Appendix A

Preconstruction Documentation

Ramp 1 – International Airport EB - Minnesota WB On Ramp

Ramp contained significant longitudinal cracking as well as moderate to high rut depths.

Ramp 2 – Minnesota NB - International Airport Ramp

Ramp had moderate rut depths at the intersection with International Airport Road, and moderate raveling and isolated high severity transverse cracking.

Ramp 3 – International Airport EB - Minnesota NB Loop

This ramp is a cloverleaf with minimal rutting, minor raveling and isolated moderate severity cracking.

Ramp 4 – International Airport - Minnesota NB Ramp

Microsurfacing was applied over a small portion of this ramp to cover an area of raveling and cracking.

Ramp 5 – Minnesota SB - International Airport Ramp

The initial part of this ramp has high severity longitudinal cracking. The worst of this was fixed as part of the earthquake repair portion of the project and did not receive microsurfacing. The rest of the cracking received crackseal and hot mix tamped in place. The later part of the ramp had moderate severity transverse and longitudinal cracking and minor raveling.

Ramp 6 – Minnesota SB - International Airport Ramp

This ramp had minor rut depths but moderate to high severity longitudinal cracking.

Ramp 7 – International Airport WB - Minnesota SB Loop

There are low rut depths but high severity longitudinal cracking is present in the middle of the ramp that may be related to embankment movement as well as underlying frost susceptible soils. At the base of the ramp there is transverse cracking with potholing.

Ramp 8 – Raspberry WB - Minnesota SB Ramp

The entire ramp is blocked cracked with a centerline crack present for the entire length. Fatigue cracking is beginning to develop in the inside wheelpