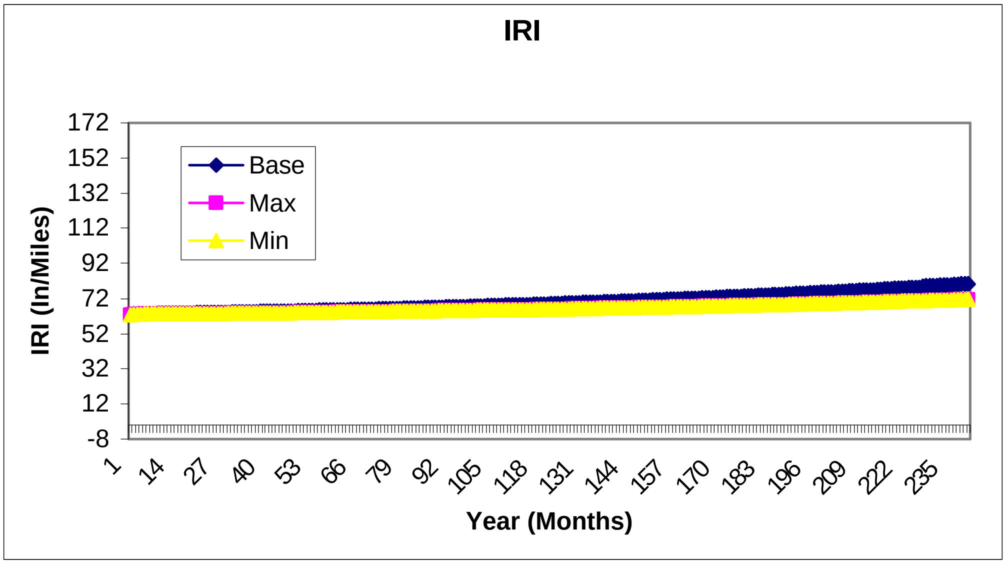


Figure D -398 0209 Subgrade Modulus

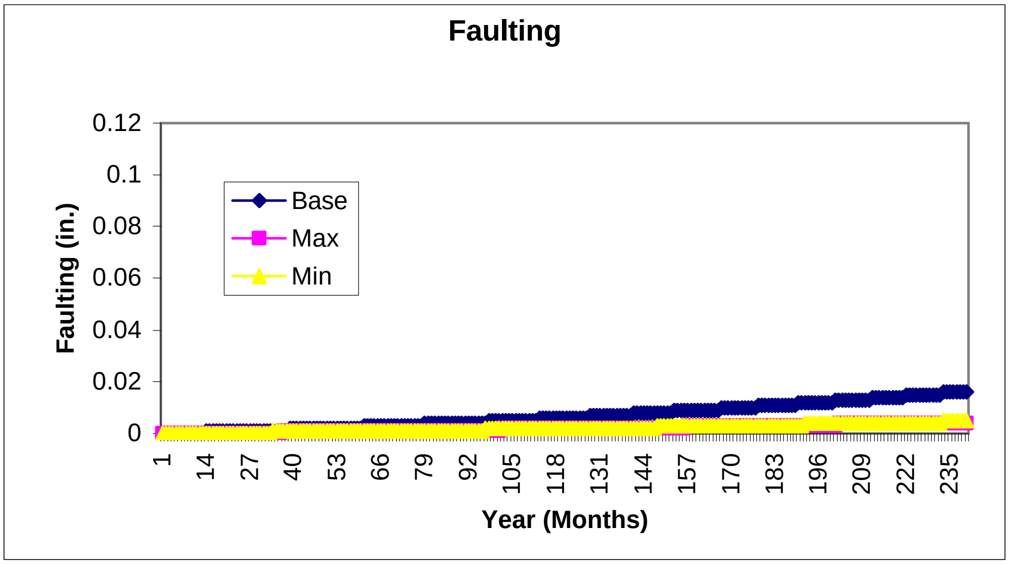


Figure D -399 0209 Subgrade Modulus

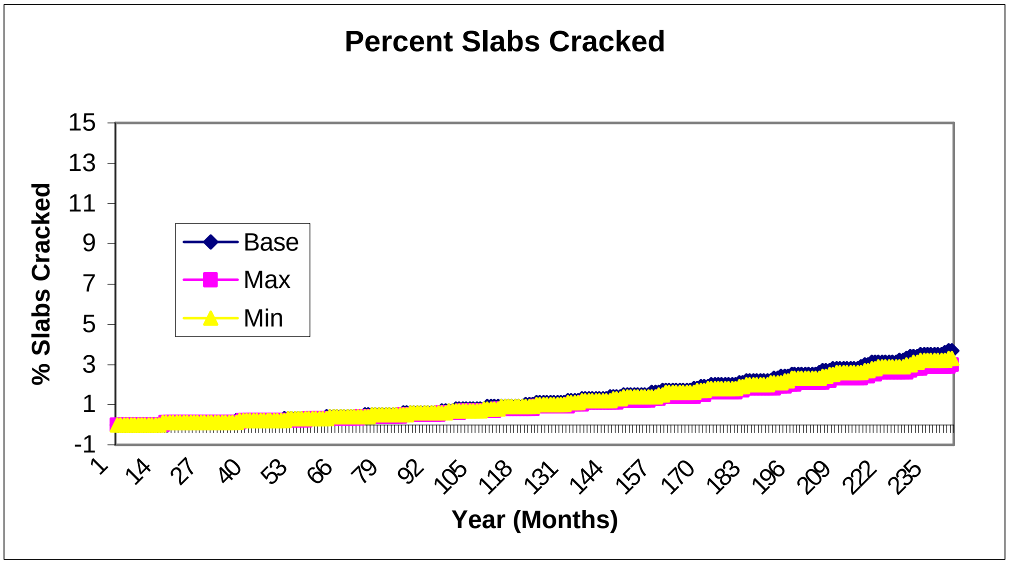


Figure D -400 0209 Subgrade Modulus

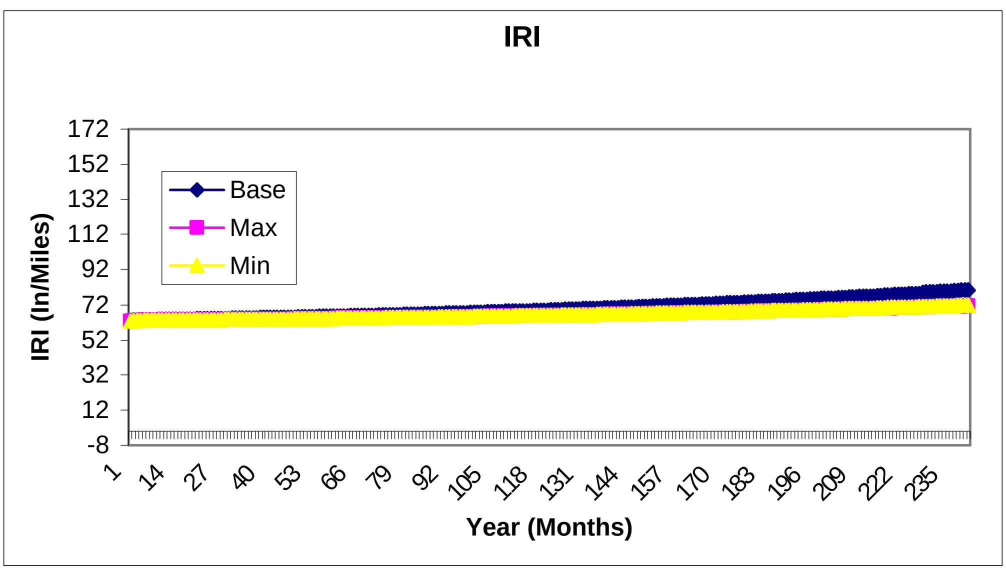


Figure D -401 0209 Surface Shortwave Absorptivity

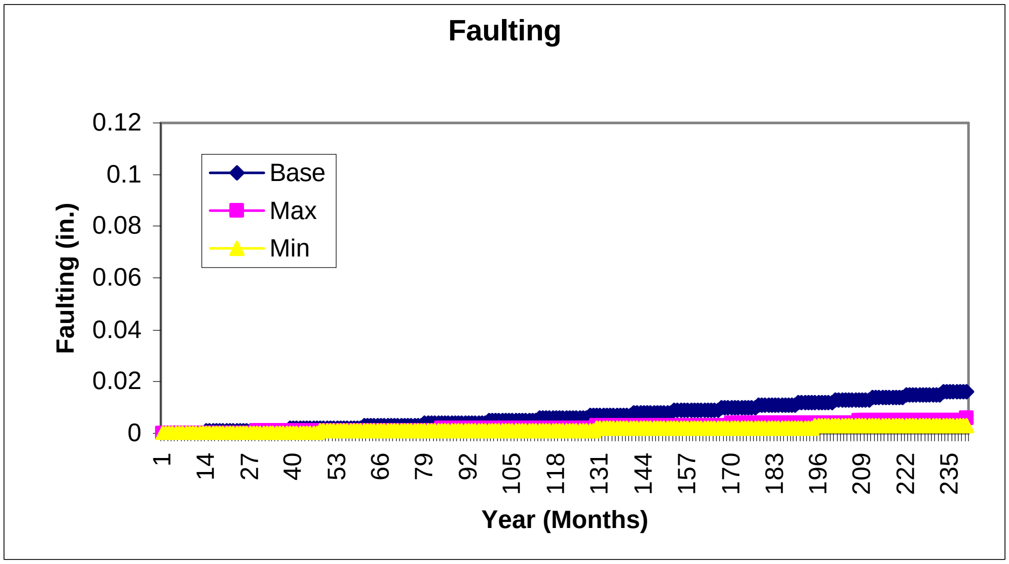


Figure D -402 0209 Surface Shortwave Absorptivity

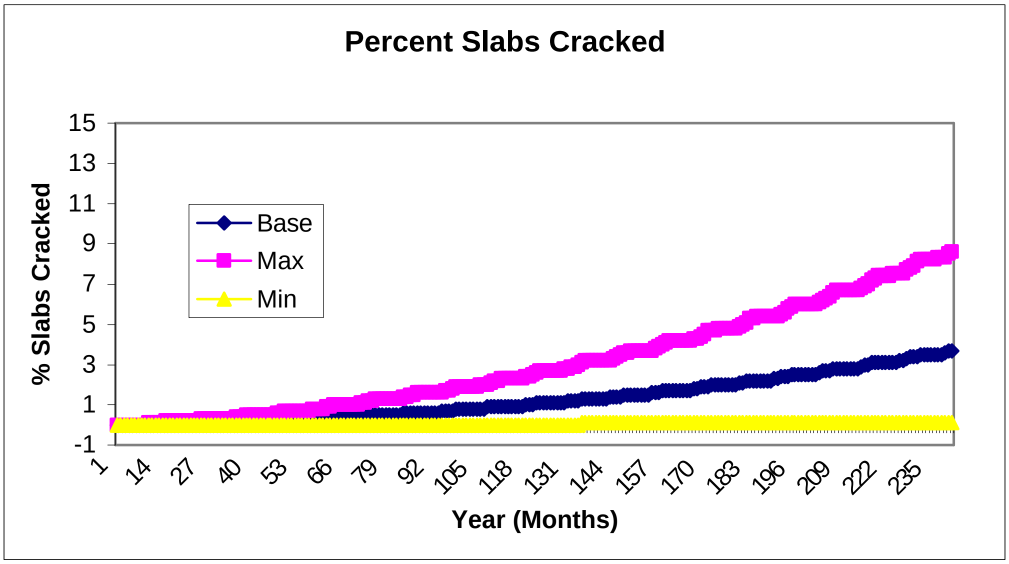


Figure D -403 0209 Surface Shortwave Absorptivity

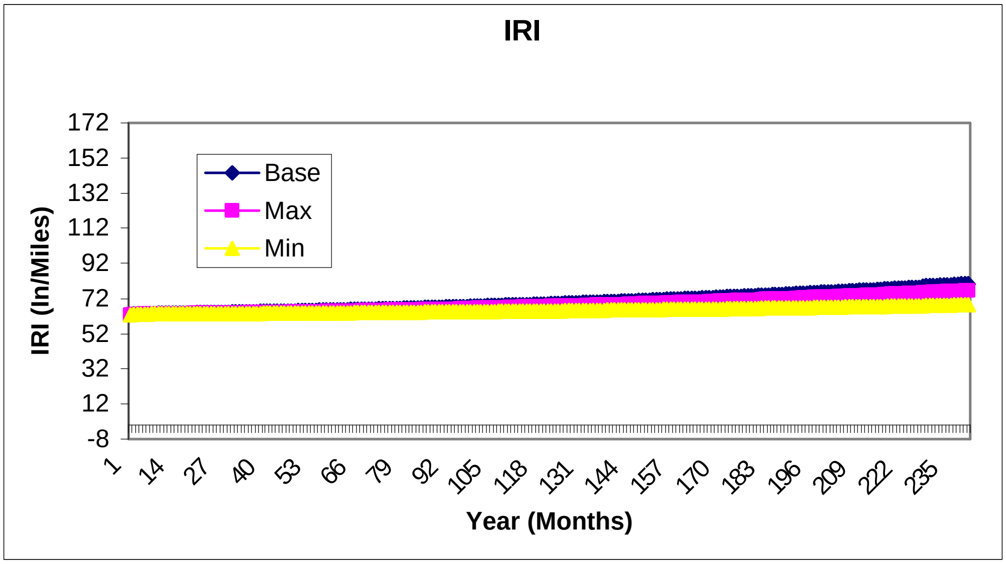


Figure D -404 0209 Load Transfer Efficiency

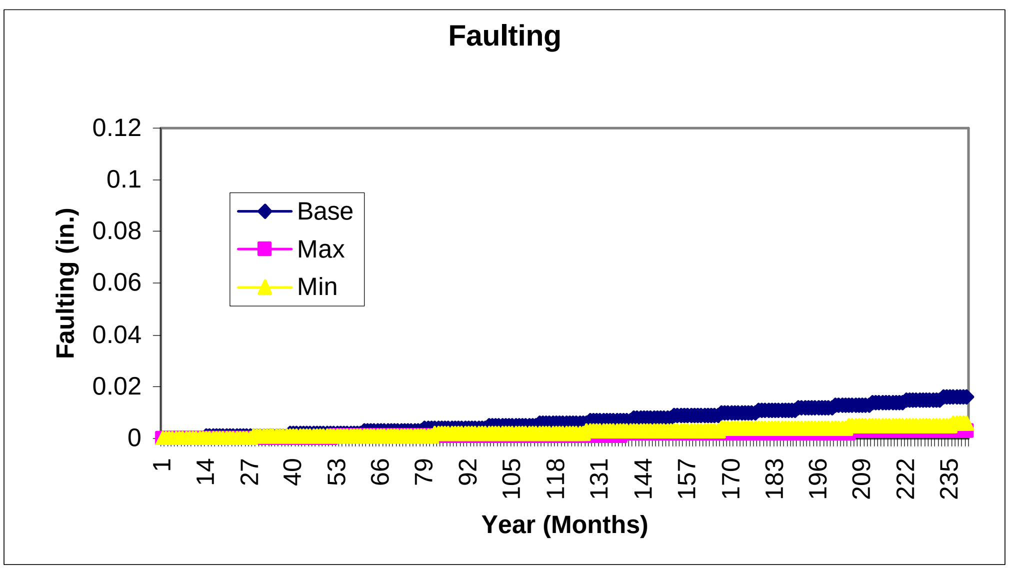


Figure D -405 0209 Load Transfer Efficiency

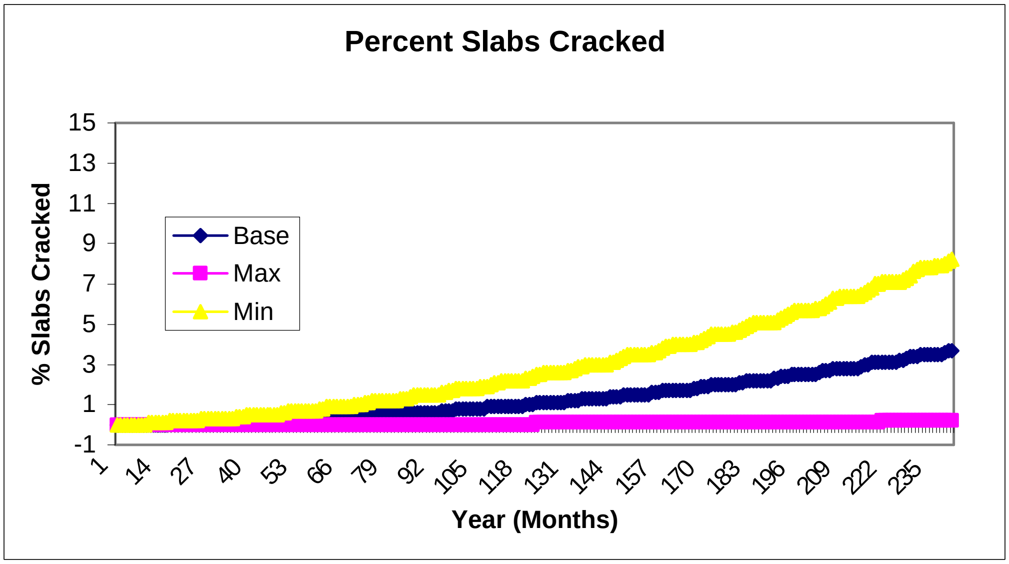


Figure D -406 0209 Load Transfer Efficiency

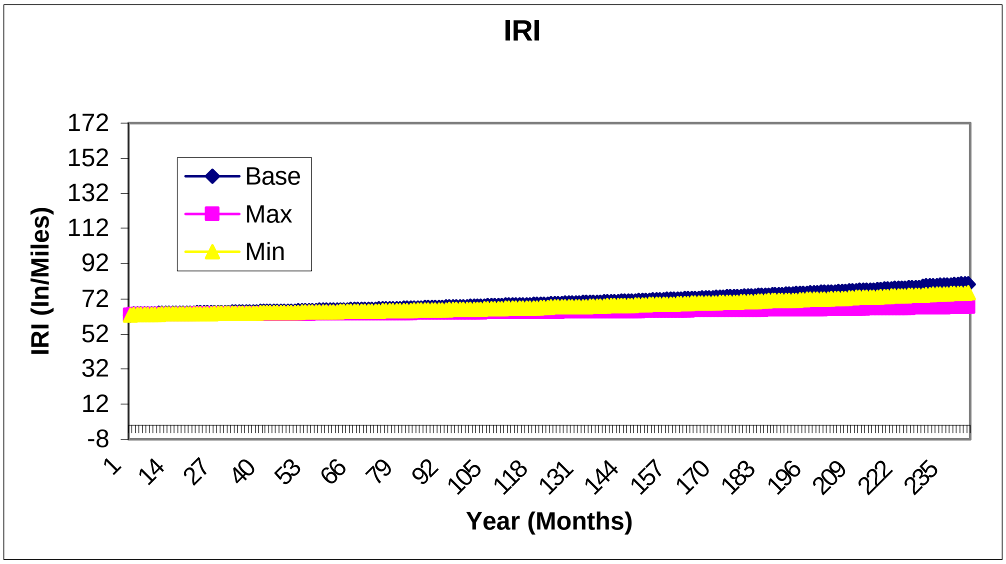


Figure D -407 0209 Joint Spacing

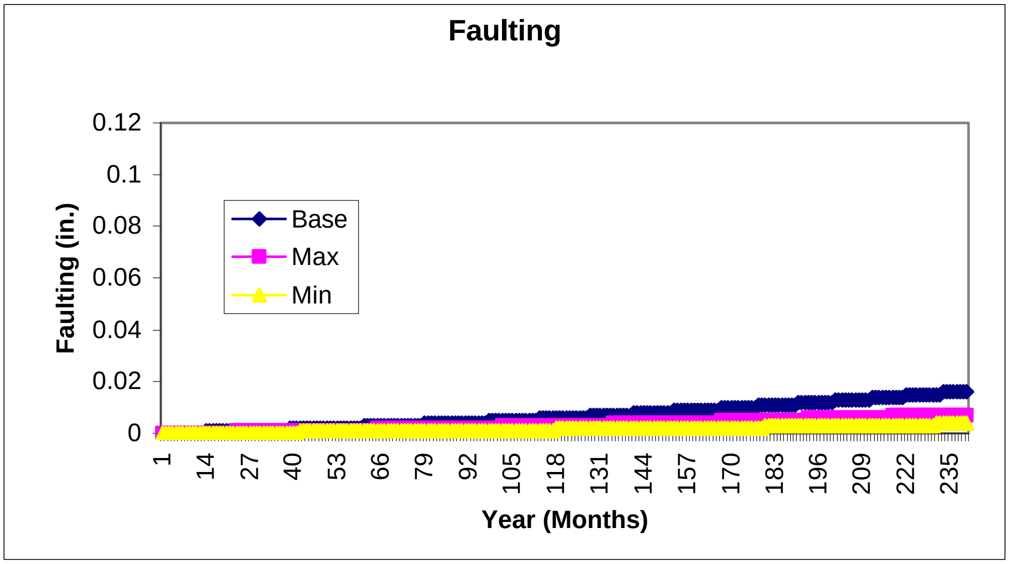


Figure D -408 0209 Joint Spacing

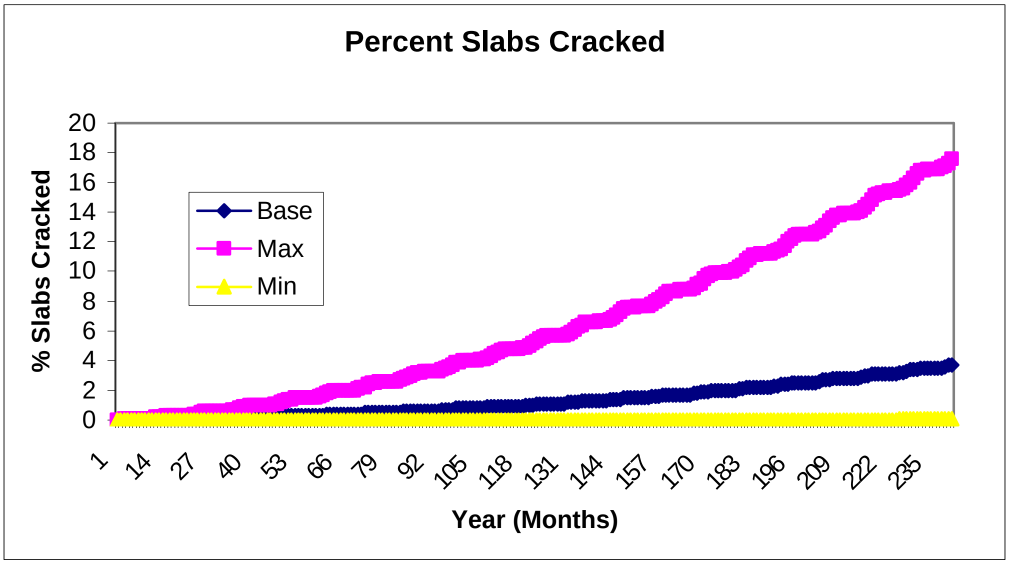


Figure D -409 0209 Joint Spacing

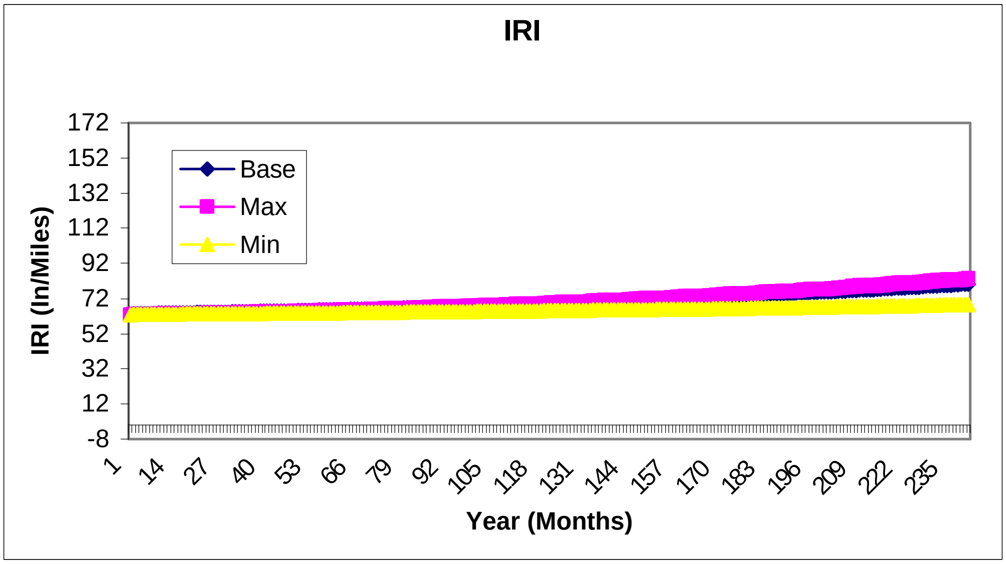


Figure D -410 0209 Dowell Diameter

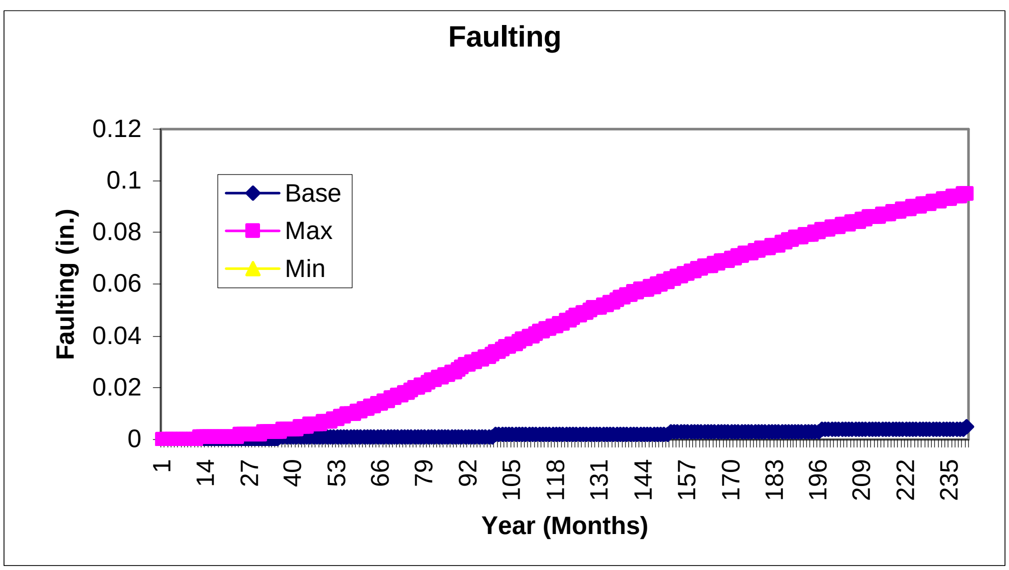


Figure D -411 0209 Dowell Diameter

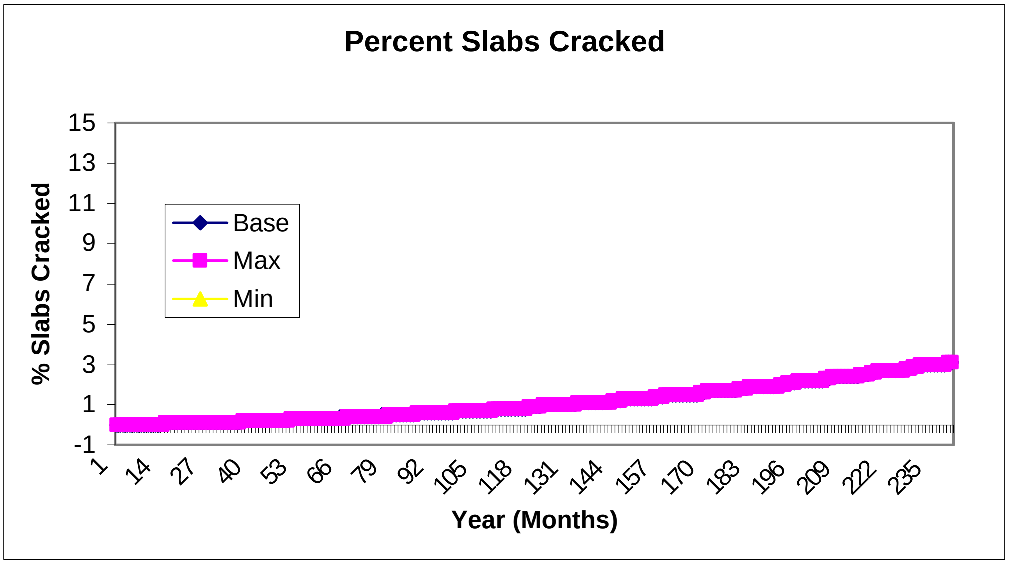


Figure D -412 0209 Dowell Diameter

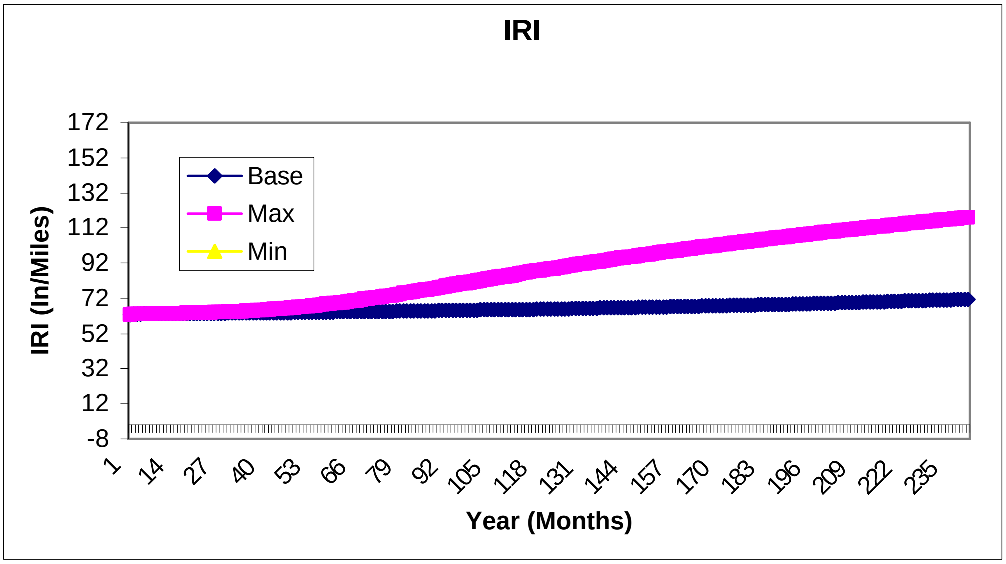


Figure D -413 0209 Base Vs Dec/Jan

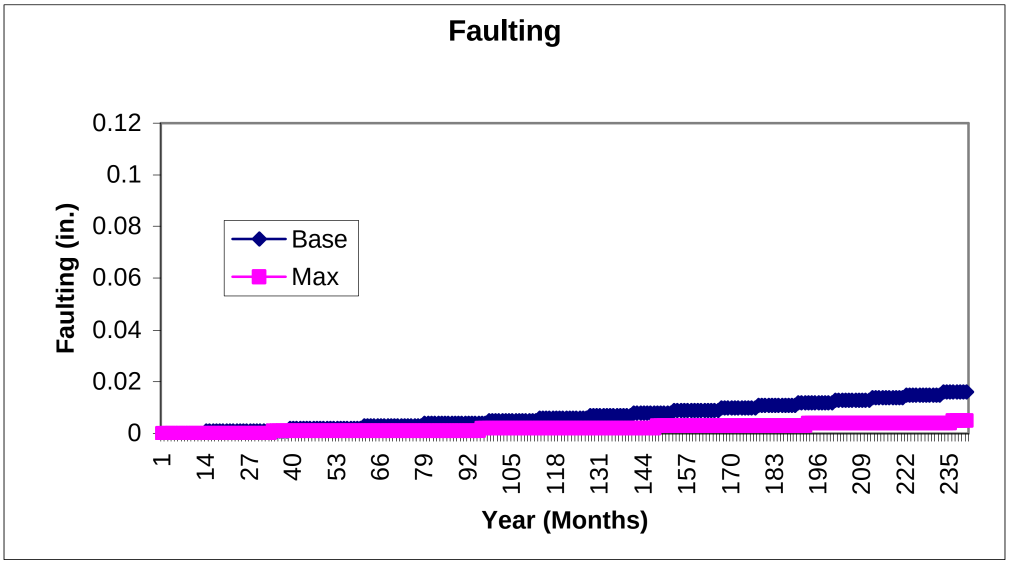


Figure D -414 0209 Base Vs Dec/Jan

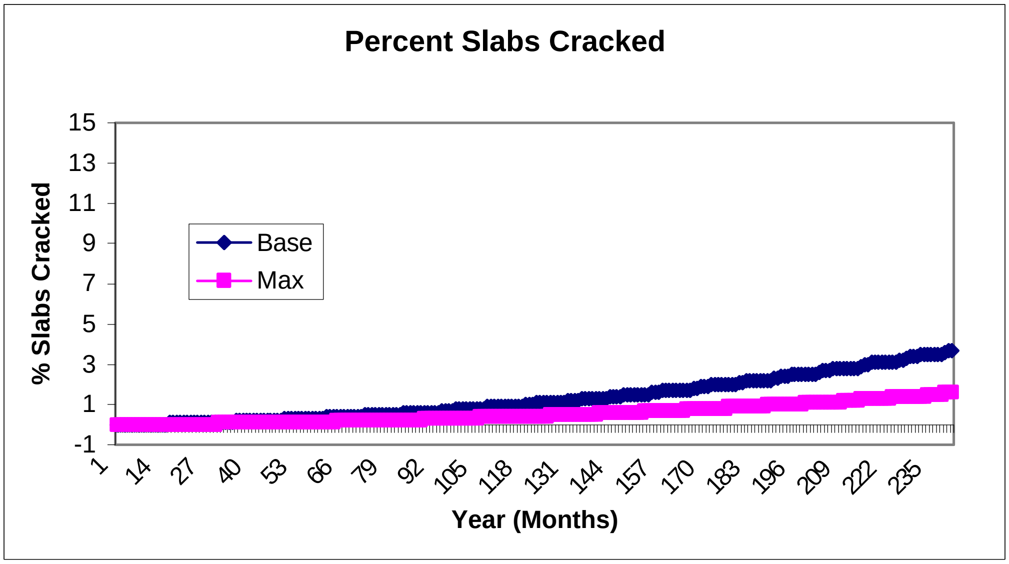


Figure D -415 0209 Base Vs Dec/Jan

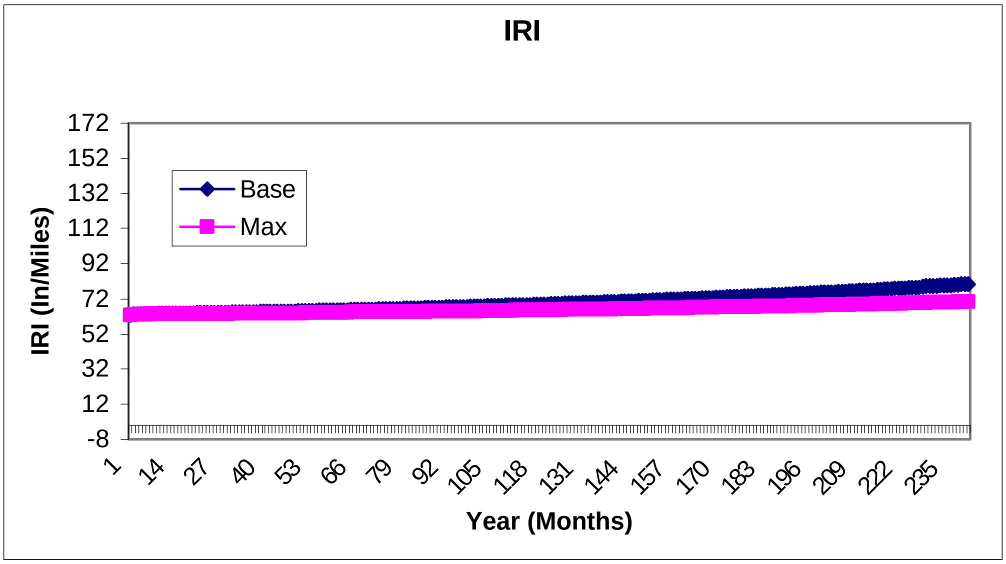


Figure D -416 0209 Base Vs Mar/Apr

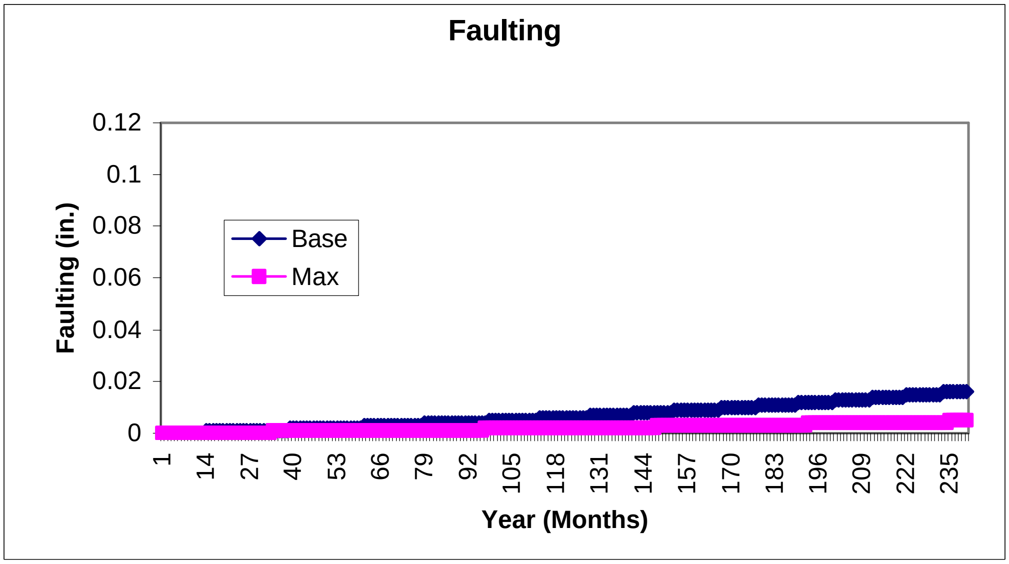


Figure D -417 0209 Base Vs Mar/Apr

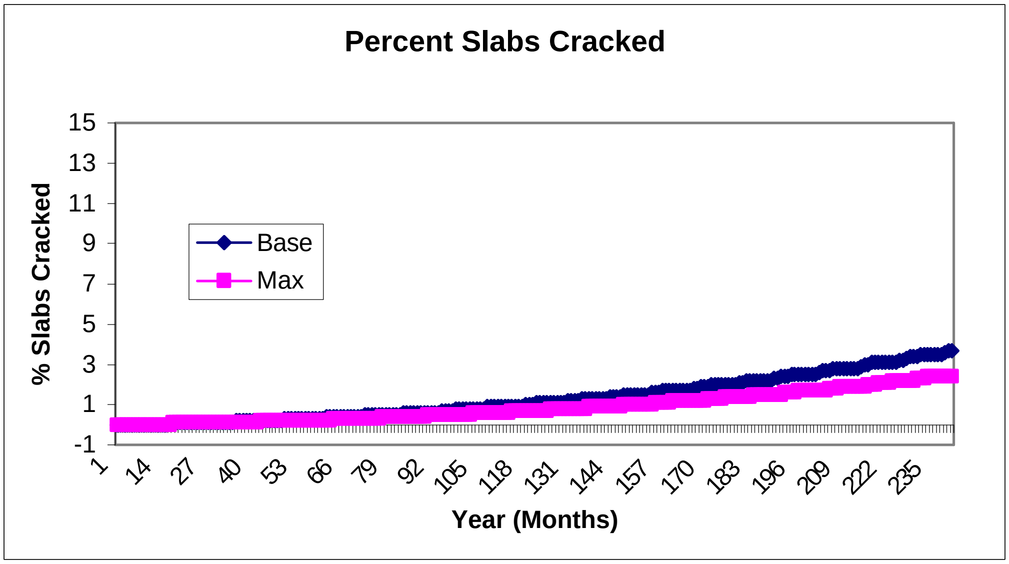


Figure D -418 0209 Base Vs Mar/Apr

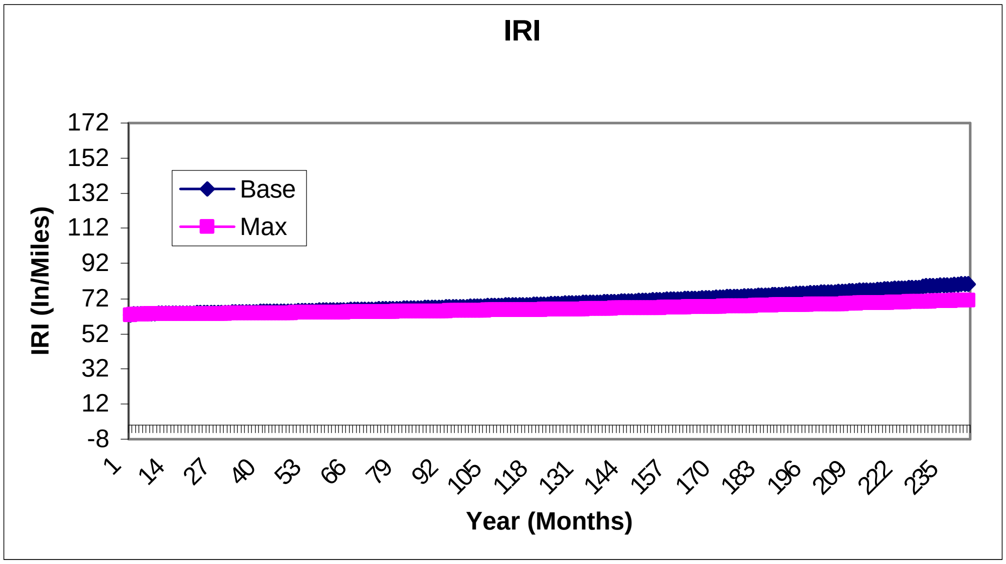


Figure D -419 0209 Base Vs Sep/Oct

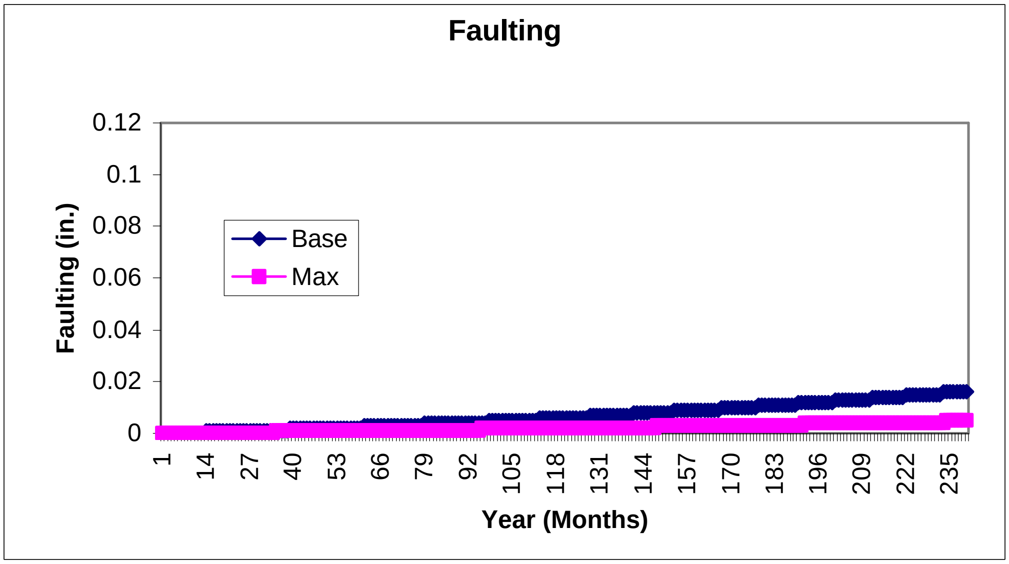


Figure D -420 0209 Base Vs Sep/Oct

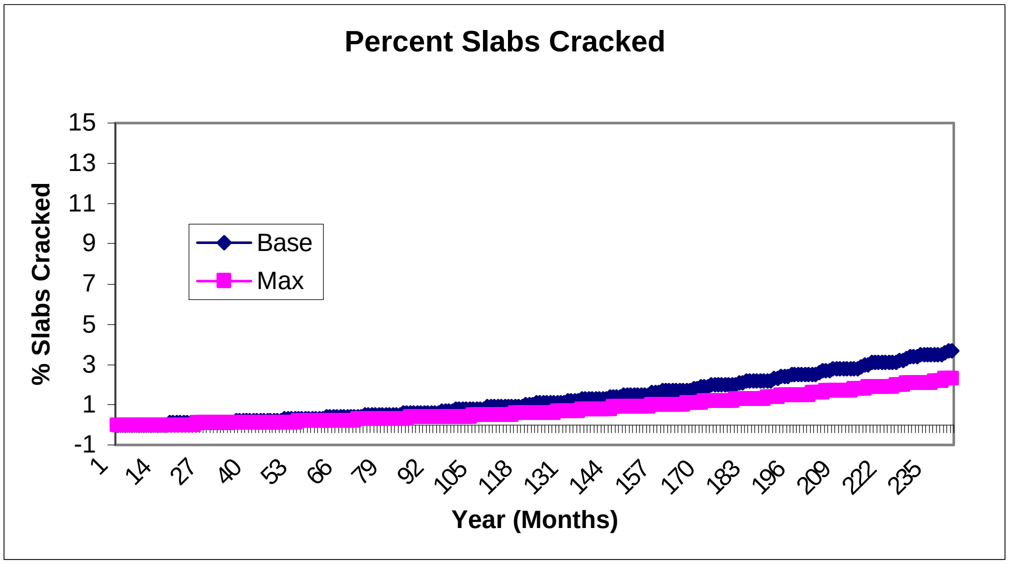


Figure D -421 0209 Base Vs Sep/Oct

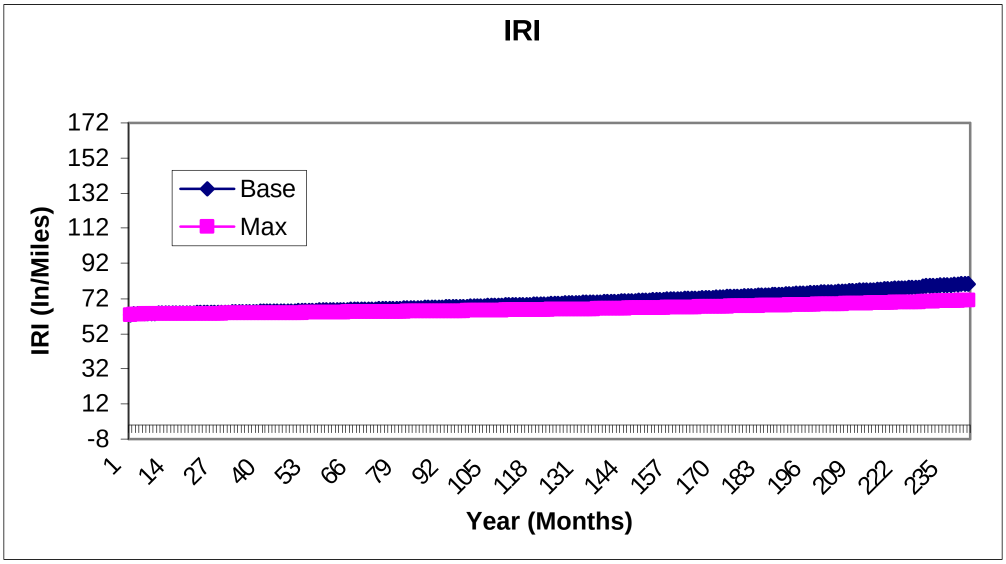


Figure D -422 3011 Coefficient of Thermal Expansion - JPCP

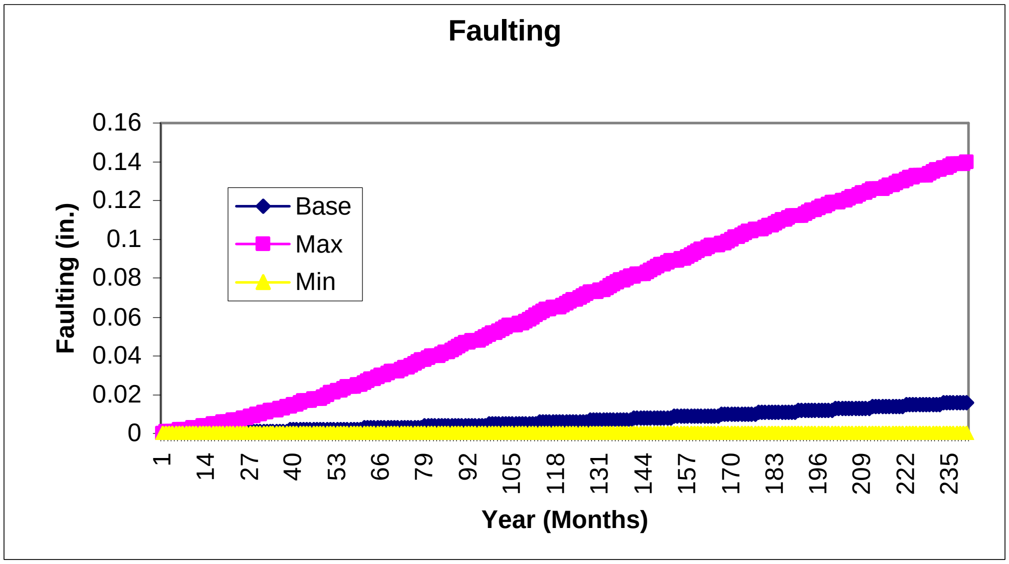


Figure D -423 3011 Coefficient of Thermal Expansion - JPCP

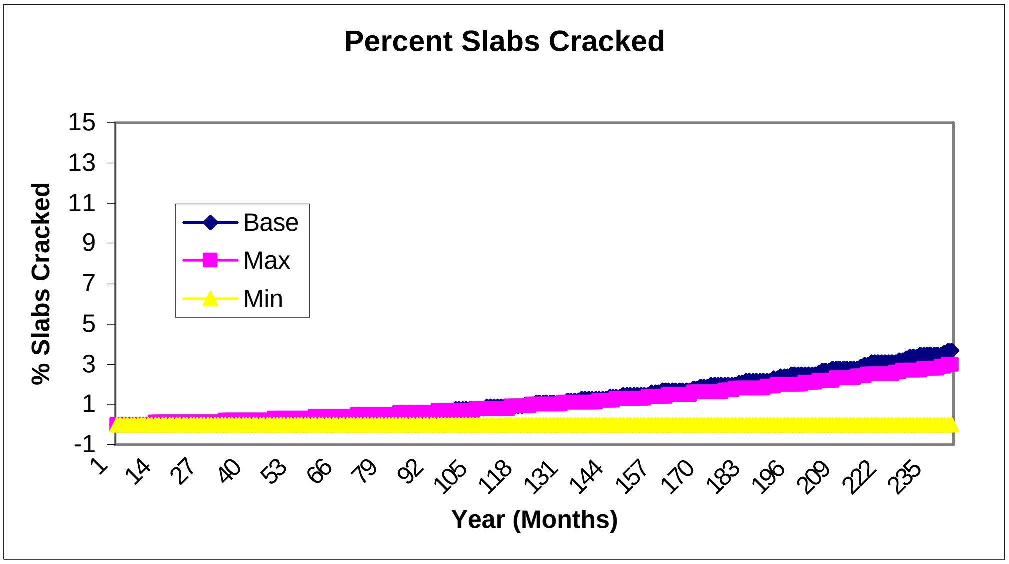


Figure D -424 3011 Coefficient of Thermal Expansion - JPCP

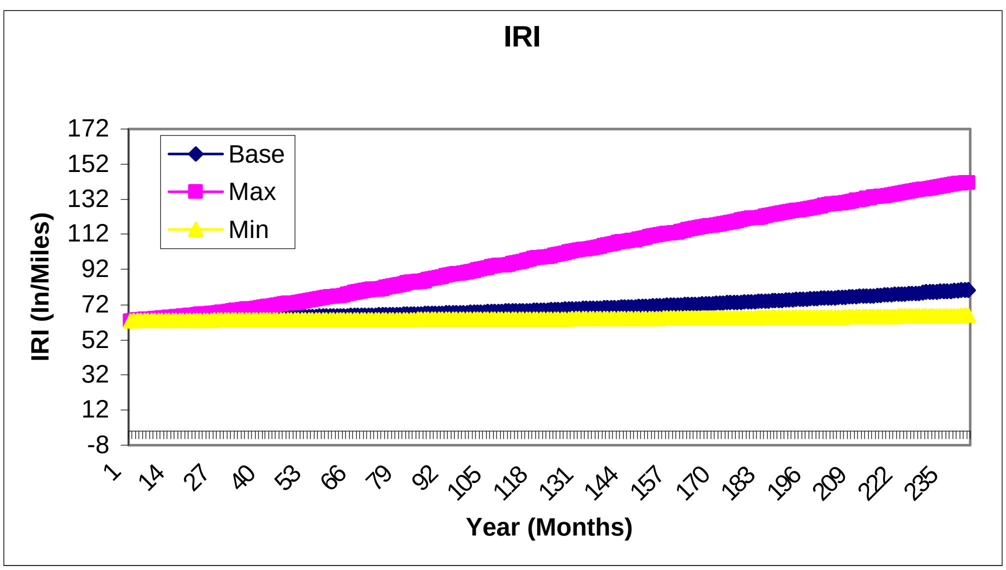


Figure D -425 3011 HeatCapacity - JPCP

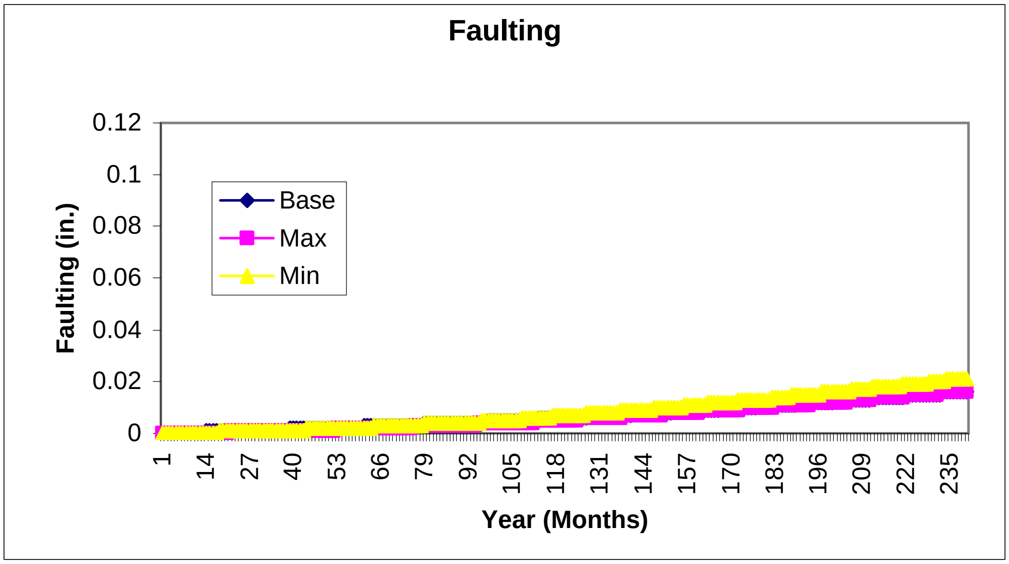


Figure D -426 3011 HeatCapacity - JPCP

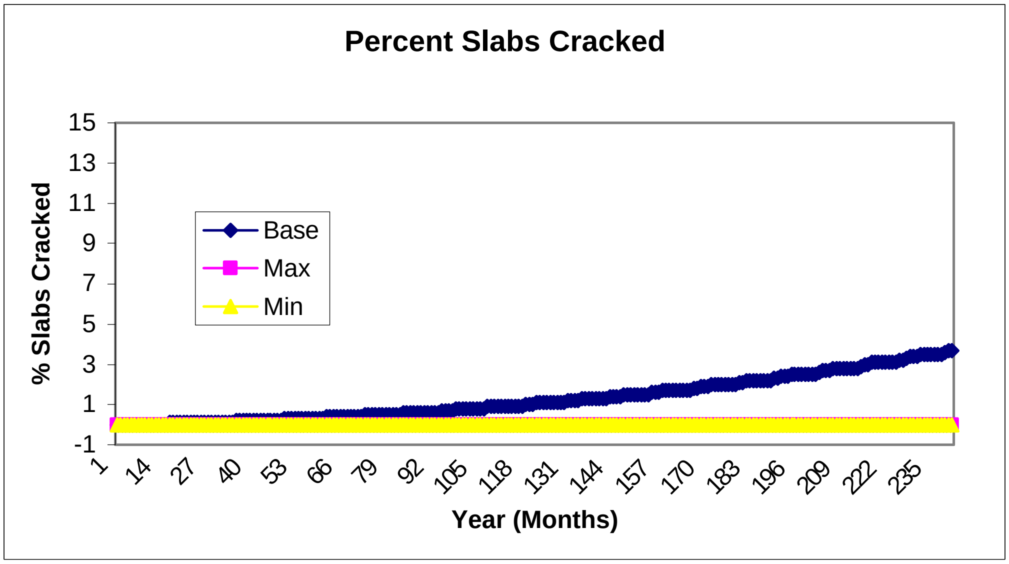


Figure D -427 3011 HeatCapacity - JPCP

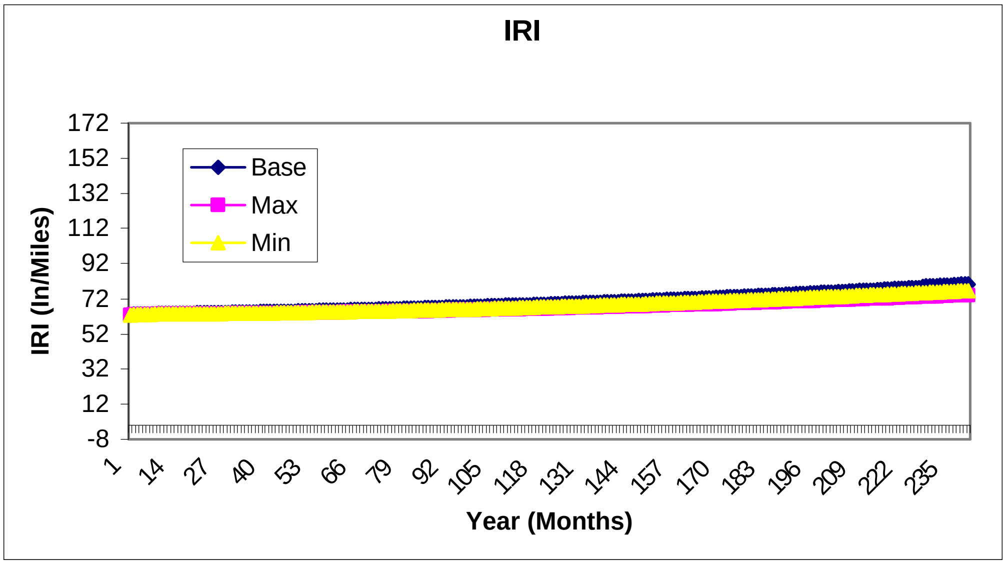


Figure D -428 3011 ThermalConductivity - JPCP

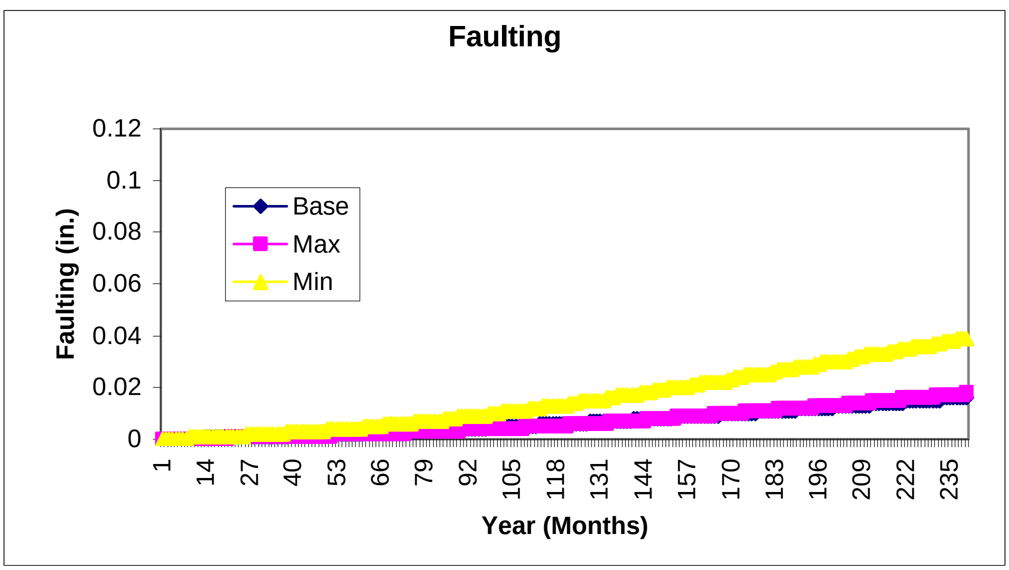


Figure D -429 3011 ThermalConductivity – JPCP

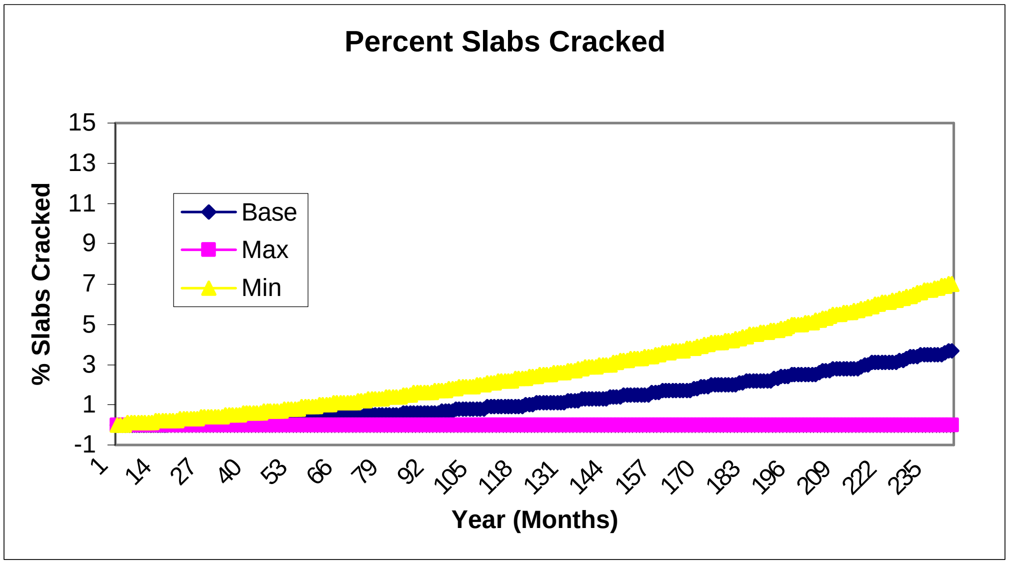


Figure D -430 3011 ThermalConductivity - JPCP

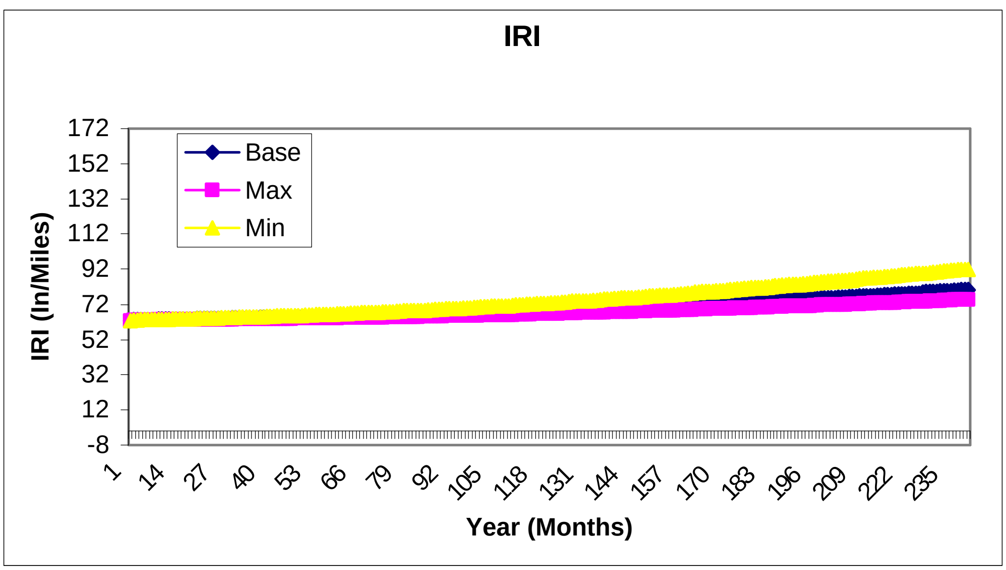


Figure D -431 3011 Airvoids – ATB

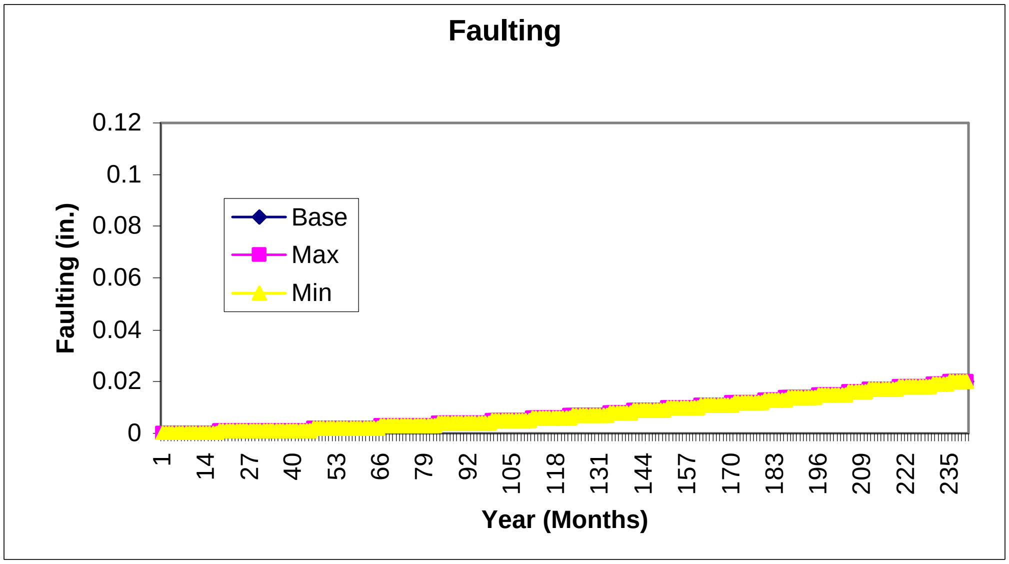


Figure D -432 3011 Airvoids – ATB

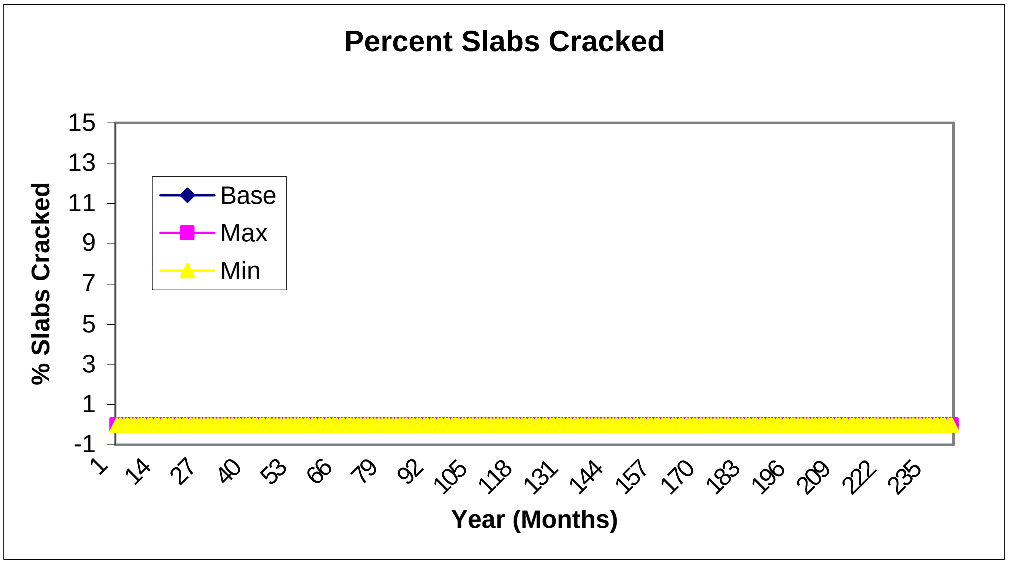


Figure D -433 3011 Airvoids – ATB

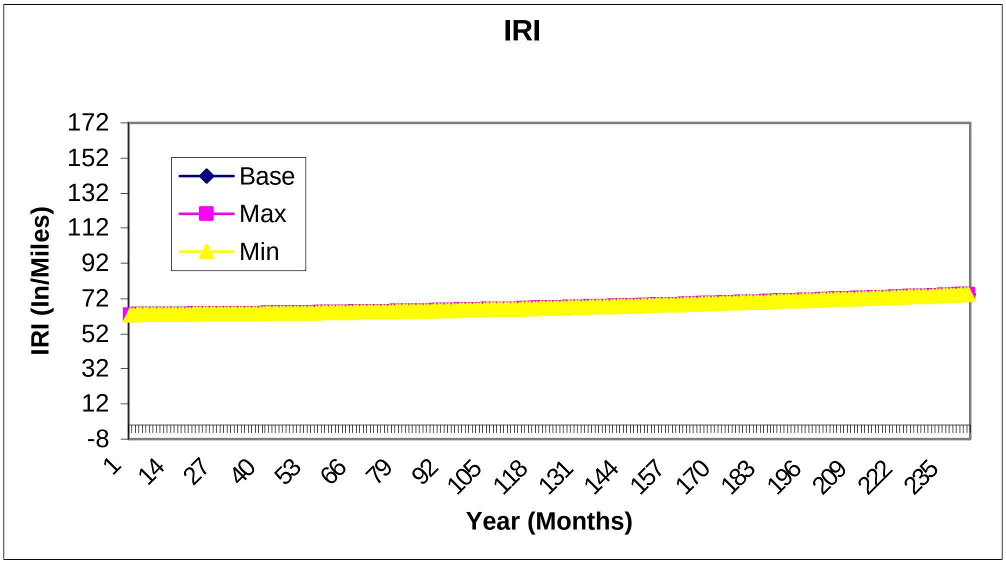


Figure D -434 3011 HeatCapacity – ATB

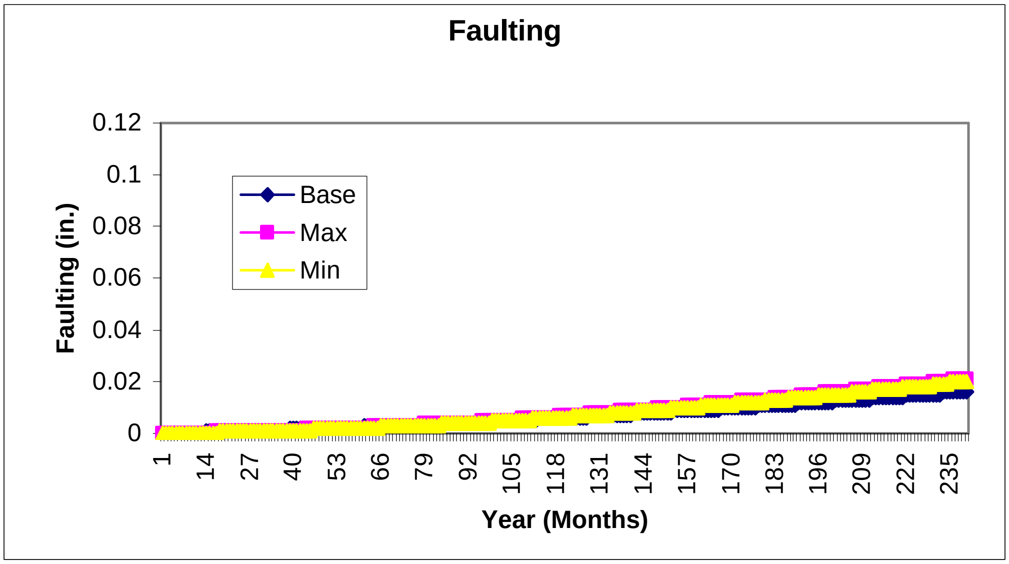


Figure D -435 3011 HeatCapacity – ATB

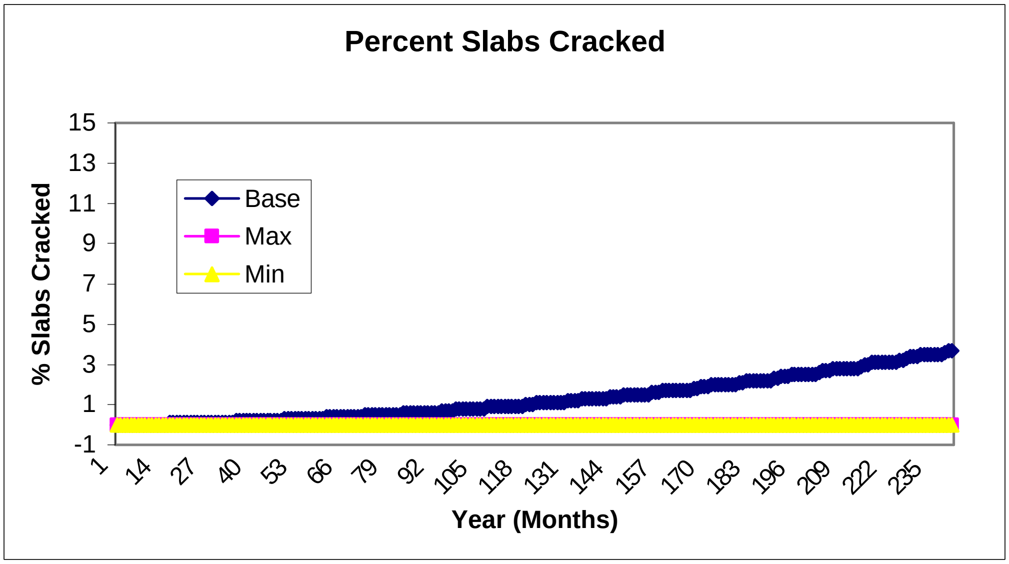


Figure D -436 3011 HeatCapacity – ATB

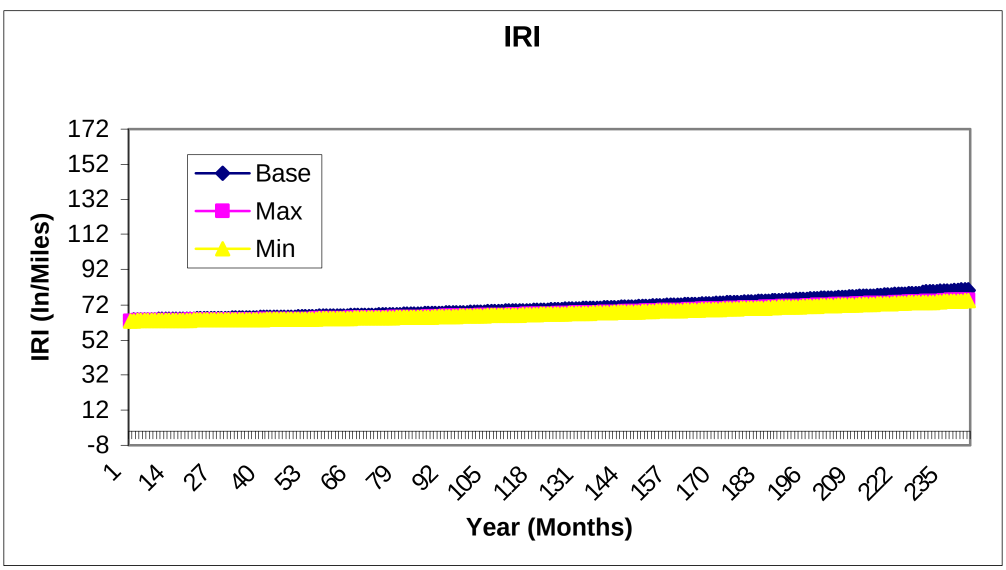


Figure D -437 3011 ThermalConductivity – ATB

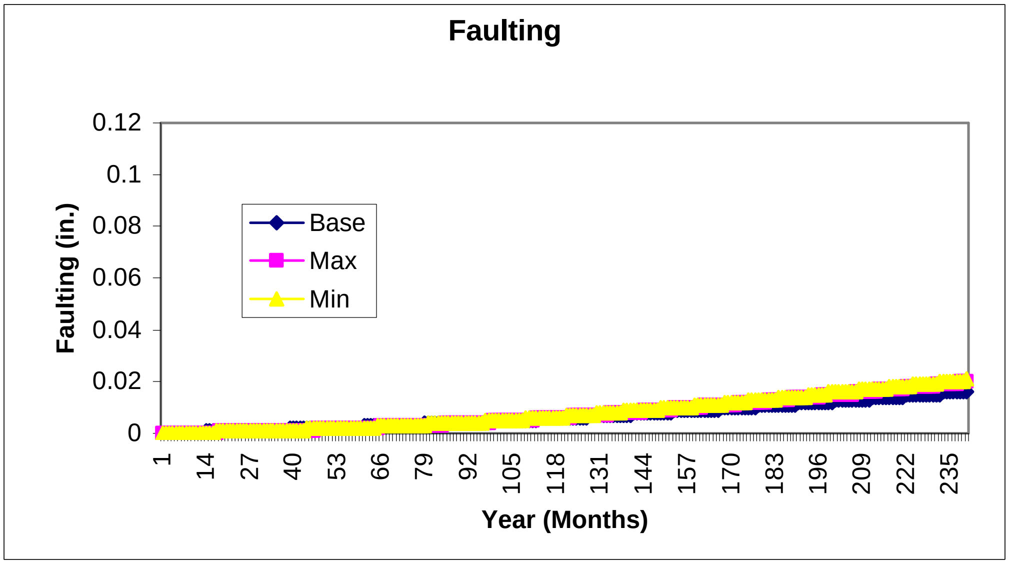


Figure D -438 3011 ThermalConductivity – ATB

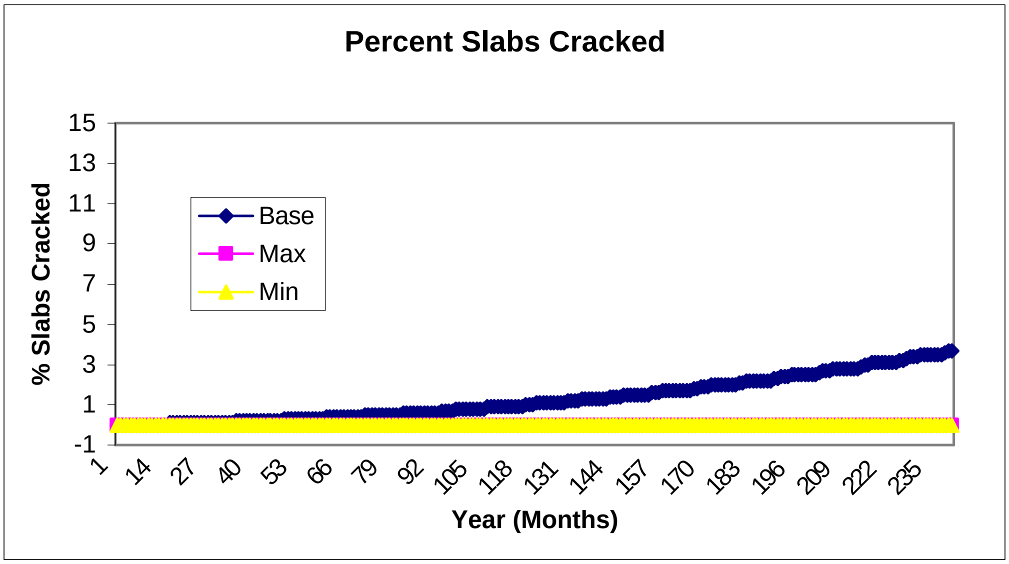


Figure D -439 3011 ThermalConductivity – ATB

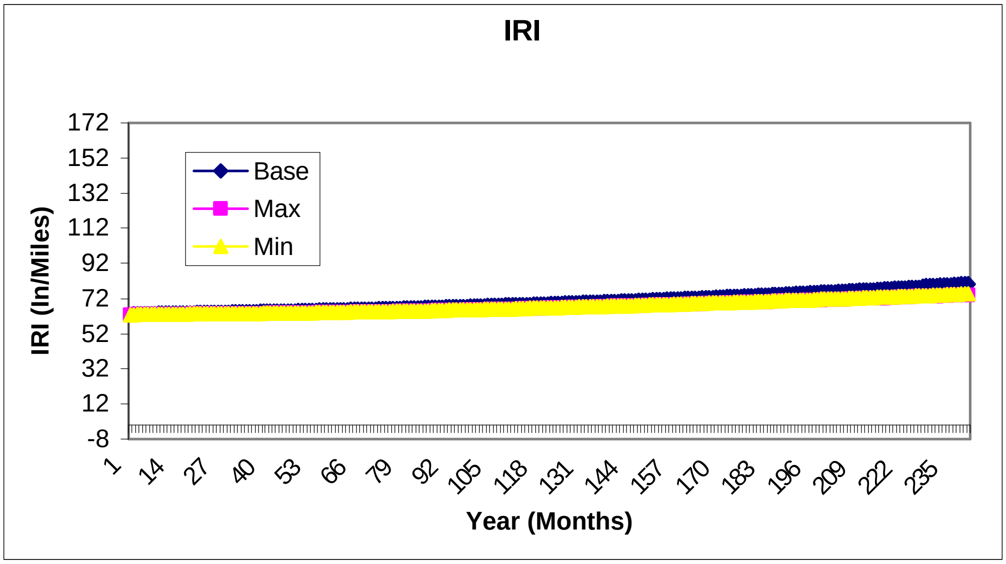


Figure D -440 3011 Subgrade Modulus

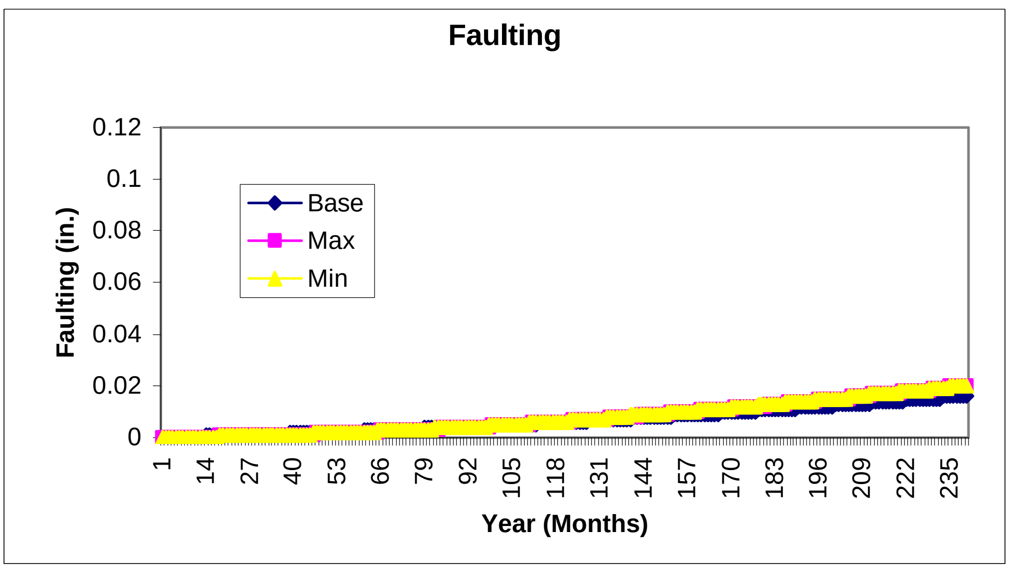


Figure D -441 3011 Subgrade Modulus

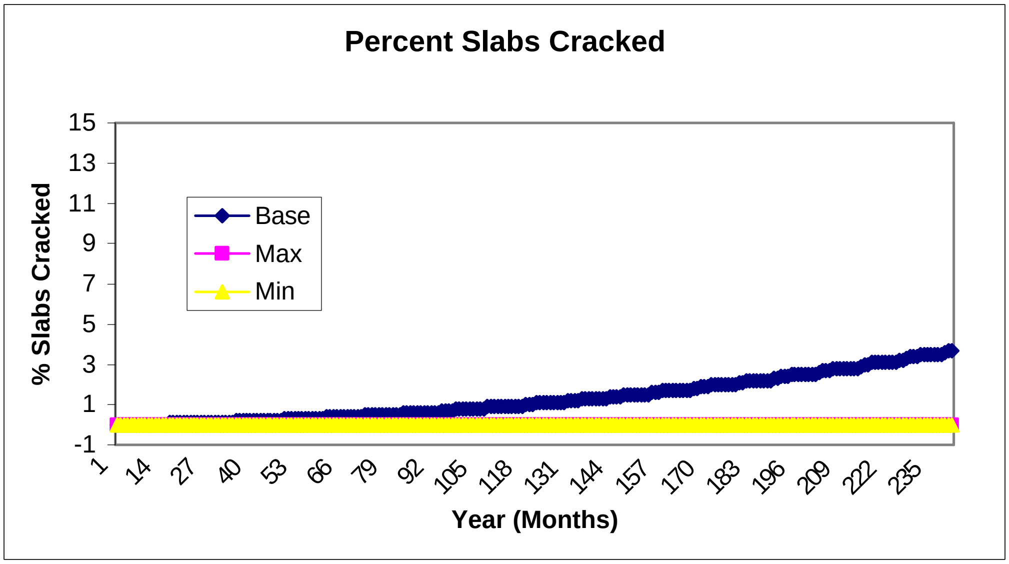


Figure D -442 3011 Subgrade Modulus

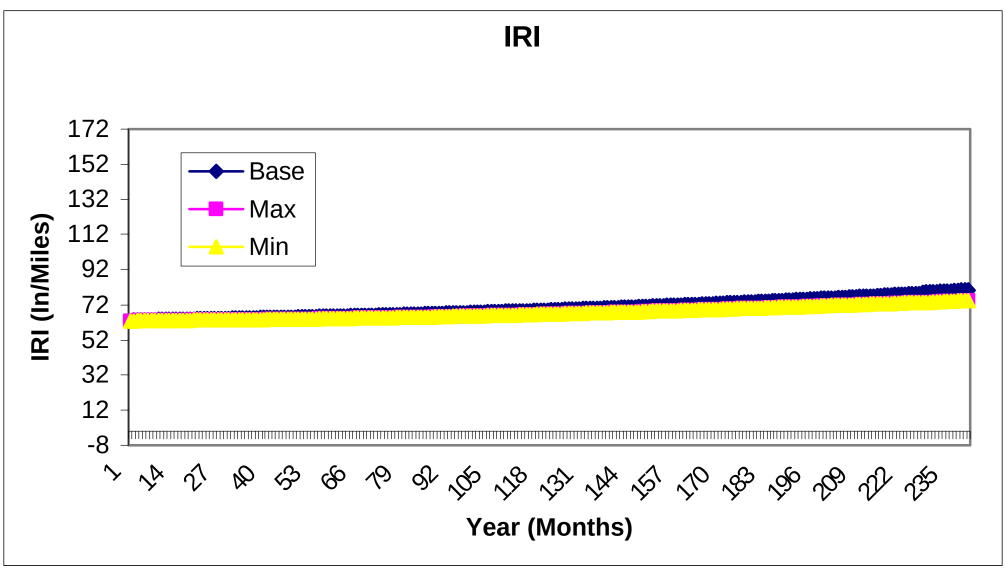


Figure D -443 3011 Surface Shortwave Absorptivity

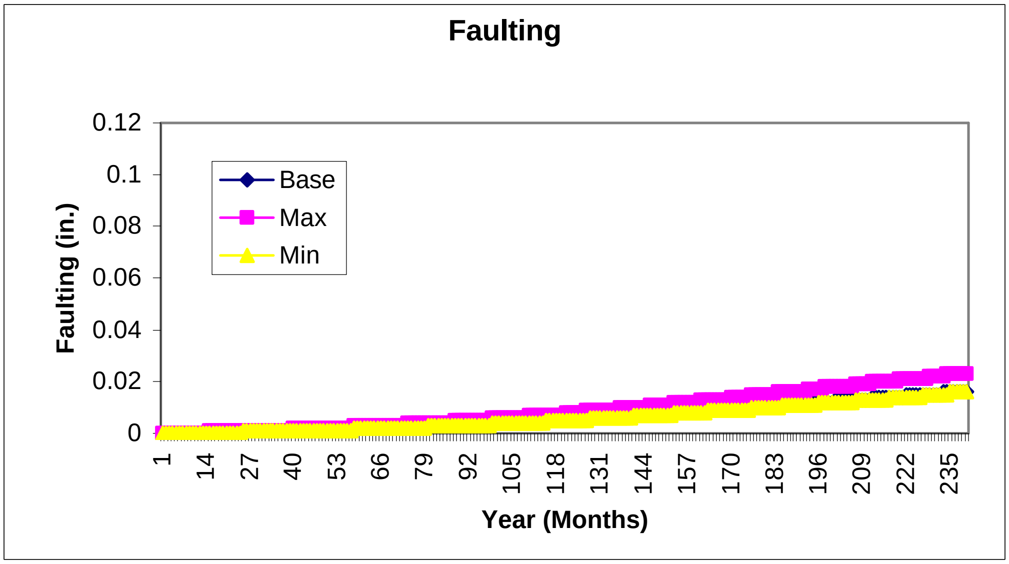


Figure D -444 3011 Surface Shortwave Absorptivity

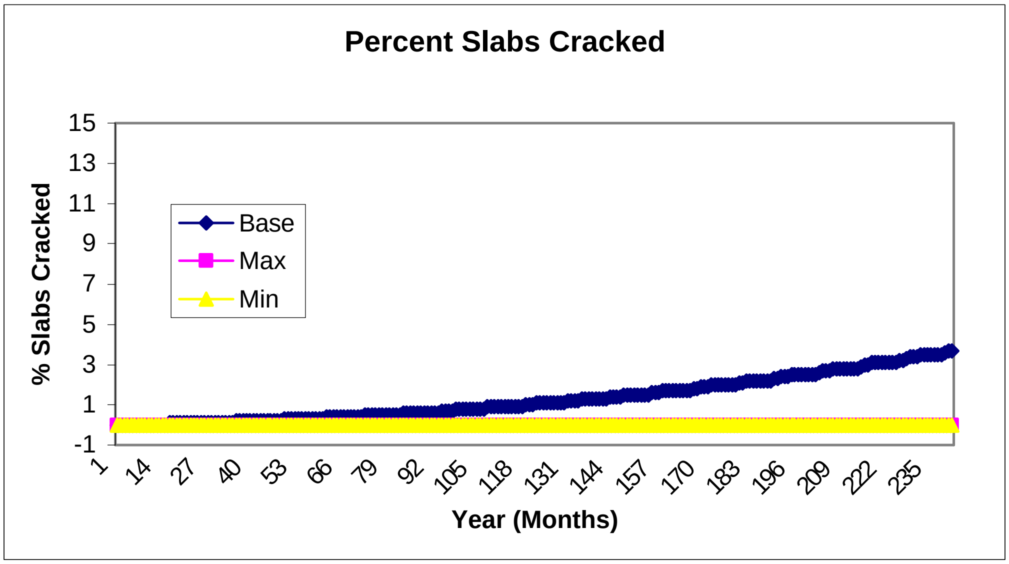


Figure D -445 3011 Surface Shortwave Absorptivity

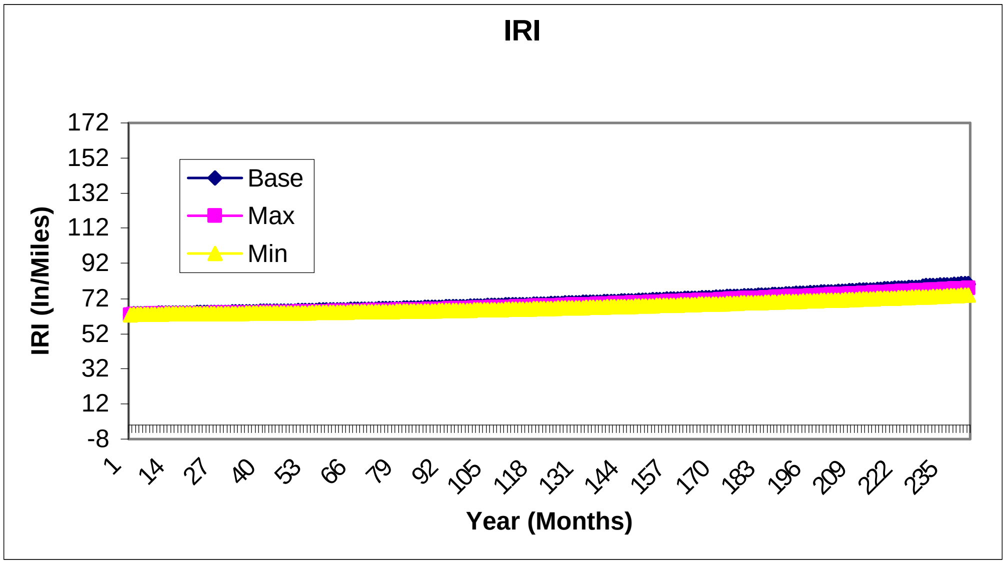


Figure D -446 3011 Load Transfer Efficiency

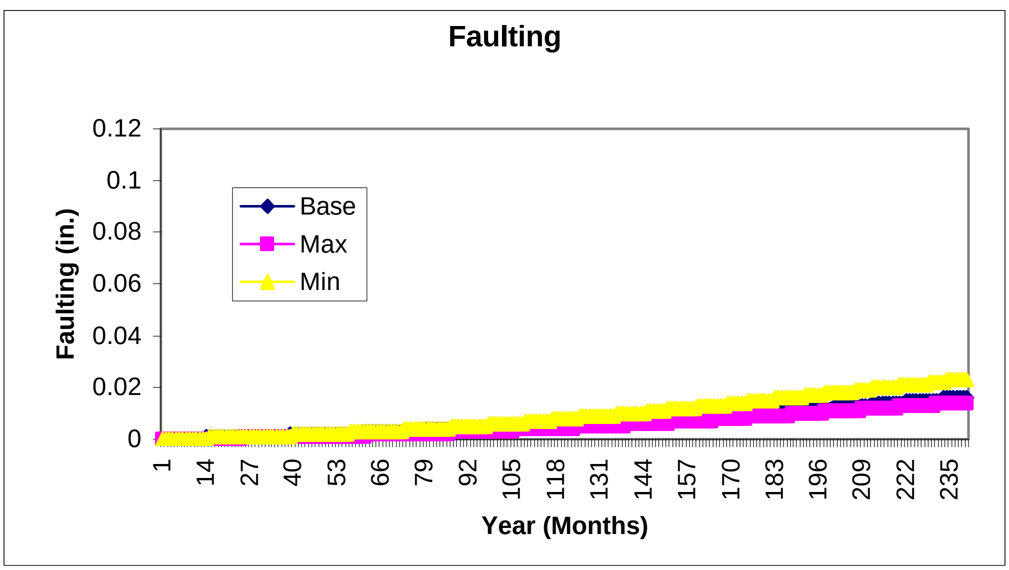


Figure D -447 3011 Load Transfer Efficiency

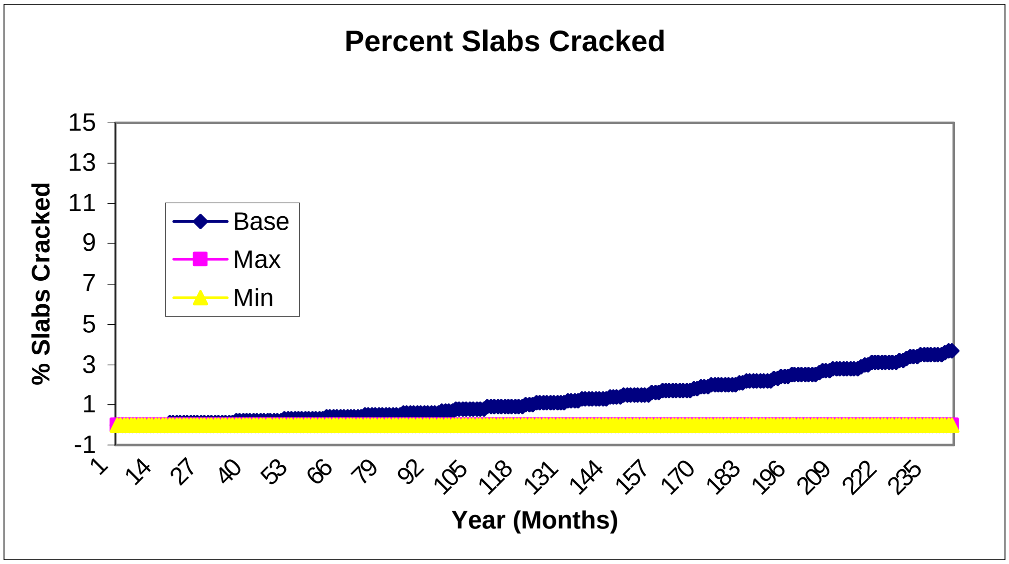


Figure D -448 3011 Load Transfer Efficiency

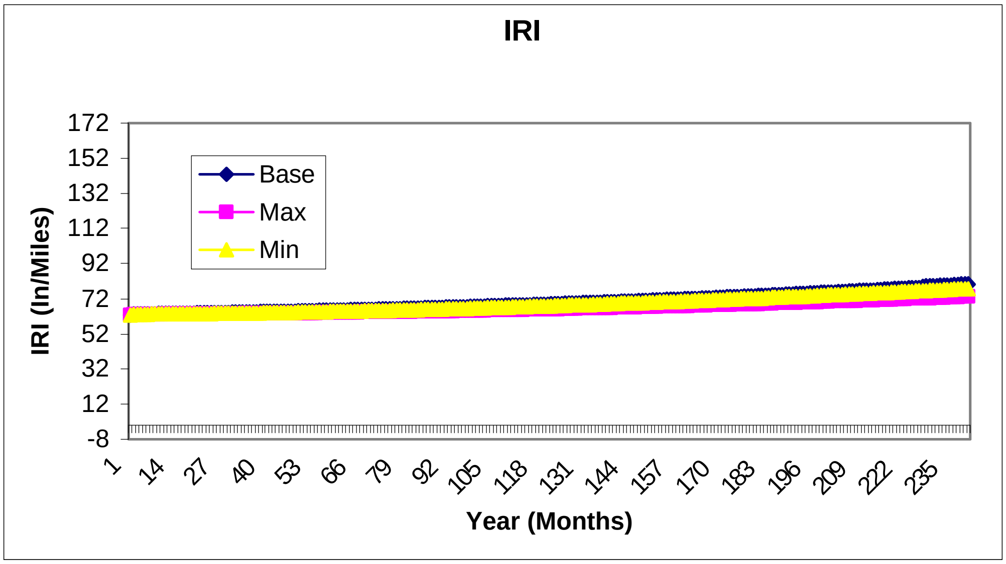


Figure D -449 3011 Joint Spacing

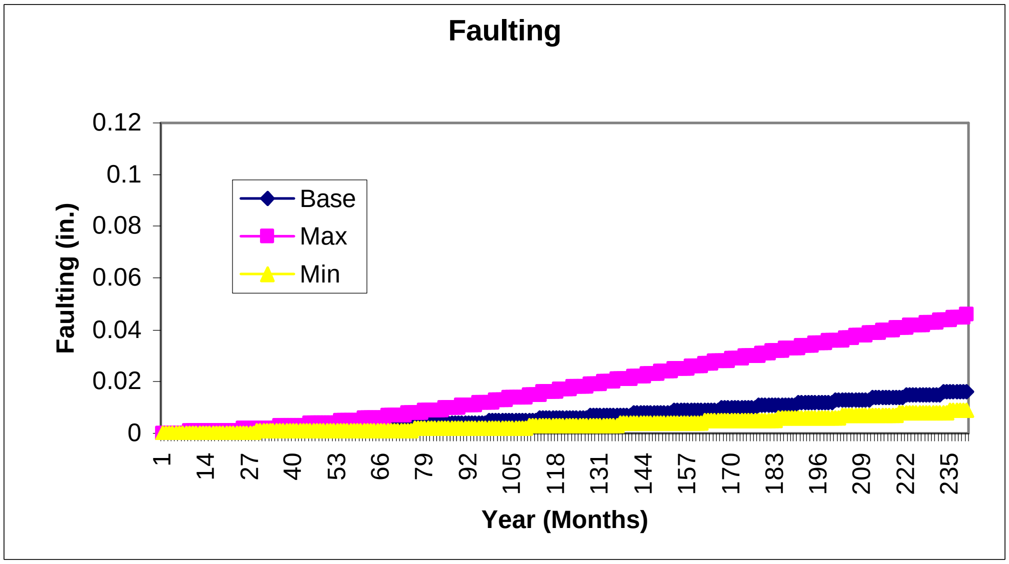


Figure D -450 3011 Joint Spacing

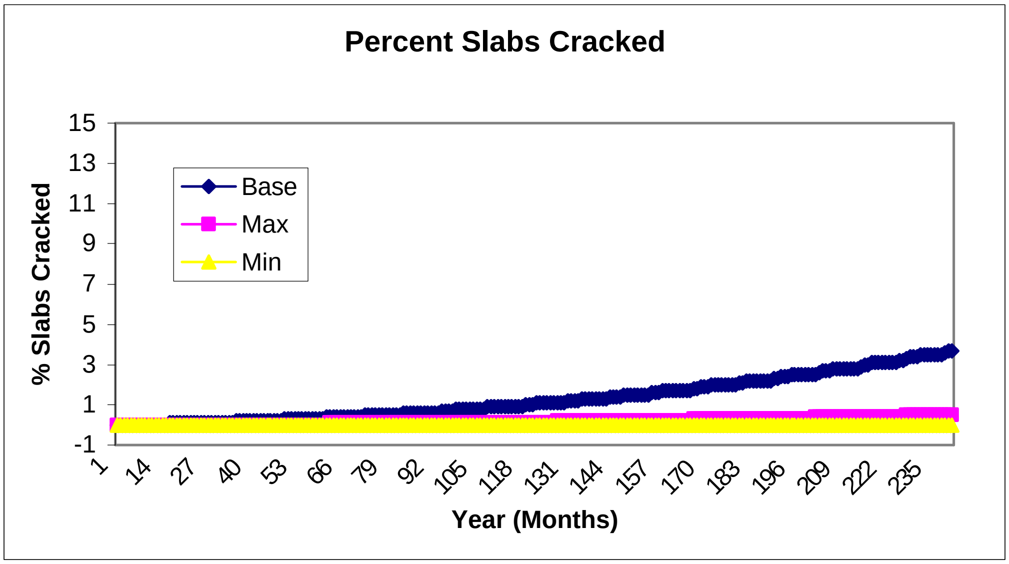


Figure D -451 3011 Joint Spacing

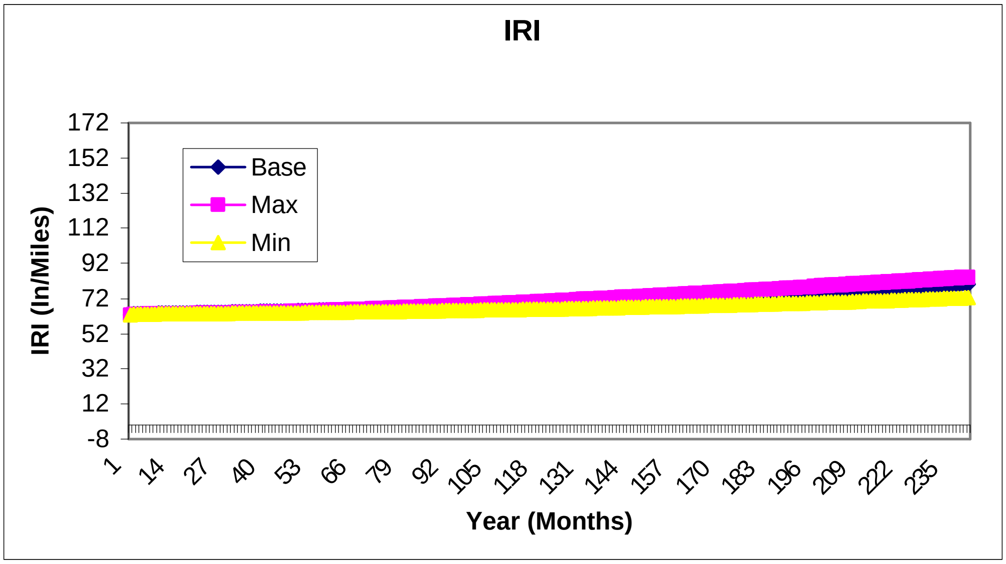


Figure D -452 3011 Dowell Diameter

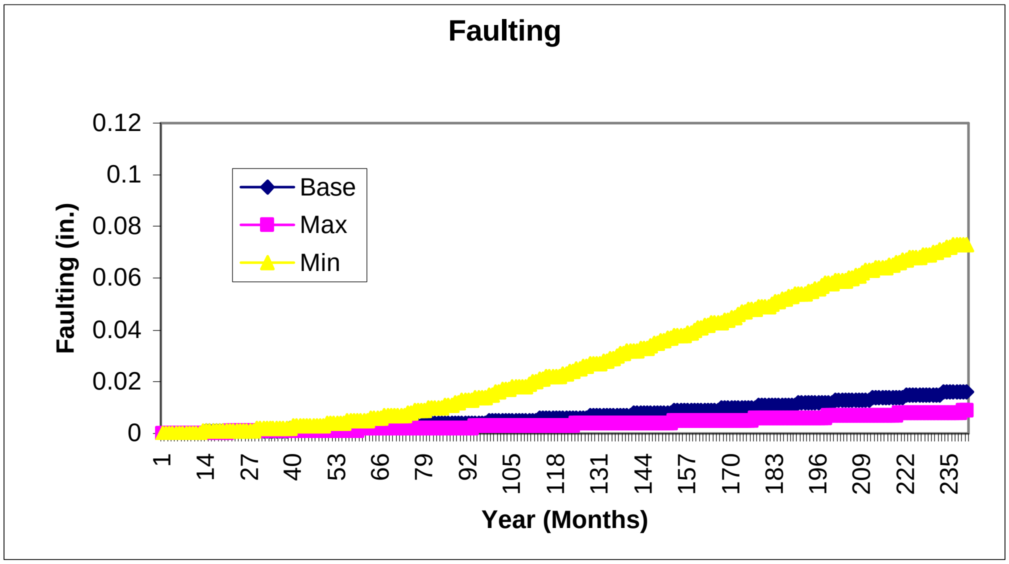


Figure D -453 3011 Dowell Diameter

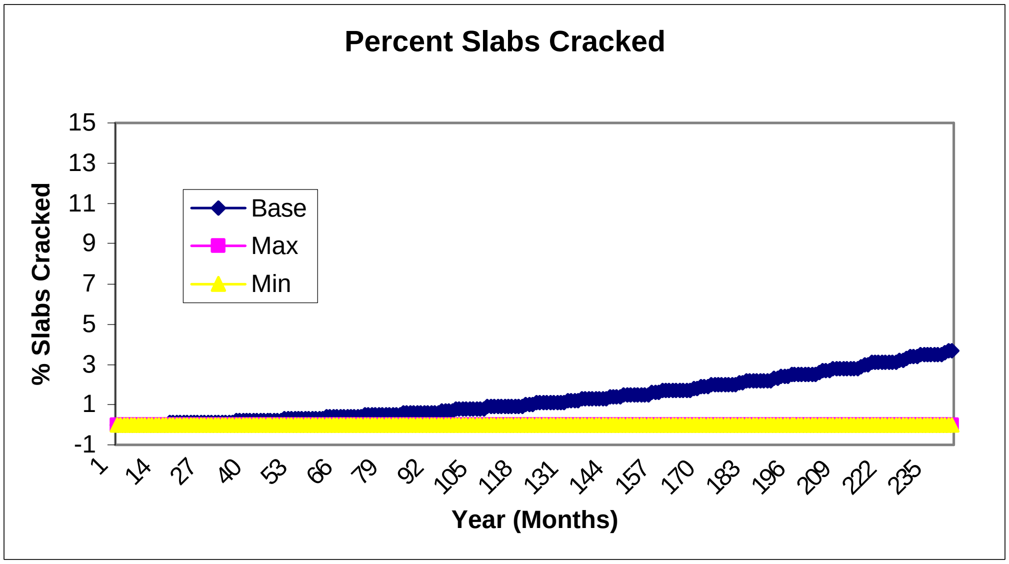


Figure D -454 3011 Dowell Diameter

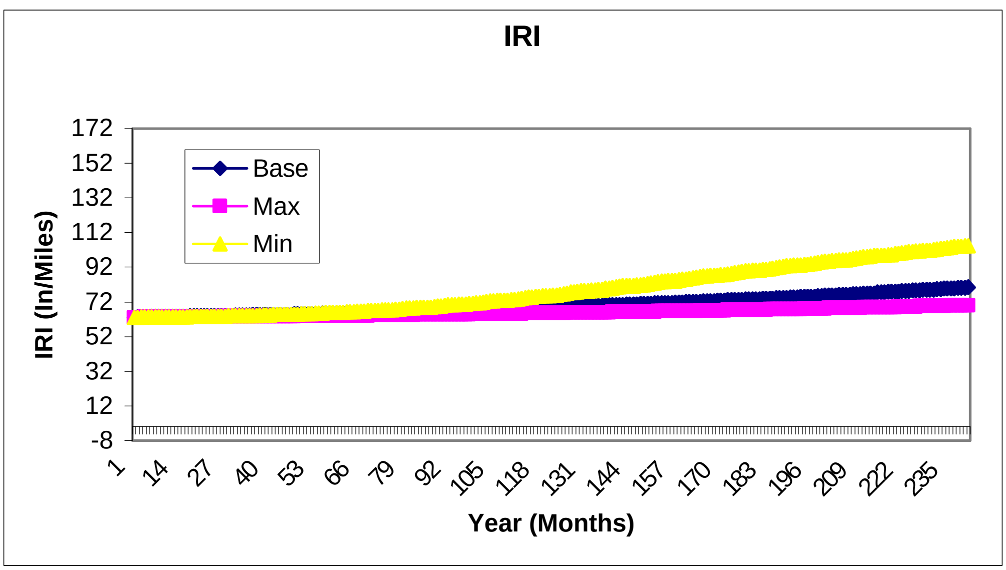


Figure D -455 3011 Base Vs Dec/Jan

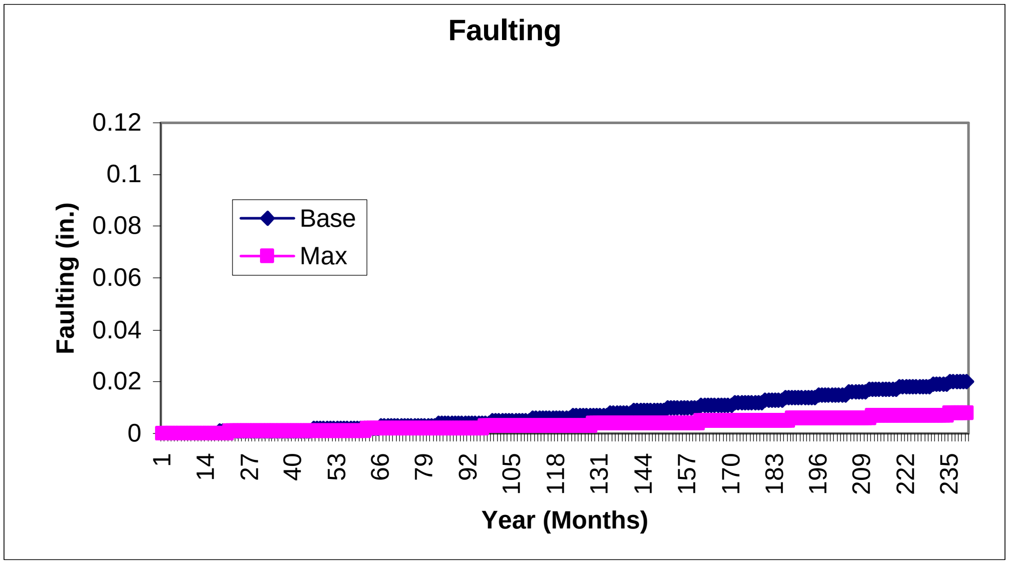


Figure D -456 3011 Base Vs Dec/Jan

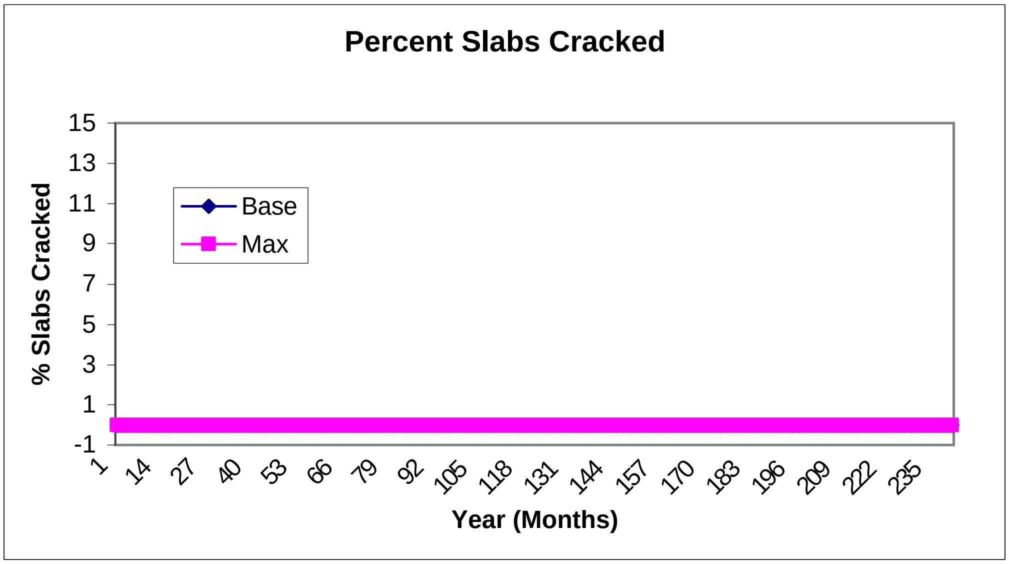


Figure D -457 3011 Base Vs Dec/Jan

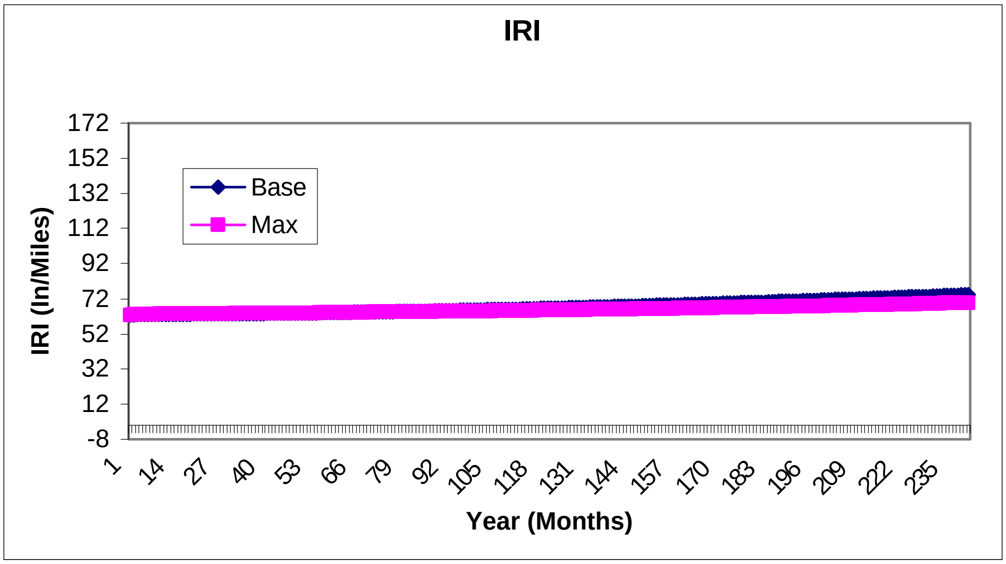


Figure D -458 3011 Base Vs Jun/Jul

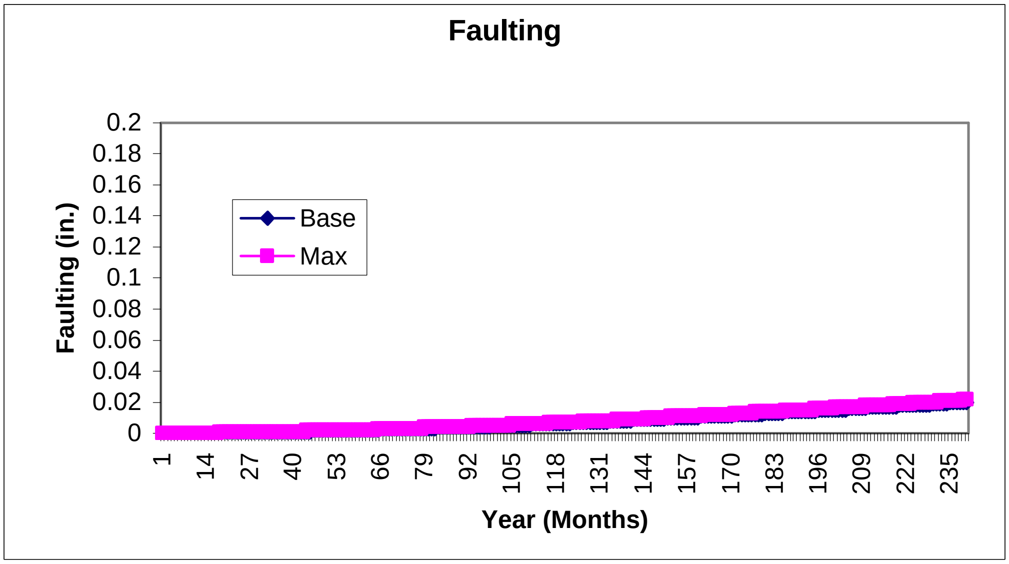


Figure D -459 3011 Base Vs Jun/Jul

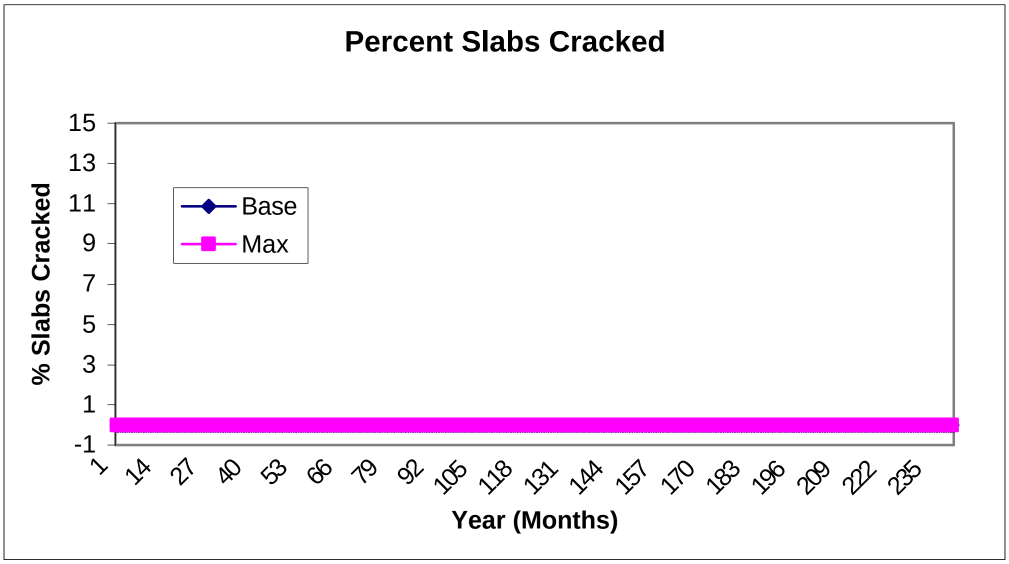


Figure D -460 3011 Base Vs Jun/Jul

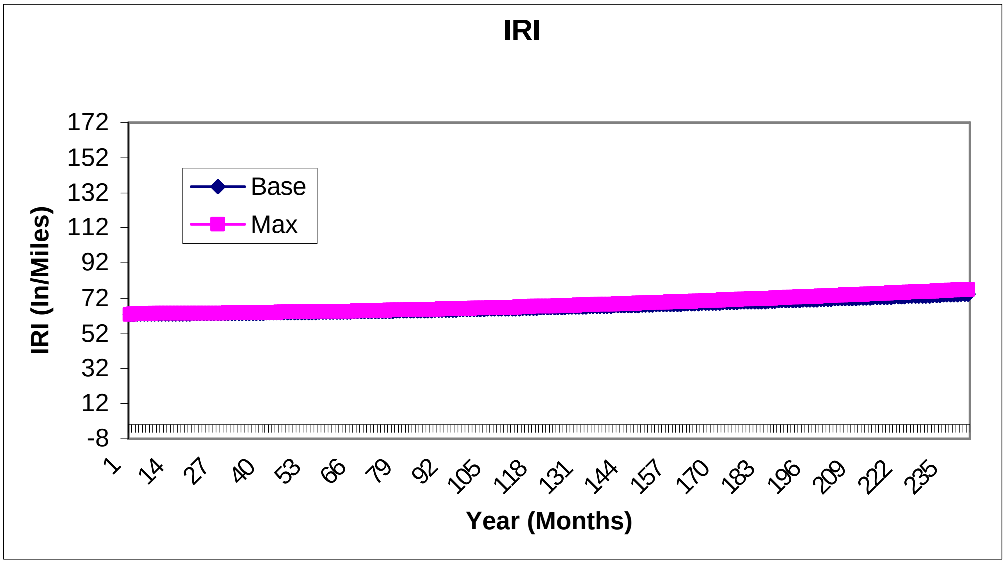


Figure D -461 3011 Base Vs Mar/Apr

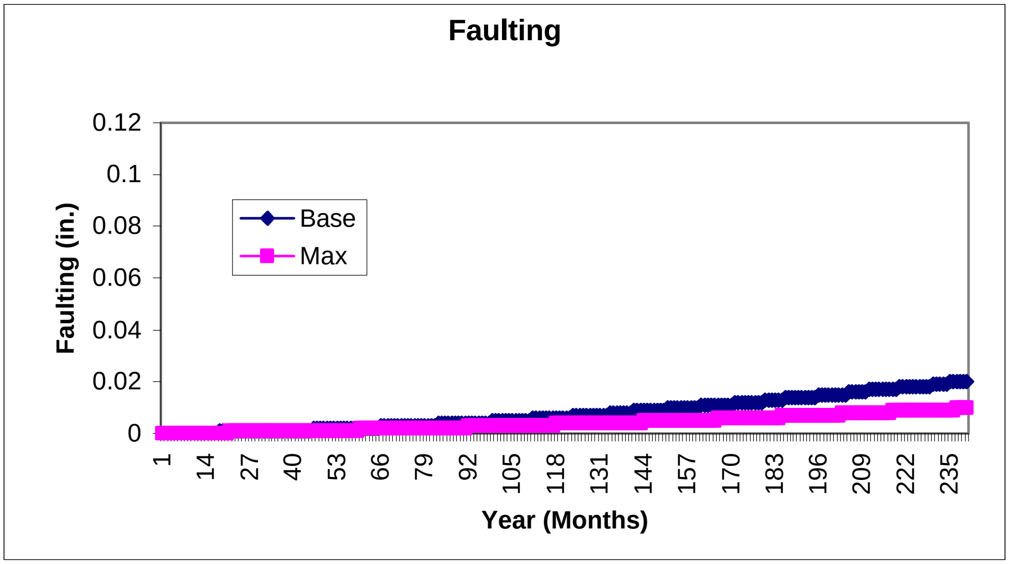


Figure D -462 3011 Base Vs Mar/Apr

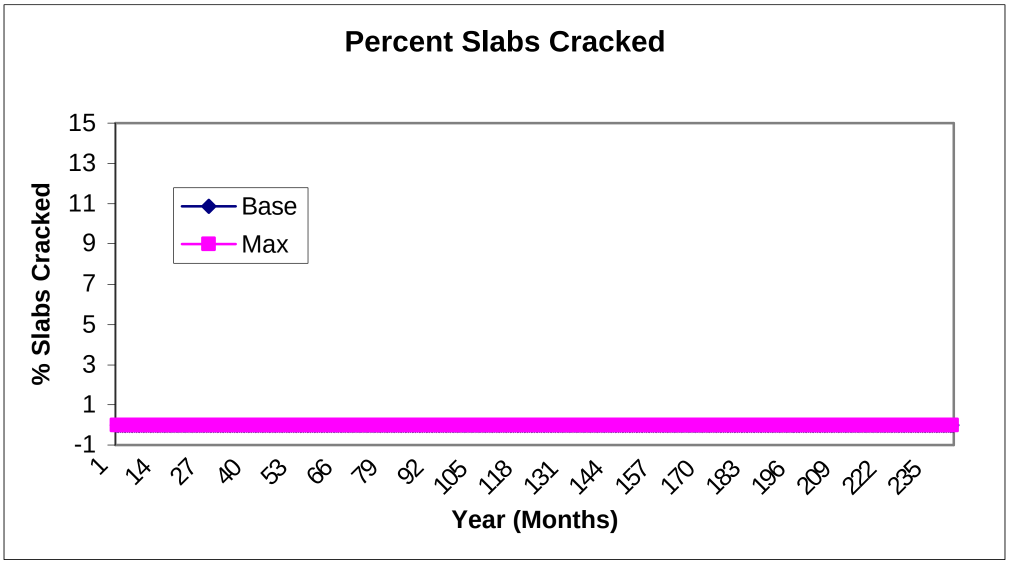


Figure D -463 3011 Base Vs Mar/Apr

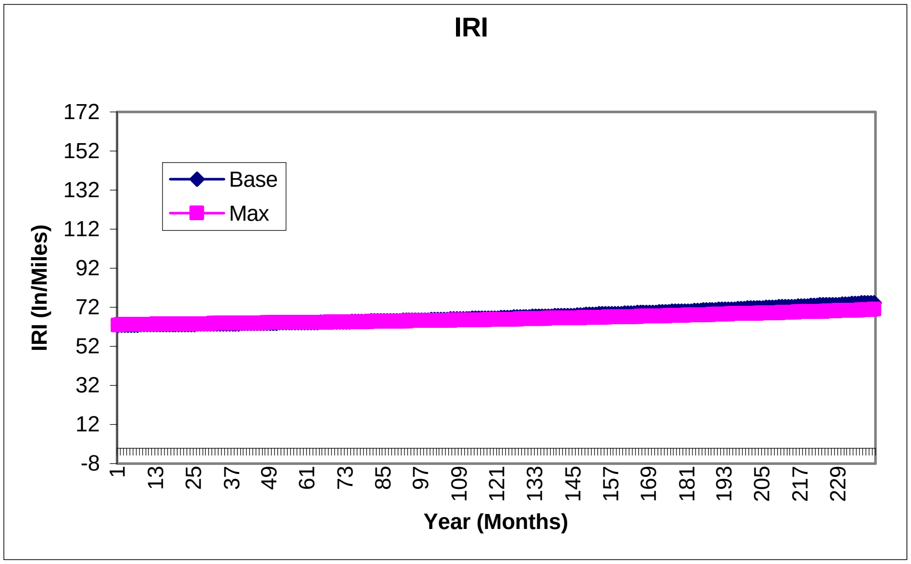


Figure D -464 3011 TruckGrowthFactor

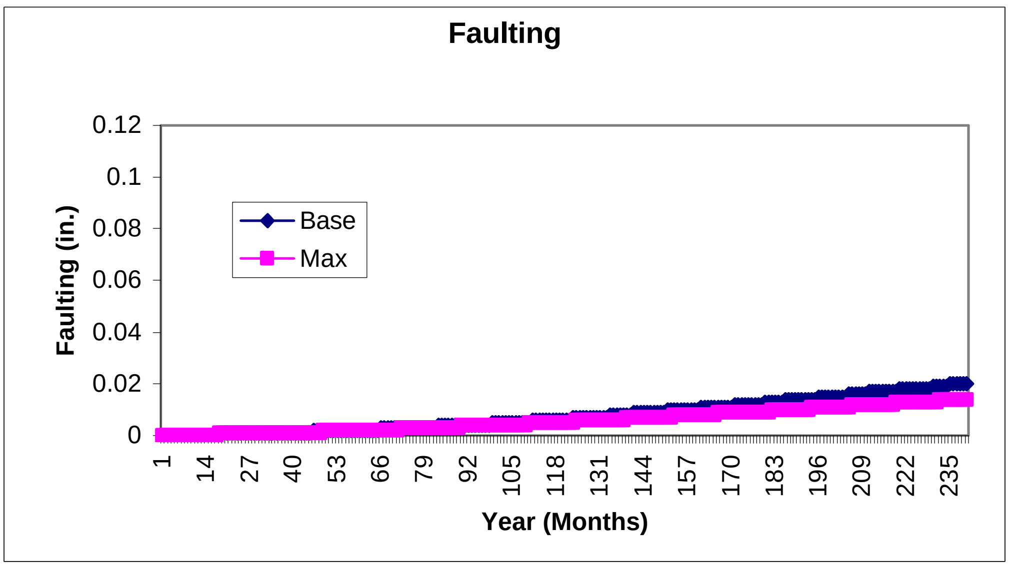


Figure D -465 3011 TruckGrowthFactor

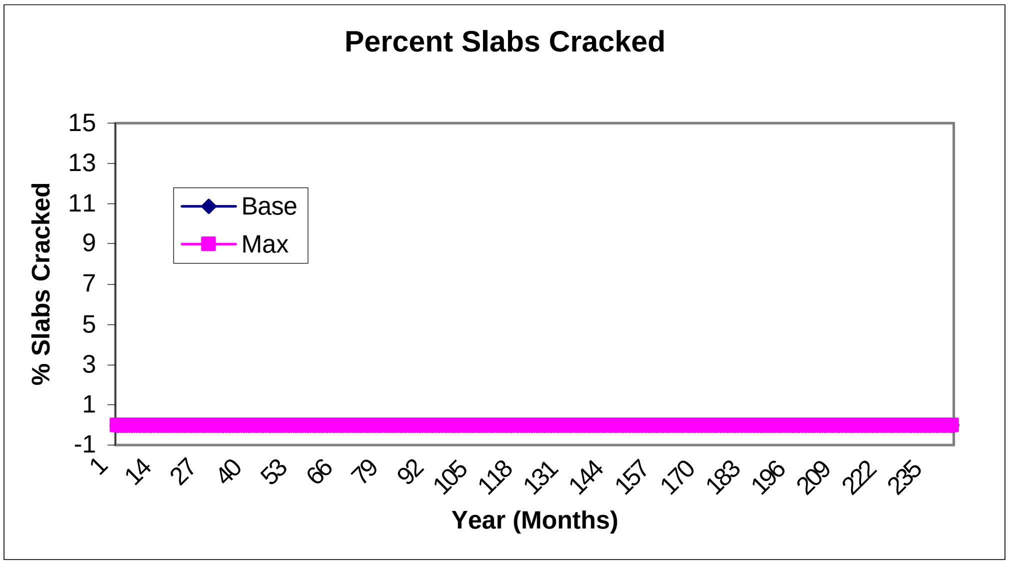


Figure D -466 3011 TruckGrowthFactor

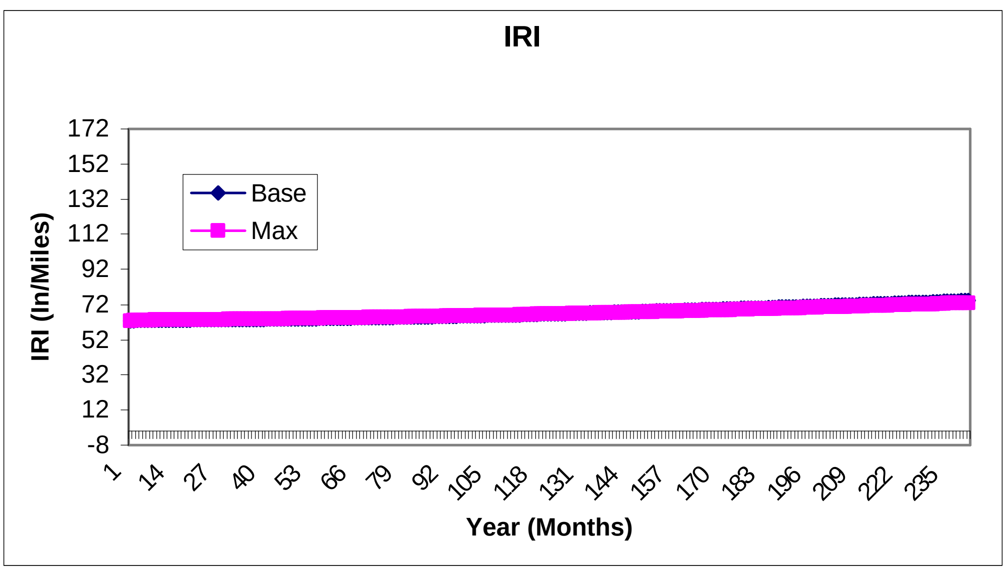


Figure D -467 3816 Coefficient of Thermal Expansion - JPCP

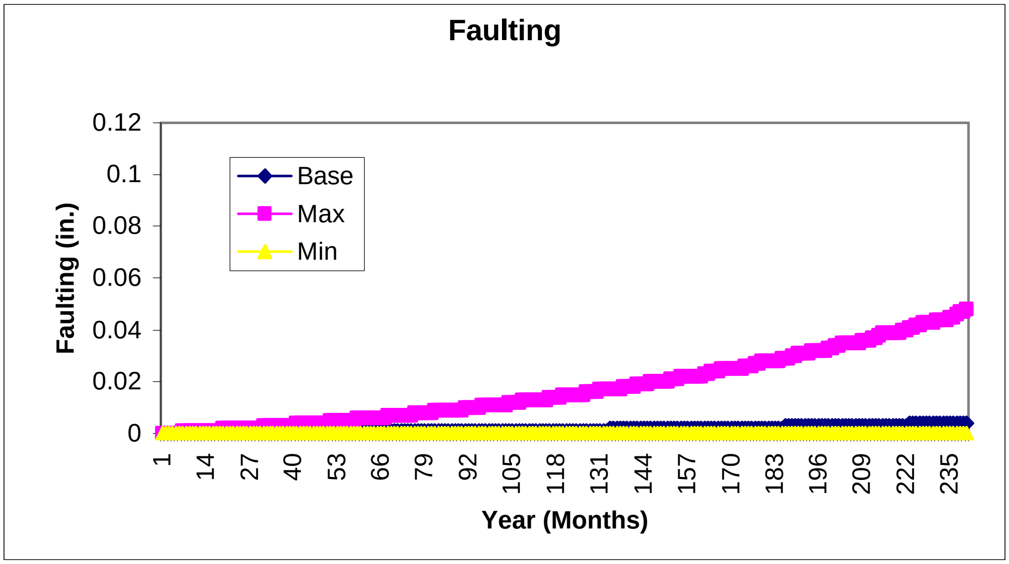


Figure D -468 3816 Coefficient of Thermal Expansion - JPCP

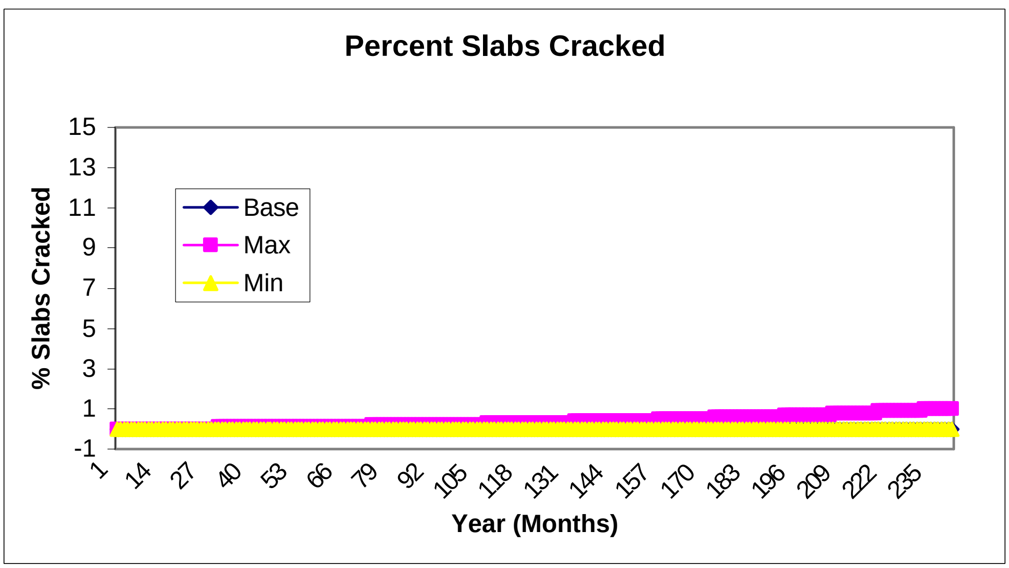


Figure D -469 3816 Coefficient of Thermal Expansion - JPCP

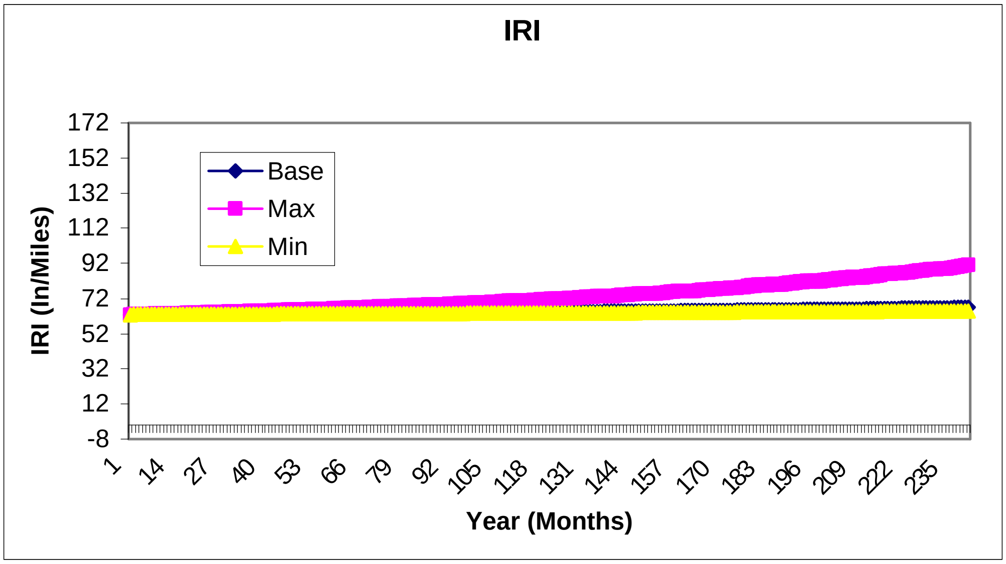


Figure D -470 3816 HeatCapacity - JPCP

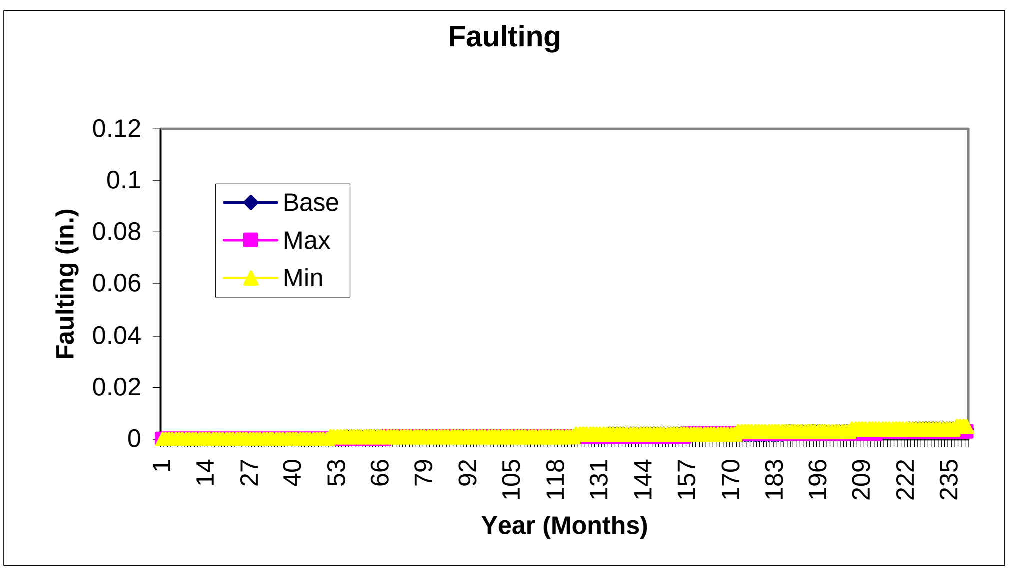


Figure D -471 3816 HeatCapacity - JPCP

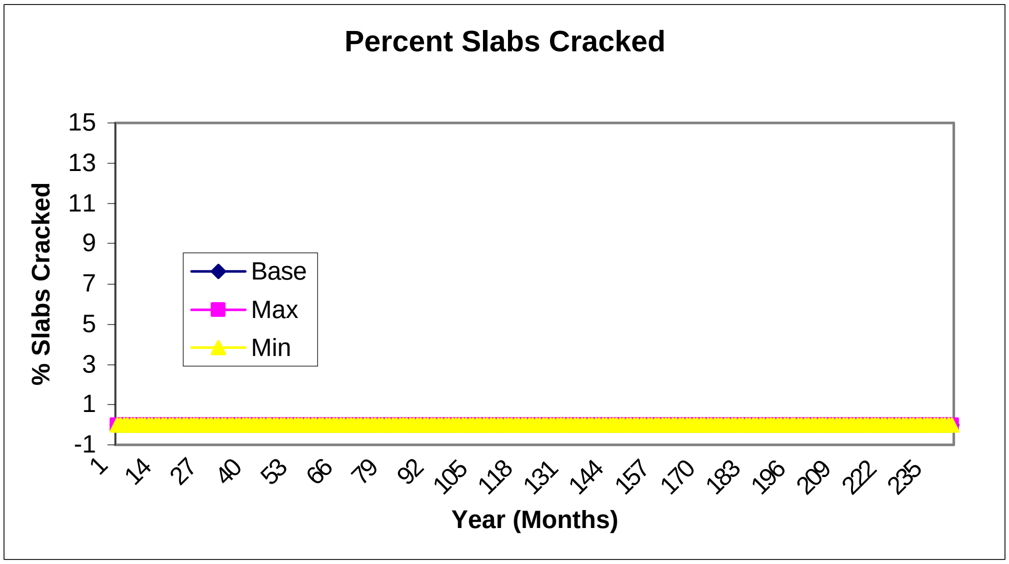


Figure D -472 3816 HeatCapacity - JPCP

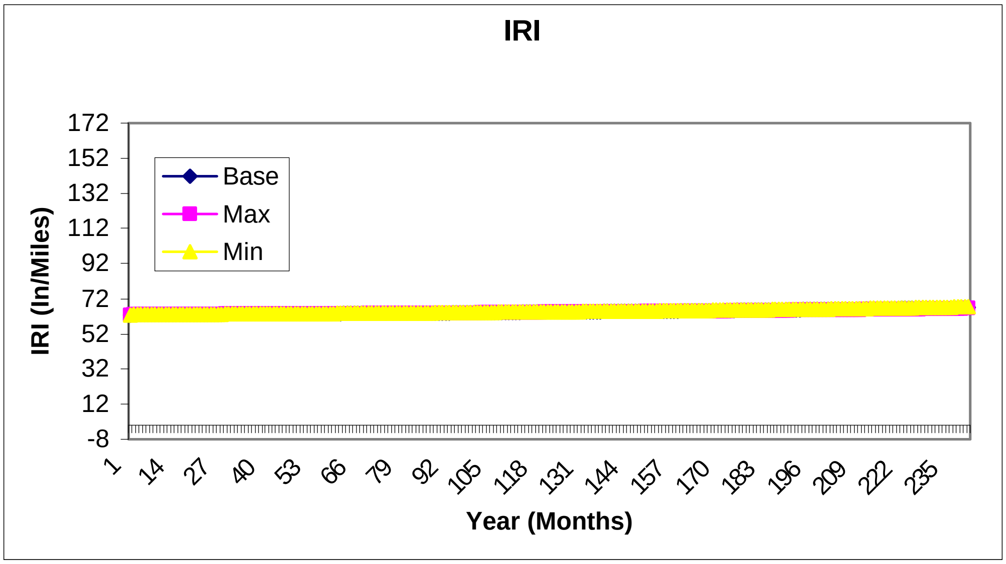


Figure D -473 3816 Thermal Conductivity - JPCP

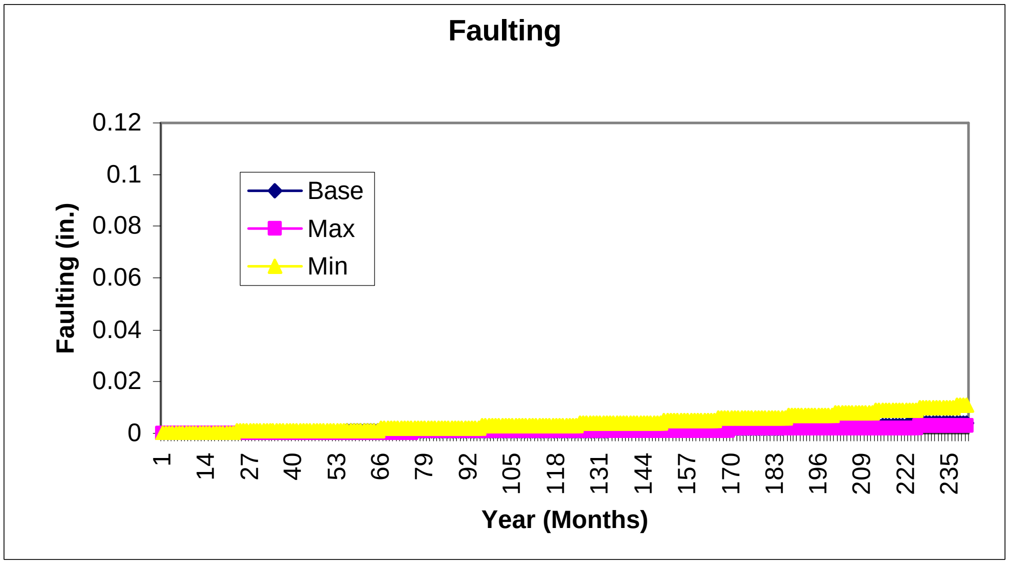


Figure D -474 3816 Thermal Conductivity - JPCP

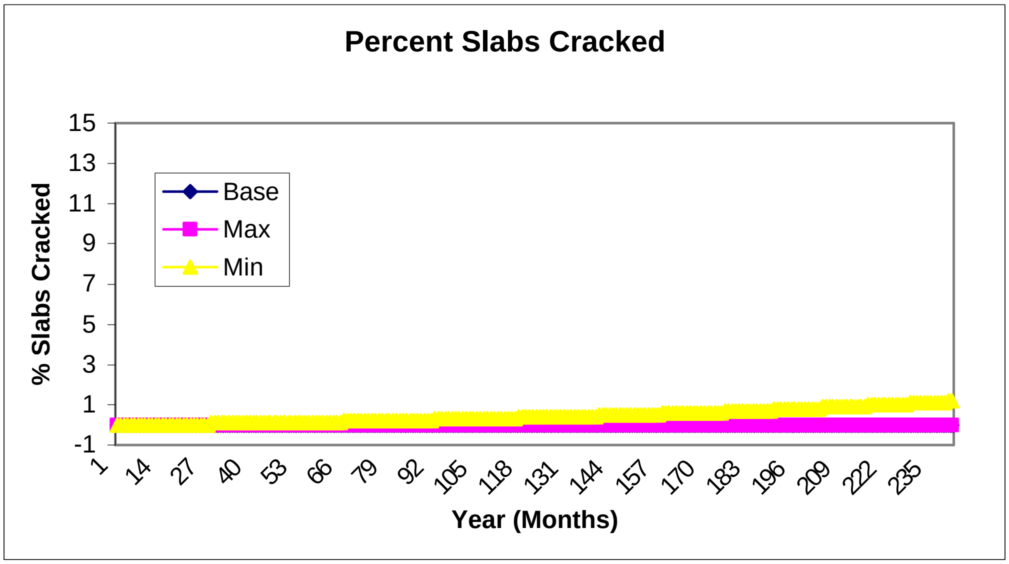


Figure D -475 3816 Thermal Conductivity - JPCP

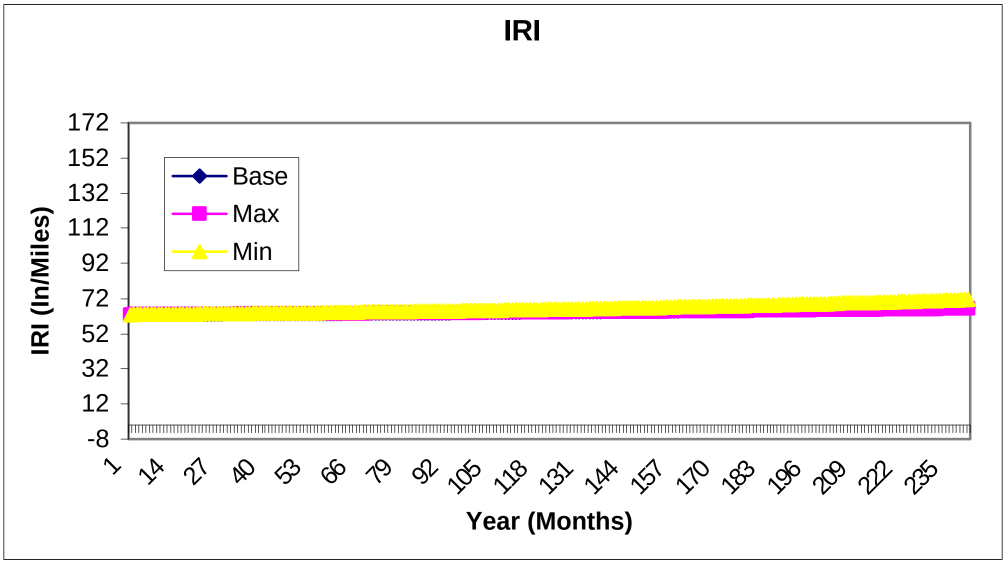


Figure D -476 3816 HeatCapcity - CSM

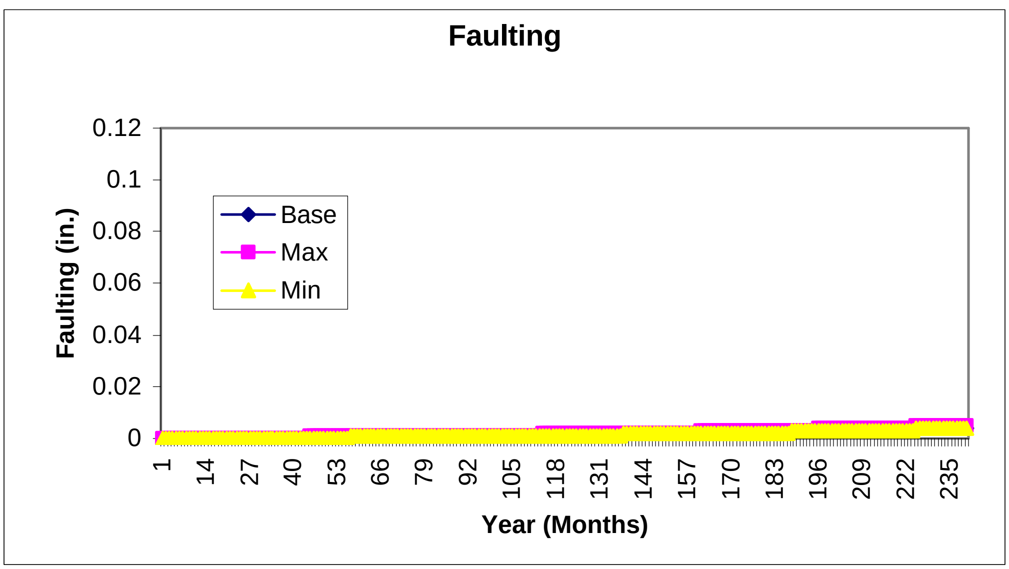


Figure D -477 3816 HeatCapcity - CSM

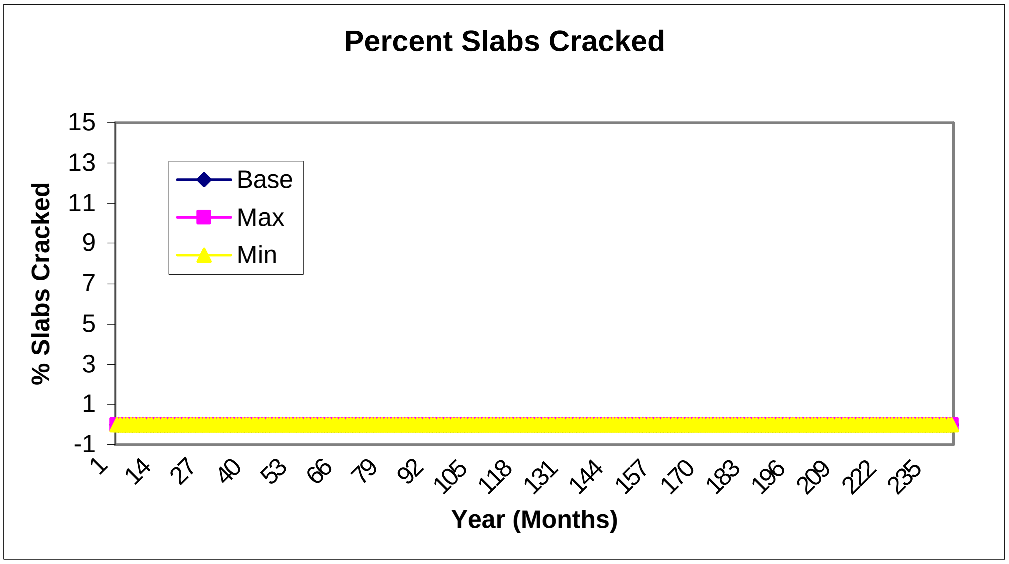


Figure D -478 3816 HeatCapcity - CSM

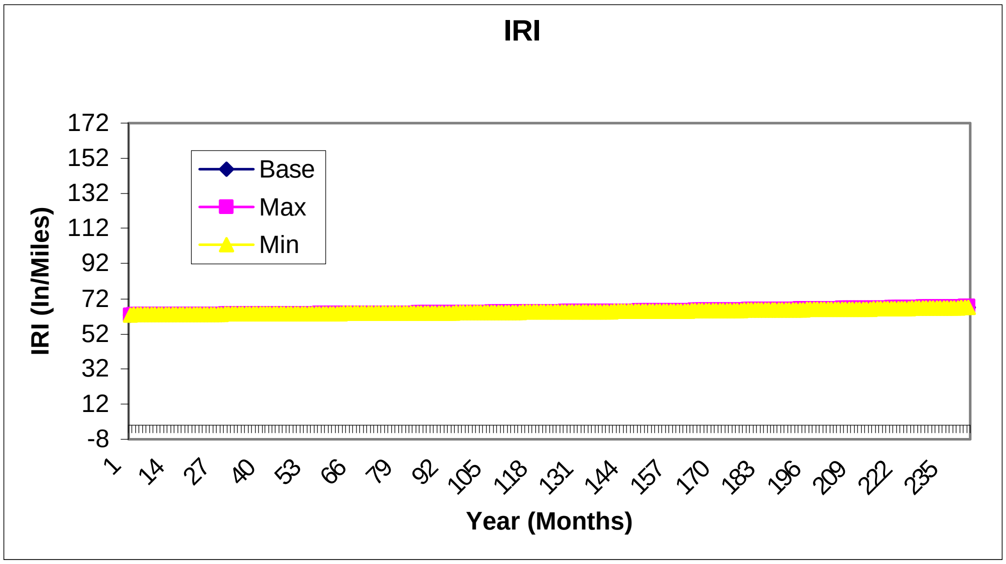


Figure D -479 3816 ThermalConductivity - CSM

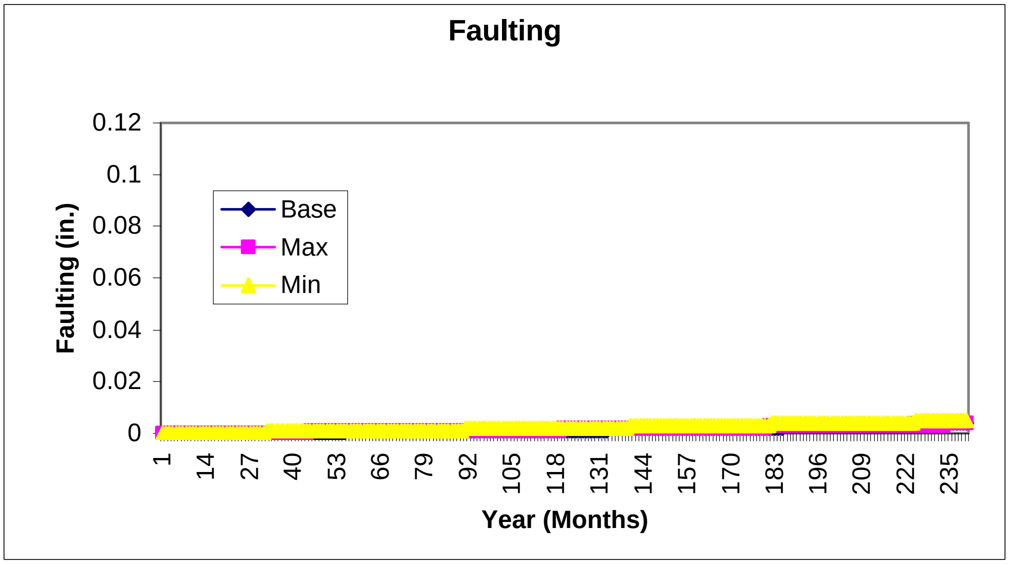


Figure D -480 3816 ThermalConductivity - CSM

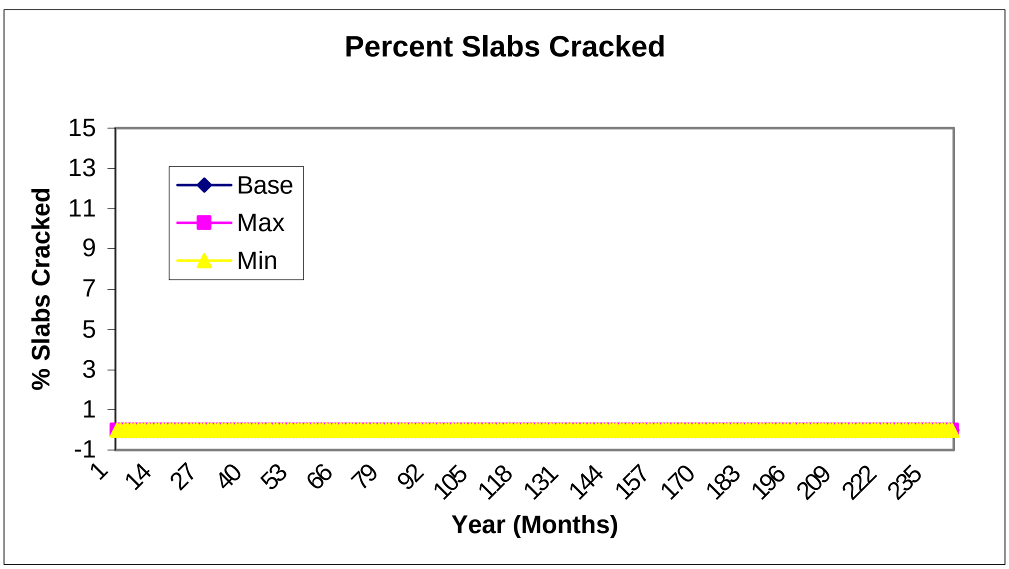


Figure D -481 3816 ThermalConductivity - CSM

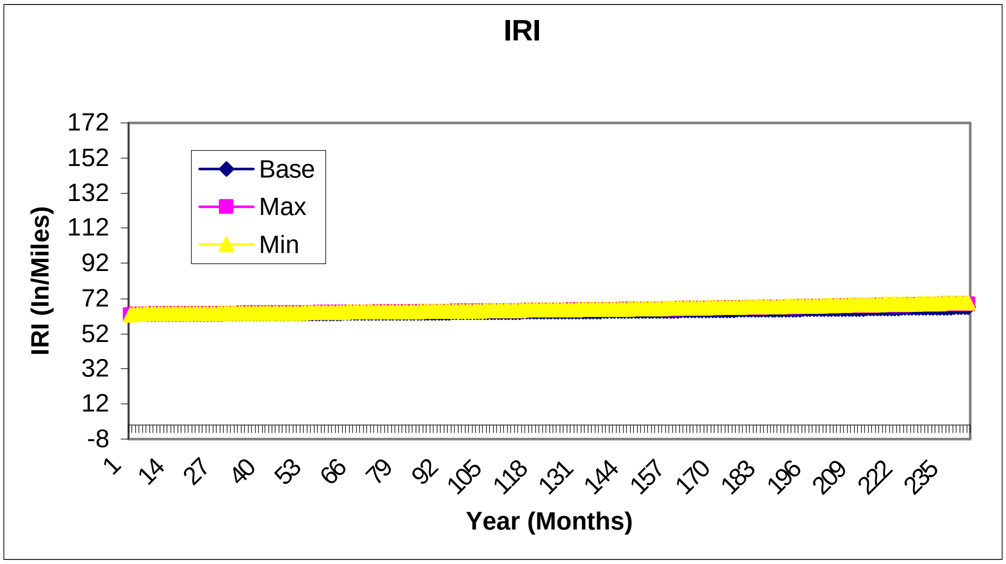


Figure D -482 3816 Unit Weight - CSM

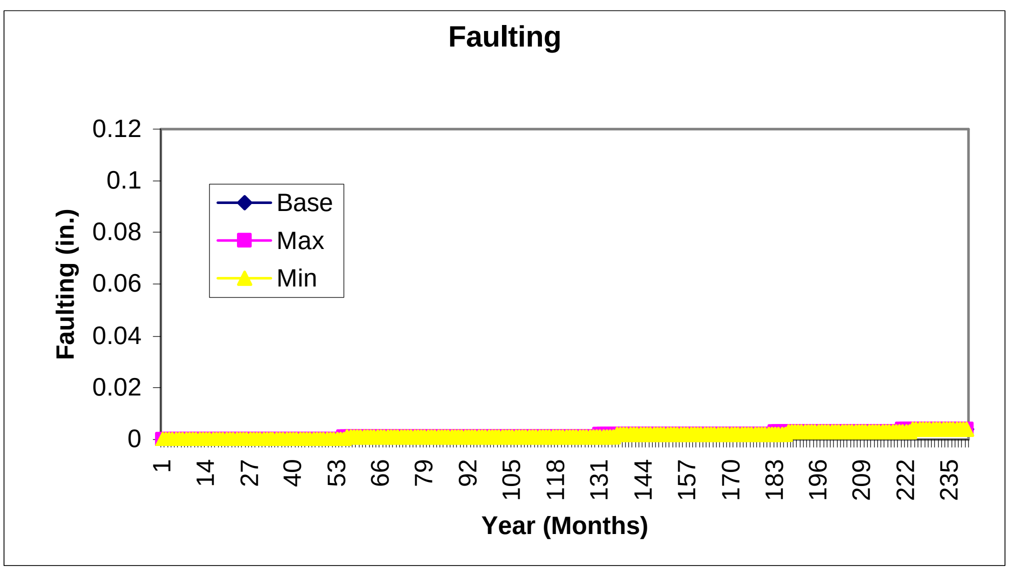


Figure D -483 3816 Unit Weight - CSM

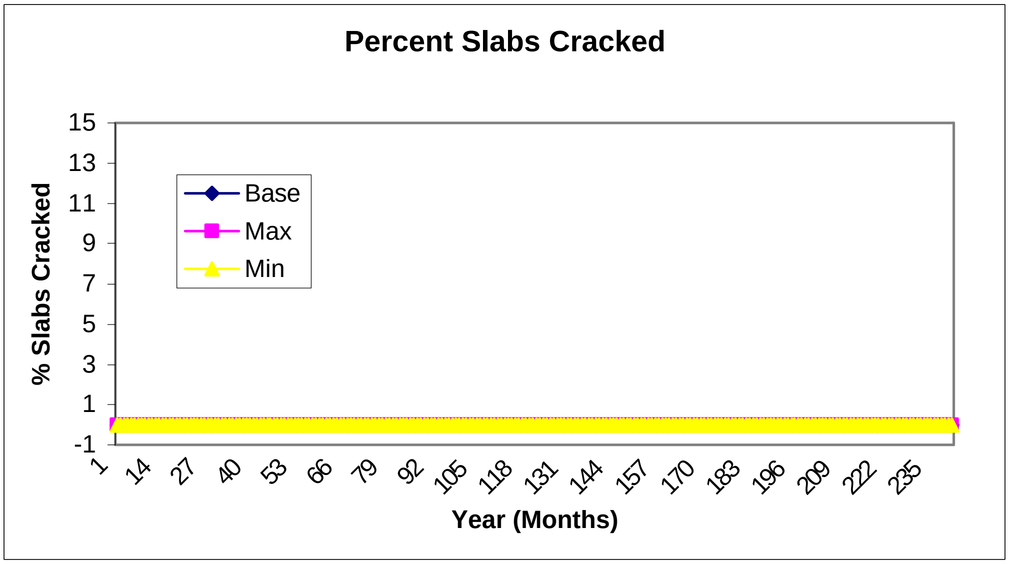


Figure D -484 3816 Unit Weight - CSM

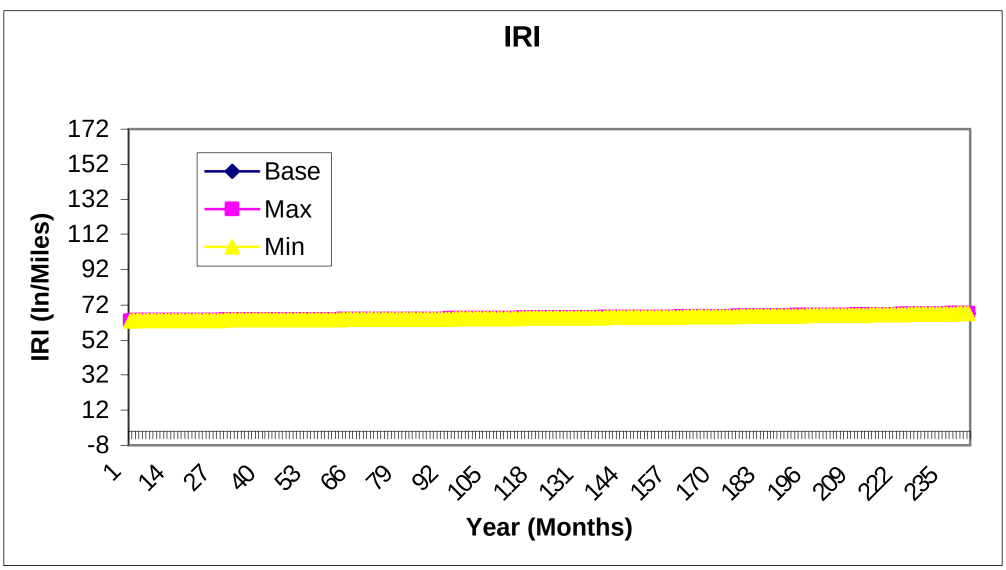


Figure D -485 3816 Subgrade Modulus

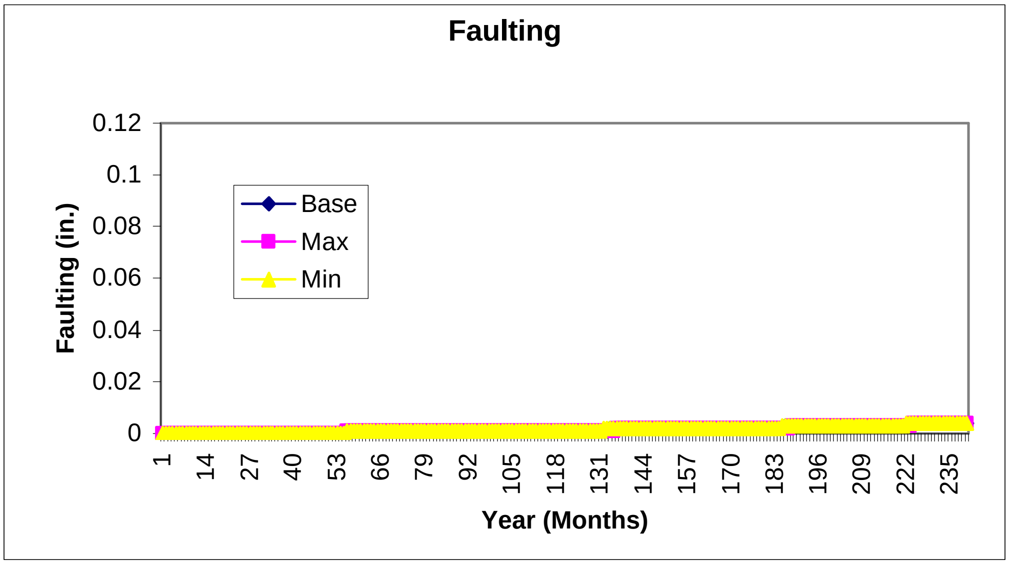


Figure D -486 3816 Subgrade Modulus

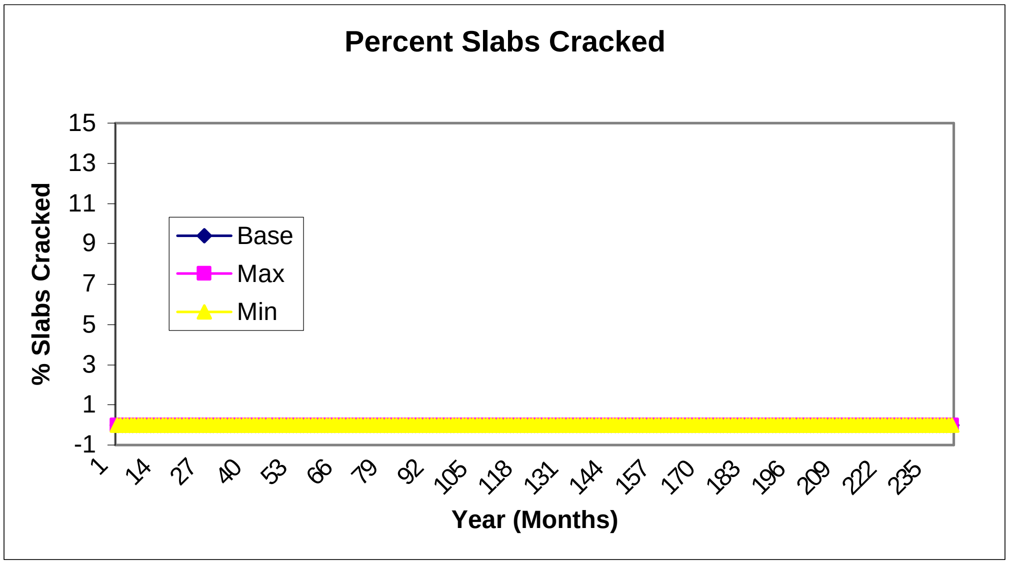


Figure D -487 3816 Subgrade Modulus

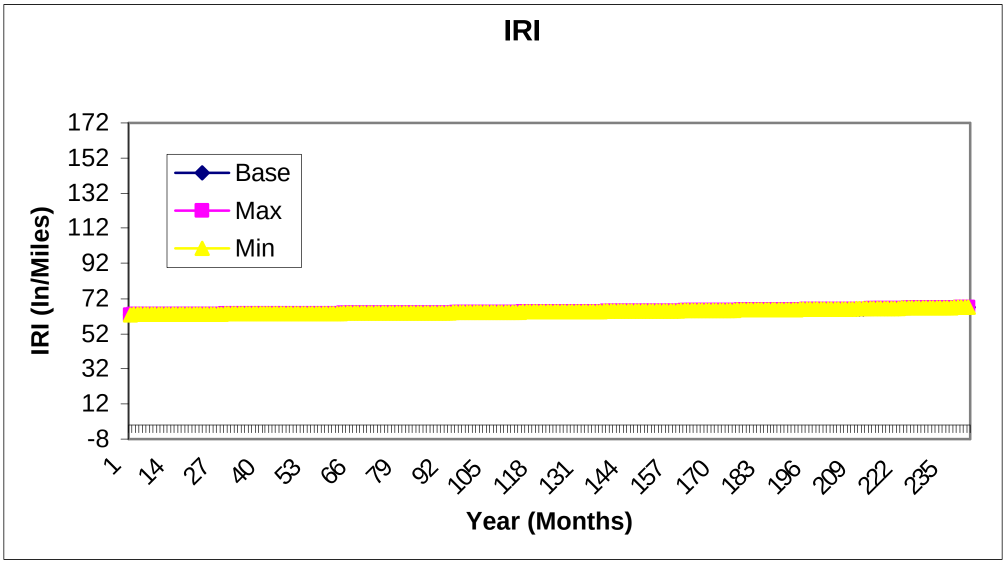


Figure D -488 3816 Surface Shortwave Absorptivity

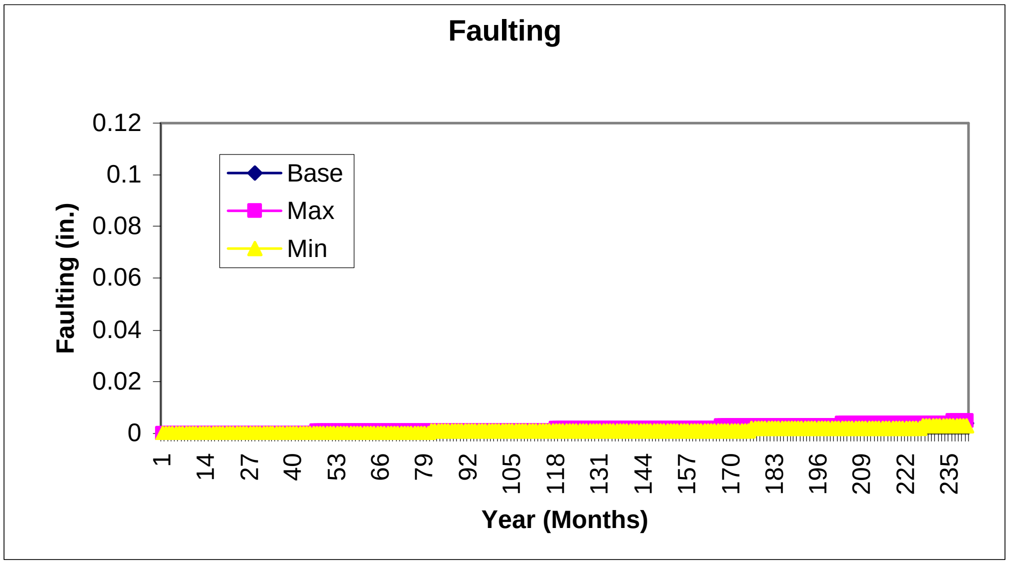


Figure D -489 3816 Surface Shortwave Absorptivity

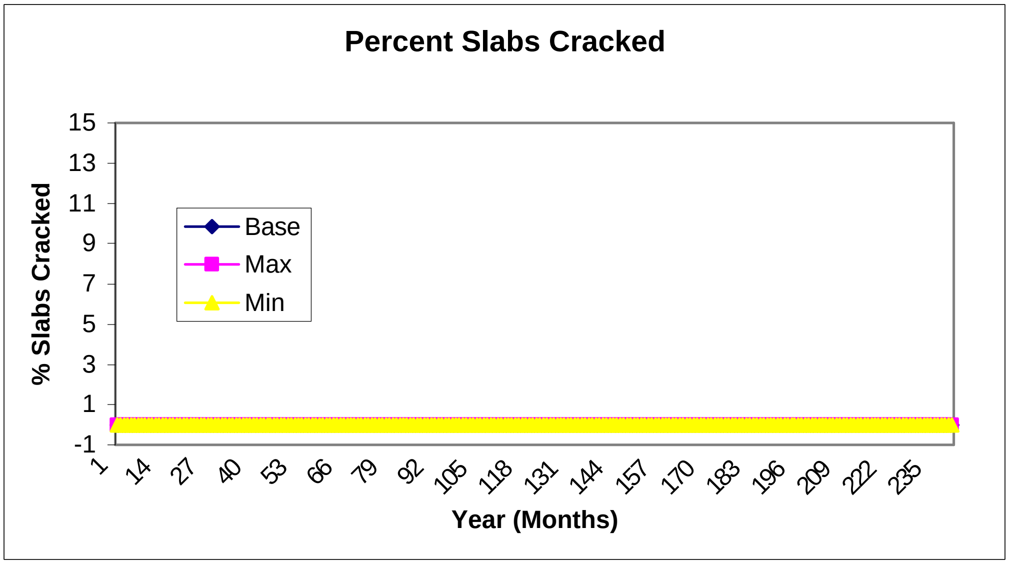


Figure D -490 3816 Surface Shortwave Absorptivity

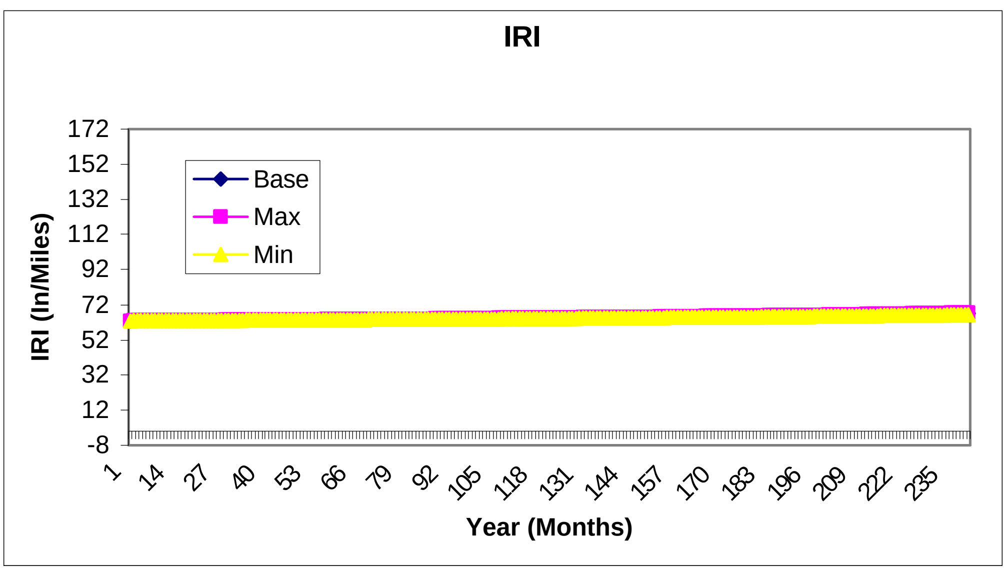


Figure D -491 3816 Load Transfer Efficiency

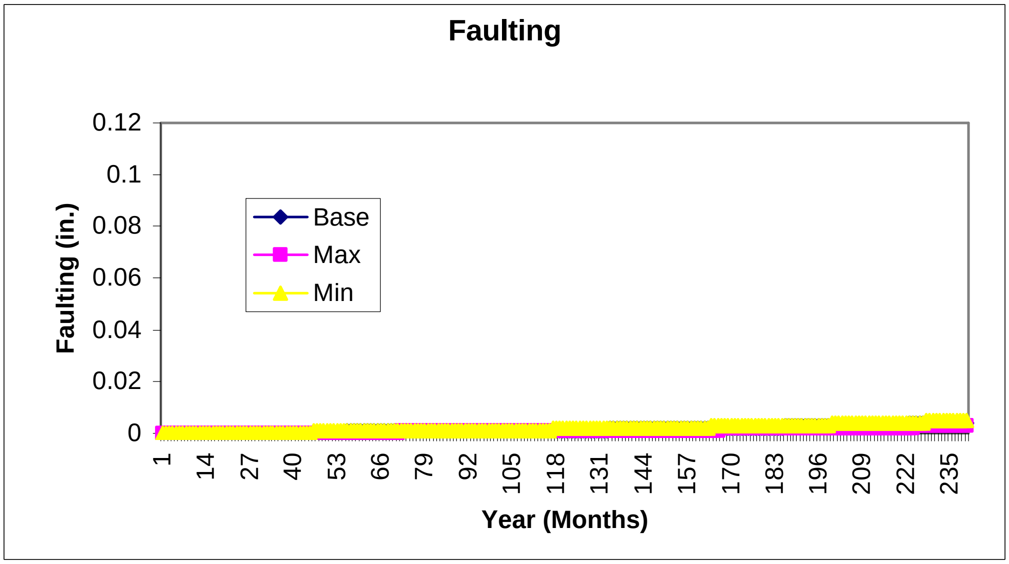


Figure D -492 3816 Load Transfer Efficiency

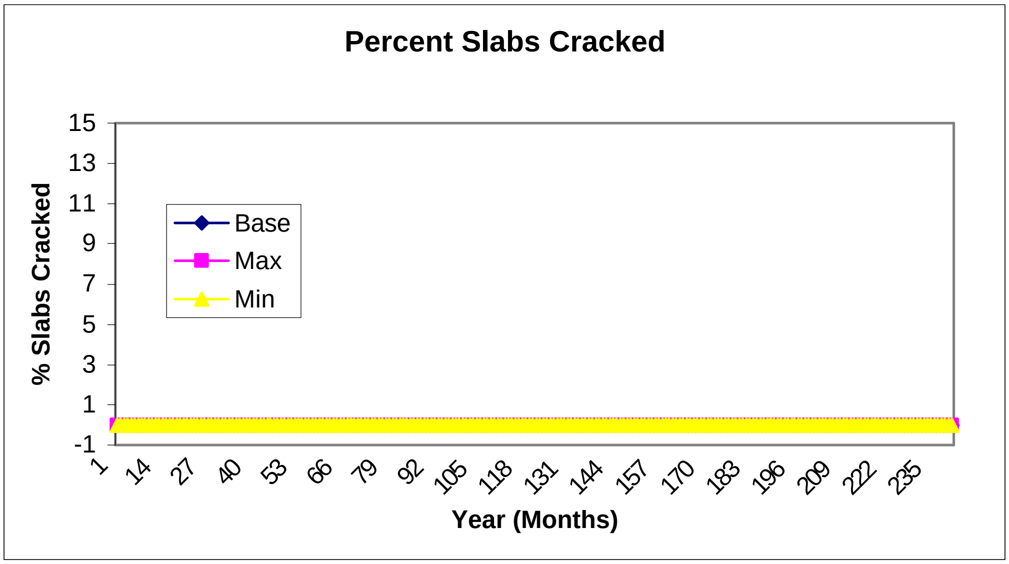


Figure D -493 3816 Load Transfer Efficiency

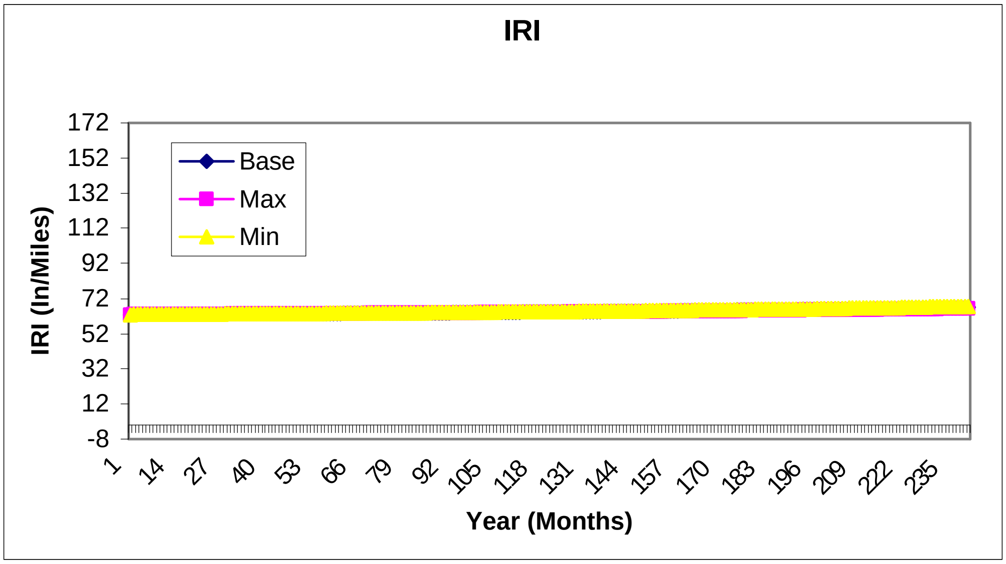


Figure D -494 3816 Joint Spacing

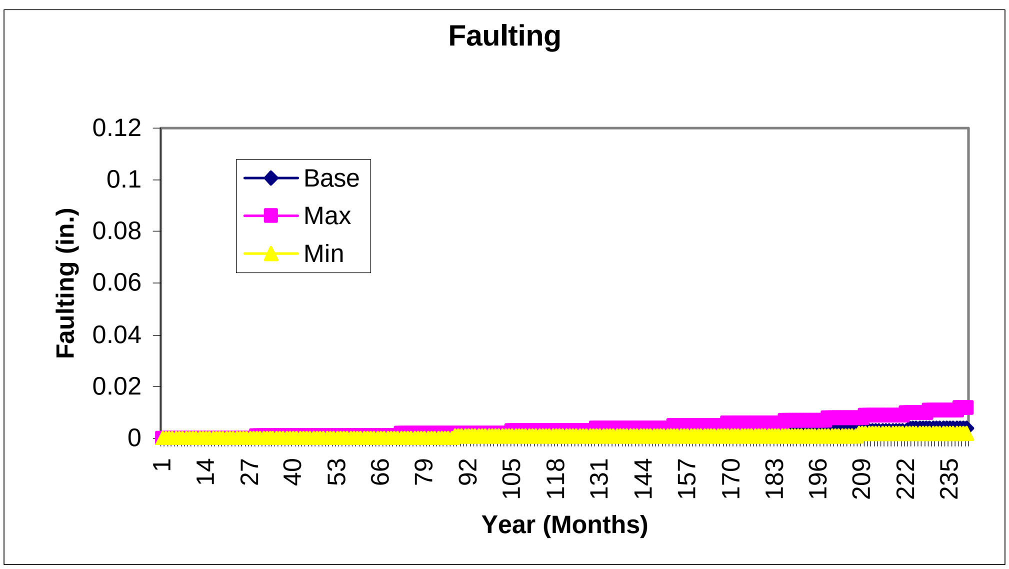


Figure D -495 3816 Joint Spacing

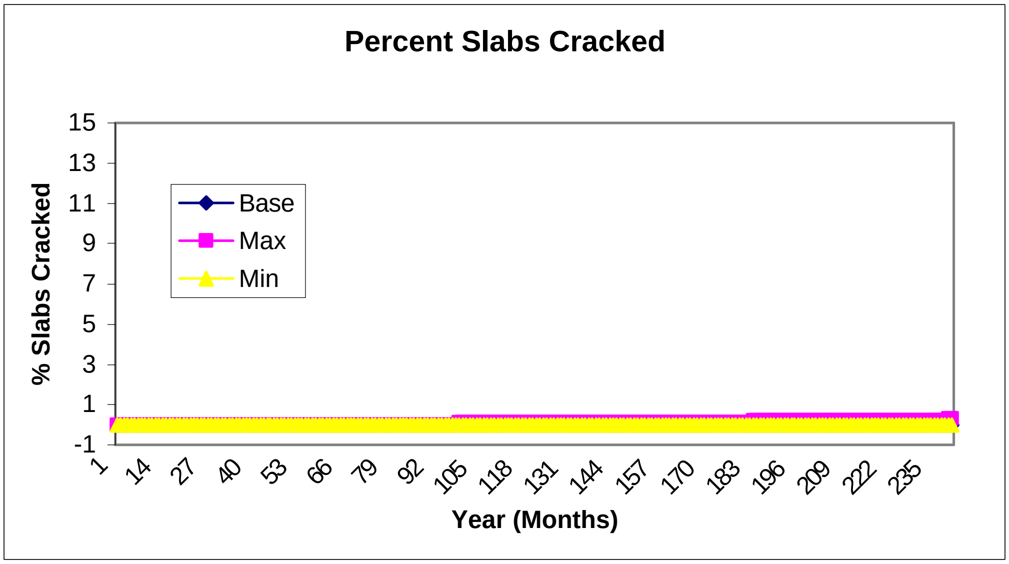


Figure D -496 3816 Joint Spacing

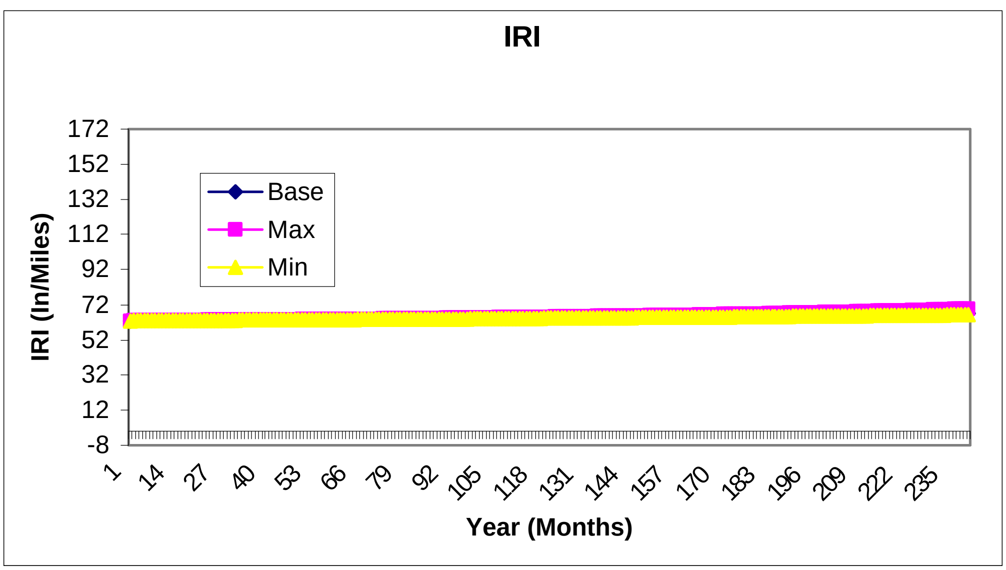


Figure D -497 3816 Dowell Diameter

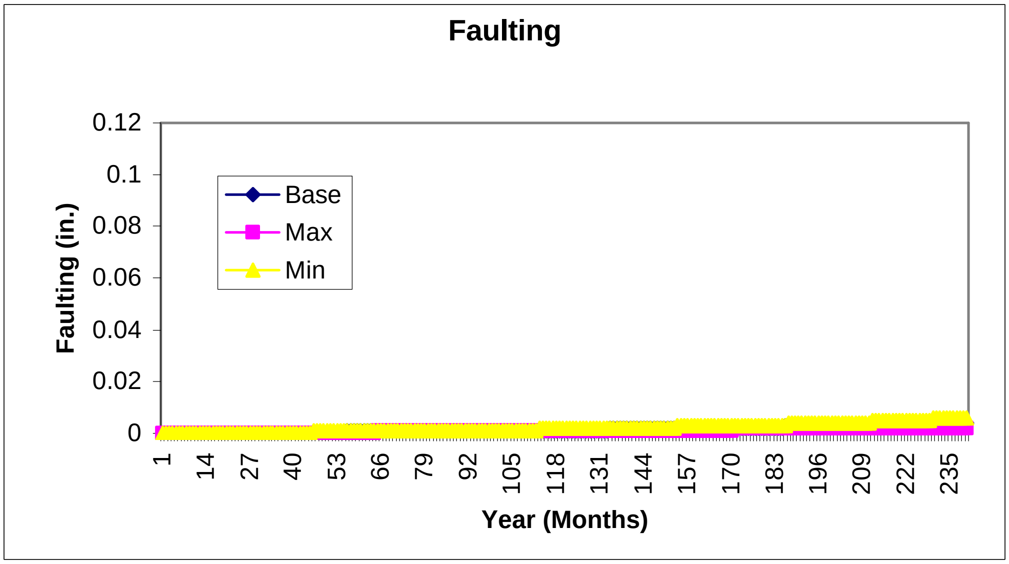


Figure D -498 3816 Dowell Diameter

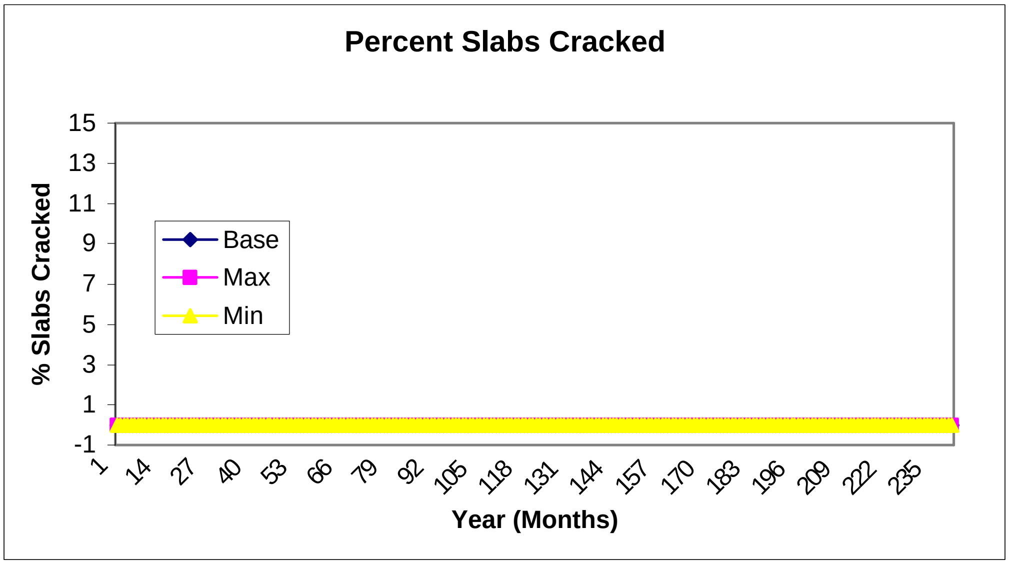


Figure D -499 3816 Dowell Diameter

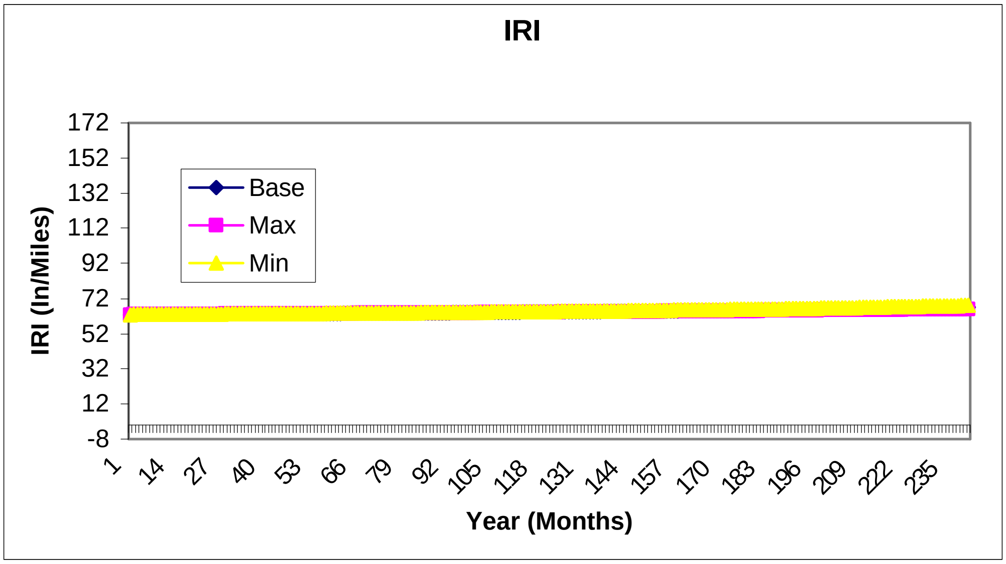


Figure D -500 3816 Base Vs Jan/Feb

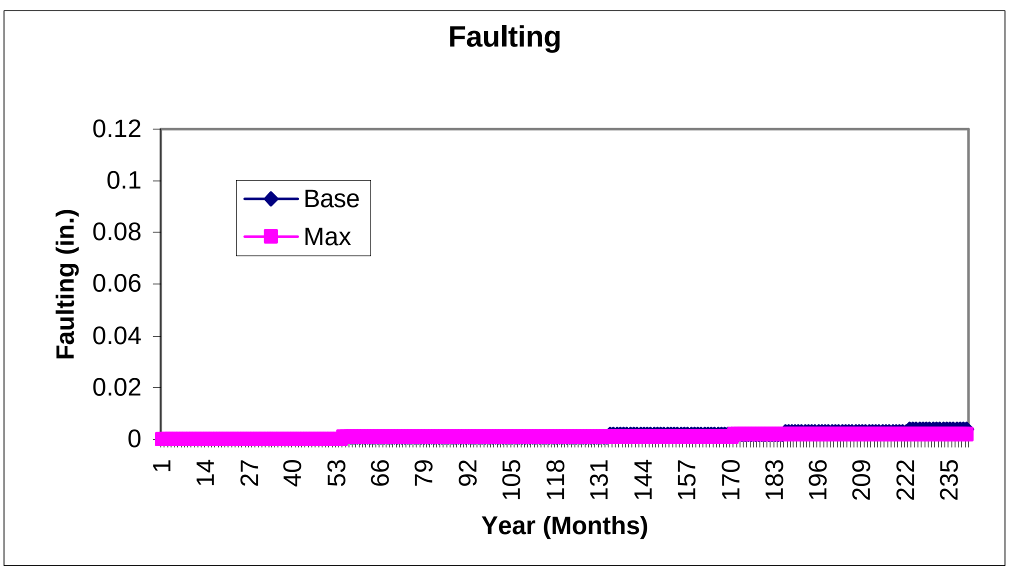


Figure D -501 3816 Base Vs Jan/Feb

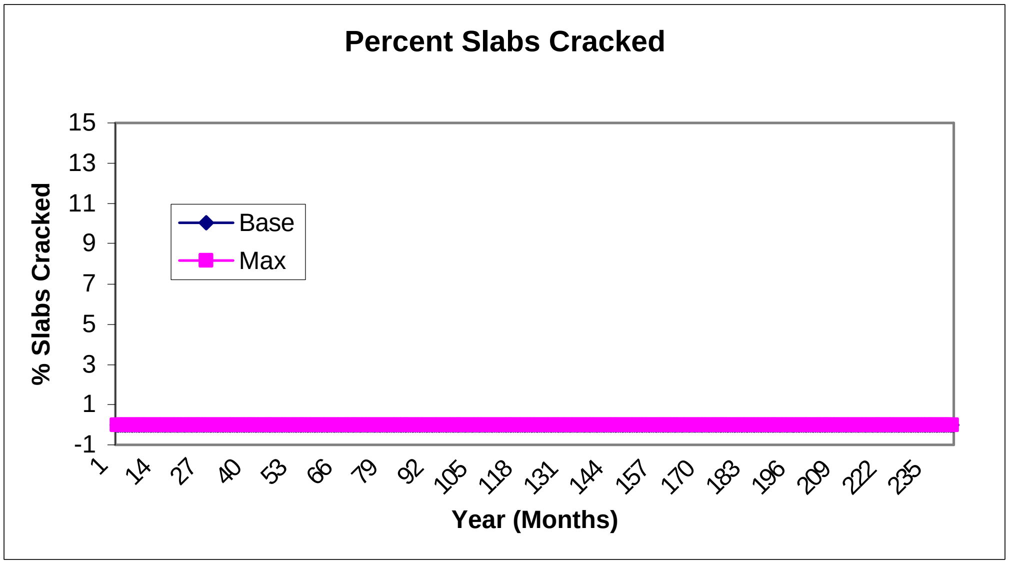


Figure D -502 3816 Base Vs Jan/Feb

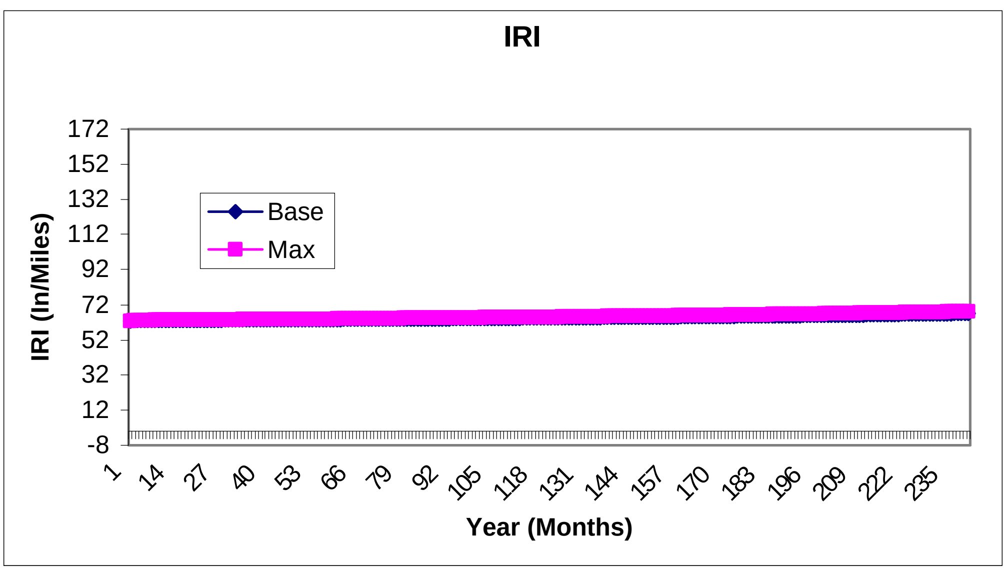


Figure D -503 3816 Base Vs Jul/Aug

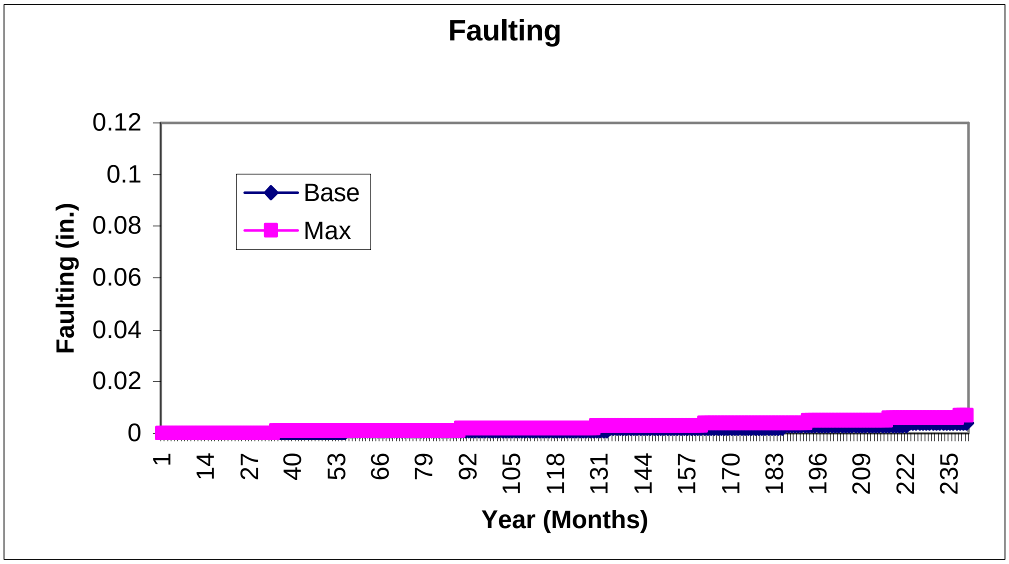


Figure D -504 3816 Base Vs Jul/Aug

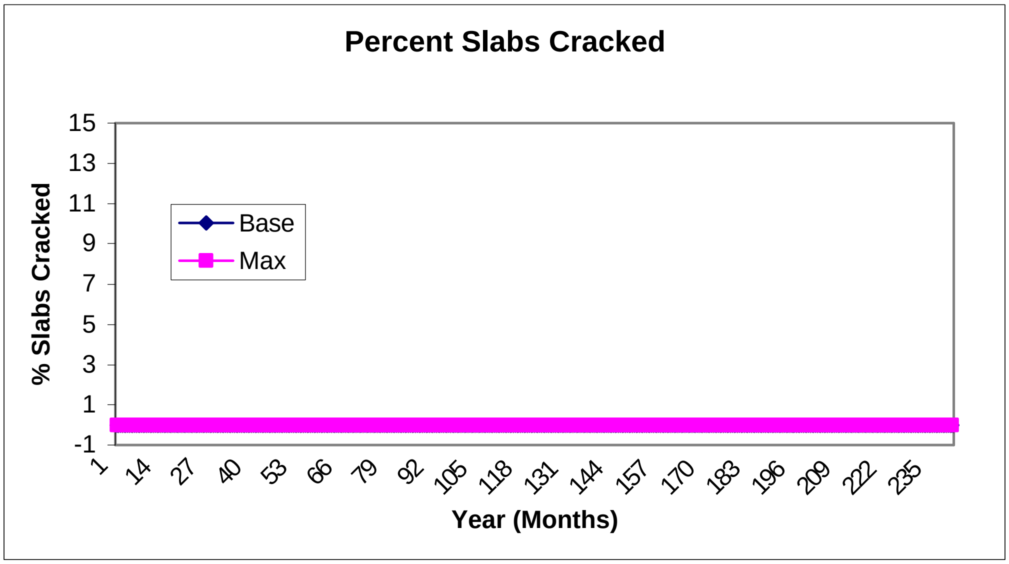


Figure D -505 3816 Base Vs Jul/Aug

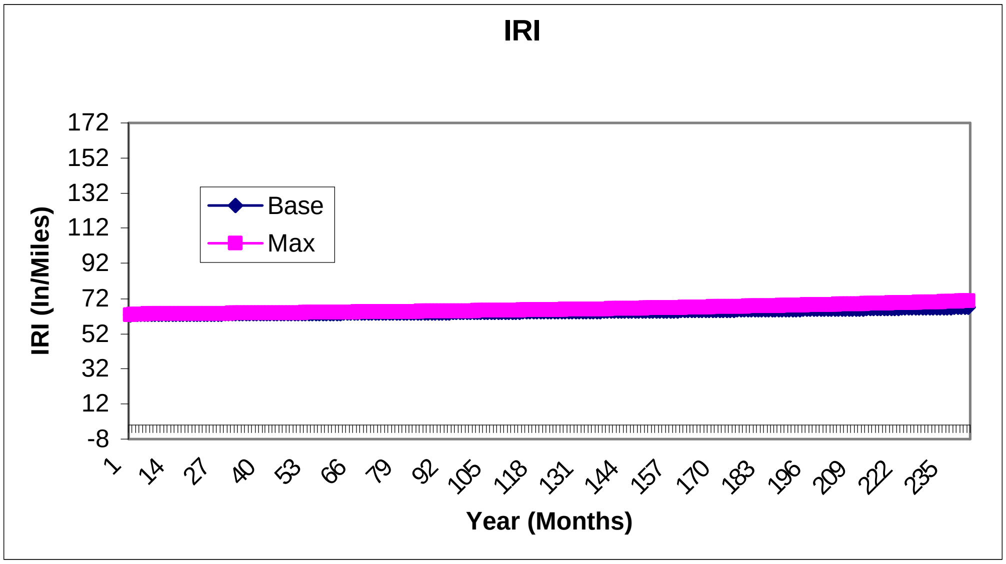


Figure D -506 3816 Base Vs Oct/Nov

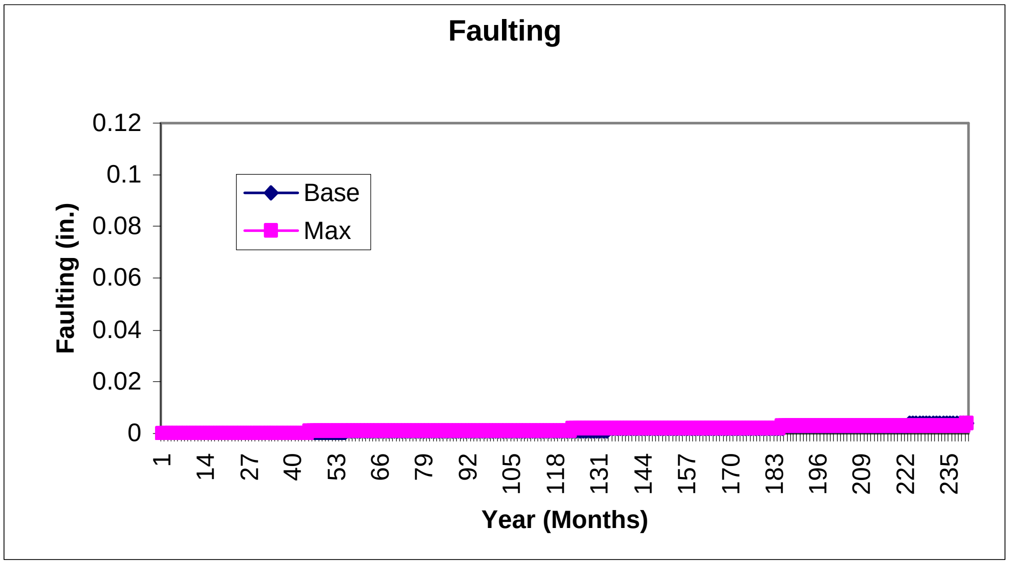


Figure D -507 3816 Base Vs Oct/Nov

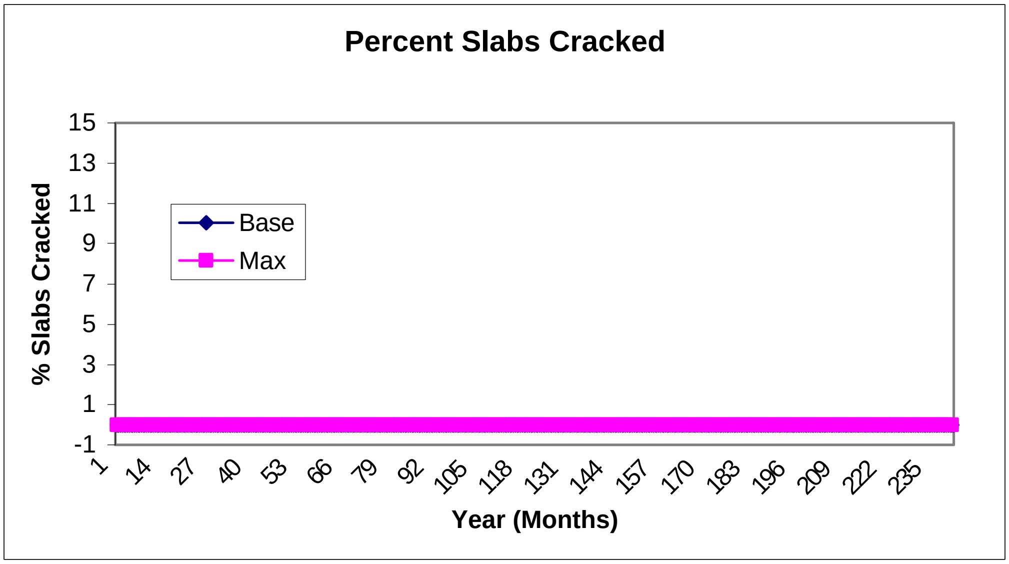


Figure D -508 3816 Base Vs Oct/Nov

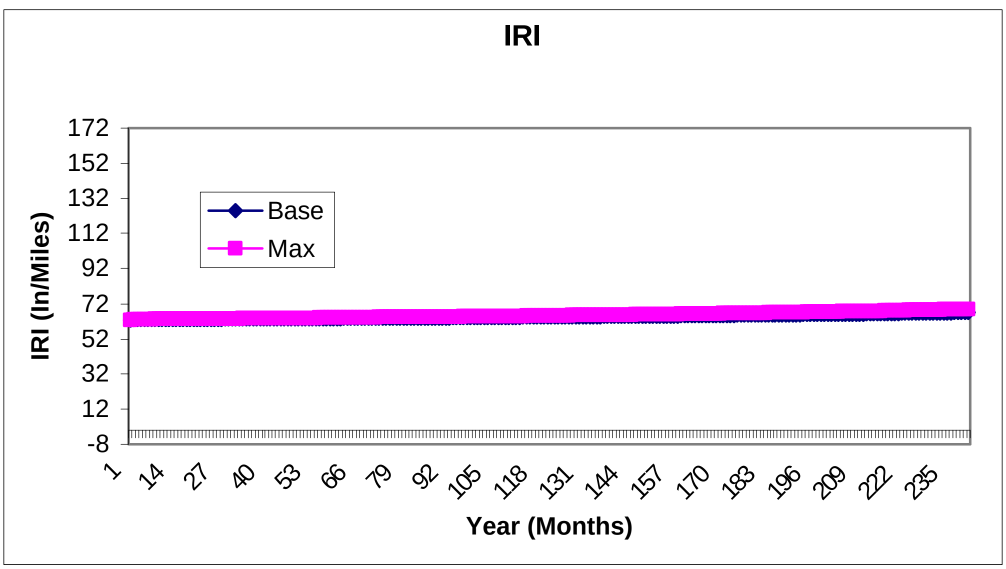


Figure D -509 3816 Truck Growth Factor

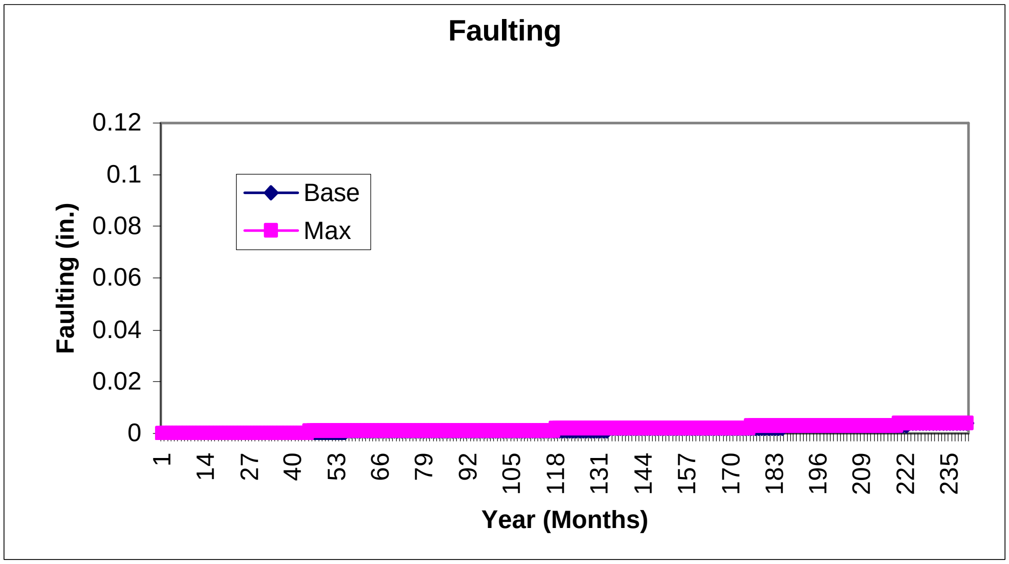


Figure D -510 3816 Truck Growth Factor

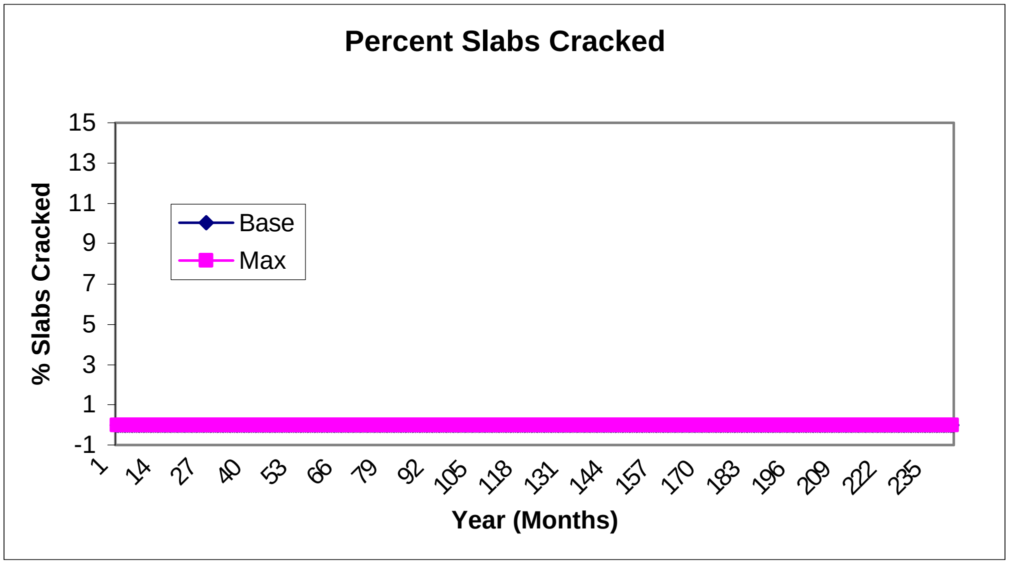


Figure D -511 3816 Truck Growth Factor

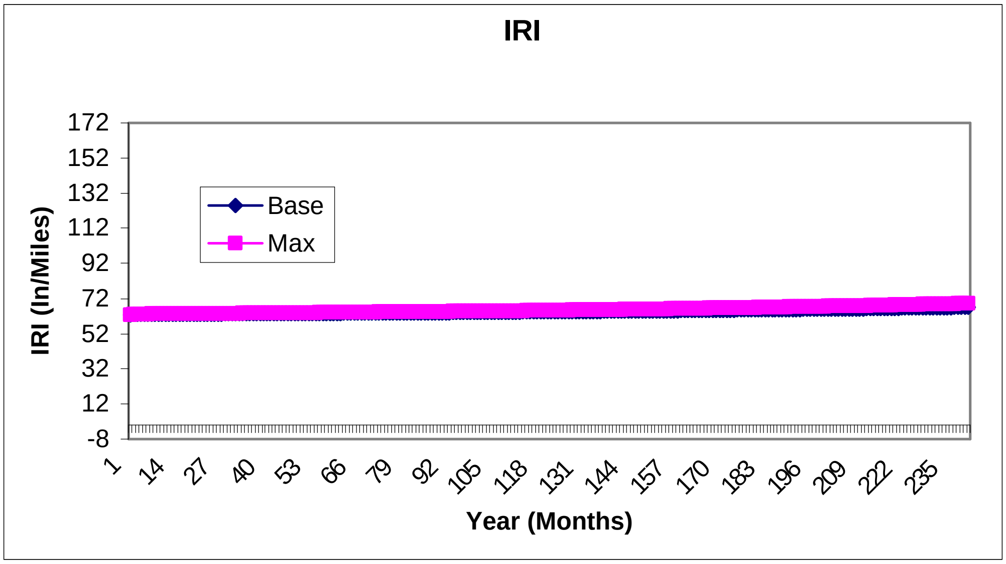


Figure D -512 5827 Coefficient of Thermal Expansion - CRCP

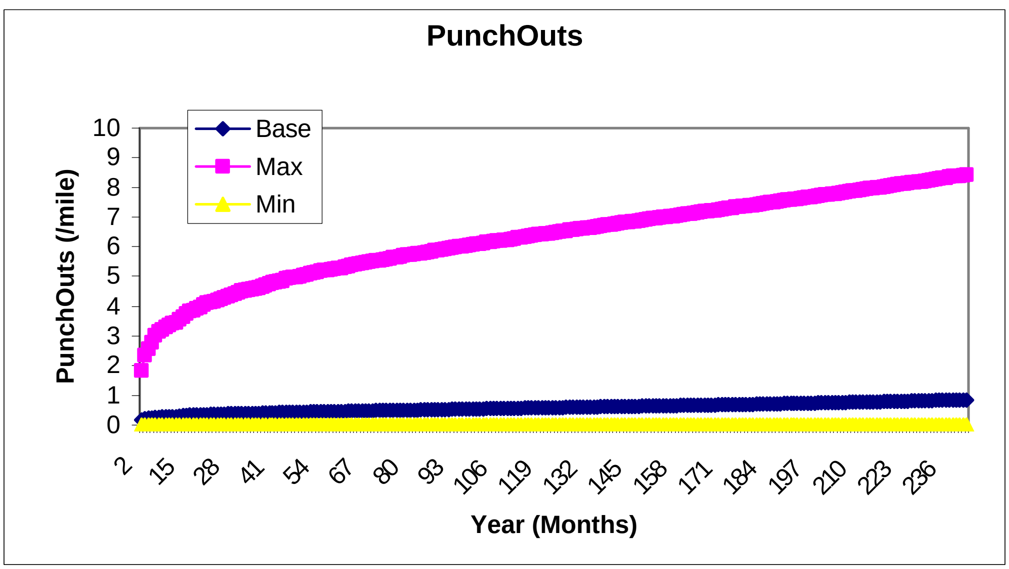


Figure D -513 5827 Coefficient of Thermal Expansion - CRCP

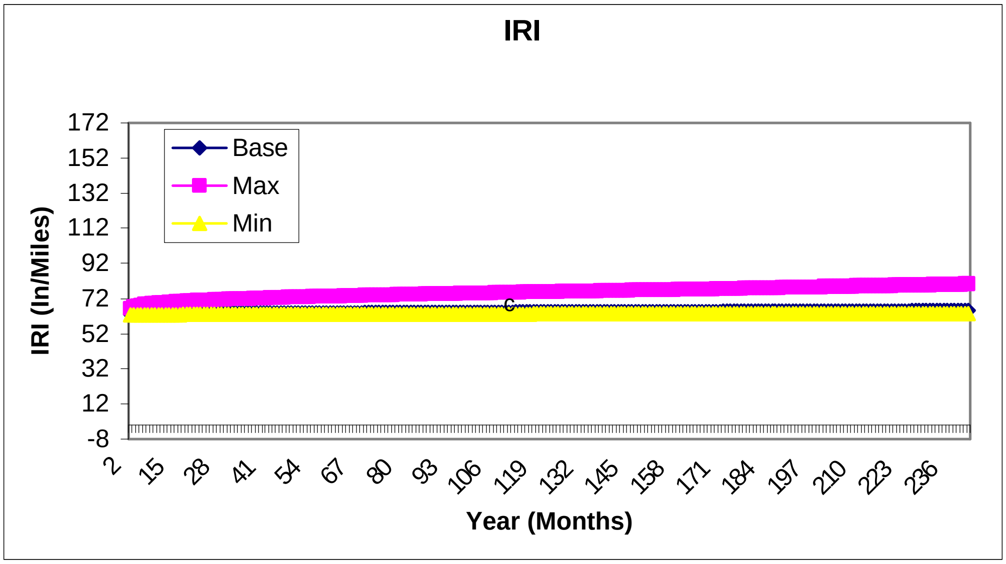


Figure D -514 5827 HeatCapacity - CRCP

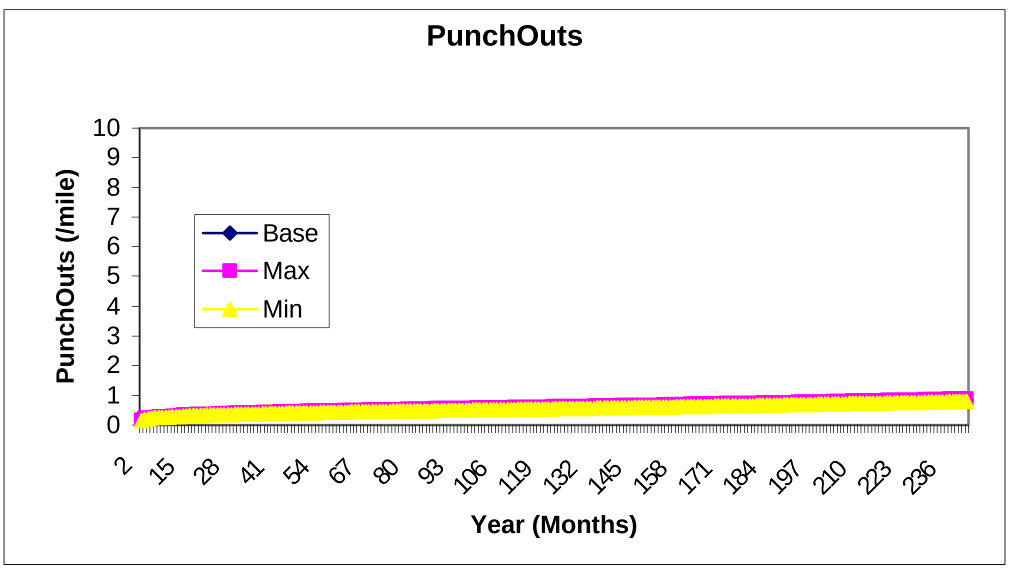


Figure D -515 5827 HeatCapacity - CRCP

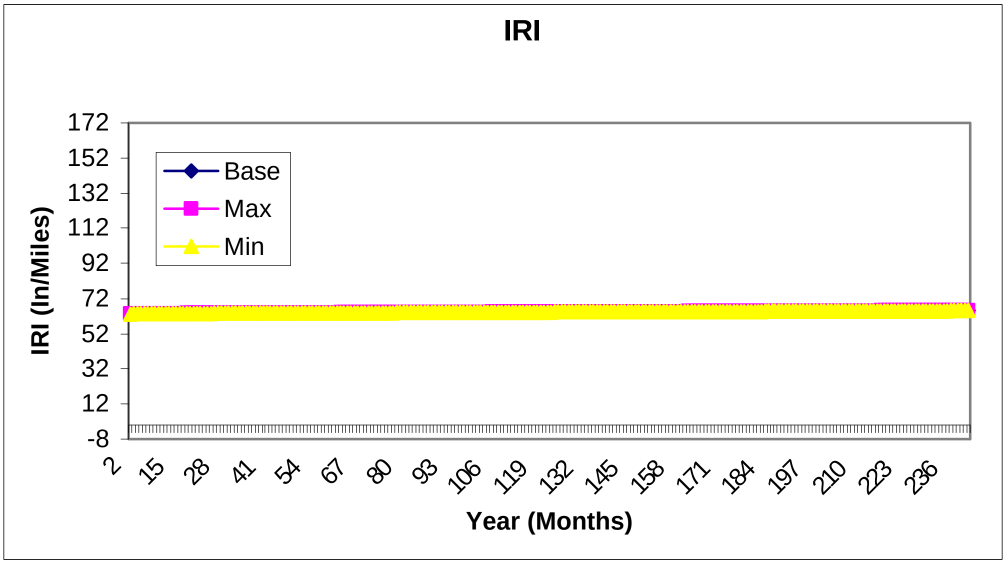


Figure D -516 5827 ThermalConductivity - CRCP

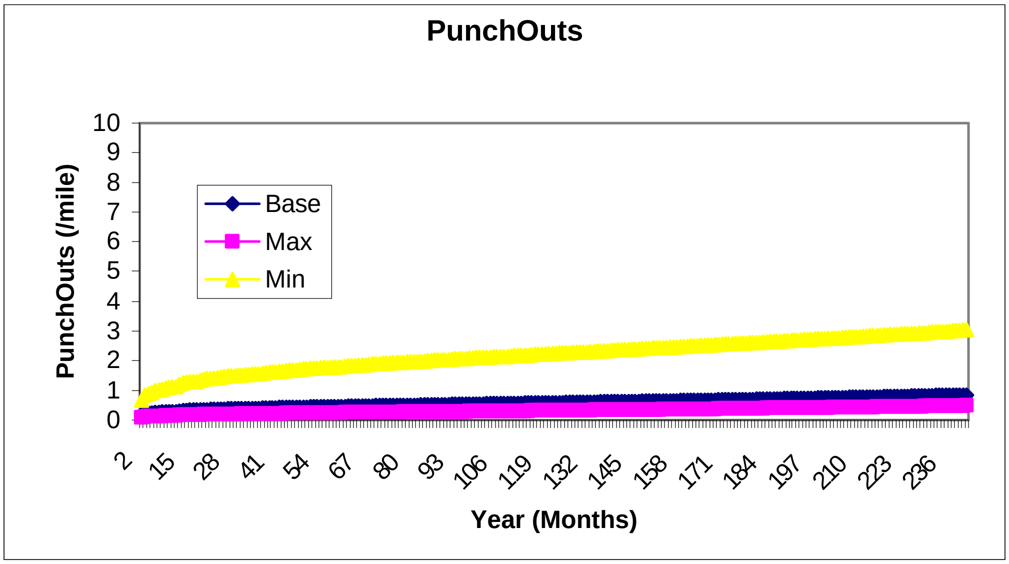


Figure D -517 5827 ThermalConductivity - CRCP

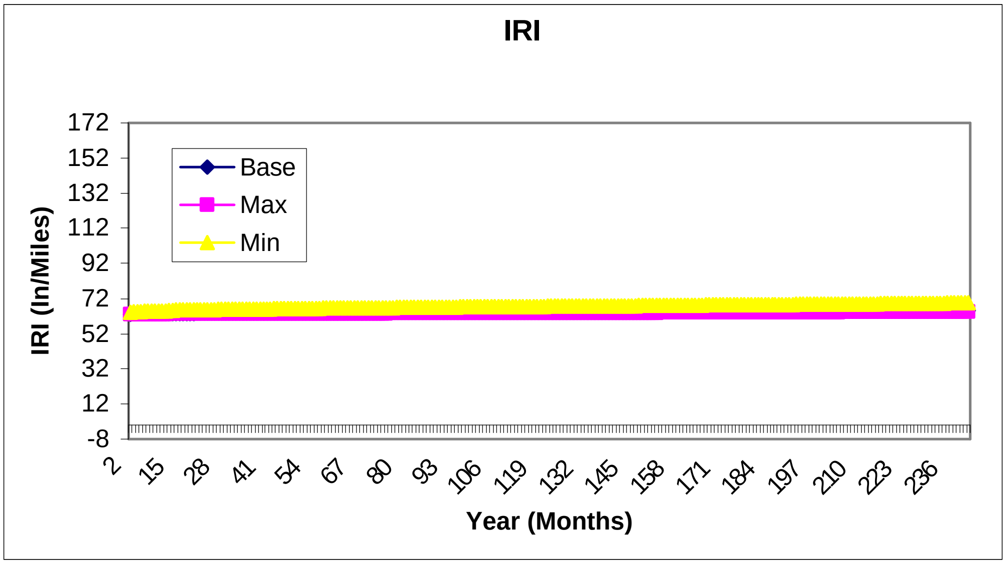


Figure D -518 5827 Granular Base Modulus

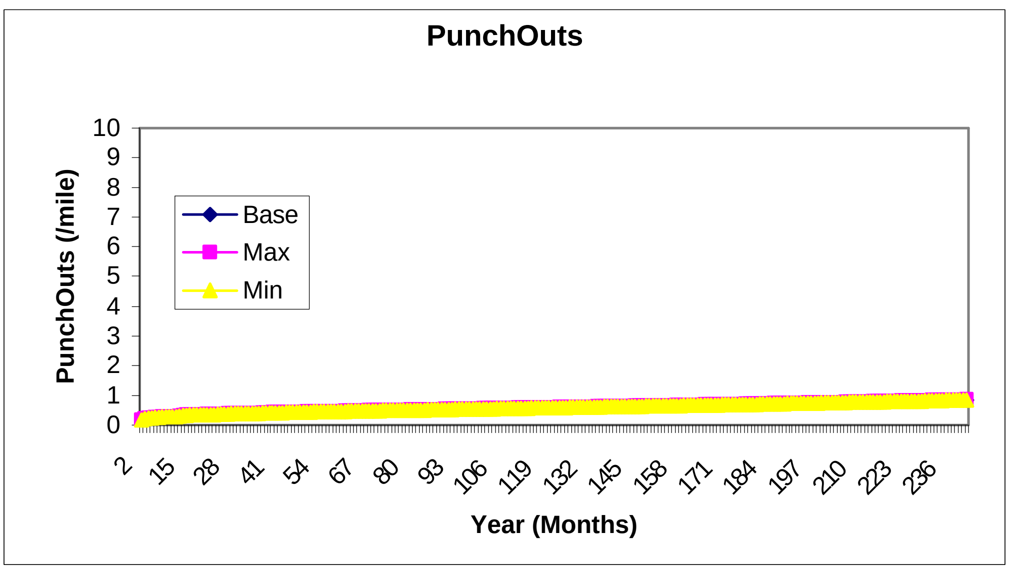


Figure D -519 5827 Granular Base Modulus

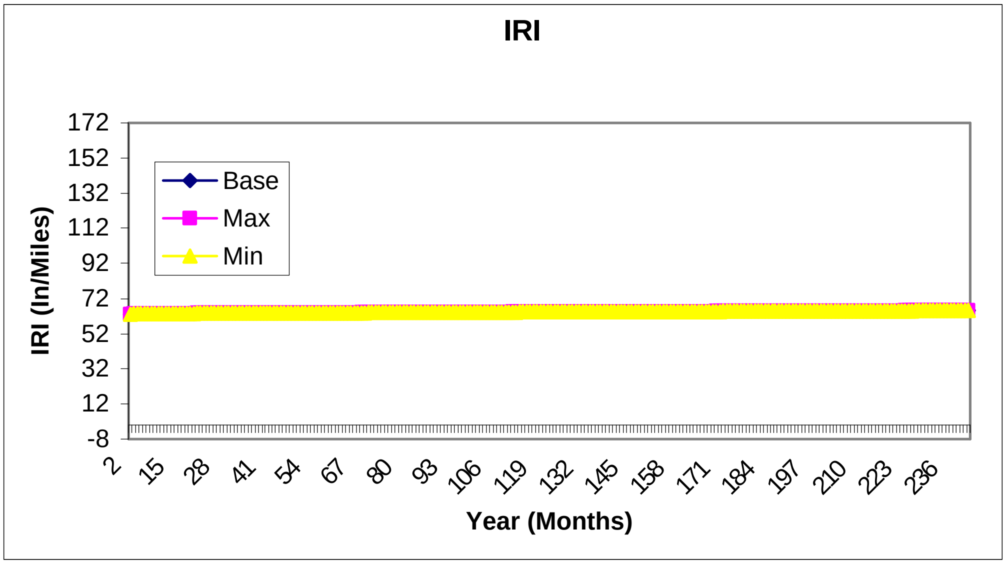


Figure D -520 5827 Subgrade Modulus

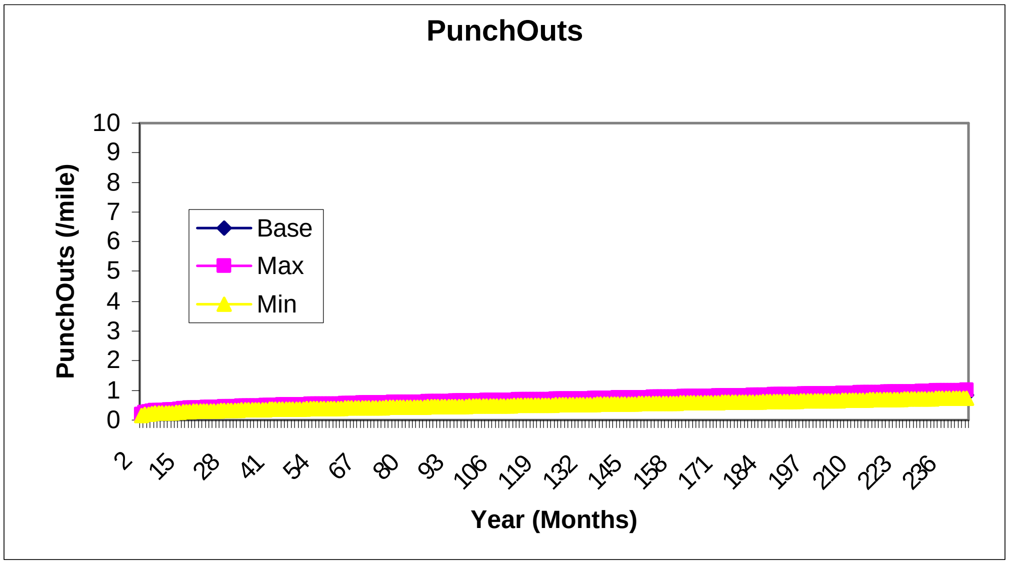


Figure D -521 5827 Subgrade Modulus

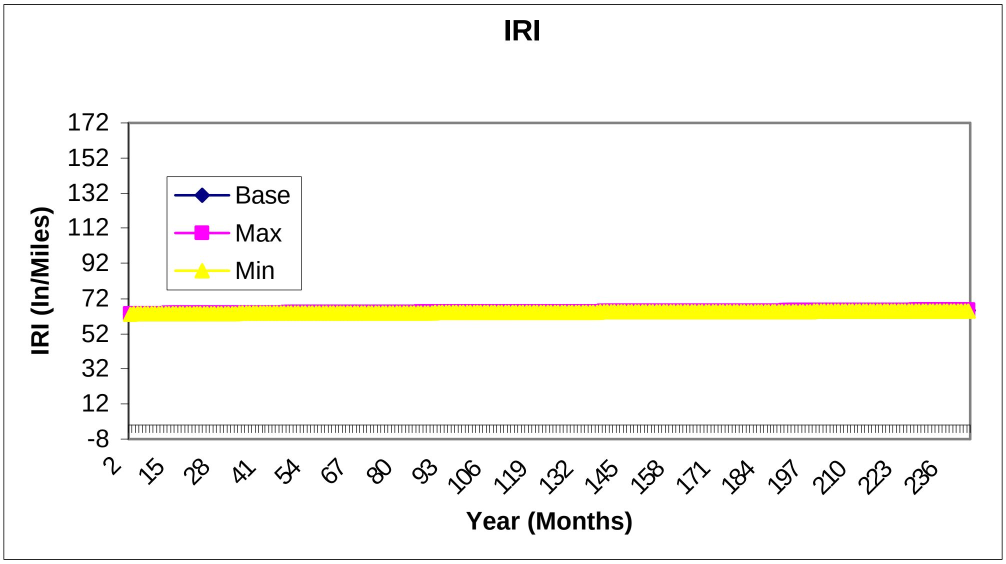


Figure D -522 5827 Surface Shortwave Absorptivity

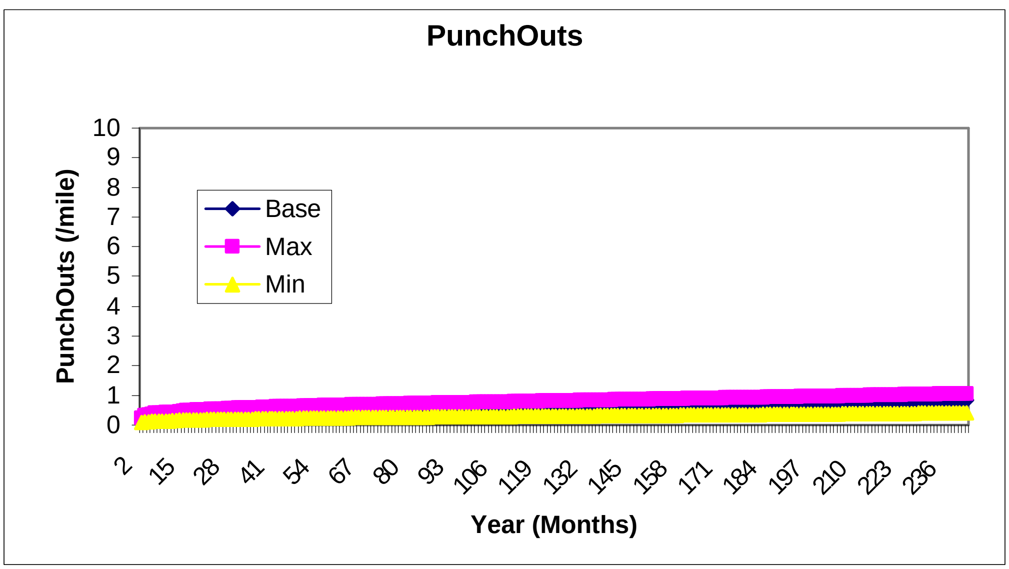


Figure D -523 5827 Surface Shortwave Absorptivity

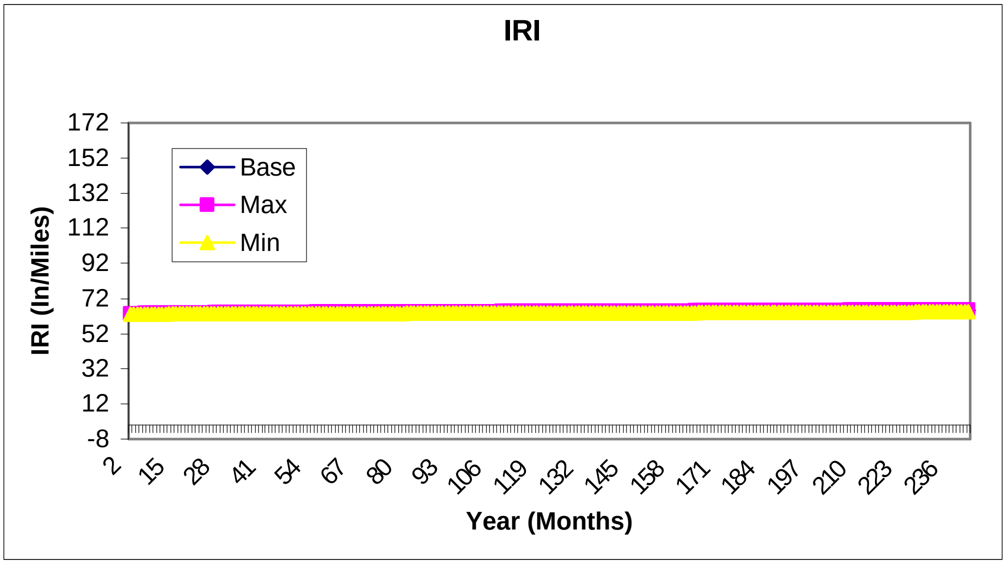


Figure D -524 5827 BarDiameter

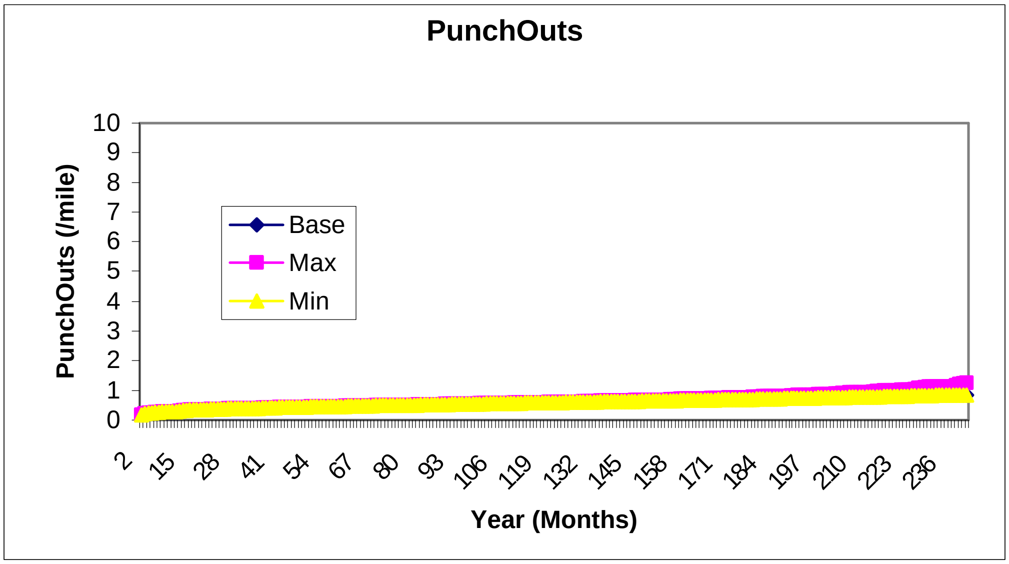


Figure D -525 5827 CarDiameter

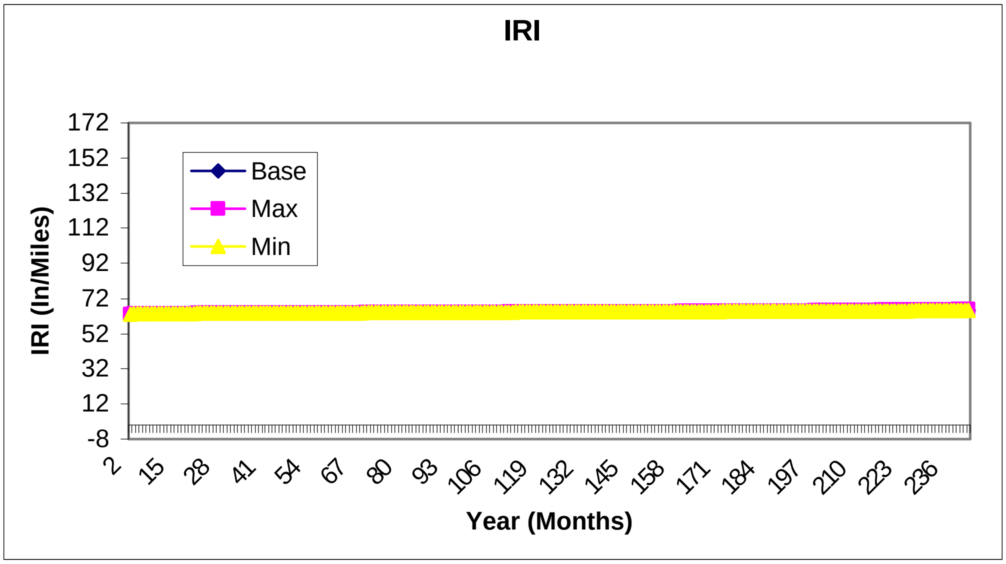


Figure D -526 5827 Percent steel

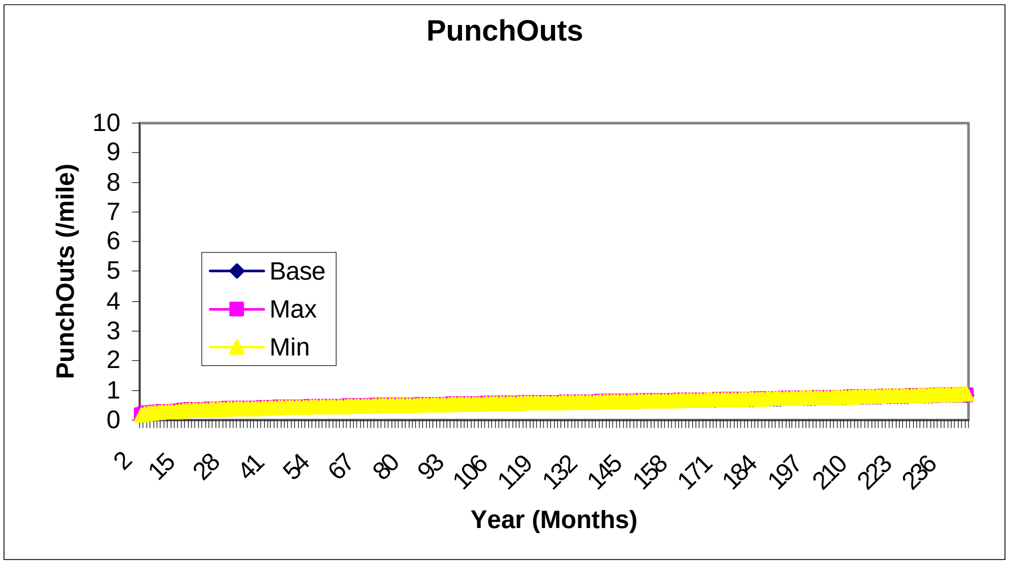


Figure D -527 5827 Percent steel

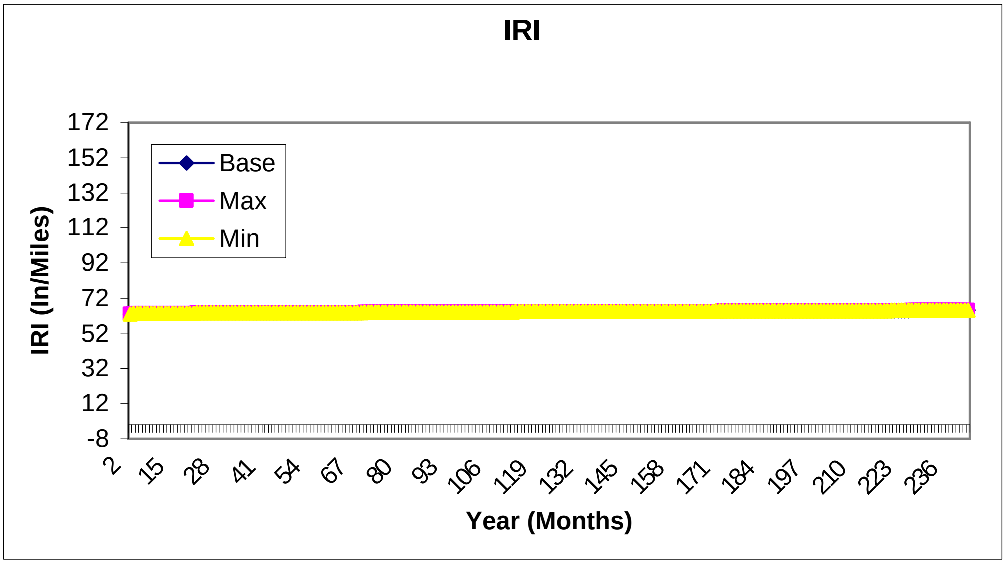


Figure D -528 5827 Steel Depth

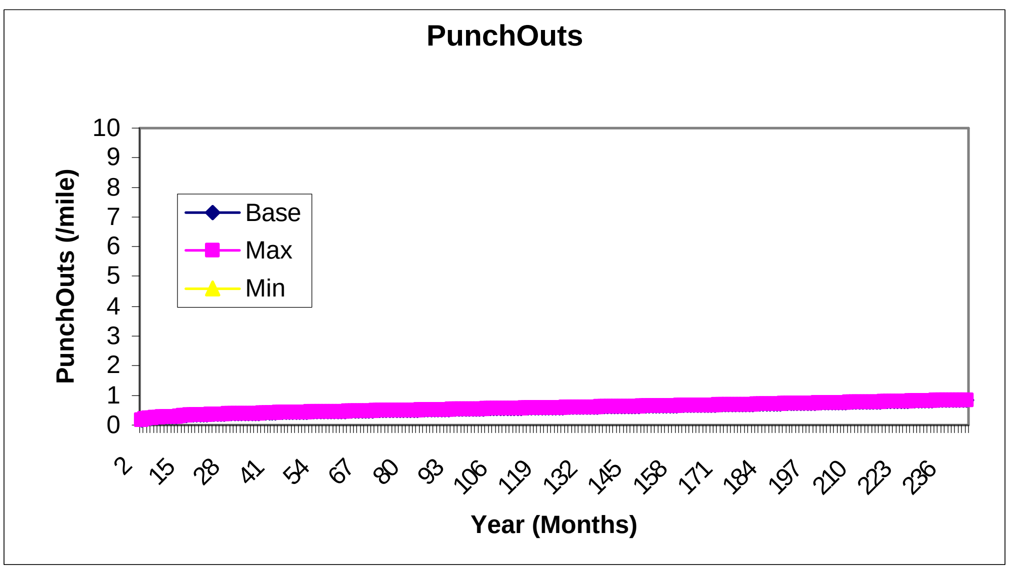


Figure D -529 5827 Steel Depth

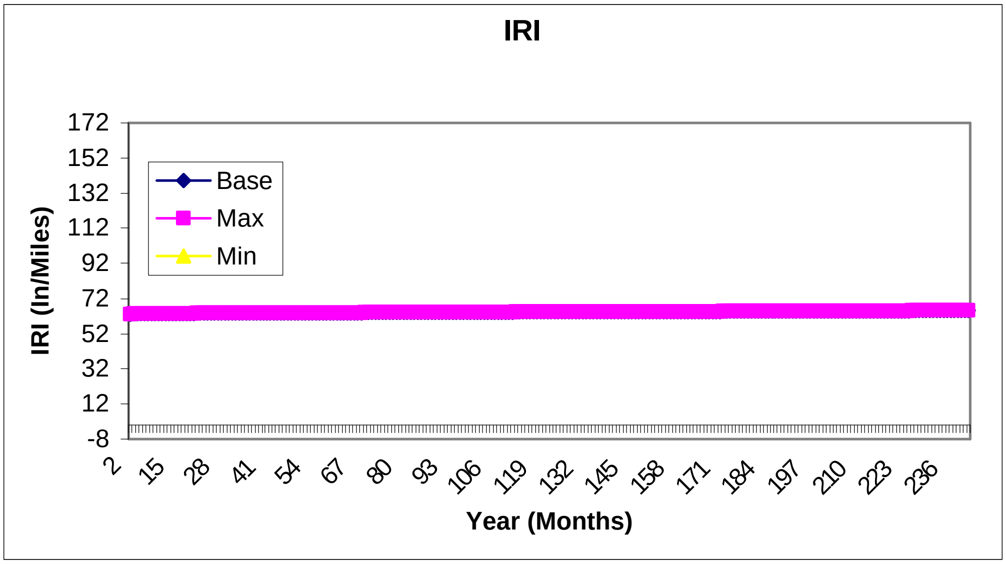


Figure D -530 5827 Shoulder Type

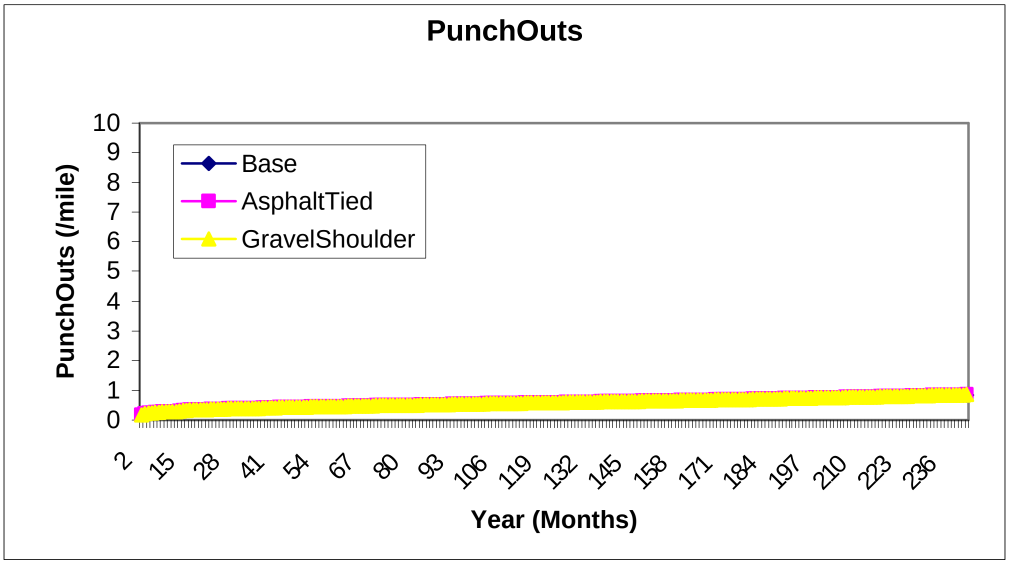


Figure D -531 5827 Shoulder Type

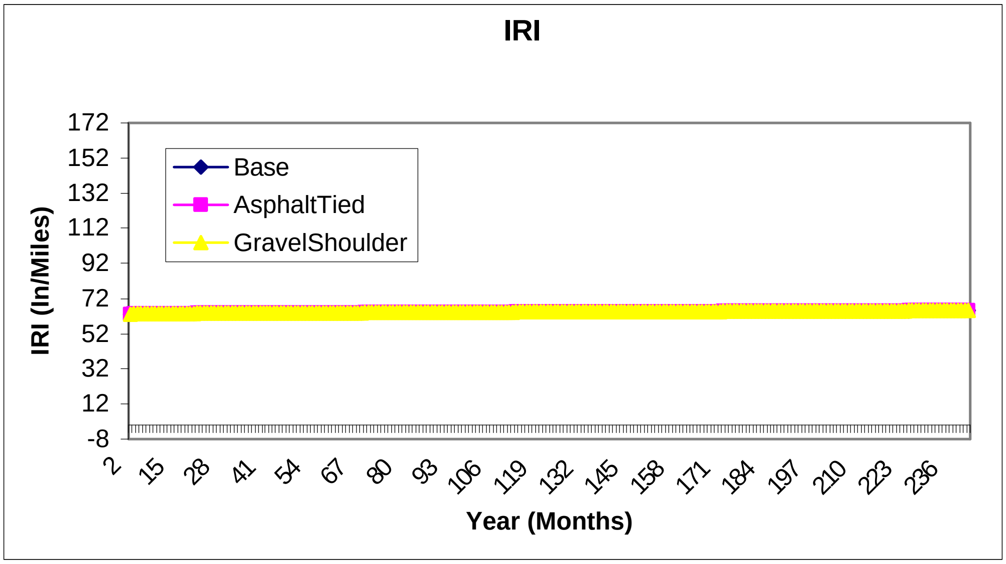


Figure D -532 5827 Base Vs Dec/Jan

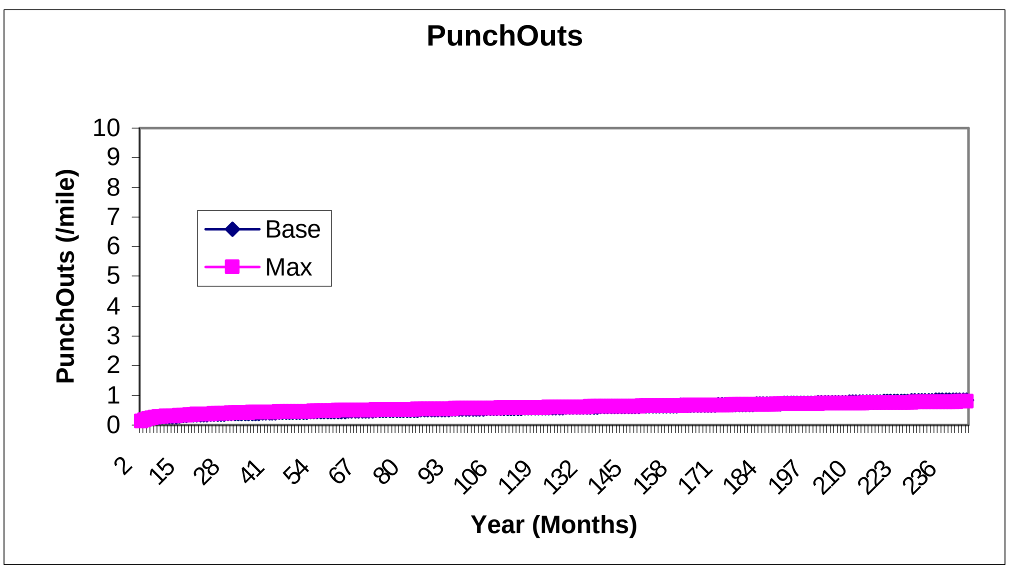


Figure D -533 5827 Base Vs Dec/Jan

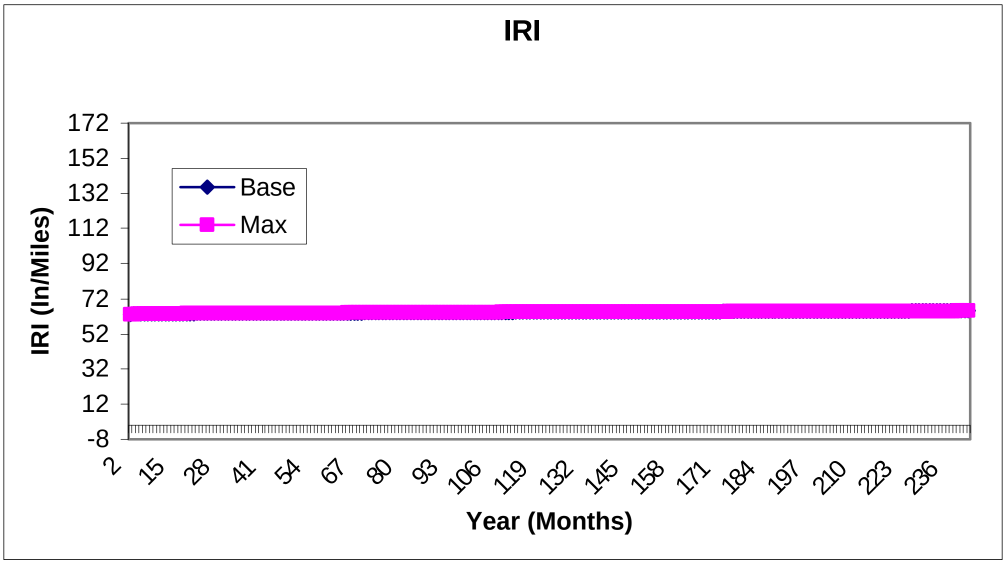


Figure D -534 5827 Base Vs Jun/Jul

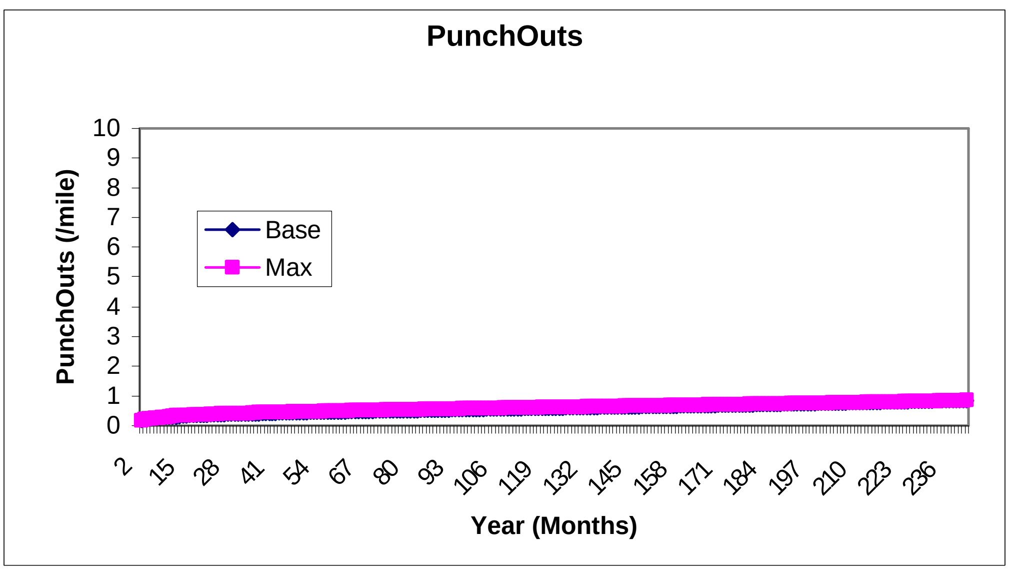


Figure D -535 5827 Base Vs Jun/Jul

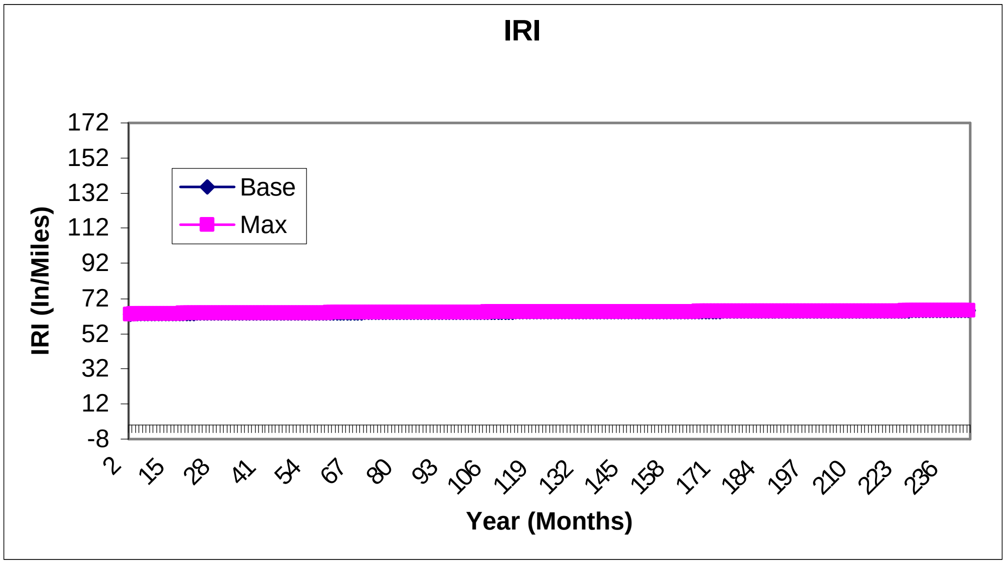


Figure D -536 5827 Base Vs Sep/Oct

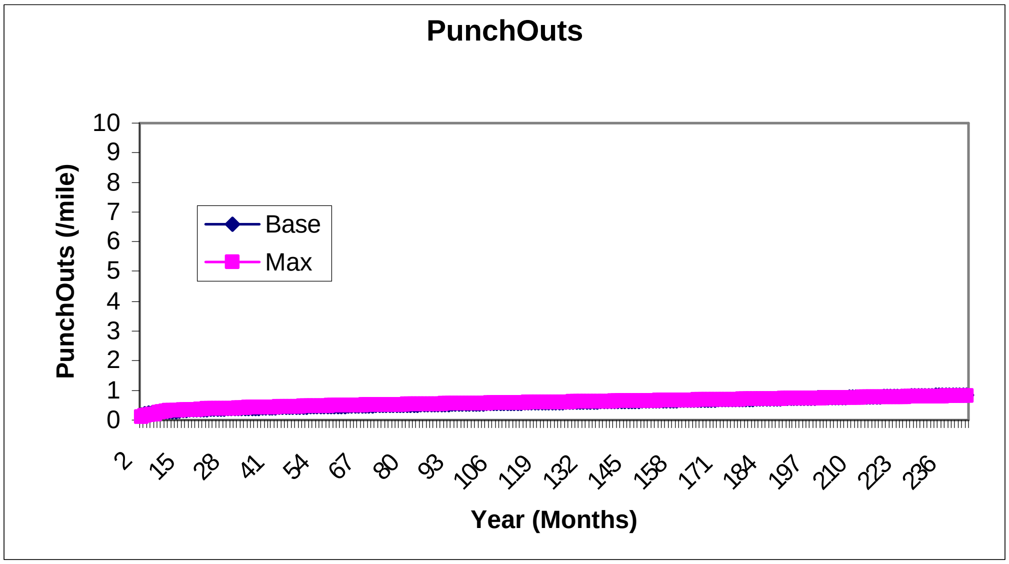


Figure D -537 5827 Base Vs Sep/Oct

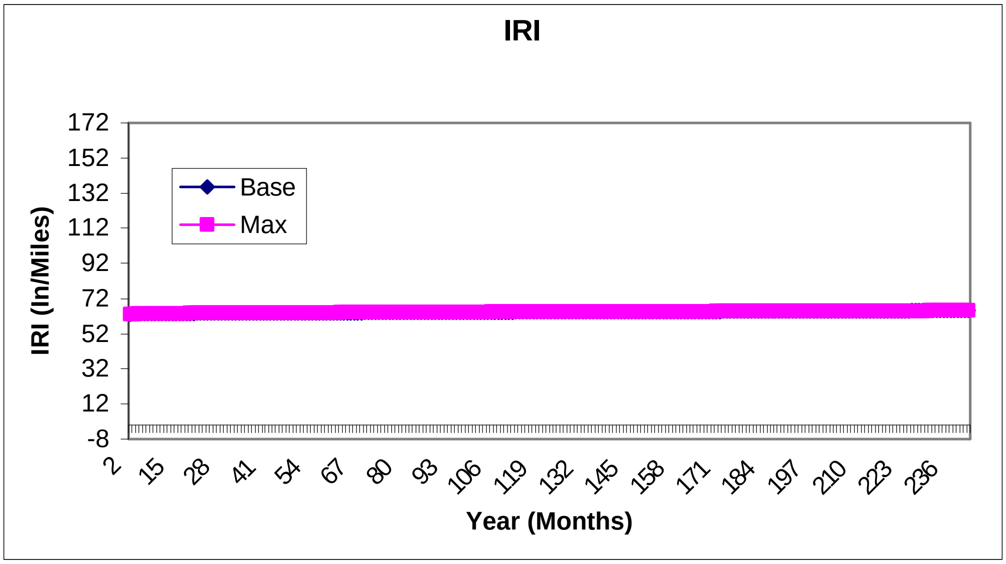


Figure D -538 5827 Truck Growth Factor

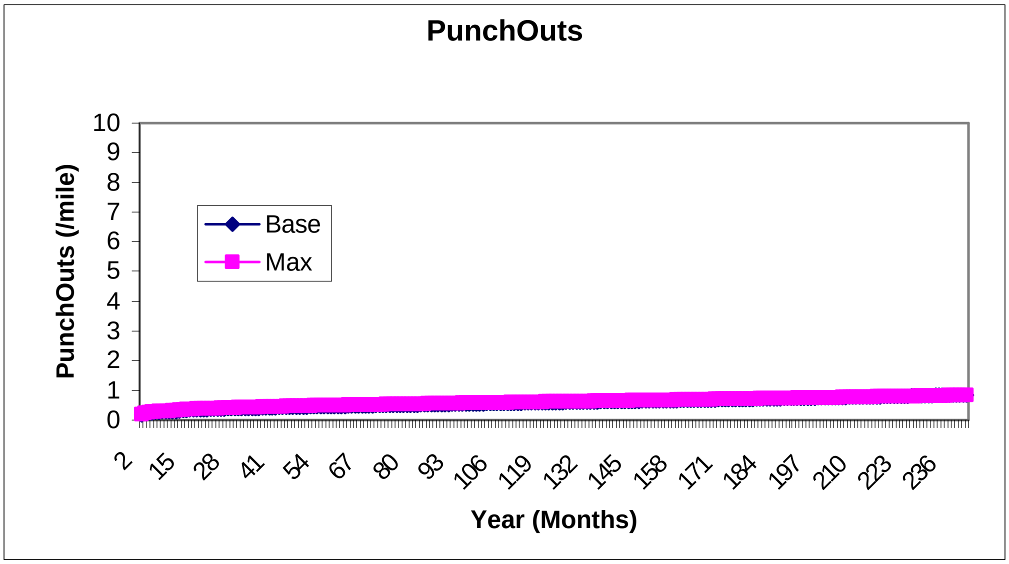


Figure D -539 5827 Truck Growth Factor

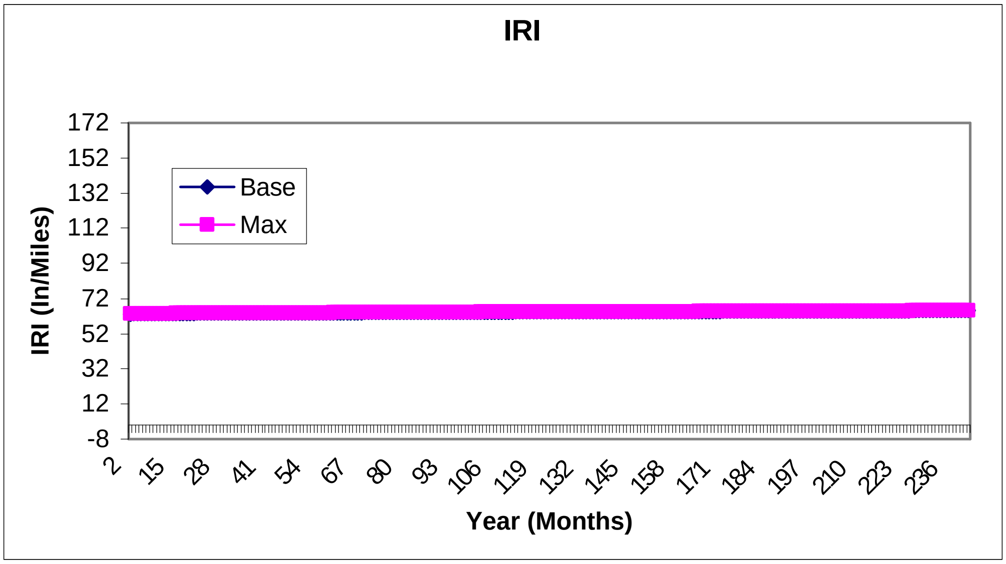


Figure D -540 5037 Coefficient of Thermal Expansion – CRCP

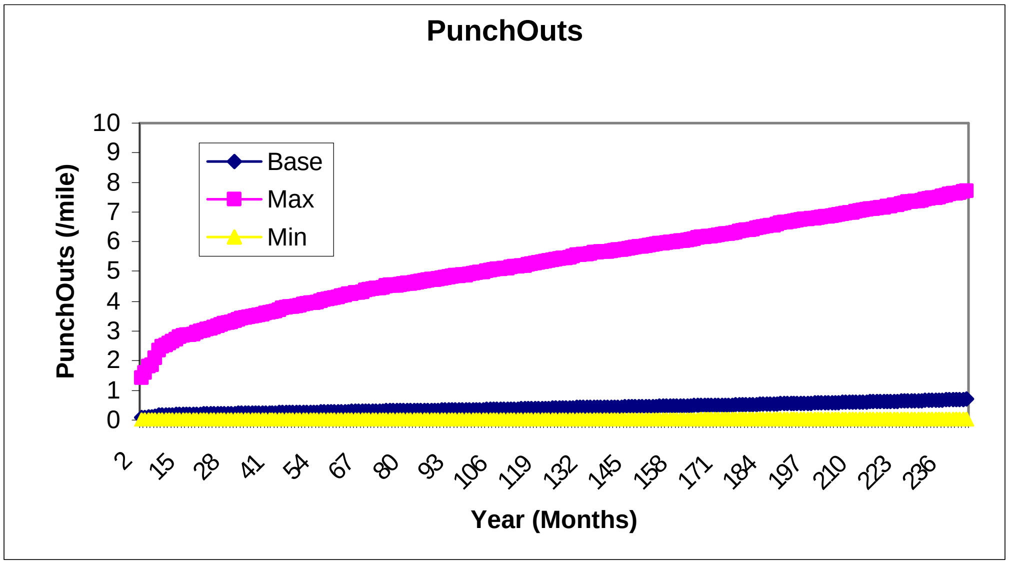


Figure D -541 5037 Coefficient of Thermal Expansion - CRCP

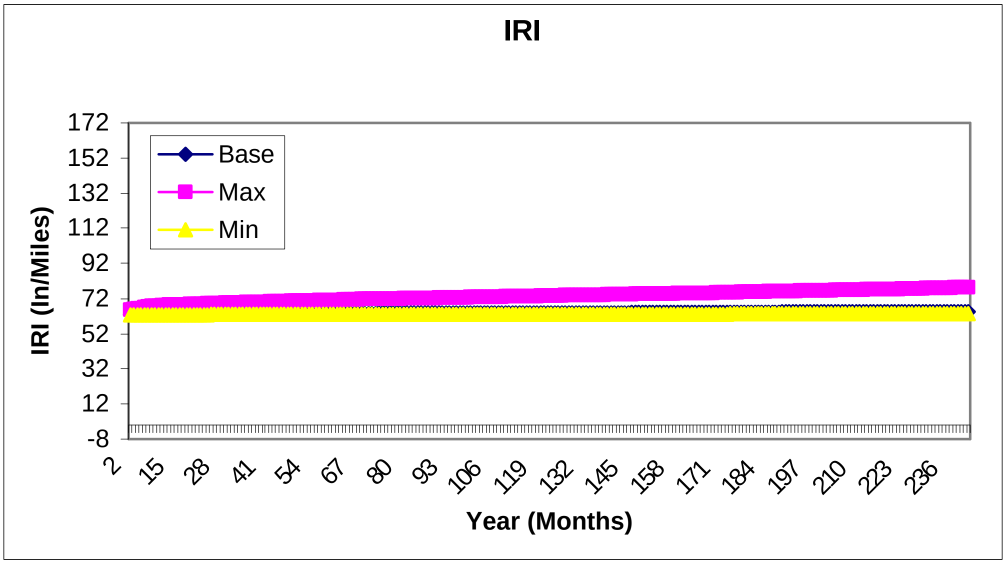


Figure D -542 5037 HeatCapacity - CRCP

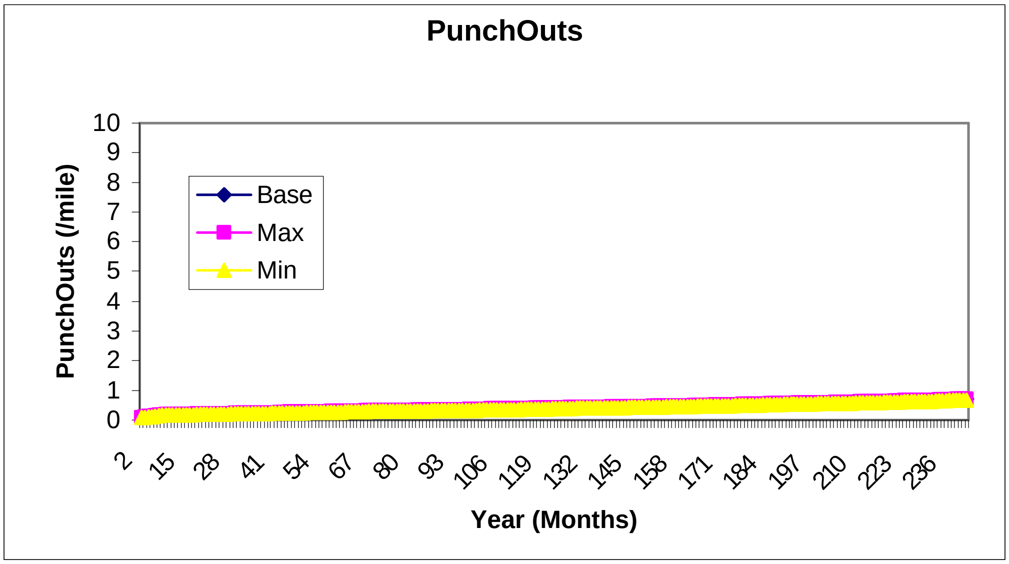


Figure D -543 5037 HeatCapacity - CRCP

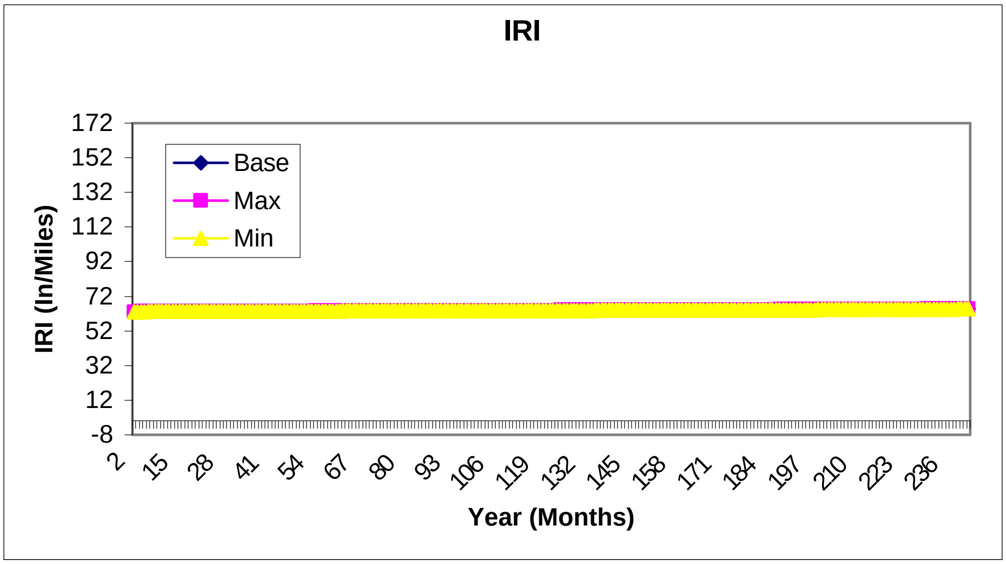


Figure D -544 5037 Thermal Conductivity- CRCP

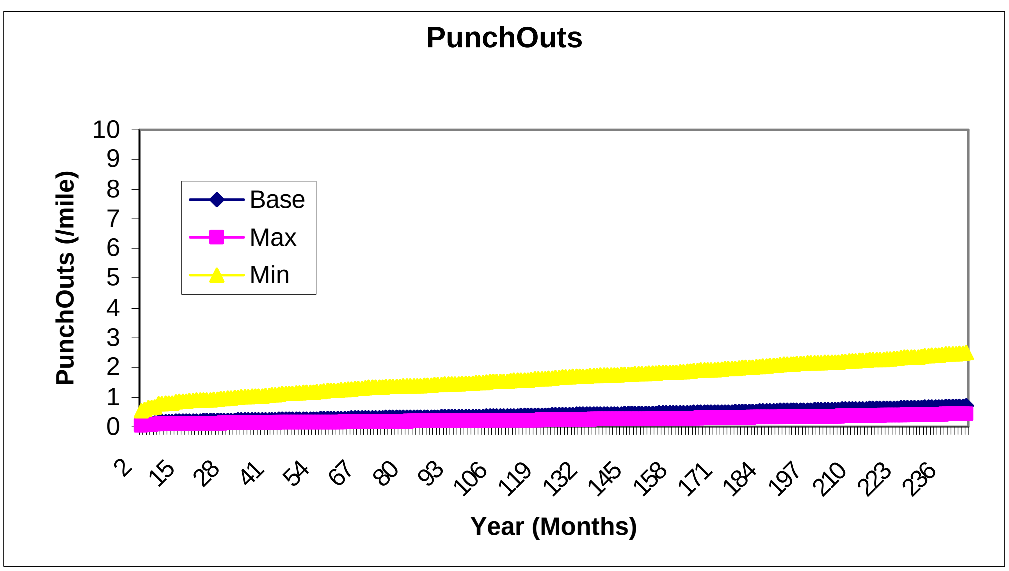


Figure D -545 5037 Thermal Conductivity- CRCP

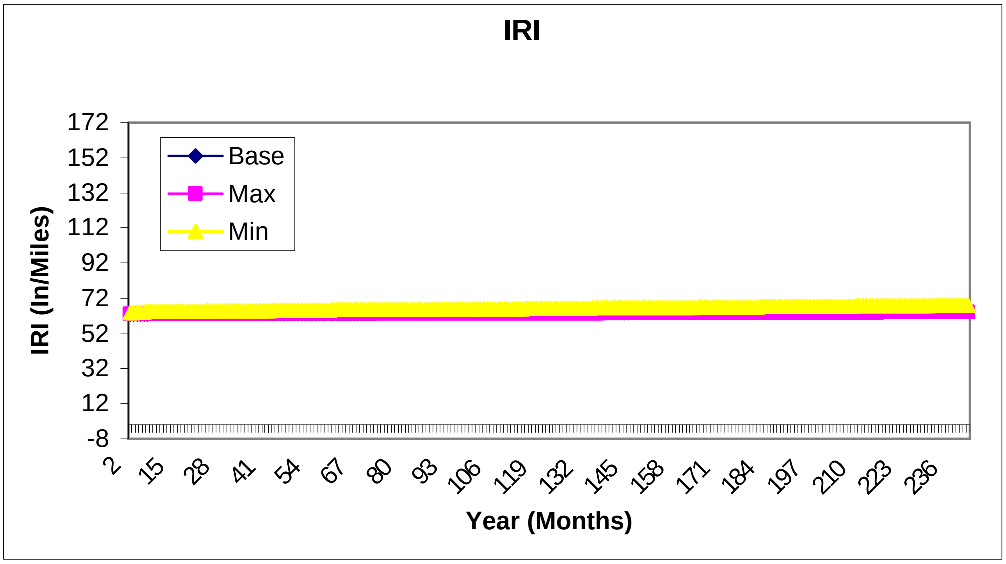


Figure D -546 5037 Granular Base Modulus

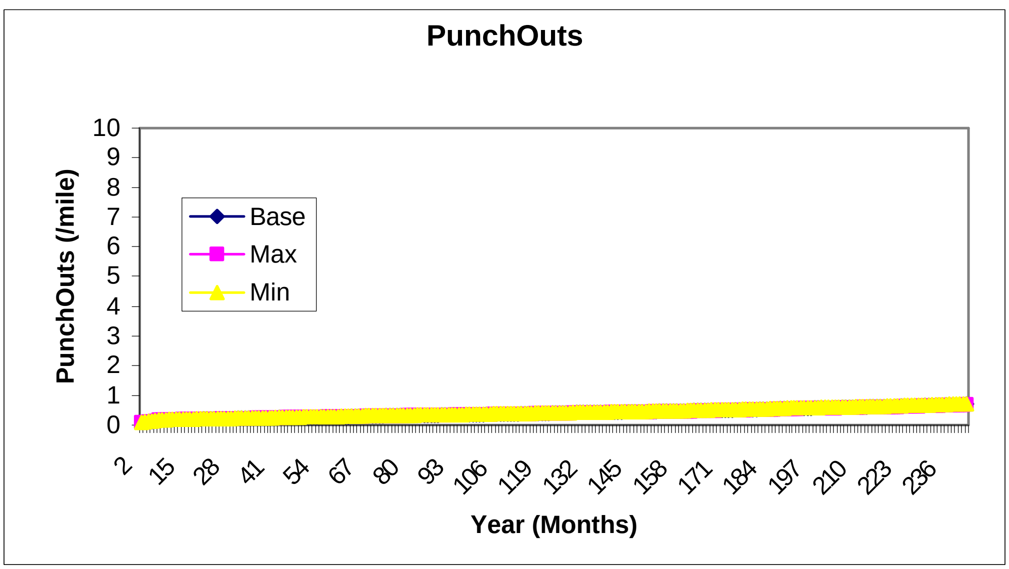


Figure D -547 5037 Granular Base Modulus

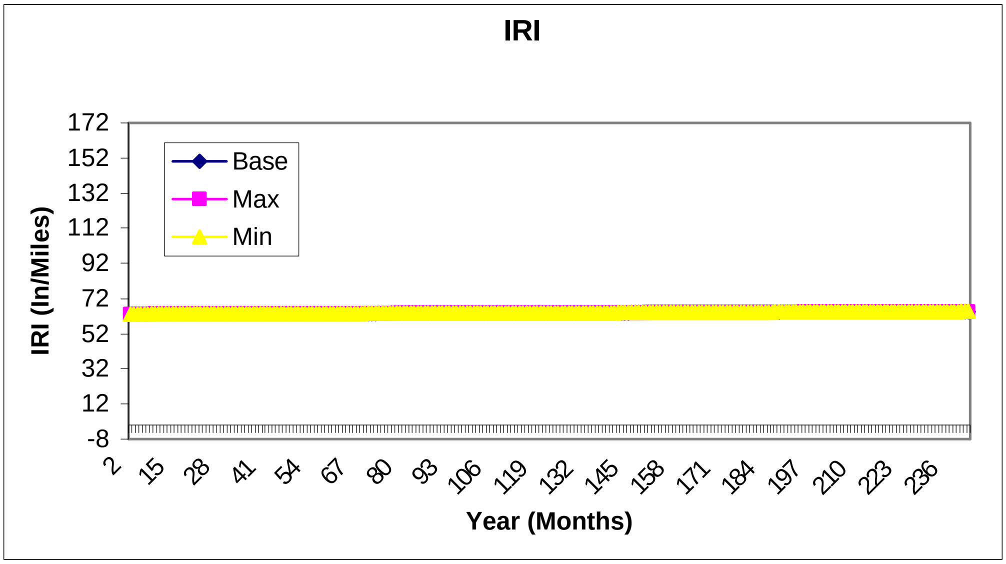


Figure D -548 5037 Subgrade Modulus

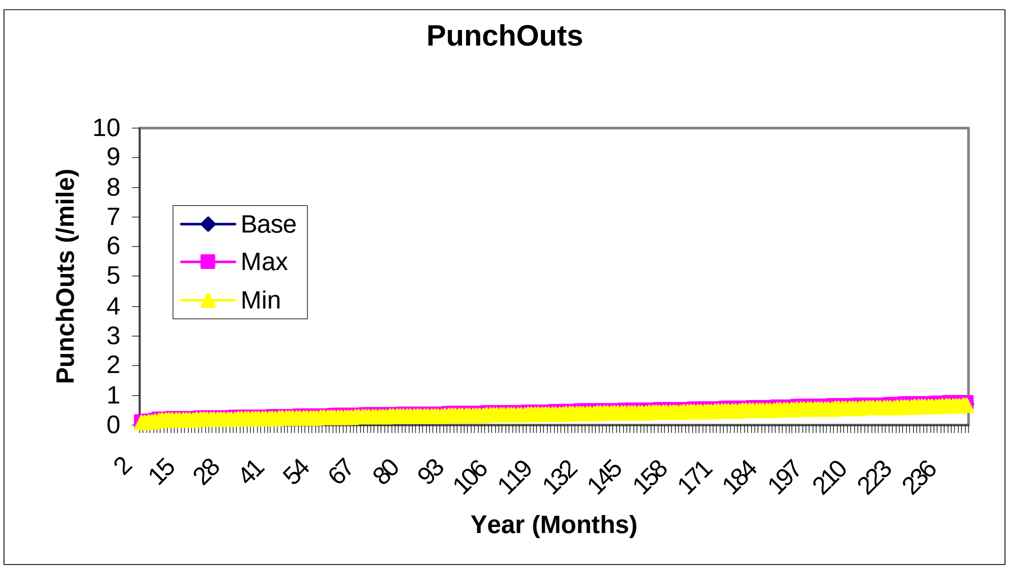


Figure D -549 5037 Subgrade Modulus

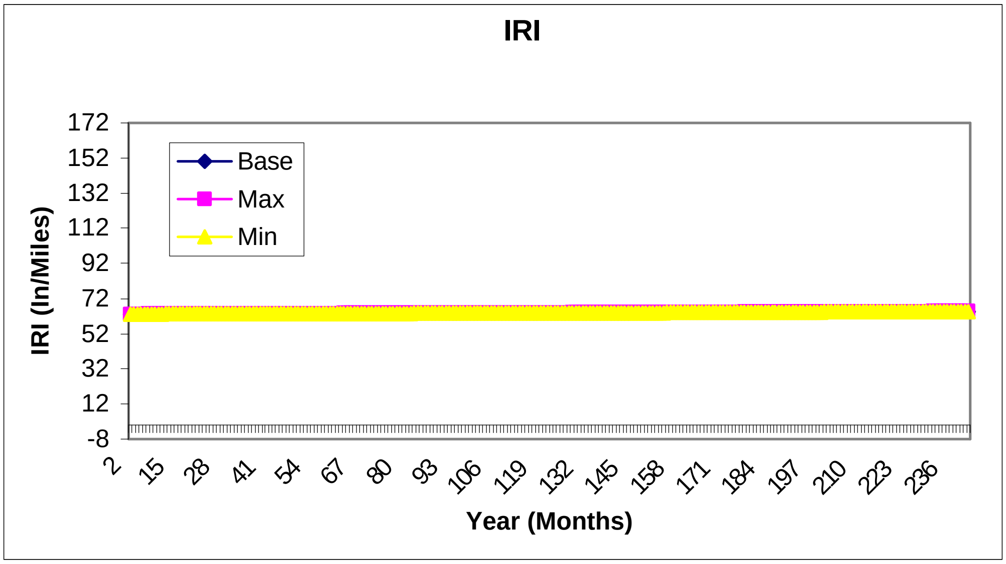


Figure D -550 5037 Surface Shortwave Absorptivity

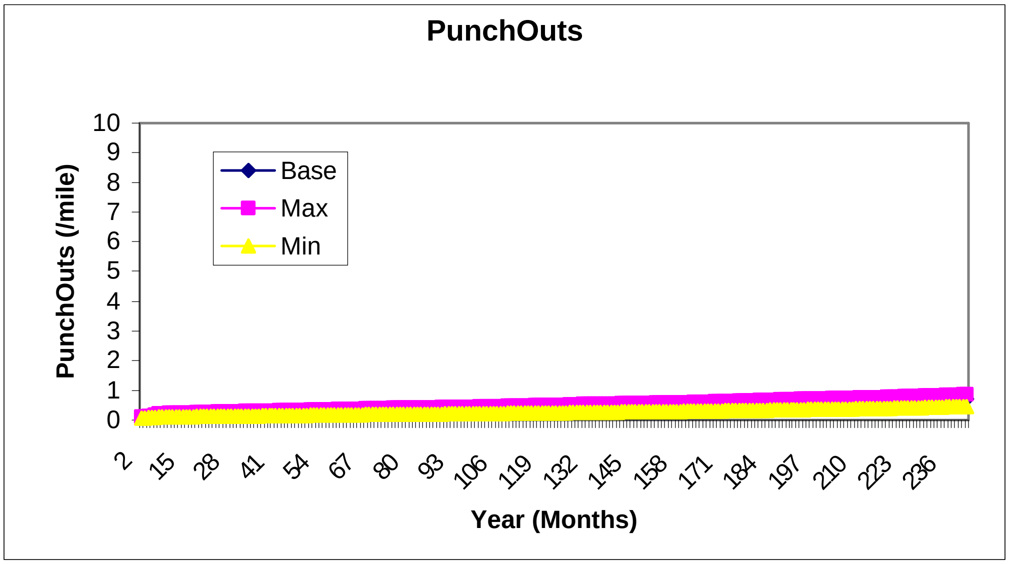


Figure D -551 5037 Surface Shortwave Absorptivity

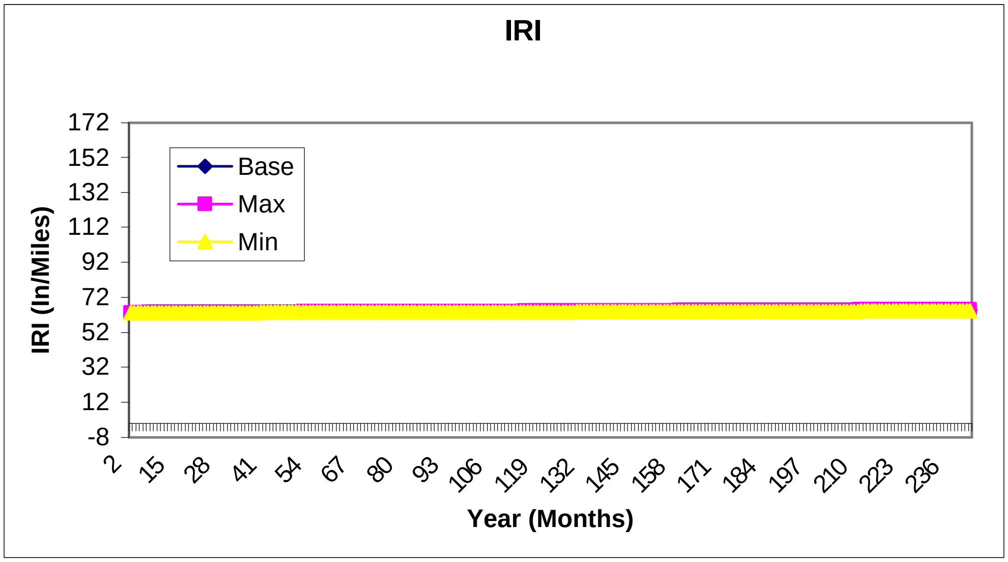


Figure D -552 5037 Bar Diameter

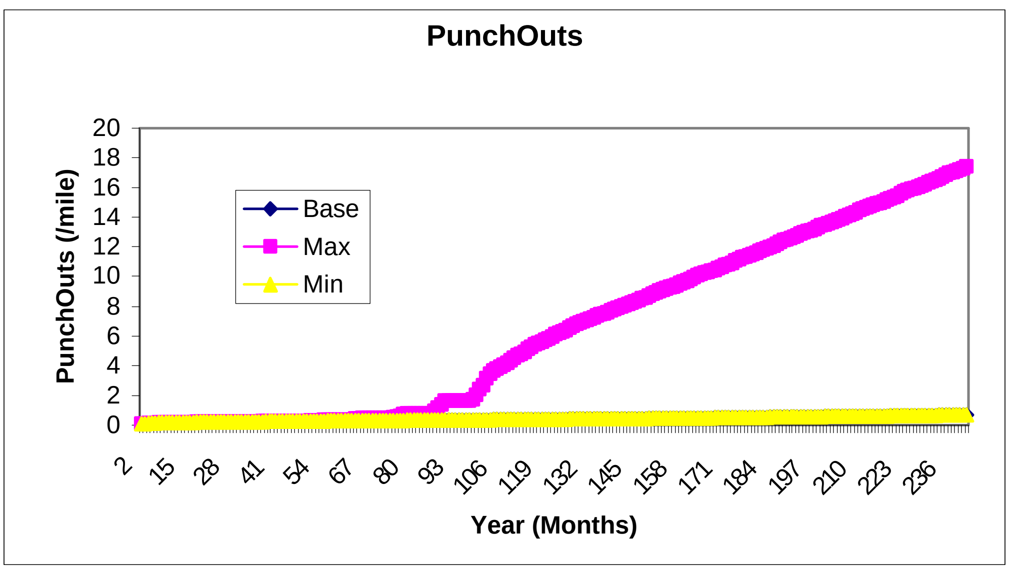


Figure D -553 5037 Bar Diameter

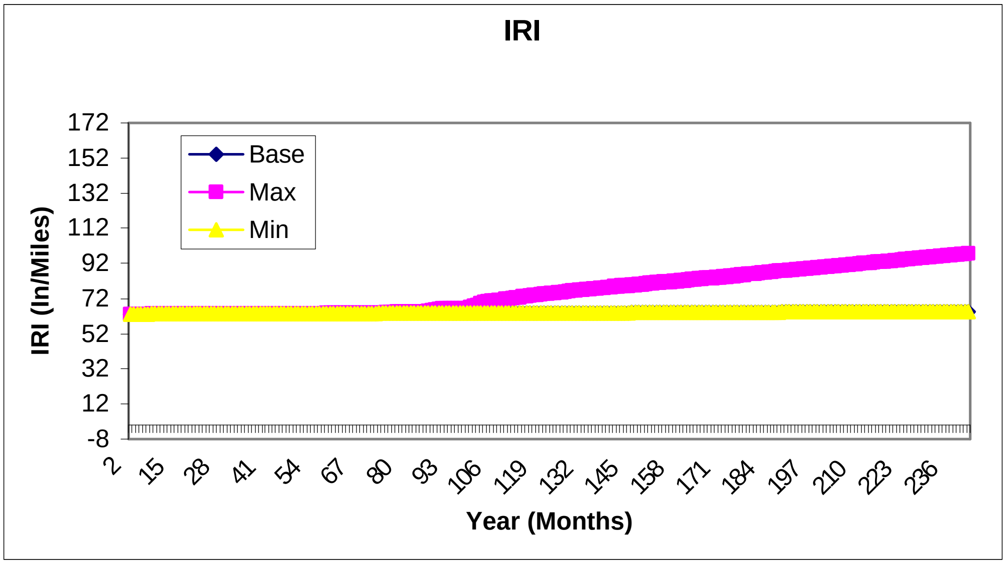


Figure D -554 5037 Percent Steel

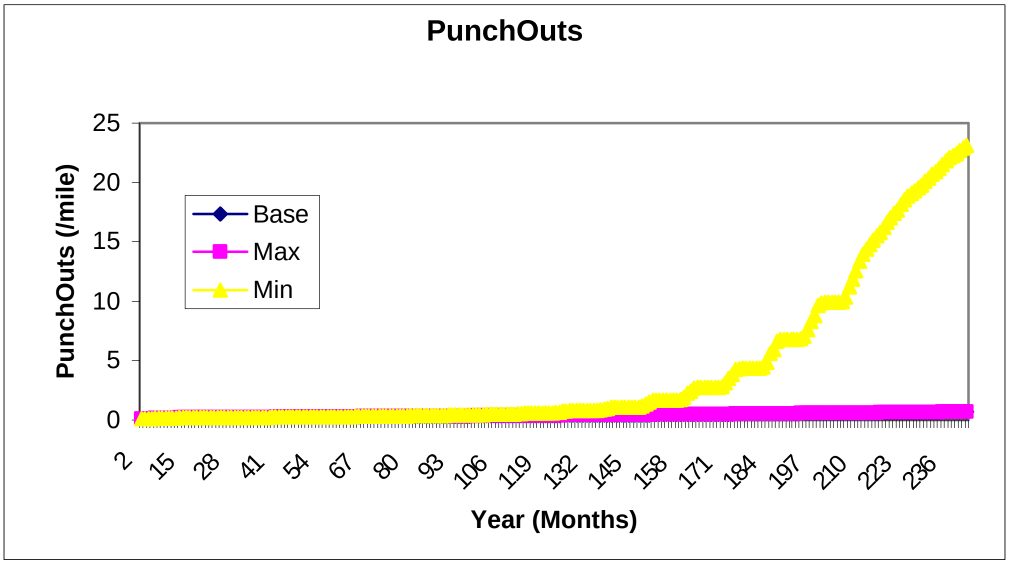


Figure D -555 5037 Percent Steel

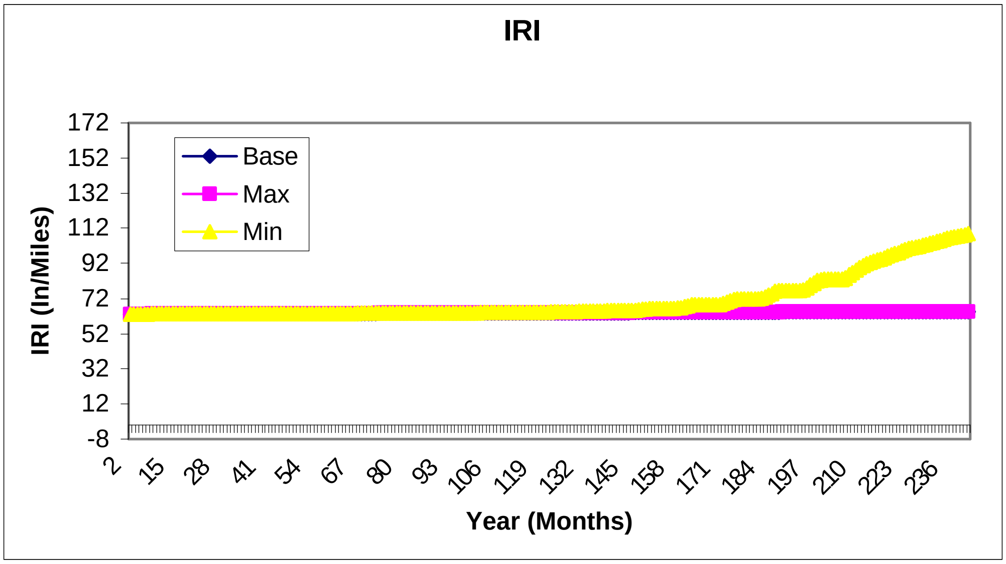


Figure D -556 5037 Steel Depth

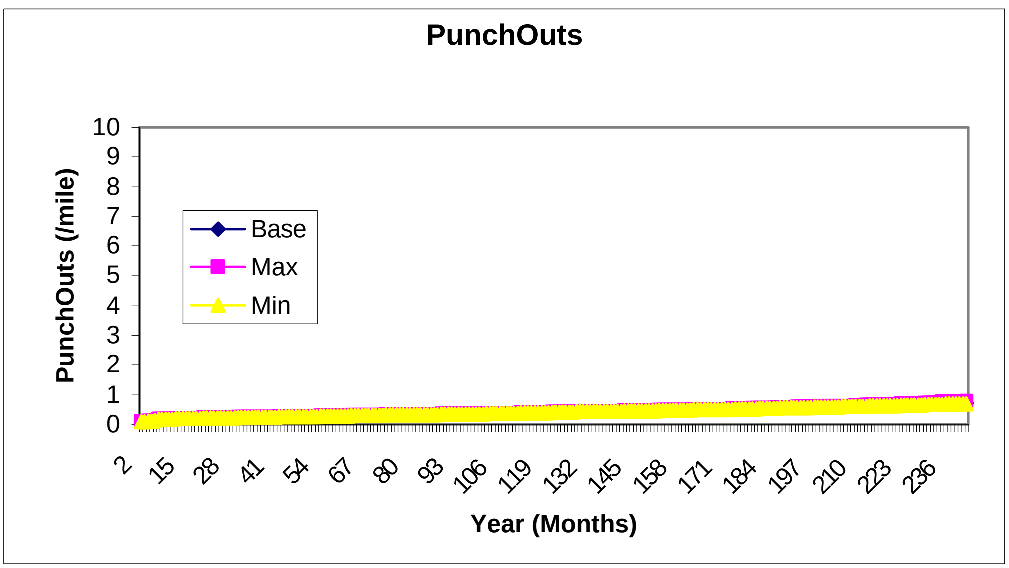


Figure D -557 5037 Steel Depth

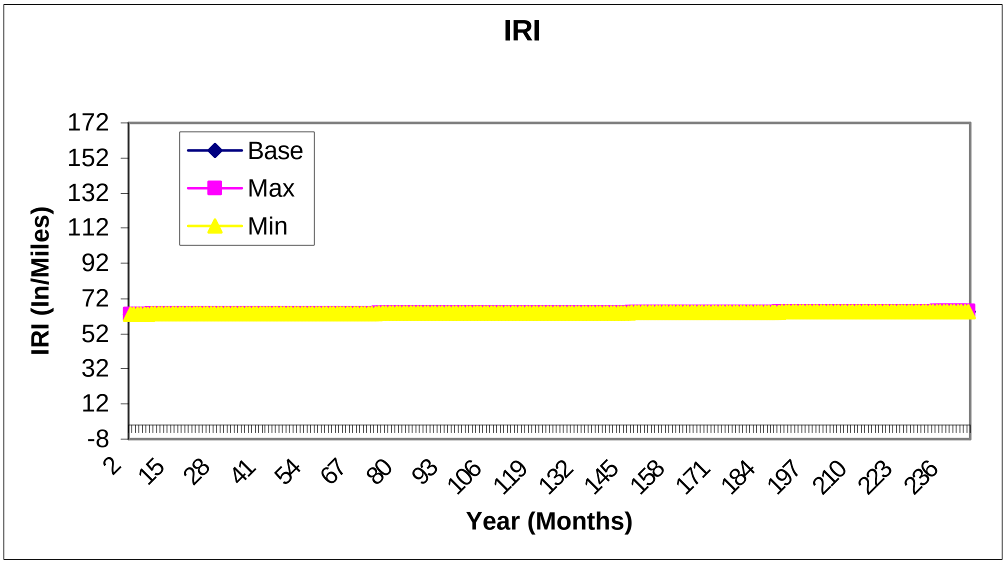


Figure D -558 5037 Shoulder Type

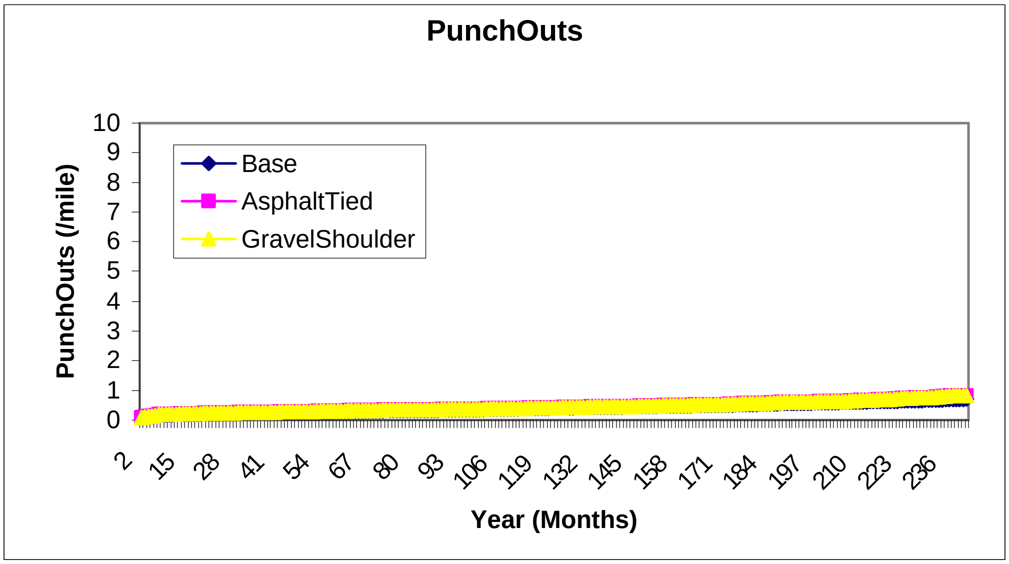


Figure D -559 5037 Shoulder Type

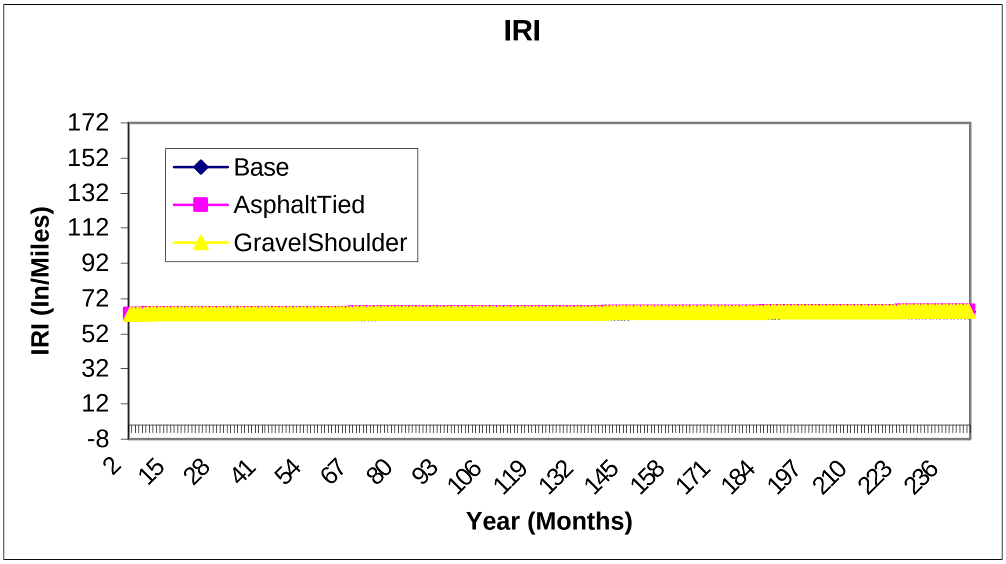


Figure D -560 5037 Base Vs Apr/May

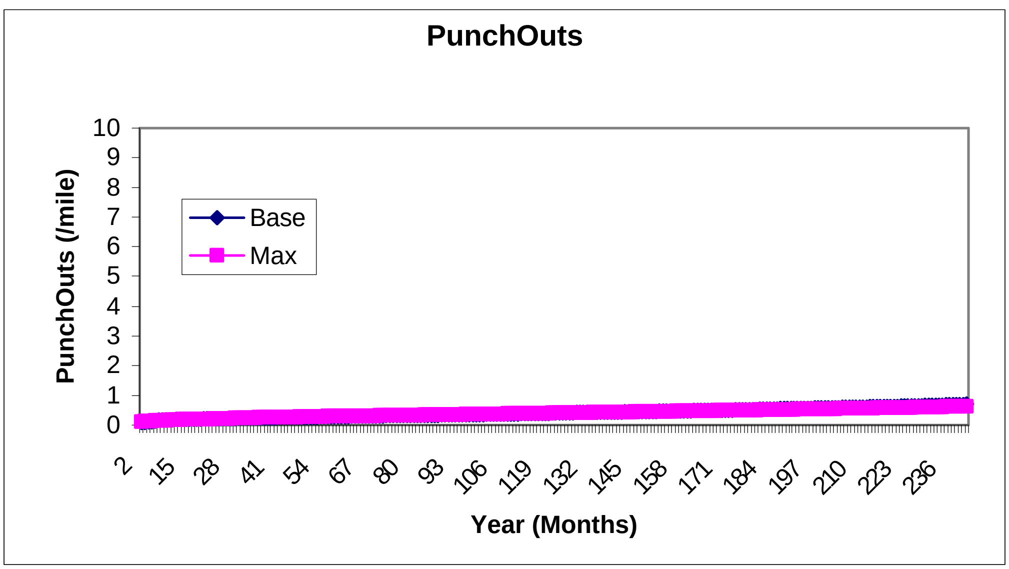


Figure D -561 5037 Base Vs Apr/May

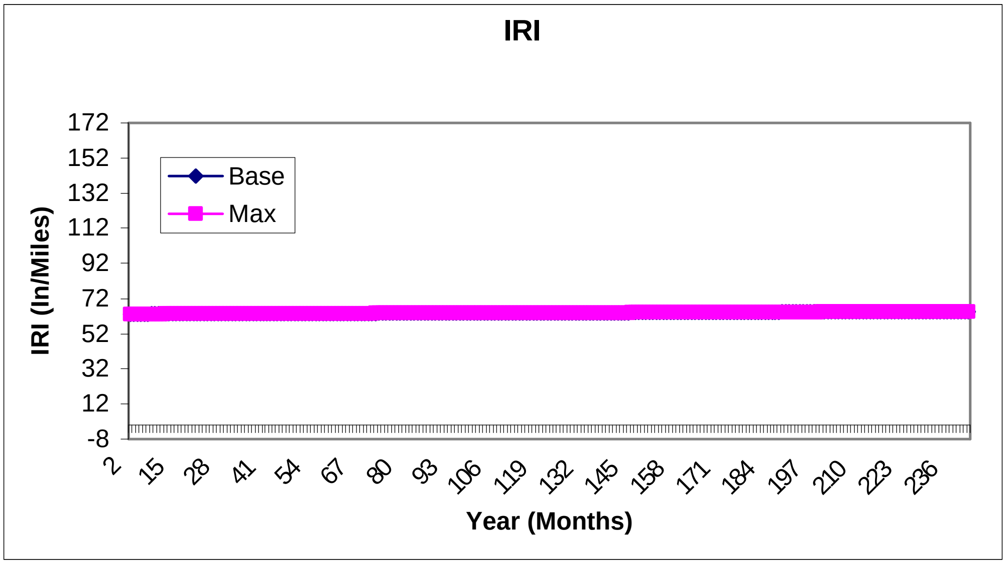


Figure D -562 5037 Base Vs Jan/Feb

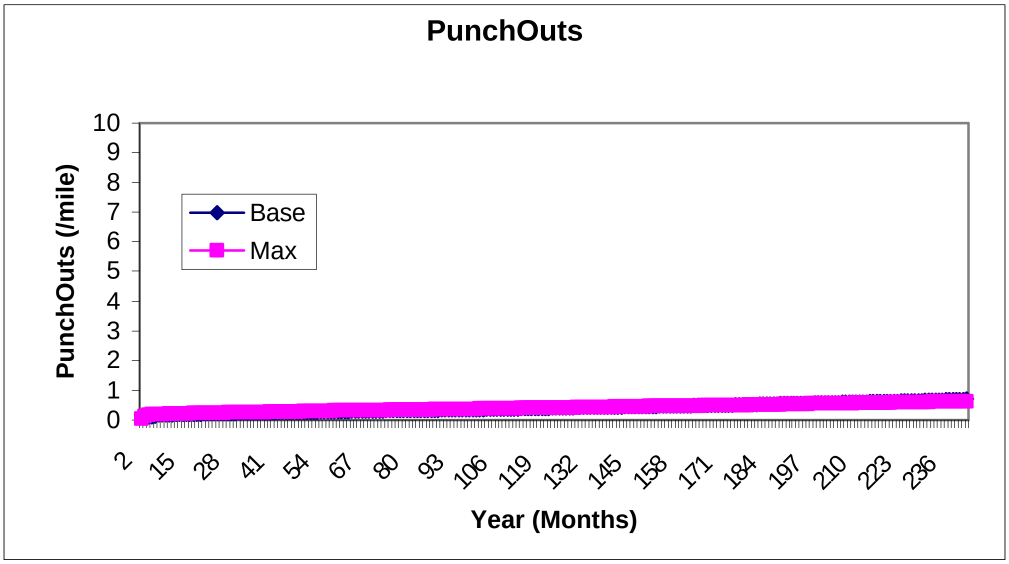


Figure D -563 5037 Base Vs Jan/Feb

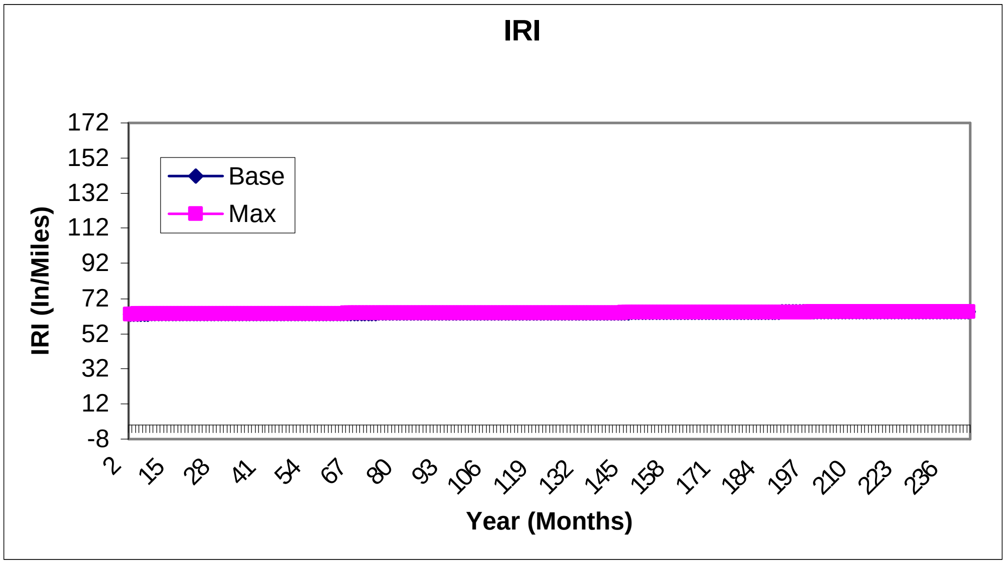


Figure D -564 5037 Base Vs Jul/Aug

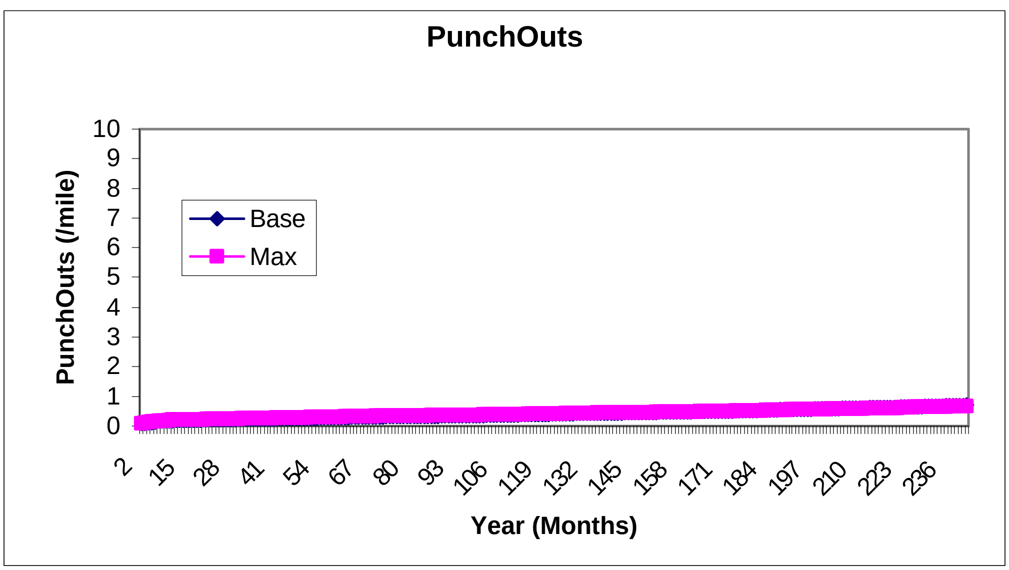


Figure D -565 5037 Base Vs Jul/Aug

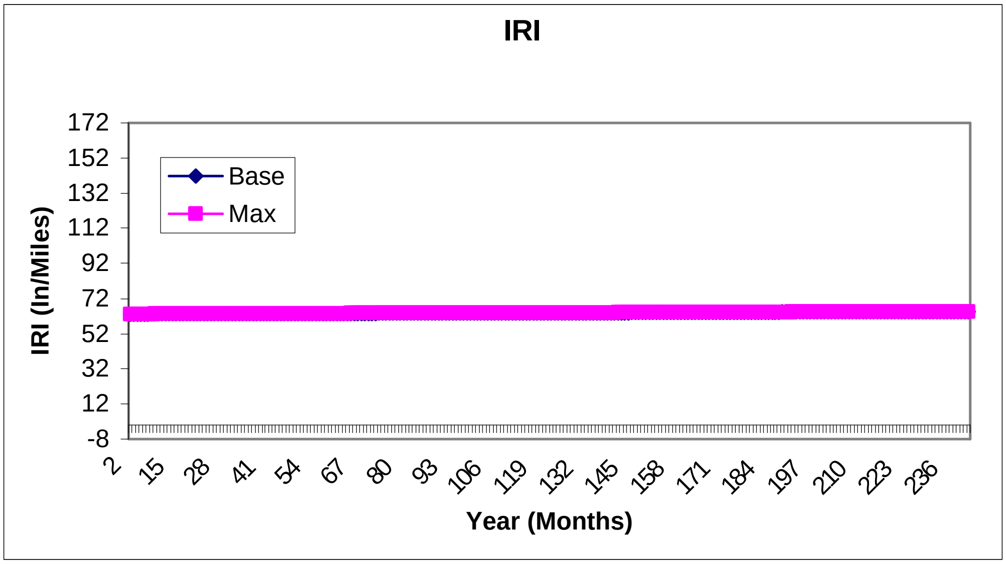


Figure D -566 5037 Truck Growth Factor

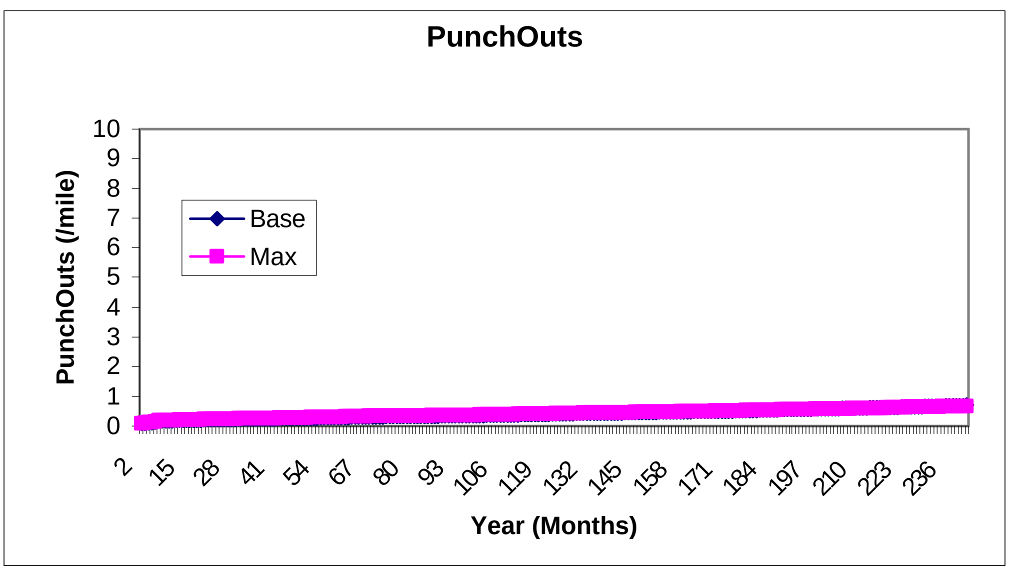


Figure D -567 5037 Truck Growth Factor

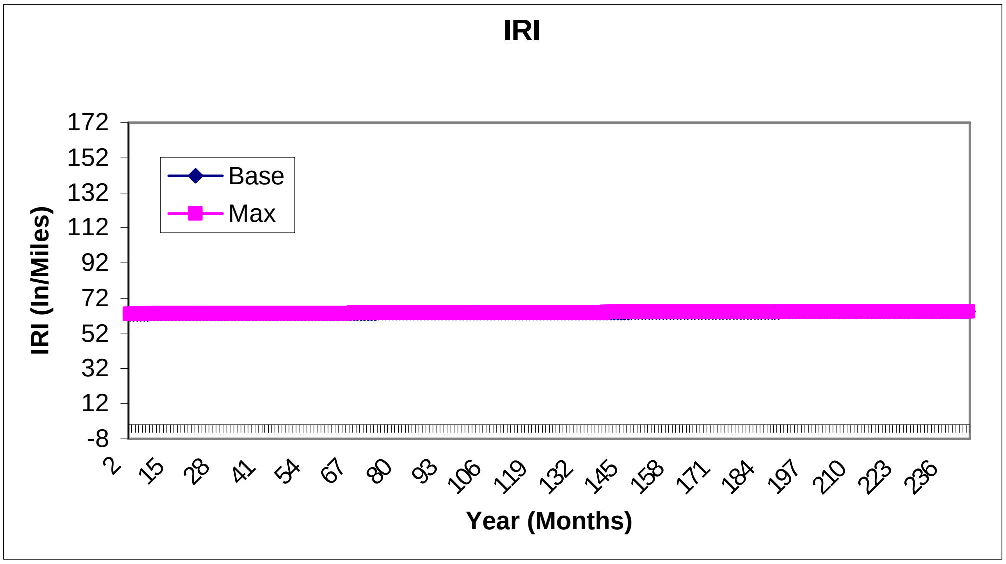


Figure D -568 1814 Ground Water Table

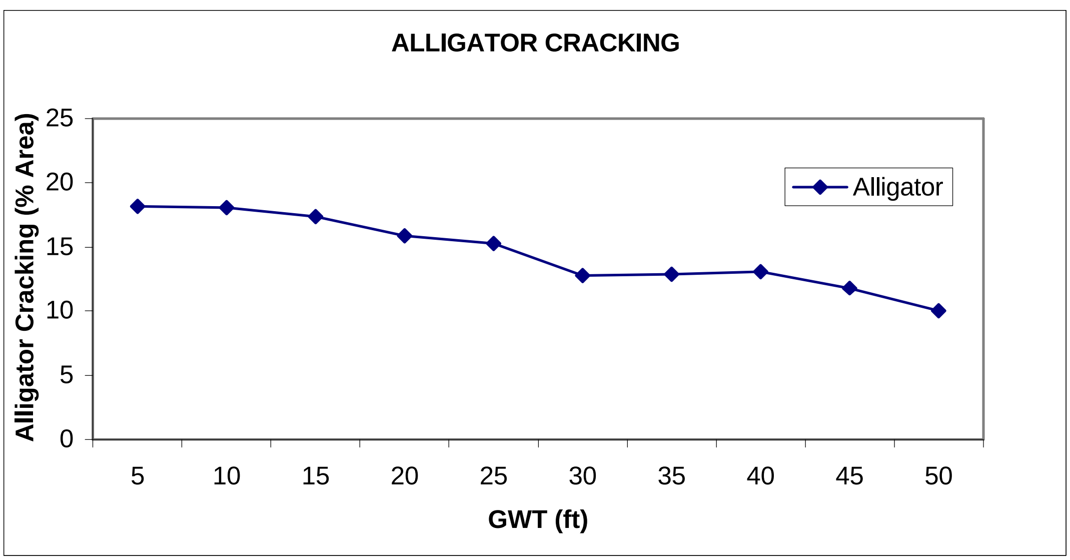


Figure D -569 1814 Ground Water Table

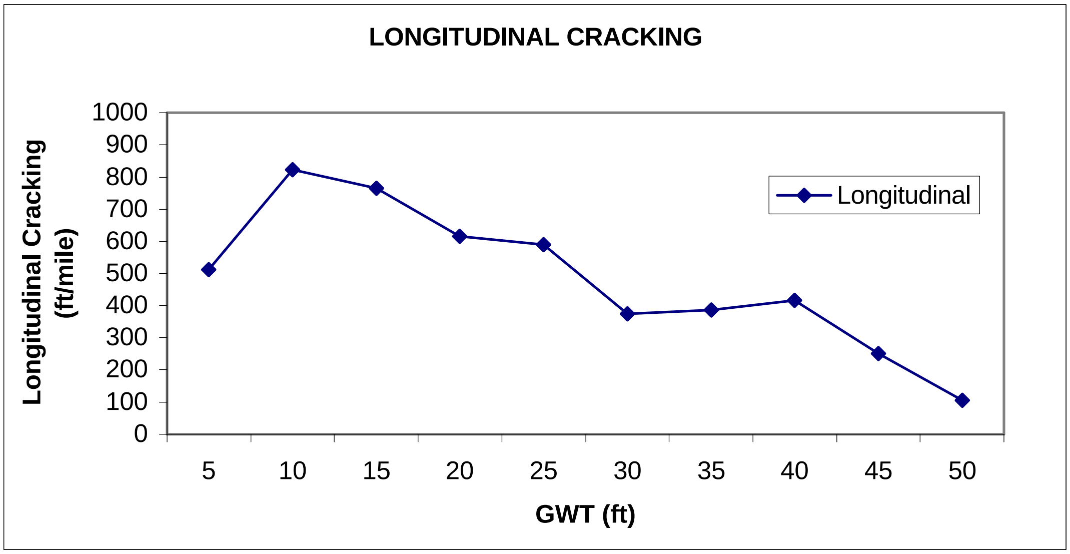


Figure D -570 1814 Ground Water Table

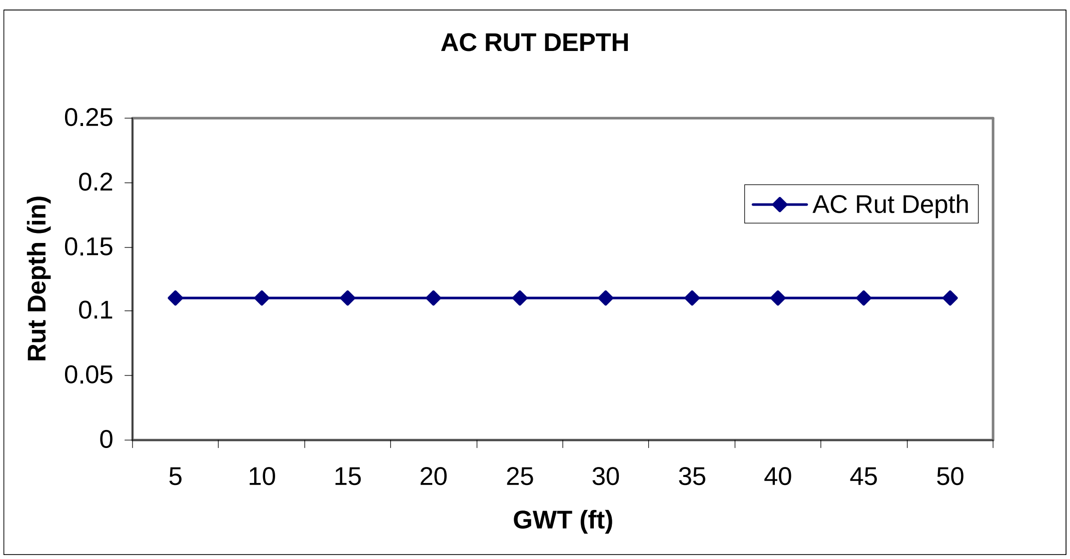


Figure D -571 1814 Ground Water Table

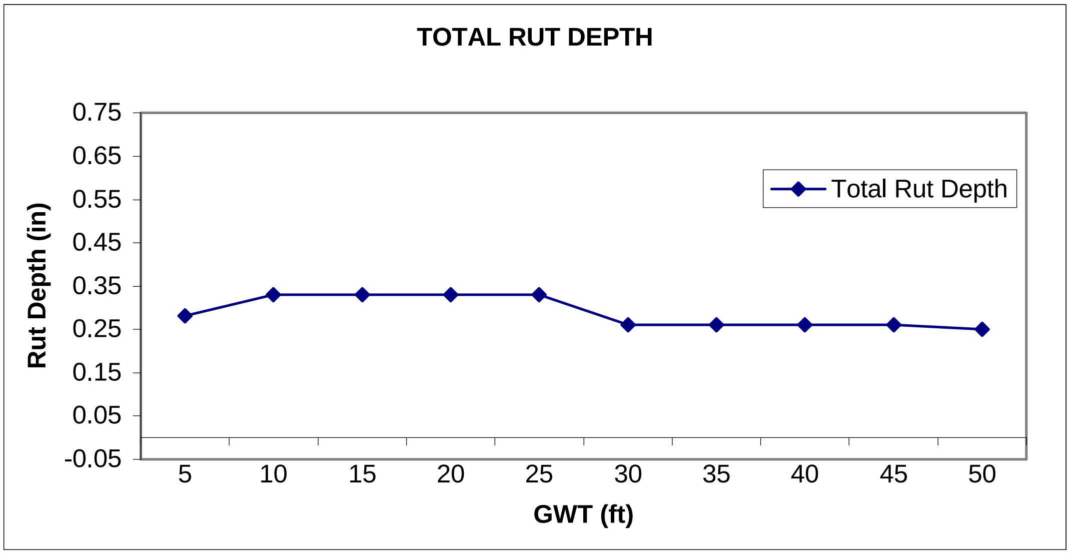


Figure D -572 1814 Ground Water Table

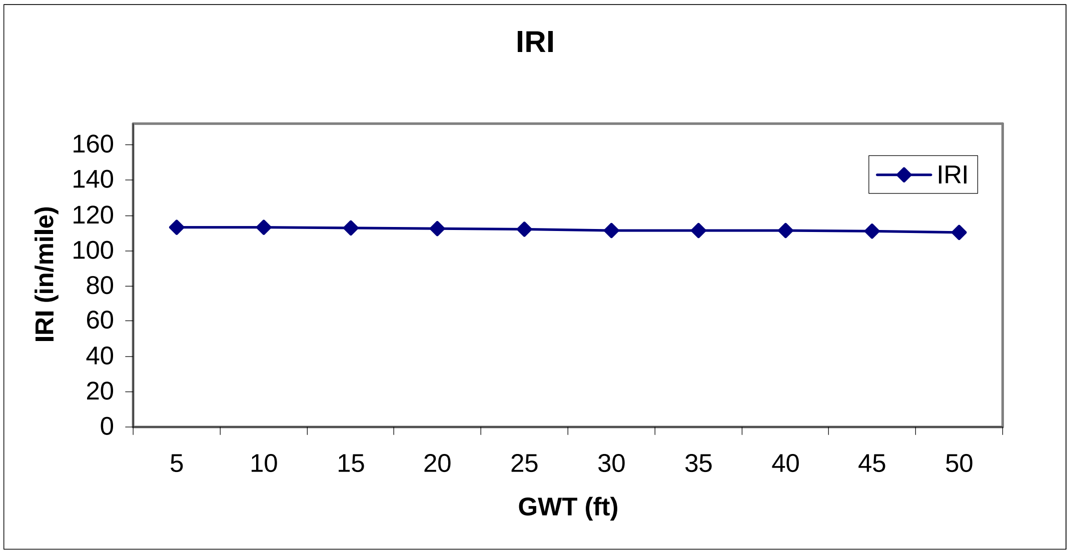


Figure D -573 5037 Ground Water Table

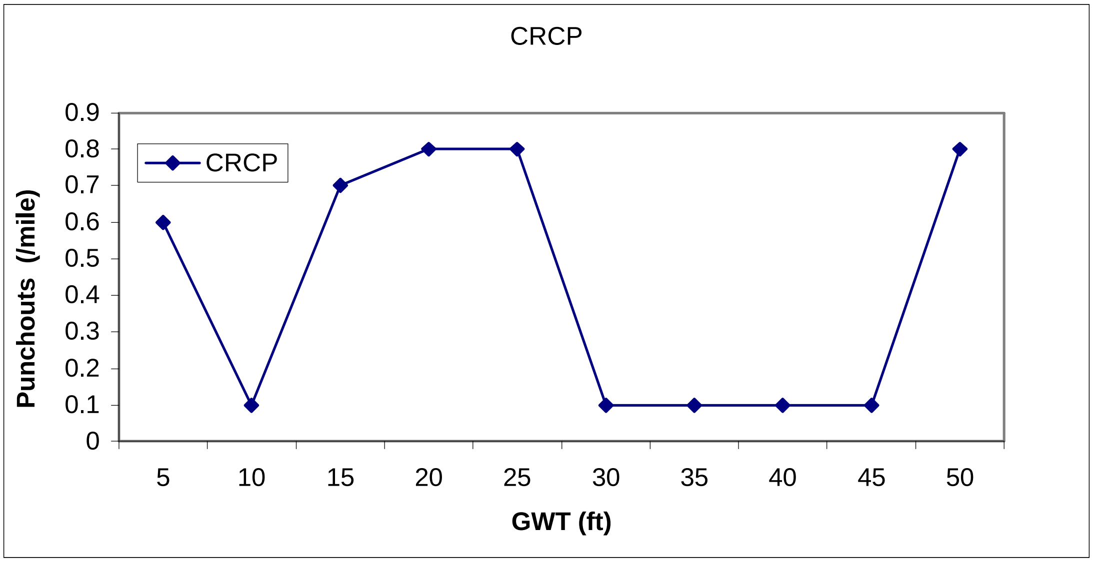
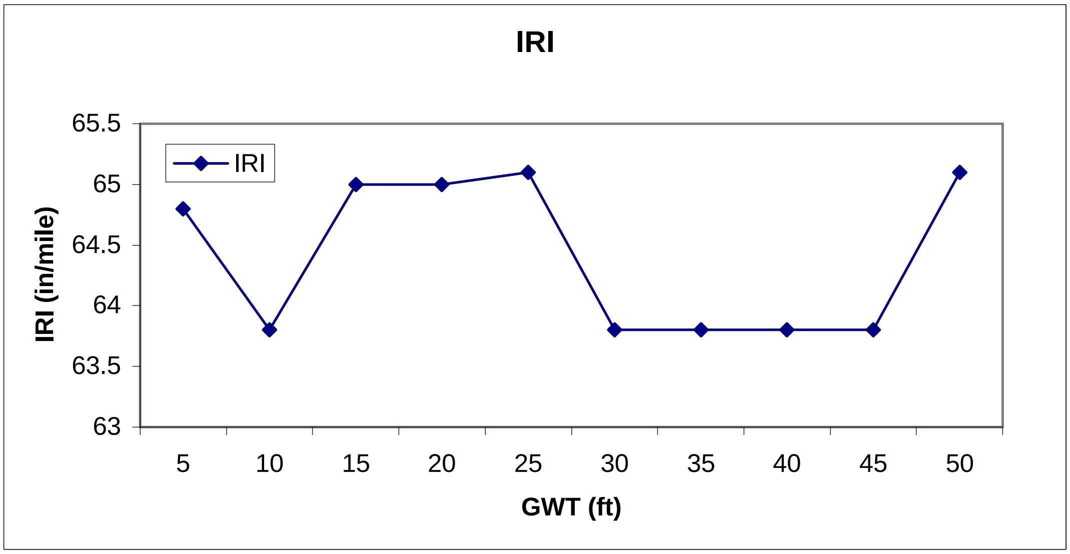


Figure D -574 5037 Ground Water Table



APPENDIX E: RELIABILITY 50% VS 90%

Table E - 1 Run-1-with 90% Reliability-Base case

Performance Criteria	Distress Target	Reliablity Target	Distress Predicted	Reliability Predicted	Acceptable
Terminal IRI (in/mi)	172	90	121.2	97.67	Pass
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	90	138	69.64	Fail
AC Bottom Up Cracking (Alligator Cracking) (%):	25	90	12.7	86.3	Fail
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	90	1	99.999	Pass
Chemically Stabilized Layer (Fatigue Fracture)	25	90			N/A
Permanent Deformation (AC Only) (in):	0.25	90	0.15	92.2	Pass
Permanent Deformation (Total Pavement) (in):	0.75	90	0.35	99.999	Pass

Figure E - 1 Run-1-with 90% Longitudinal Cracking - Base case

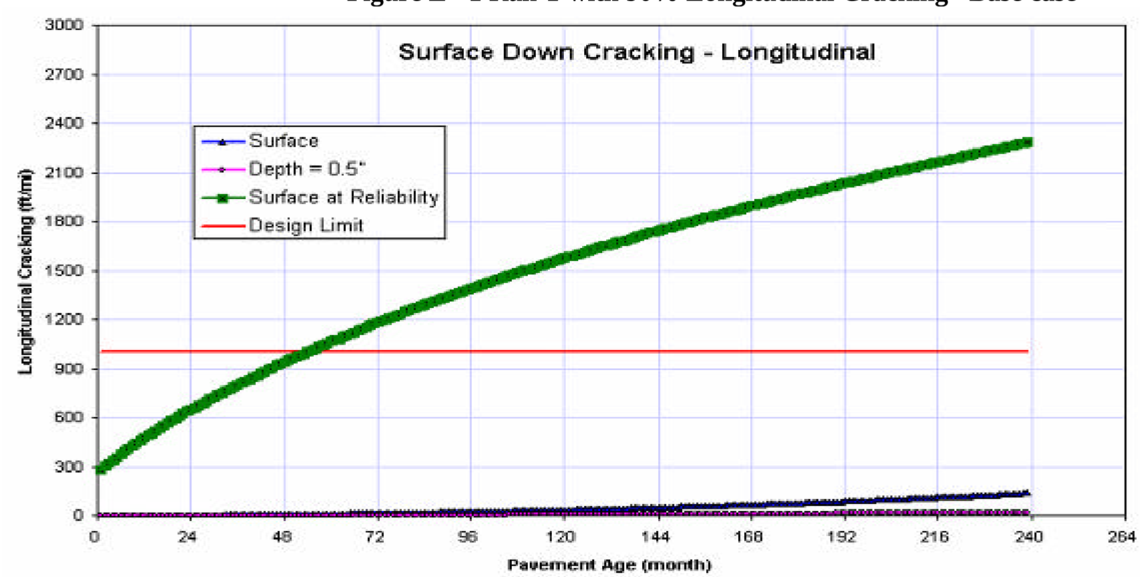


Figure E - 2 Run-1-with 90% Alligator Cracking - Base case

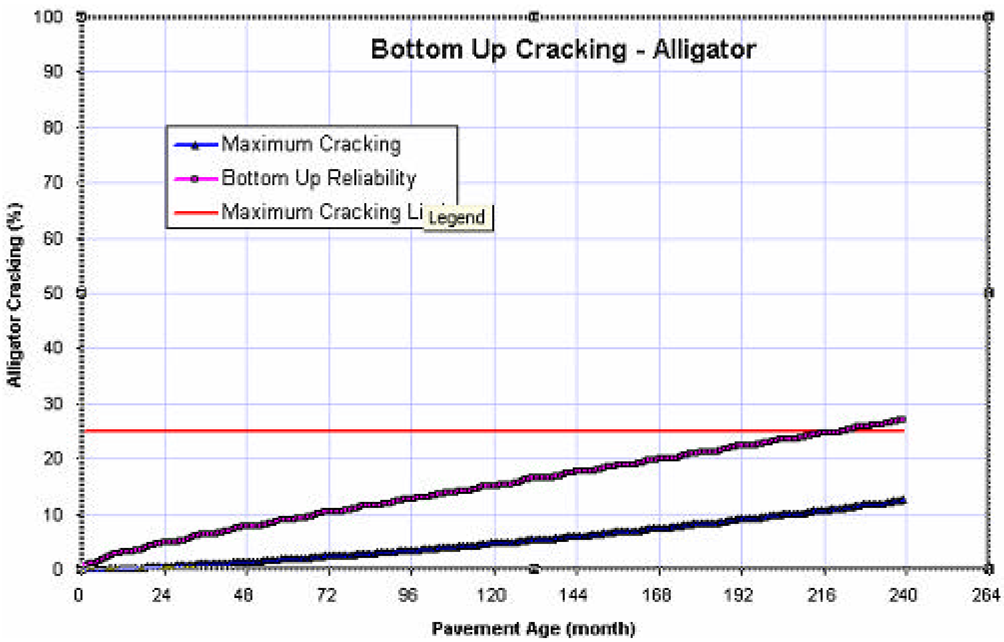


Figure E - 3 Run-1-with 90% Total Rutting - Base case

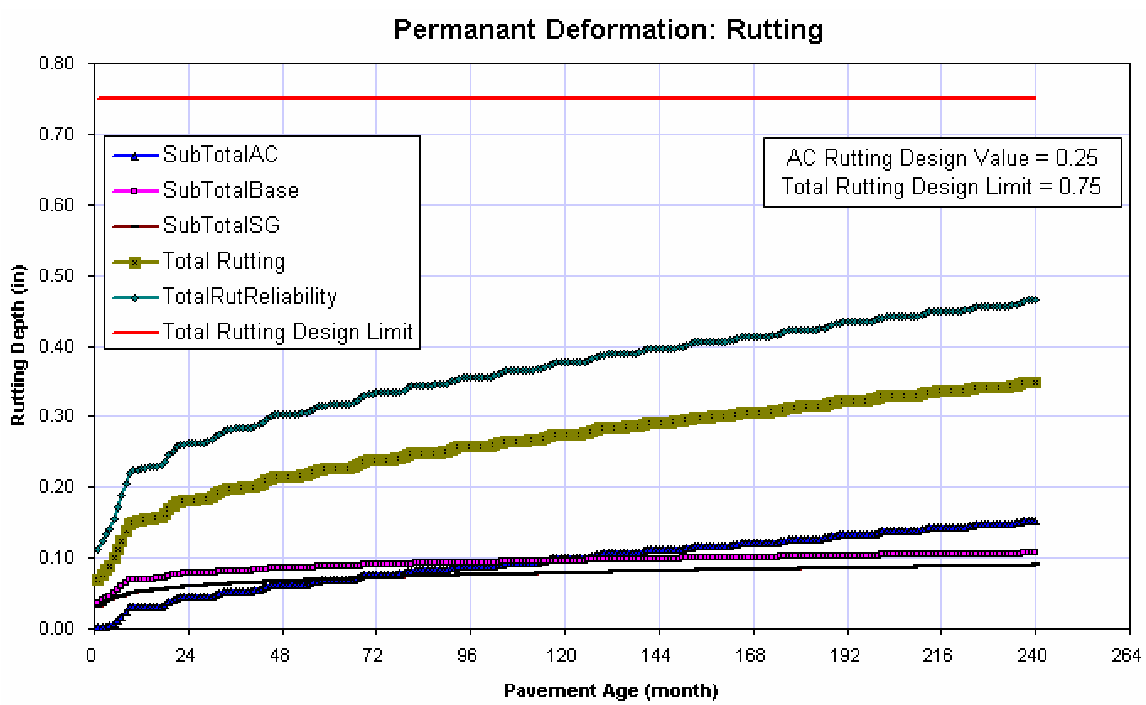


Figure E - 4 Run-1-with 90% IRI - Base case

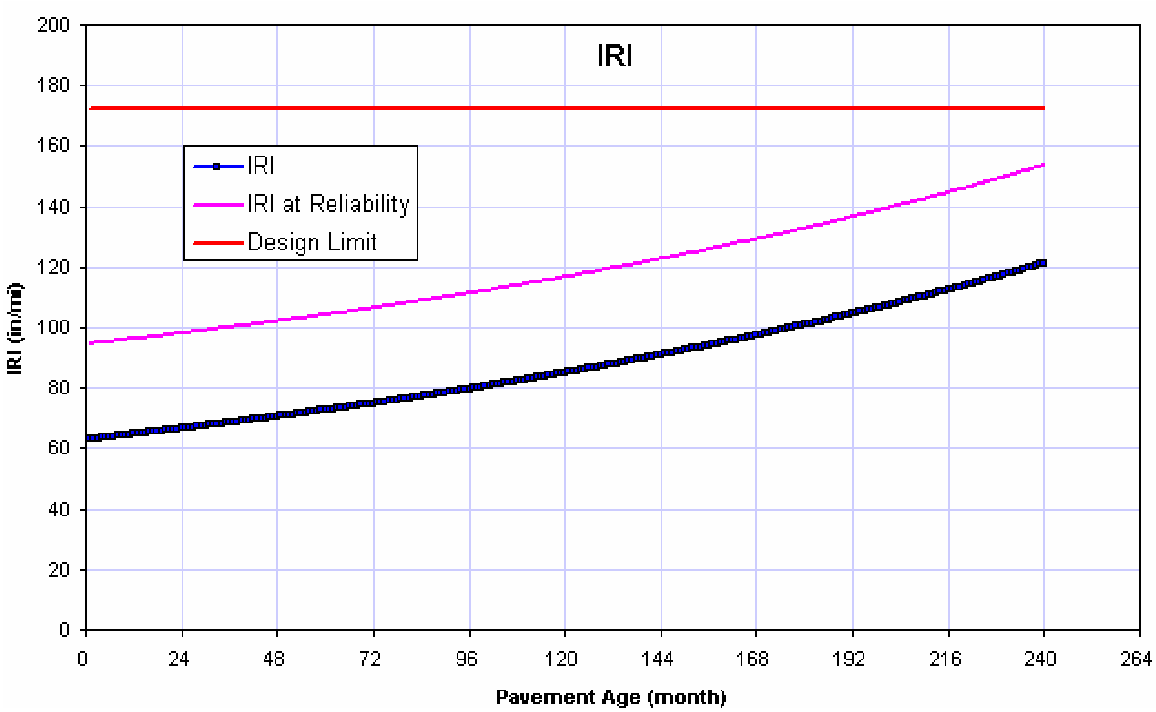


Table E - 2 Run-1-with 90% Reliability case - Minimum - Thermal Conductivity

Performance Criteria	Distress Target	Reliablity Target	Distress Predicted	Reliability Predicted	Acceptable
Terminal IRI (in/mi)	172	90	121.1	97.69	Pass
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	90	138	69.66	Fail
AC Bottom Up Cracking (Alligator Cracking) (%):	25	90	12.5	86.83	Fail
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	90	1	99.999	Pass
Chemically Stabilized Layer (Fatigue Fracture)	25	90			N/A
Permanent Deformation (AC Only) (in):	0.25	90	0.14	94.5	Pass
Permanent Deformation (Total Pavement) (in):	0.75	90	0.34	99.999	Pass

Figure E - 5 Run-1-with 90% Longitudinal Cracking - Minimum - Thermal Conductivity

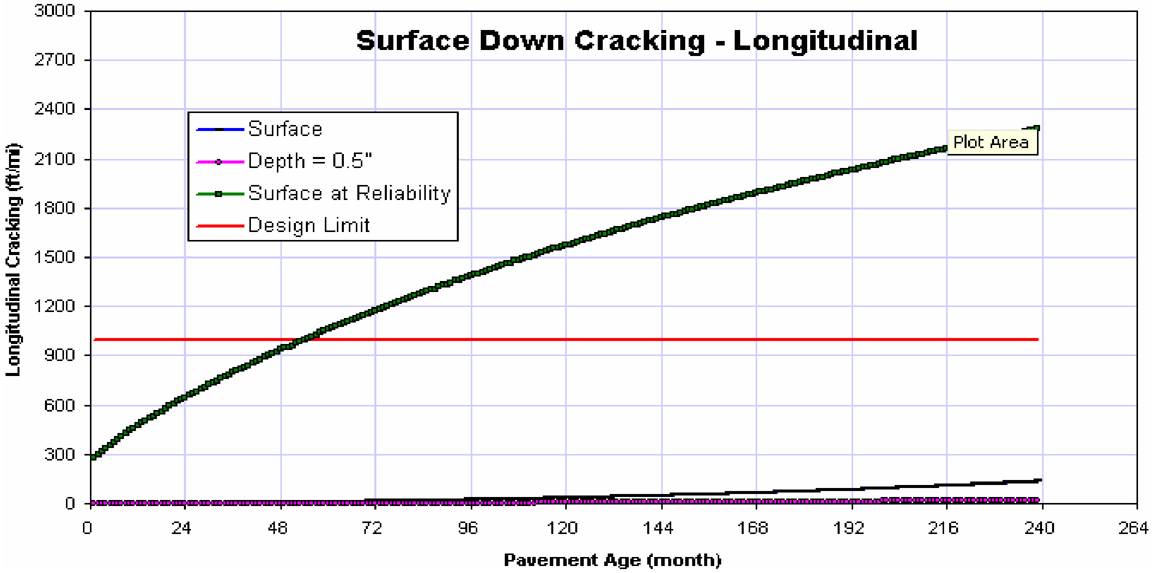


Figure E - 6 Run-1-with 90% Alligator Cracking - Minimum - Thermal Conductivity

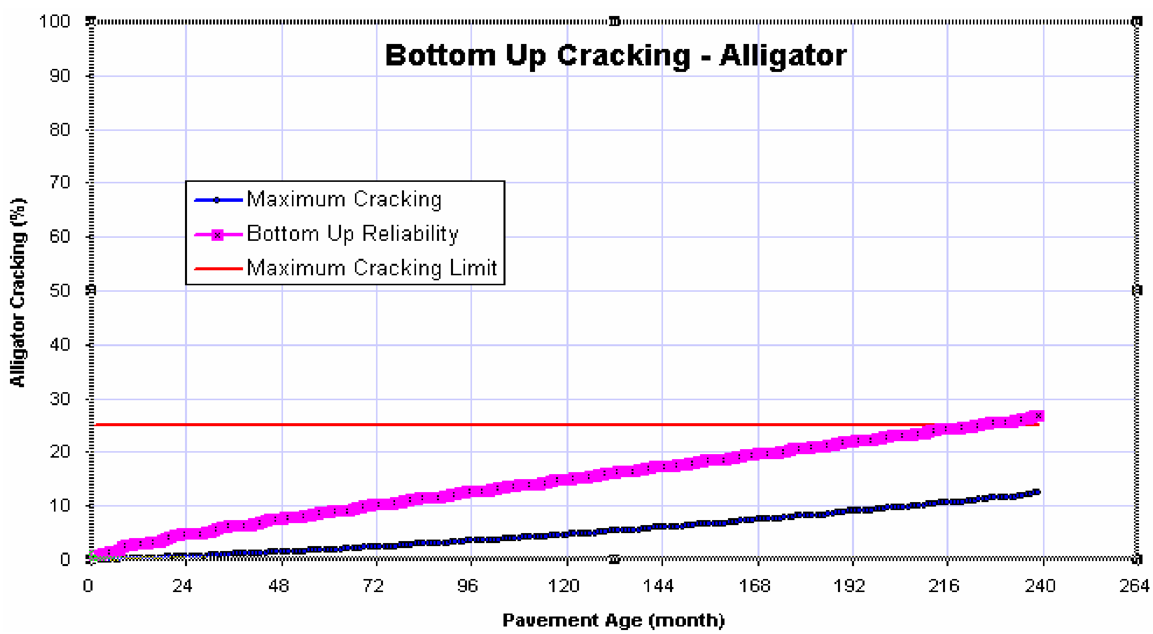


Figure E - 7 Run-1-with 90% Total Rutting - Minimum - Thermal Conductivity

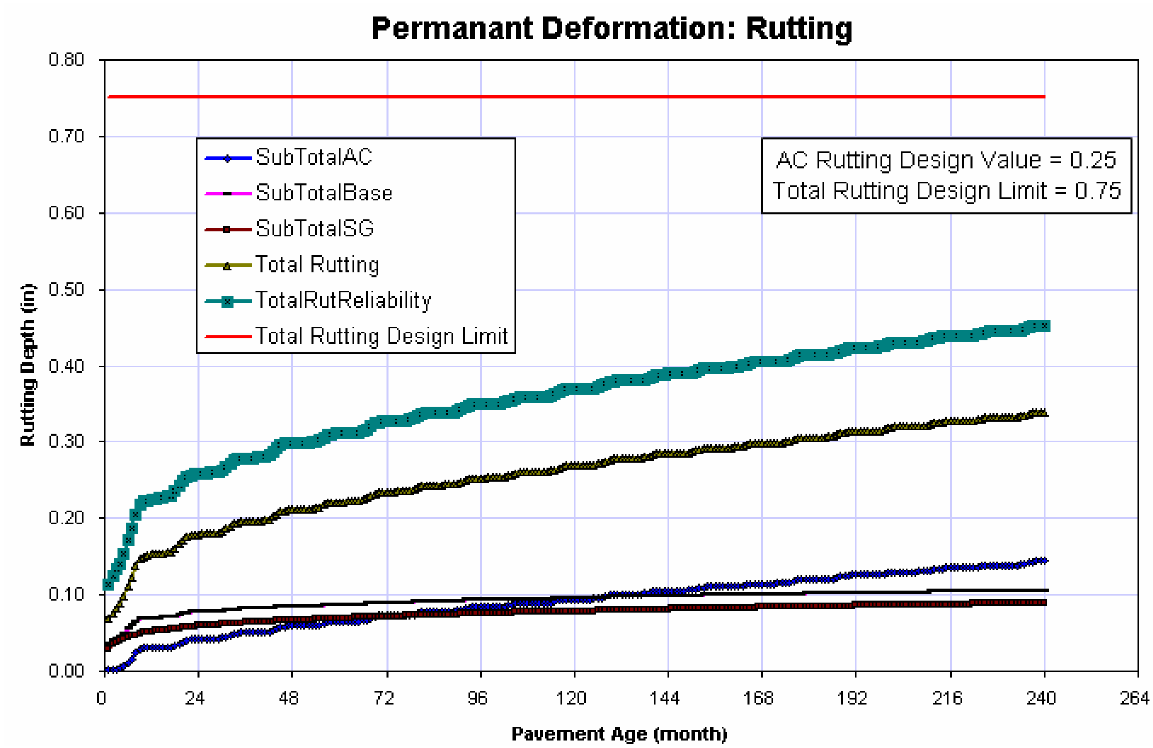


Figure E - 8 Run-1-with 90% IRI - Minimum - Thermal Conductivity

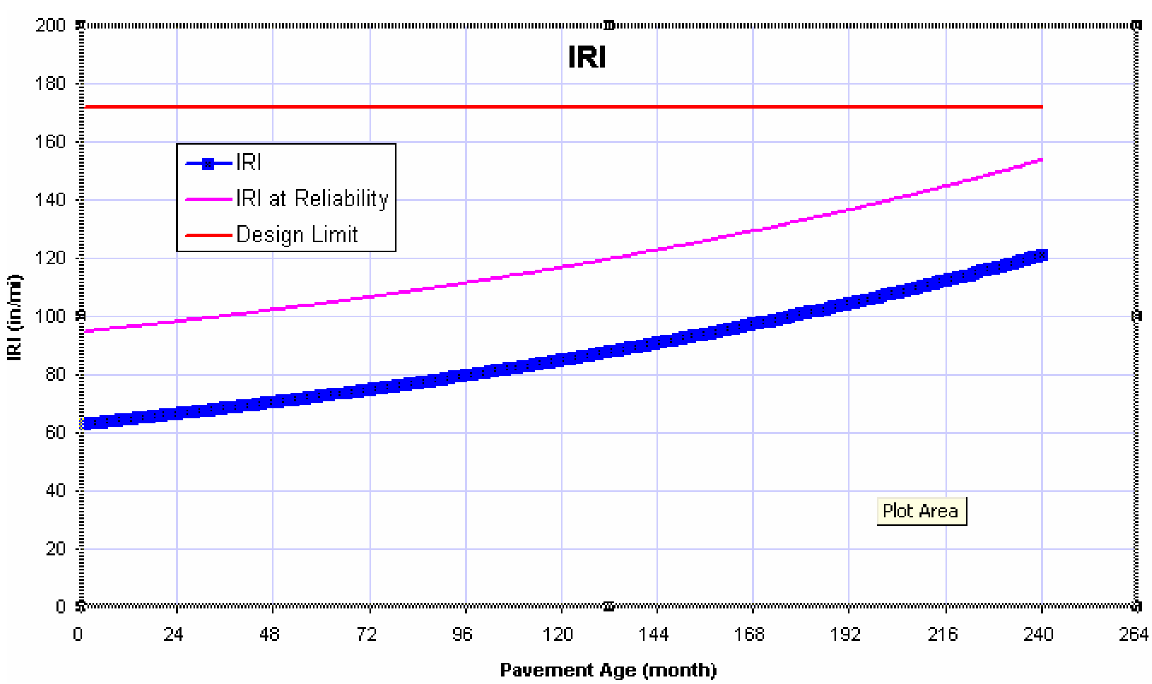


Table E - 3 Run-1-with 90% Reliability case – Maximum - Thermal Conductivity

Performance Criteria	Distress Target	Reliablity Target	Distress Predicted	Reliablity Predicted	Acceptable
Terminal IRI (in/mi)	172	90	121.2	97.66	Pass
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	90	139	69.59	Fail
AC Bottom Up Cracking (Alligator Cracking) (%):	25	90	12.8	86.07	Fail
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	90	1	99.999	Pass
Chemically Stabilized Layer (Fatigue Fracture)	25	90			N/A
Permanent Deformation (AC Only) (in):	0.25	90	0.16	90.61	Pass
Permanent Deformation (Total Pavement) (in):	0.75	90	0.36	99.999	Pass

Figure E - 9 Run-1-with 90% Longitudinal Cracking – Maximum - Thermal Conductivity

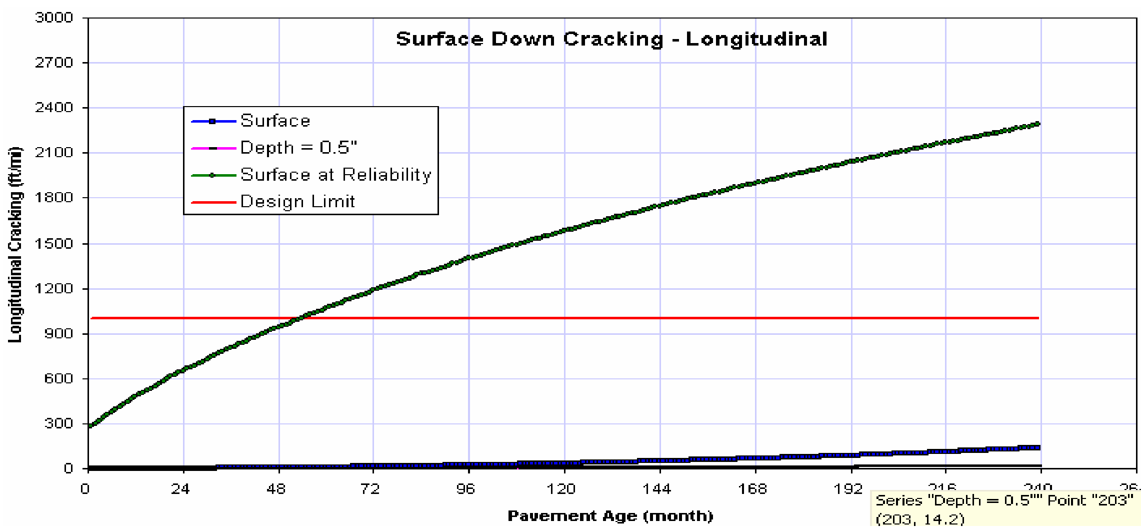


Figure E - 10 Run-1-with 90% Alligator Cracking – Maximum - Thermal Conductivity

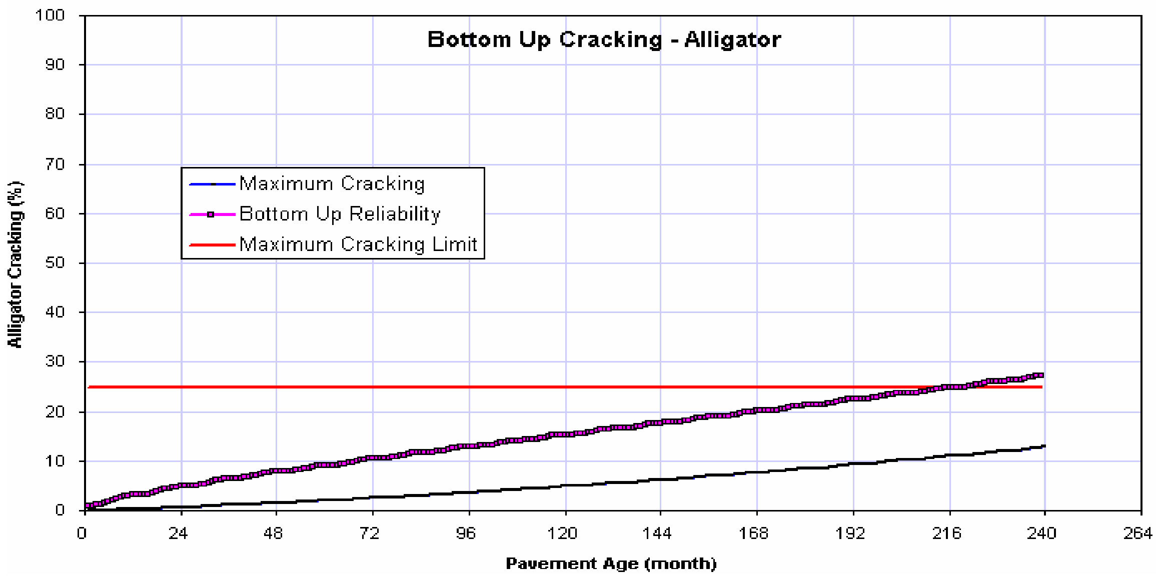


Figure E - 11 Run-1-with 90% Total Rutting – Maximum - Thermal Conductivity

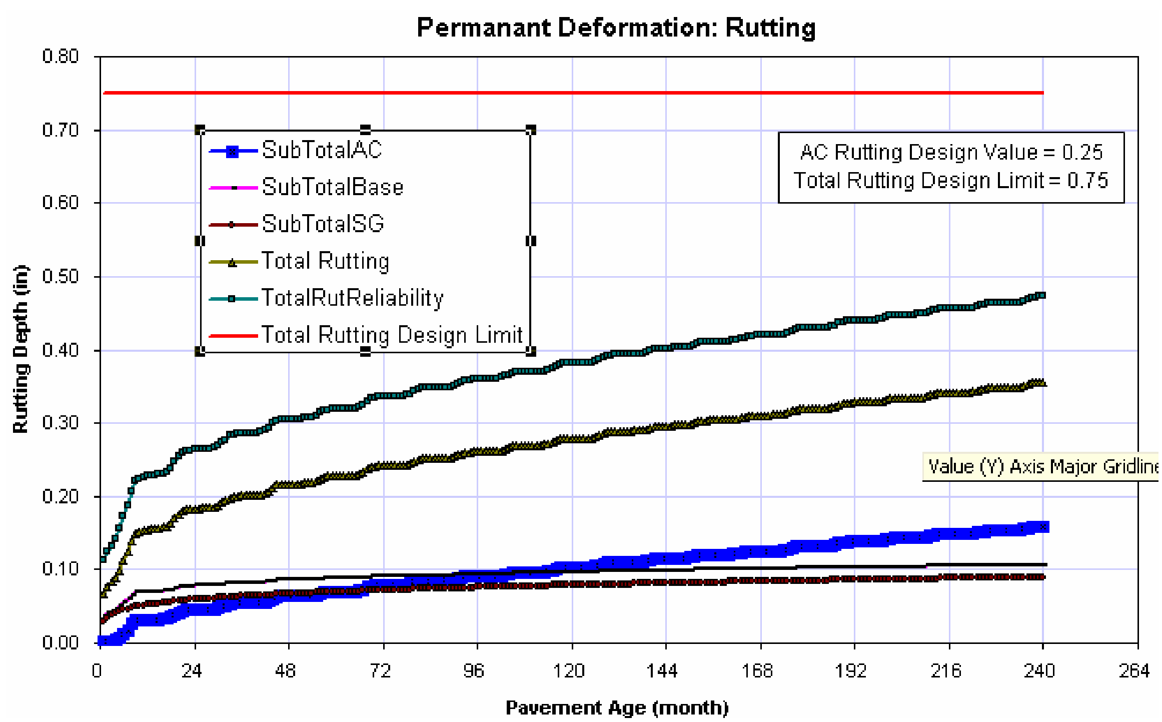


Figure E - 12 Run-1-with 90% IRI – Maximum - Thermal Conductivity

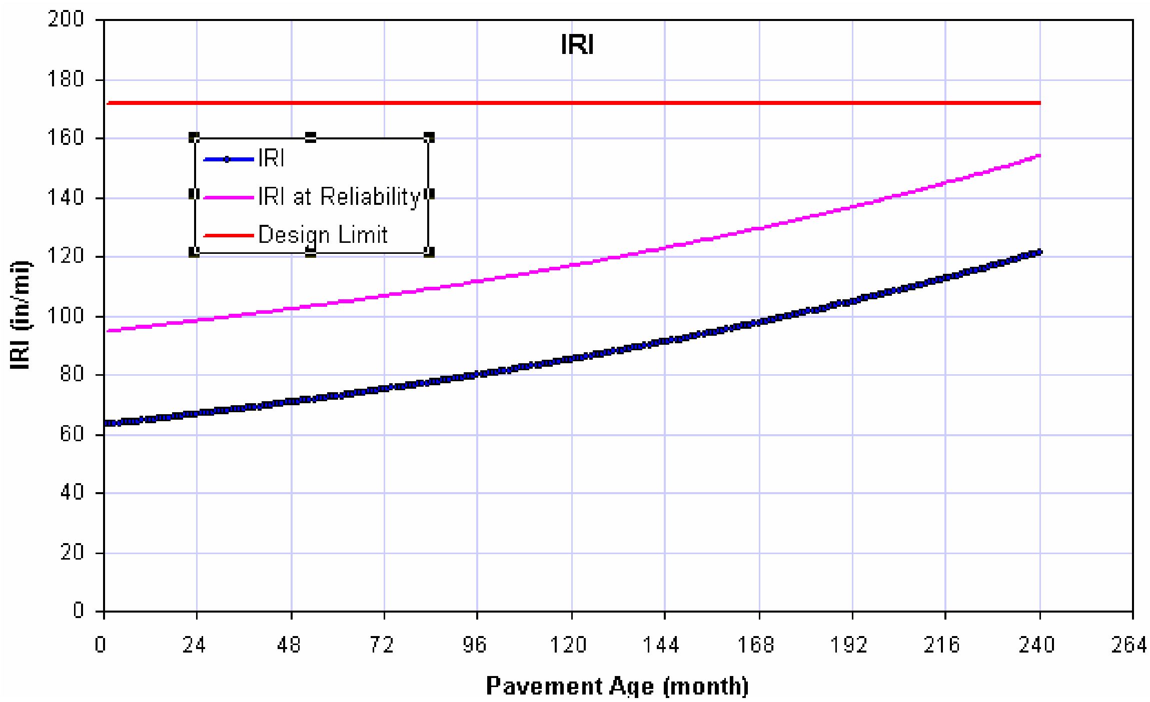


Table E - 4 Run-1-with 50% Reliability case - Base

Reliability Summary						
Performance Criteria		Distress Target	Reliablity Target	Distress Predicted	Reliability Predicted	Acceptable
1	Terminal IRI (in/mi)	172	50	121.2	97.67	Pass
2	AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	138	69.64	Pass
3	AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	12.7	86.3	Pass
4	AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	99.999	Pass
5	Chemically Stabilized Layer (Fatigue Fracture)	25	50			N/A
6	Permanent Deformation (AC Only) (in):	0.25	50	0.15	92.2	Pass
7	Permanent Deformation (Total Pavement) (in):	0.75	50	0.35	99.999	Pass

Figure E - 13 Run-1-with 50% Reliability case Longitudinal Cracking - Base

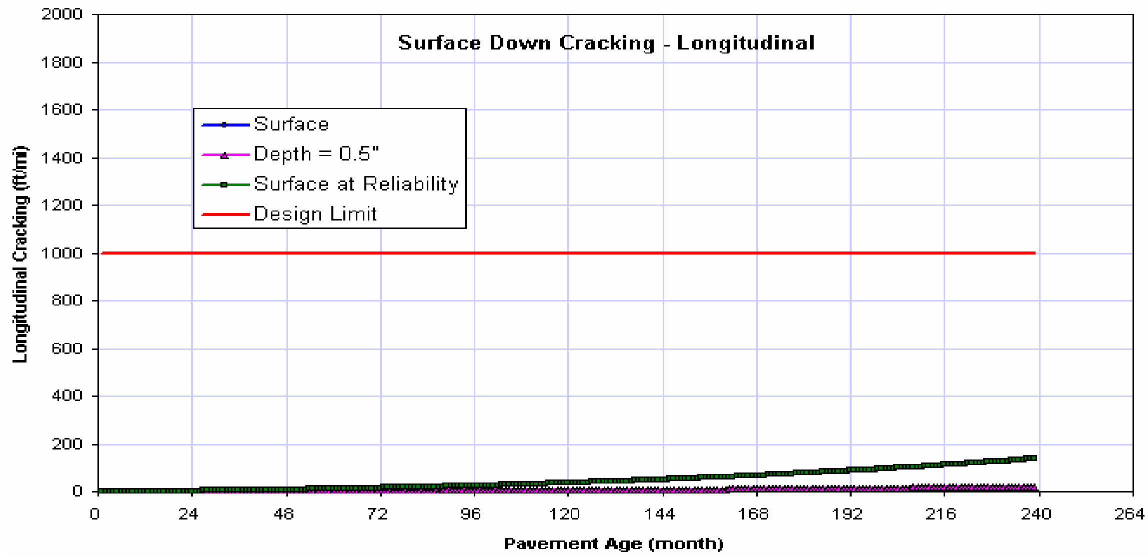


Figure E - 14 Run-1-with 50% Reliability case Alligator Cracking - Base

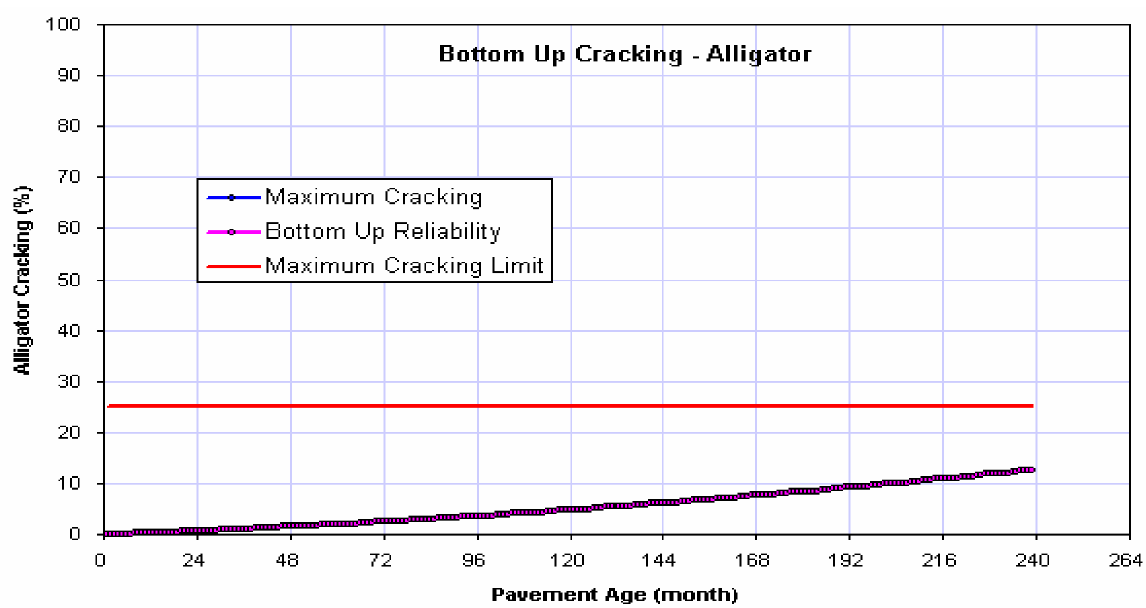


Figure E - 15 Run-1-with 50% Reliability case Total Rutting - Base

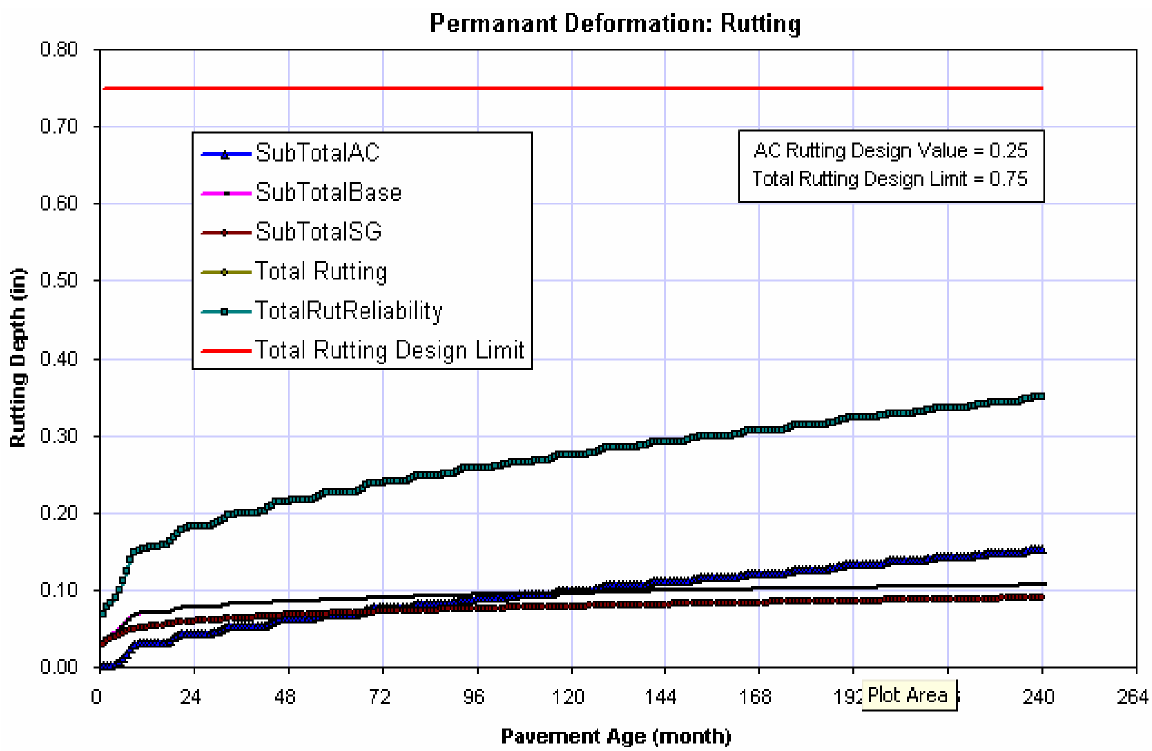


Figure E - 16 Run-1-with 50% Reliability case IRI - Base

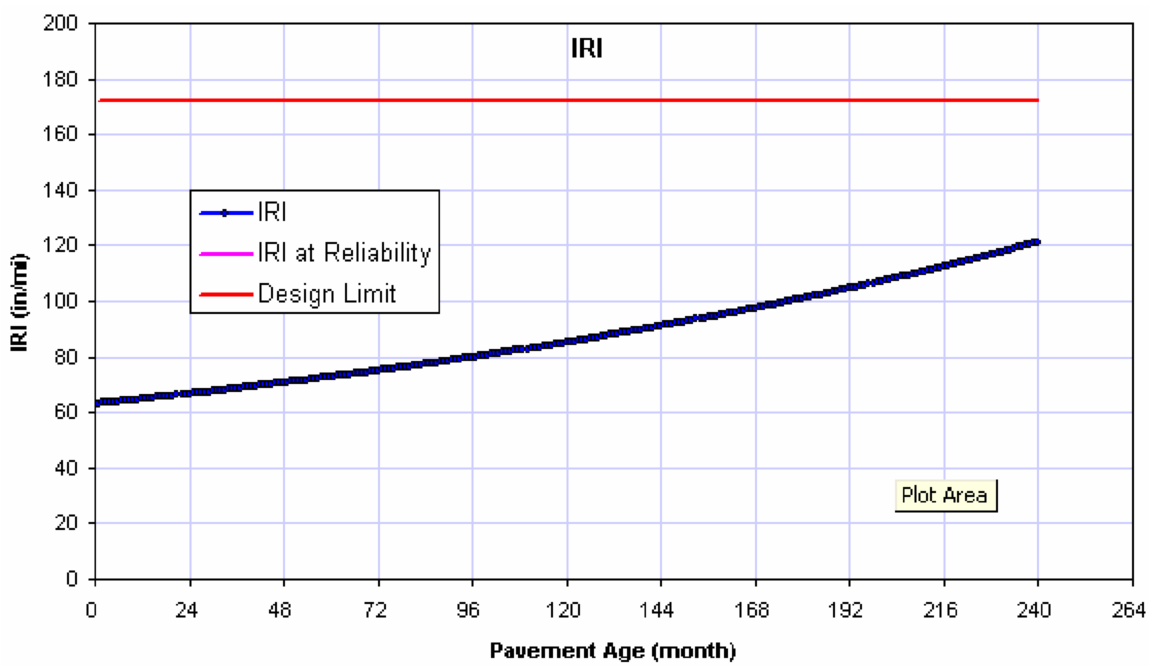


Table E - 5 Run-1-with 50% Reliability case – Minimum - Thermal conductivity

Reliability Summary						
Performance Criteria		Distress Target	Reliablity Target	Distress Predicted	Reliability Predicted	Acceptable
1	Terminal IRI (in/mi)	172	50	121.1	97.69	Pass
2	AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	138	69.66	Pass
3	AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	12.5	86.83	Pass
4	AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	99.999	Pass
5	Chemically Stabilized Layer (Fatigue Fracture)	25	50			N/A
6	Permanent Deformation (AC Only) (in):	0.25	50	0.14	94.5	Pass
7	Permanent Deformation (Total Pavement) (in):	0.75	50	0.34	99.999	Pass

Figure E - 17 Run-1-with 50% Reliability case Longitudinal Cracking – Minimum - Thermal conductivity

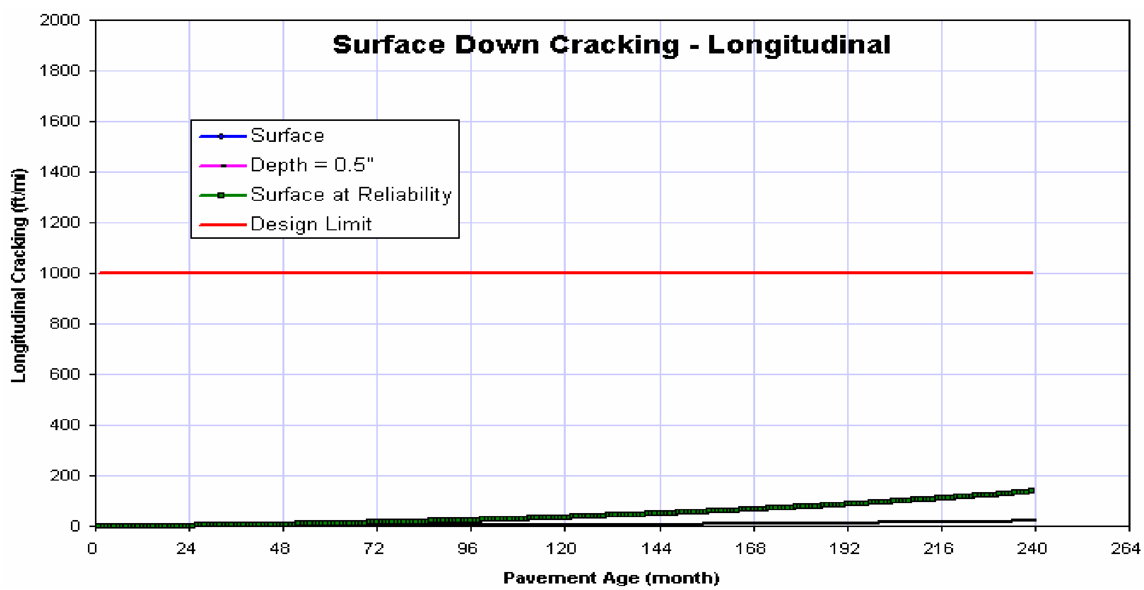


Figure E - 18 Run-1-with 50% Reliability case Alligator Cracking – Minimum - Thermal conductivity

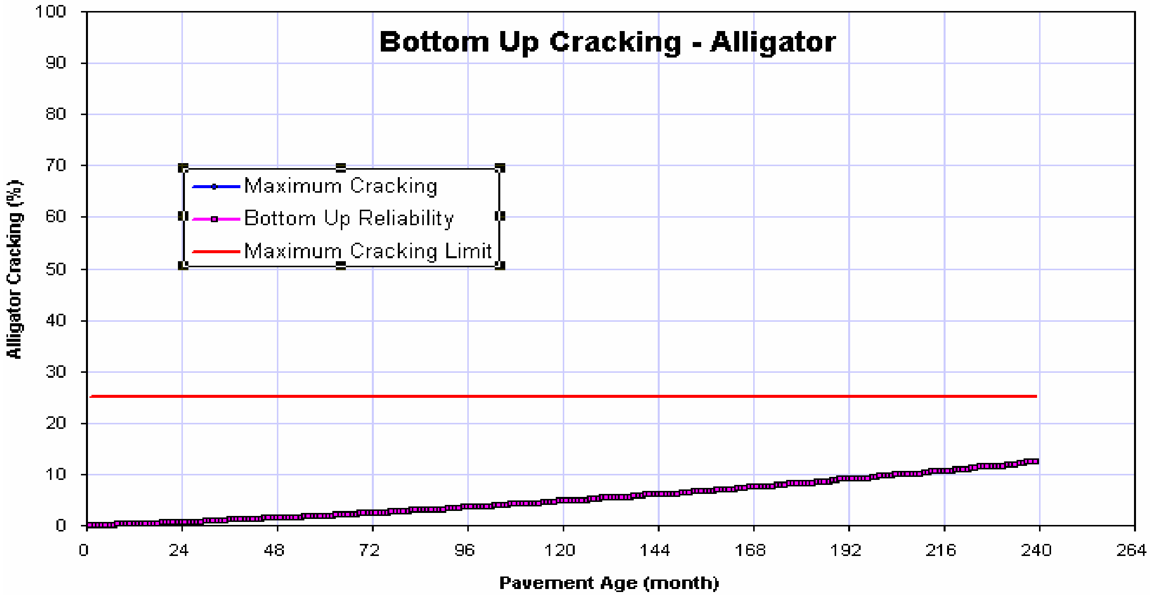


Figure E - 19 Run-1-with 50% Reliability case Total Rutting – Minimum - Thermal conductivity

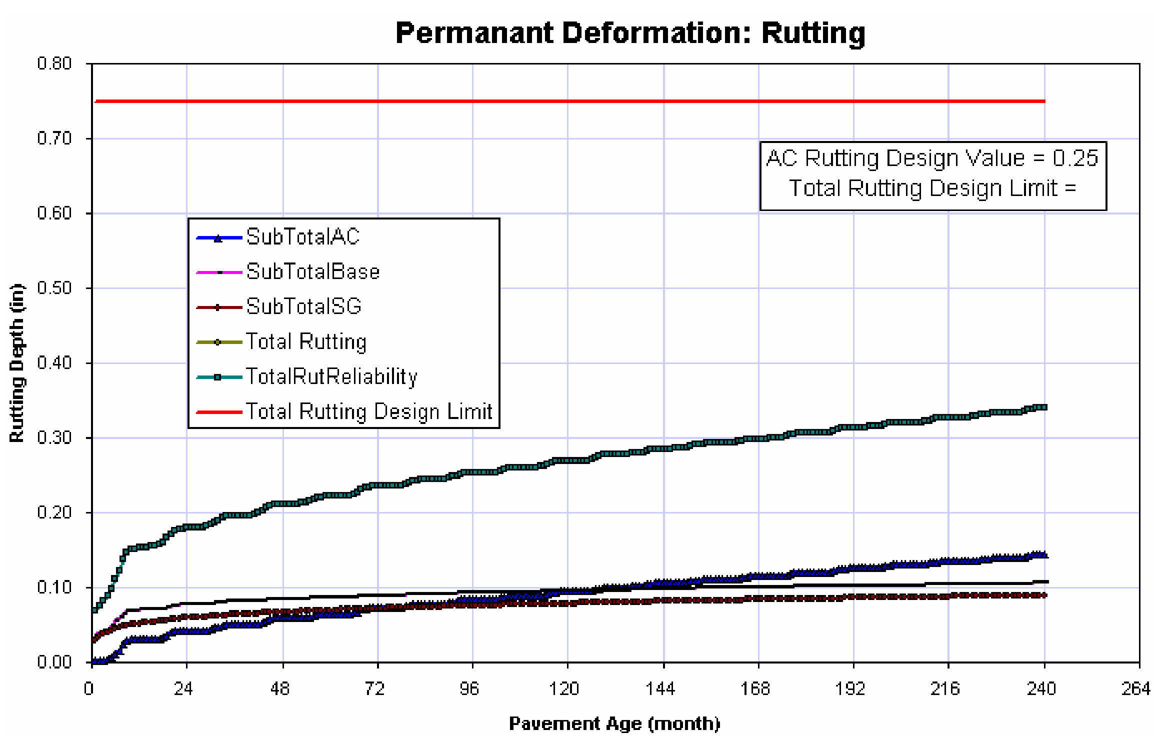


Figure E - 20 Run-1-with 50% Reliability case IRI – Minimum - Thermal conductivity

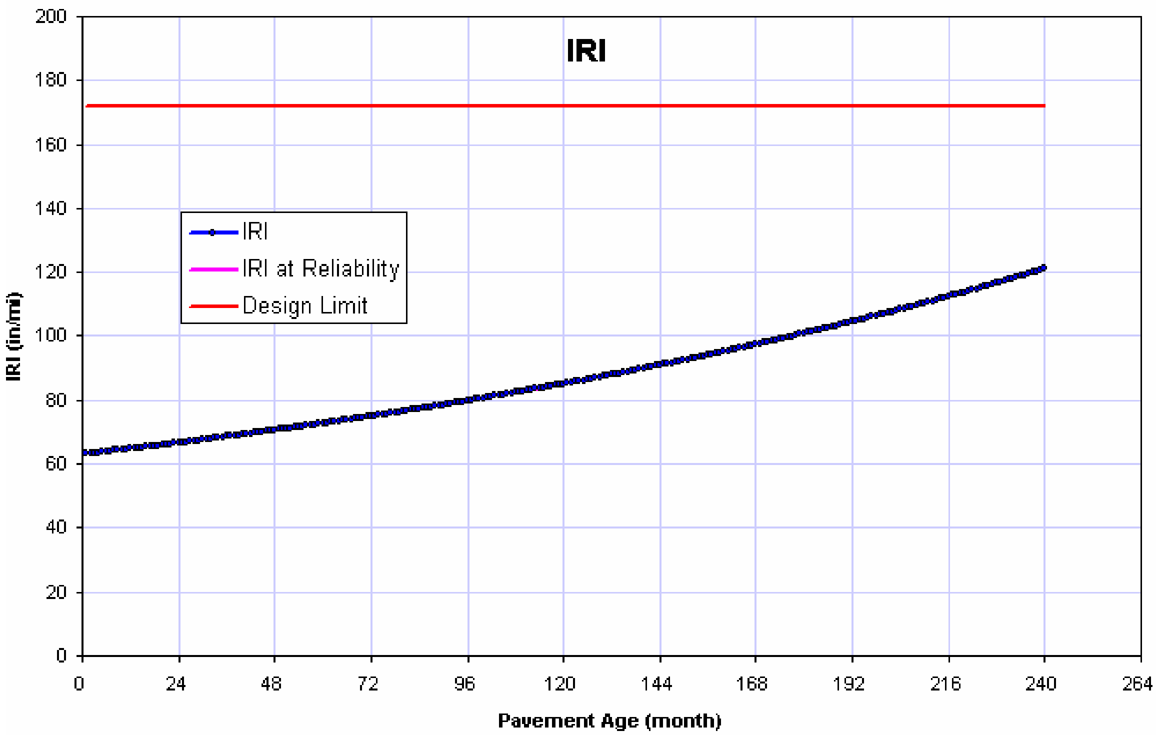


Table E - 6 Run-1-with 50% Reliability case - Maximum - Thermal conductivity

Reliability Summary						
Performance Criteria		Distress Target	Reliablity Target	Distress Predicted	Reliability Predicted	Acceptable
1	Terminal IRI (in/mi)	172	50	121.2	97.66	Pass
2	AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	50	139	69.59	Pass
3	AC Bottom Up Cracking (Alligator Cracking) (%):	25	50	12.8	86.07	Pass
4	AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	50	1	99.999	Pass
5	Chemically Stabilized Layer (Fatigue Fracture)	25	50			N/A
6	Permanent Deformation (AC Only) (in):	0.25	50	0.16	90.61	Pass
7	Permanent Deformation (Total Pavement) (in):	0.75	50	0.36	99.999	Pass

Figure E - 21 Run-1-with 50% Reliability case Longitudinal Cracking - Maximum - Thermal conductivity

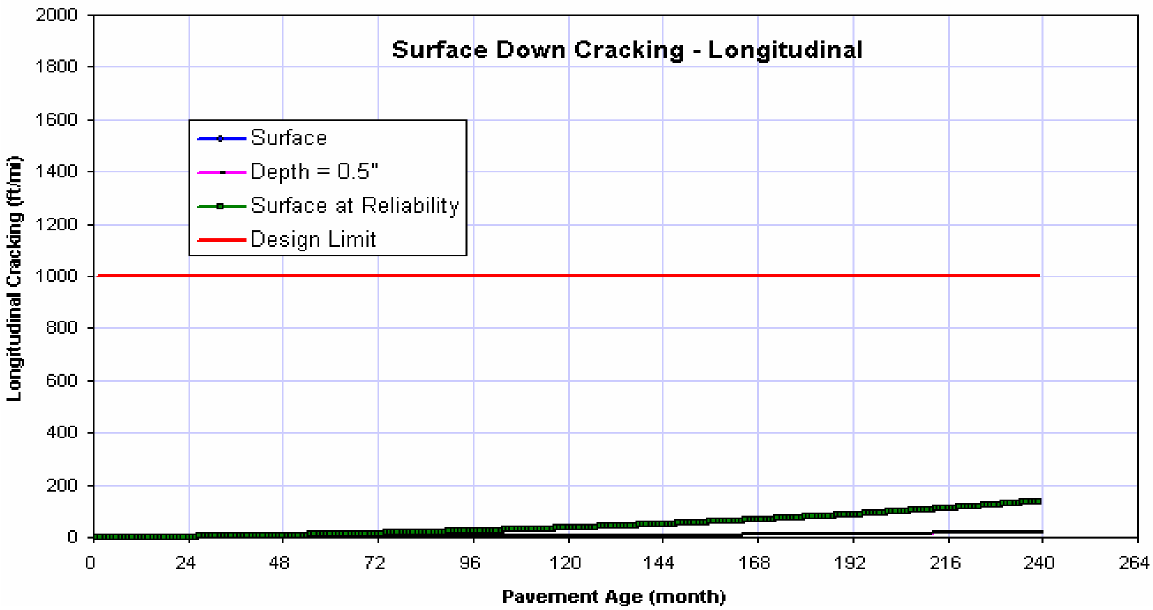


Figure E - 22 Run-1-with 50% Reliability case Alligator Cracking - Maximum - Thermal conductivity

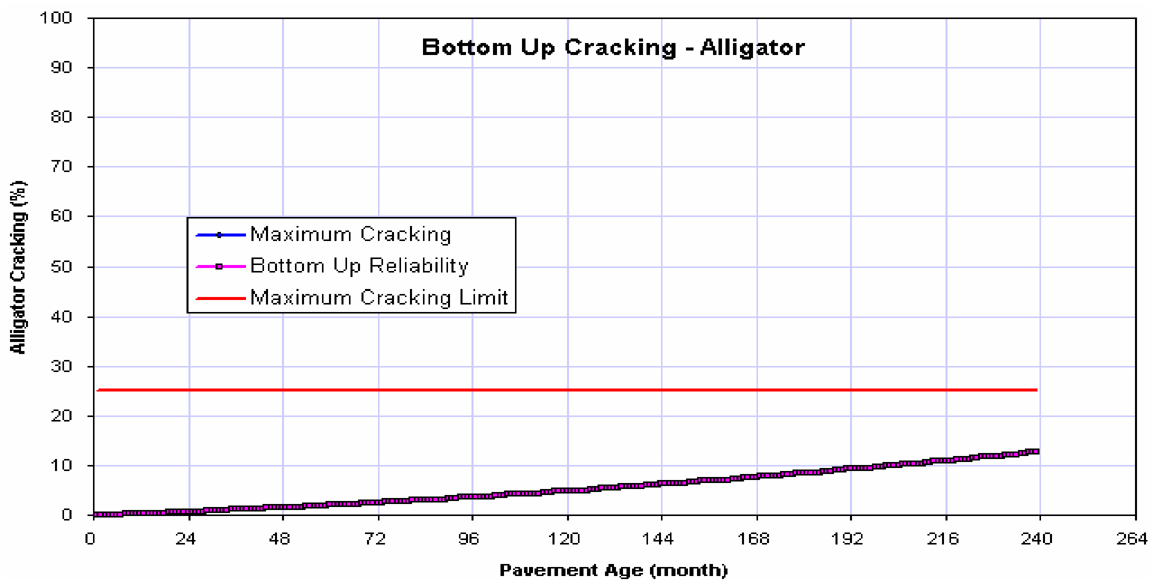


Figure E - 23 Run-1-with 50% Reliability case Total Rutting - Maximum - Thermal conductivity

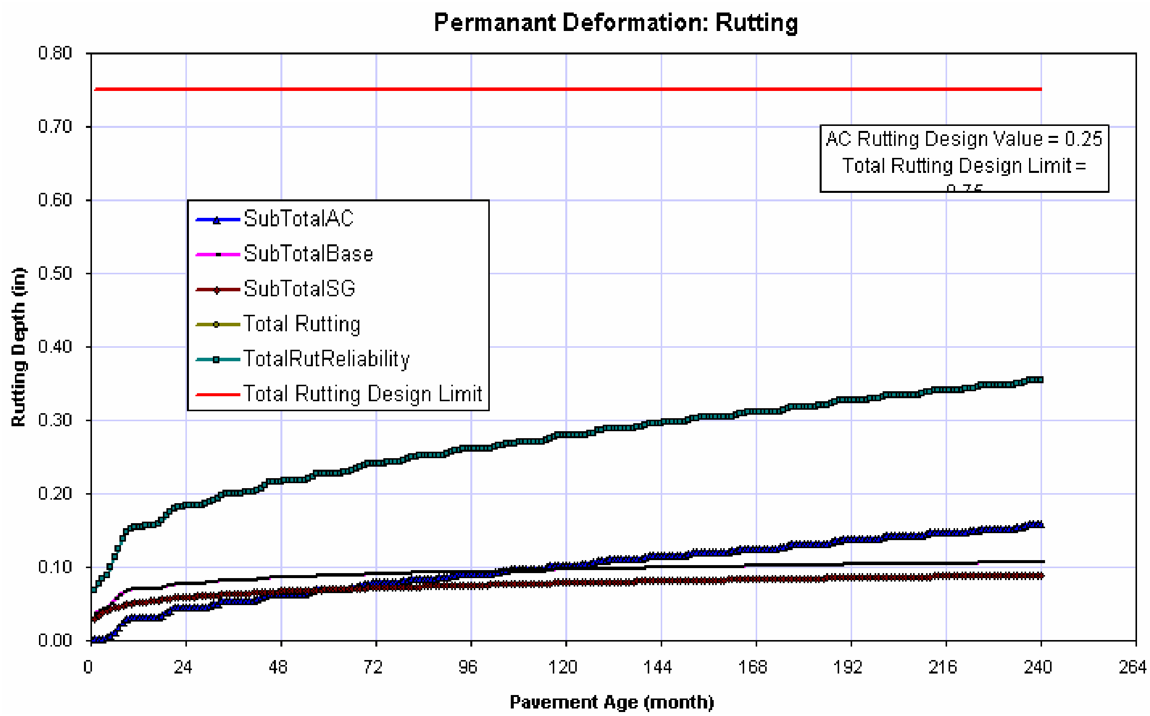
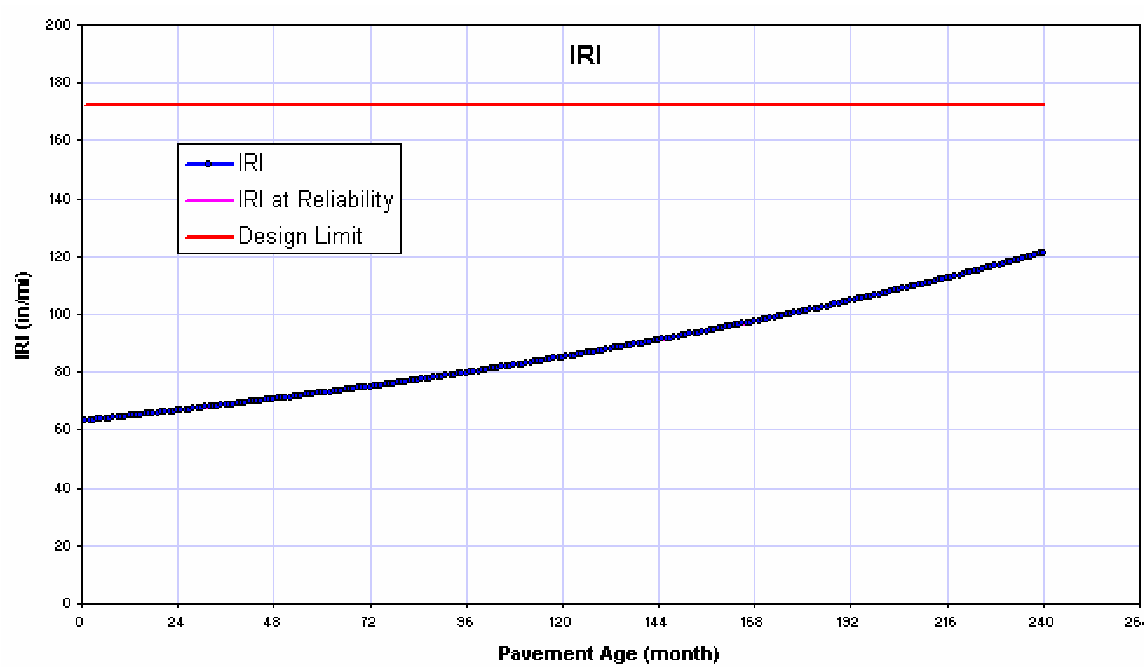


Figure E - 24 Run-1-with 50% Reliability case IRI - Maximum - Thermal conductivity



APPENDIX F: DYNAMIC MODULI VALUES OF HOT MIX ASPHALT MIXTURES

Table F-1 S9.5B

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2165123	2667678	2904670	3354867	3555309	3981140
50	353021.8	624822.4	740562.5	1109828	1297942	1801223
95	30167.84	47282.29	59465.46	109068.4	148663.6	302838.7

Table F-2 S9.5B0

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2040825	2291306	2523946	2886830	3028822	3351241
50	470792.4	699226.8	828600.4	1123462	1267484	1626018
95	34954.09	55839.51	70343.28	121396.6	157075.8	290075.4

Table F-3 S9.5B1

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2335977	2745564	3070303	3437539	3614920	4050758
50	483121	696181	874432.3	1234416	1404110	1887666
95	40900.6	61641	76144.79	129808.7	169549	321403.5
129.92		35679.3	30602.95	36839.58	42786.1	68602.83

Table F-4 S9.5B2

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2295947	2747594	2838388	3171829	3291921	3645233
50	720257	976973.9	1130134	1430362	1560316	1938719
95	70198.2	107763	130098.8	213495	261793	445990.9
129.92		31763.26	35969.35	50618.2	61641.02	108343.2

Table F-5 S9.5B3

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2395153	2823014	2981975	3365020	3526881.8	3878598
50	595089.7	876462.8	994668.5	1354362	1522170.7	1938574
95	50473.12	80350.89	100076	170999.4	221037.45	394792.6
129.92		23496.11	24656.41	34228.9	41625.82	71358.55

Table F-6 I19B

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2040825	2291306	2523946	2886830	3028822	3351241
50	470792.4	699226.8	828600.4	1123462	1267484	1626018
95	34954.09	55839.51	70343.28	121396.6	157075.8	290075.4

Table F-7 B25B

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2343519	2933097	2948326	3458424	3652049	4081361
50	470502.3	735051.1	881394.1	1241813	1430362	1921024
95	42496.05	64251.7	79625.7	135900.3	190579.5	336487.5

Table F-8 S9.5C

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2620396	2804594	3244783	3551538	3694400	4041185
50	823088.9	1160302	1323324	1682872	1860399	2275496
95	72518.85	112404.2	138946.1	236701.5	301098.3	525616.6

Table F-9 S9.5C0

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2902639	3277417	3565027	3923850	4097315	4449031
50	851081.2	1276912	1375828	1773376	1972658	2458534
95	72518.85	118495.8	148663.6	249464.8	317922.6	555639.4

Table F-10 S9.5C1

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2668549	2984876	3263783	3573874	3721667	4054094
50	854562.1	1160447	1307805	1682002	1848941	2267374
95	80931.04	121831.7	152869.7	249029.7	310525.7	526486.9
129.92	44236.5	42641.08	62946.36	76724.94	131984.3	170274.3

Table F-11 S9.5C2

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2807205	3386630	3513538	3799263	3972293	4341704
50	868775.8	1143042	1365965	1777292	1966711	2433007
95	69763.13	111243.9	139381.2	238296.9	307044.8	544906.6
129.92	39305.22	40175.44	57144.85	68892.91	123717.2	161136.9

Table F-12 S9.5C3

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2540190	3028967	3216356	3685698	3851476	4282673
50	504151	786974.6	944050.4	1354942	1553064	2047787
95	33068.6	52793.72	67587.57	124587.4	168533.8	329090.5
129.92	20160.24	20595.35	26831.97	32633.48	57434.93	77740.21

Table F-13 S9.5C4

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2370206	2780953	2791831	3097860	3204028	3473073
50	837012.6	1147683	1259652	1598315	1741323	2100436
95	91953.9	134885.1	164182.7	263823.6	330831	555639.4
129.92	41045.67	44671.61	45831.91	65121.93	81511.19	145907.9

Table F-14 S12.5C-Course

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2872472	3405340	3480325	4010728	4174910	4571298
50	670364.2	1081546	1193950	1612964	1814132	2323359
95	51778.46	78465.4	96740.15	167663.6	214220.7	403785

Table F-15 S12.5C-Fine

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	3163997	3525431	3816522	4273971	4447146	4847740
50	955798.4	1285904	1547842	2018780	2217191	2719312
95	91808.86	142136.9	174915.5	277602.2	373617.1	634539.9

Table F-16 B25C-Course

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	3208524	4113414	4032773	4690809	4892992	5382349
50	565211.9	965951.1	1178866	1753216	2028932	2714961
95	47137.25	65121.93	78900.51	140976.6	199716.9	403639.9

Table F-17 B25C-Fine

|E*| (psi)	Frequency (Hz)					
Temp (^oF)	0.01	0.1	1	5	10	25
14	2429527	2883059	3112219	3372417	3533553	3895858
50	670364.2	991042.6	1113599	1444575	1600781	2019360
95	73969.23	111098.9	135755.3	222777.9	291380.7	494288.5

Table F-18 G* and Phi Data for PG 70-22

Temp (^oC)	Temp (^oF)	G* (Pa)	Phase (^{o})
16	60.8	3522103.254	7.554093862
22.05	71.69	1620360.965	38.47632198
27.95	82.31	792330.3004	51.530074
40	104	167737.9513	63.03315181
53.95	129.11	22017.08776	73.44310516

Table F-19 G* and Phi Data for PG 64-22

Temp (^oC)	Temp (^oF)	G* (Pa)	Phase (^{o})
16	60.8	2044337.033	27.95277127
22	71.6	1118637.873	34.86533747
28.05	82.49	544059.3681	49.16497405
39.95	103.91	84359.83015	58.35311004
54.05	129.29	8555.549633	65.58667183

APPENDIX G: CLUSTERING TECHNIQUE ANALYSIS

Table G - 1 Euclidean Distance Matrix for All Class of Vehicles Combined – Axle Load Distribution

	0200	0900	1006	1352	1802	1817	1992	2819	2824	2825	3008	3044	3807	3816	5827
0200															
0900	0.011														
1006	0.005	0.010													
1352	0.009	0.004	0.003												
1802	0.015	0.010	0.012	0.007											
1817	0.014	0.033	0.023	0.032	0.033										
1992	0.010	0.010	0.003	0.004	0.015	0.040									
2819	0.022	0.044	0.025	0.035	0.034	0.016	0.041								
2824	0.010	0.010	0.002	0.003	0.013	0.034	0.004	0.031							
2825	0.013	0.012	0.004	0.005	0.014	0.034	0.006	0.036	0.003						
3008	0.003	0.017	0.006	0.013	0.021	0.009	0.014	0.019	0.012	0.013					
3044	0.006	0.013	0.007	0.012	0.025	0.023	0.010	0.032	0.011	0.011	0.005				
3807	0.001	0.015	0.005	0.012	0.020	0.012	0.011	0.021	0.011	0.013	0.001	0.005			
3816	0.022	0.018	0.008	0.010	0.020	0.036	0.015	0.029	0.008	0.009	0.019	0.015	0.020		
5827	0.029	0.018	0.014	0.011	0.025	0.046	0.018	0.050	0.010	0.014	0.027	0.026	0.029	0.008	

Table G - 2 Clustering Strategy for Axle Load Distribution

Cluster	1st Item	2nd Item	Distance
1	3807	3008	0
2	2824	1006	0.001
3	Cluster 1	0200	0.003
4	Cluster 2	1352	0.004
5	Cluster 4	1992	0.006
6	Cluster 5	2825	0.009
7	Cluster 3	3044	0.012
8	5827	3816	0.016
9	1802	0900	0.021
10	2819	1817	0.030
11	Cluster 9	Cluster 6	0.039
12	Cluster 11	Cluster 8	0.053
13	Cluster 10	Cluster 7	0.072
14	Cluster 13	Cluster 12	0.114

Figure G - 1 Final Clusters for Axle Load Distribution

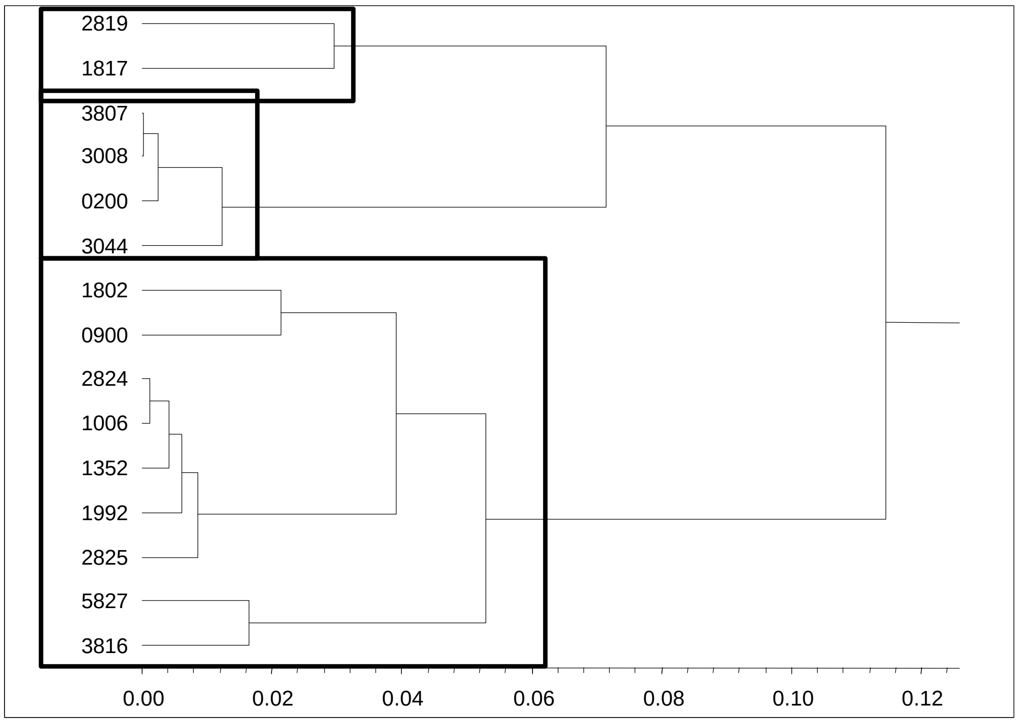


Table G - 3 Euclidean Distances for Vehicle Class Distribution

	0200	900	1006	1352	1802	1817	1992	2819	2824	2825	3008	3044	3807	3816	5827
0200															
0900	0.013														
1006	0.024	0.008													
1352	0.009	0.004	0.007												
1802	0.307	0.228	0.242	0.265											
1817	0.177	0.105	0.082	0.122	0.177										
1992	0.006	0.028	0.042	0.019	0.358	0.228									
2819	0.039	0.036	0.019	0.020	0.320	0.136	0.050								
2824	0.008	0.024	0.038	0.015	0.324	0.201	0.004	0.048							
2825	0.333	0.259	0.190	0.260	0.289	0.092	0.387	0.216	0.362						
3008	0.010	0.009	0.007	0.005	0.257	0.116	0.024	0.021	0.017	0.235					
3044	0.042	0.082	0.123	0.077	0.435	0.356	0.027	0.142	0.032	0.587	0.084				
3807	0.002	0.006	0.012	0.003	0.276	0.140	0.013	0.030	0.010	0.286	0.004	0.059			
3816	0.064	0.042	0.015	0.037	0.239	0.065	0.091	0.023	0.082	0.112	0.027	0.204	0.046		
5827	0.007	0.034	0.055	0.028	0.362	0.246	0.005	0.071	0.009	0.430	0.032	0.015	0.017	0.113	

Table G - 4 Clustering Strategy for Vehicle Class Distribution

Cluster	1st Item	2nd Item	Distance
1	3807	0200	0.001
2	1352	0900	0.003
3	2824	1992	0.005
4	3008	1006	0.009
5	Cluster 3	5827	0.013
6	Cluster 4	Cluster 2	0.017
7	Cluster 5	Cluster 1	0.026
8	3816	2819	0.038
9	Cluster 8	Cluster 6	0.063
10	Cluster 7	3044	0.089
11	2825	1817	0.135
12	Cluster 10	Cluster 9	0.239
13	Cluster 11	1802	0.379
14	Cluster 13	Cluster 12	0.808

Figure G - 2 Final Clusters - Vehicle Class Distribution

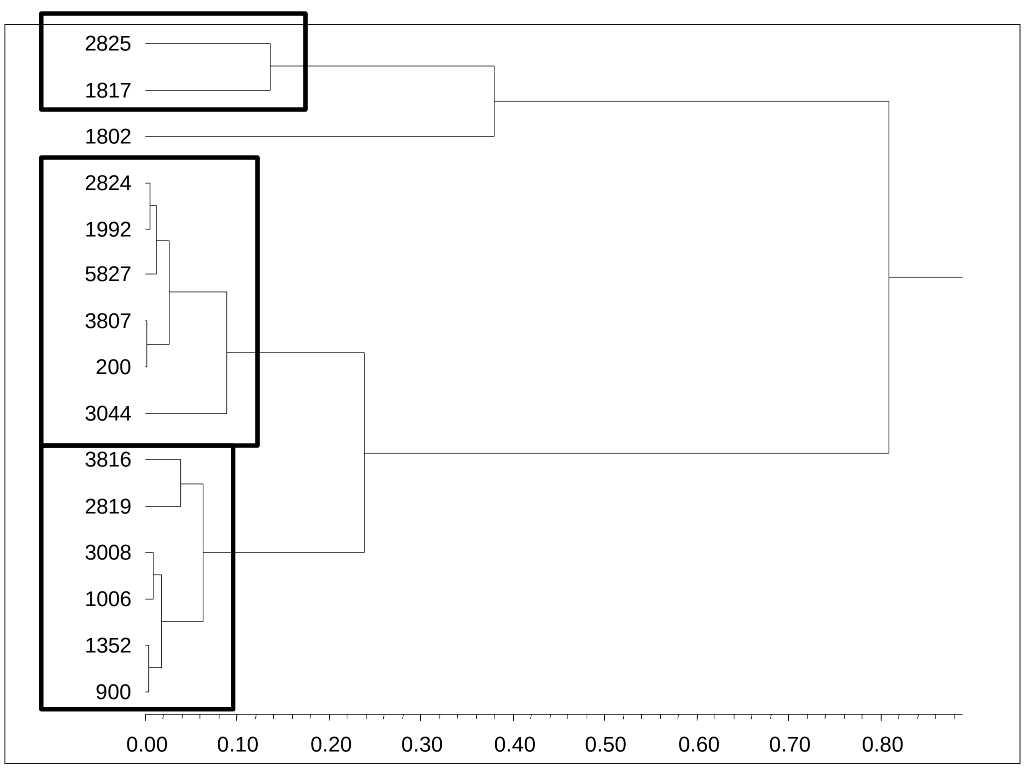


Table G - 5 Final Clusters for Axle Load Distribution

	Cluster 1	Cluster 2	Cluster 3
Final Set of Clusters for Piedmont Region, NC	2819	3807	1802
	1817	3008	0900
		0200	2824
		3044	1006
			1352
			1992
			2825
			5827
			3816

Table G - 6 Final Clusters for Vehicle Class Distribution

	Cluster 1	Cluster 2	Cluster 3
Final Set of Clusters for Piedmont Region, NC	2825	2824	3816
	1817	1992	2819
		5827	3008
		3807	1006
		0200	1352
		3044	0900

G.1 Justification

From the results presented above (Table G - 2), it can be observed that the cluster distance between two groups becomes so large that it suggests that the groups formed are not very homogenous and hence appropriate to stop the clustering process (Suggested in TMG 2001). The distance between the Cluster10 and Cluster 7 (Cluster No. 13) was observed to be 0.072, whereas the distance between Cluster 13 and Cluster 12 (Cluster No. 14) was observed to be 0.114. Hence the level of acceptable dissimilarity was set at 0.07 for axle load distribution clusters.

Similarly there is a jump in the value as you move from Cluster No. 11 to 12 in Table G - 4. Hence the level of acceptable dissimilarity is set at 0.14 for vehicle class distribution clusters. It is to be understood that the set of clusters formed may vary depending on the acceptable level of dissimilarity.

Regional values for a specific pavement can now be estimated using the above clusters.

The corresponding axle load and vehicle class distribution data files are provided below:

Table G - 7 All Classes – Annual Tandem Axle Load Distribution

Load (kN)	0200	0900	1006	1352	1802	1817	1992	2819	2824	2825	3008	3044	3807	3816	5827
8.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.79	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
26.69	0.01	0.04	0.01	0.02	0.04	0.00	0.01	0.00	0.02	0.01	0.00	0.00	0.01	0.03	0.02
35.59	0.01	0.07	0.04	0.06	0.04	0.01	0.05	0.00	0.04	0.04	0.01	0.02	0.02	0.06	0.10
44.48	0.05	0.08	0.09	0.10	0.10	0.02	0.10	0.02	0.10	0.11	0.04	0.06	0.04	0.13	0.15
53.38	0.09	0.09	0.12	0.12	0.10	0.05	0.13	0.10	0.15	0.15	0.09	0.08	0.09	0.11	0.12
62.28	0.12	0.09	0.12	0.11	0.14	0.12	0.11	0.18	0.12	0.10	0.11	0.08	0.11	0.10	0.09
71.17	0.10	0.07	0.09	0.08	0.10	0.15	0.08	0.15	0.07	0.06	0.10	0.07	0.10	0.08	0.07
80.07	0.08	0.05	0.07	0.06	0.09	0.14	0.05	0.09	0.06	0.09	0.10	0.06	0.09	0.06	0.06
88.96	0.06	0.04	0.06	0.05	0.03	0.10	0.04	0.07	0.05	0.06	0.08	0.06	0.07	0.06	0.07
97.86	0.05	0.04	0.05	0.04	0.02	0.07	0.03	0.06	0.05	0.04	0.07	0.05	0.06	0.05	0.08
106.76	0.05	0.04	0.05	0.04	0.02	0.08	0.03	0.08	0.06	0.04	0.06	0.06	0.06	0.06	0.08
115.65	0.04	0.03	0.05	0.04	0.03	0.06	0.04	0.11	0.06	0.06	0.05	0.06	0.05	0.09	0.05
124.55	0.04	0.03	0.05	0.04	0.03	0.04	0.05	0.09	0.05	0.04	0.05	0.07	0.05	0.09	0.03
133.45	0.05	0.03	0.06	0.04	0.02	0.04	0.06	0.04	0.04	0.07	0.06	0.07	0.06	0.05	0.03
142.34	0.05	0.03	0.05	0.04	0.02	0.03	0.07	0.01	0.04	0.05	0.06	0.07	0.06	0.02	0.02
151.24	0.05	0.04	0.04	0.03	0.01	0.02	0.06	0.00	0.04	0.03	0.05	0.05	0.06	0.01	0.01
160.14	0.05	0.04	0.03	0.03	0.01	0.02	0.04	0.00	0.03	0.02	0.03	0.04	0.04	0.00	0.01
169.03	0.03	0.04	0.01	0.03	0.02	0.01	0.02	0.00	0.02	0.01	0.01	0.02	0.02	0.00	0.00
177.93	0.02	0.03	0.01	0.02	0.03	0.01	0.01	0.00	0.01	0.01	0.01	0.02	0.01	0.00	0.00
186.83	0.01	0.03	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00
195.72	0.01	0.02	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
204.62	0.00	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00
213.51	0.00	0.01	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
222.41	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
231.31	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
240.20	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
249.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
258.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
266.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
275.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
284.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
293.58	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
302.48	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
311.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
320.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
329.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
338.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
346.96	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
355.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure G - 3 Tandem Axle Load Distribution – All Classes Combined

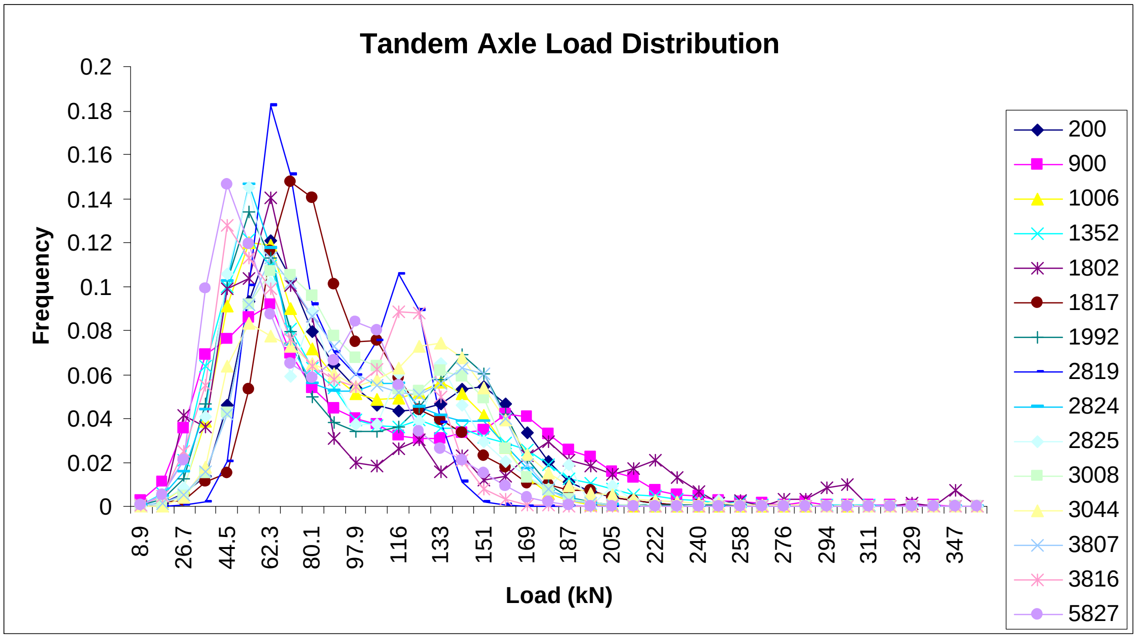


Table G - 8 Vehicle Class Distribution

SHRP ID	Vehicle Class									
	4	5	6	7	8	9	10	11	12	13
0200	4.4	15.5	4.2	0.1	10.6	58.7	0.5	3.9	2.0	0.1
0900	3.6	15.8	8.4	1.1	15.4	50.8	2.3	0.4	0.0	2.1
1006	7.0	22.5	7.5	0.6	13.5	46.7	1.1	0.7	0.3	0.1
1352	3.3	19.7	8.2	1.4	11.9	53.4	1.4	0.0	0.0	0.7
1802	4.7	2.5	18.3	2.7	12.0	20.2	3.8	0.4	0.9	34.6
1817	9.0	22.4	21.1	0.5	23.1	23.5	0.1	0.1	0.1	0.0
1992	5.1	15.9	4.6	0.2	7.4	64.8	1.0	0.9	0.1	0.0
2819	0.7	32.4	5.7	0.7	7.9	50.4	0.5	1.5	0.2	0.1
2824	3.6	15.0	10.0	0.2	5.9	62.3	0.9	1.9	0.1	0.1
2825	20.0	38.3	14.7	9.0	7.1	10.3	0.5	0.0	0.0	0.0
3008	5.6	19.5	8.6	0.2	8.7	51.0	0.4	4.6	1.4	0.0
3044	1.5	4.0	5.1	0.5	7.3	74.9	0.4	4.4	1.0	1.0
3807	4.7	16.7	6.7	0.3	11.3	55.0	0.4	3.4	1.5	0.1
3816	9.2	29.3	8.4	0.5	8.8	38.5	1.1	3.3	0.9	0.1
5827	3.9	11.4	3.2	0.1	9.5	65.8	0.4	4.9	0.6	0.1

Table G - 9 Normalized Vehicle Class Distribution

SHRP ID	Vehicle Class									
	4	5	6	7	8	9	10	11	12	13
0200	0.04	0.16	0.04	0.00	0.11	0.59	0.00	0.04	0.02	0.00
0900	0.04	0.16	0.08	0.01	0.15	0.51	0.02	0.00	0.00	0.02
1006	0.07	0.22	0.08	0.01	0.14	0.47	0.01	0.01	0.00	0.00
1352	0.03	0.20	0.08	0.01	0.12	0.53	0.01	0.00	0.00	0.01
1802	0.05	0.03	0.18	0.03	0.12	0.20	0.04	0.00	0.01	0.35
1817	0.09	0.22	0.21	0.00	0.23	0.24	0.00	0.00	0.00	0.00
1992	0.05	0.16	0.05	0.00	0.07	0.65	0.01	0.01	0.00	0.00
2819	0.01	0.32	0.06	0.01	0.08	0.50	0.00	0.02	0.00	0.00
2824	0.04	0.15	0.10	0.00	0.06	0.62	0.01	0.02	0.00	0.00
2825	0.20	0.38	0.15	0.09	0.07	0.10	0.00	0.00	0.00	0.00
3008	0.06	0.19	0.09	0.00	0.09	0.51	0.00	0.05	0.01	0.00
3044	0.02	0.04	0.05	0.00	0.07	0.75	0.00	0.04	0.01	0.01
3807	0.05	0.17	0.07	0.00	0.11	0.55	0.00	0.03	0.01	0.00
3816	0.09	0.29	0.08	0.00	0.09	0.39	0.01	0.03	0.01	0.00
5827	0.04	0.11	0.03	0.00	0.09	0.66	0.00	0.05	0.01	0.00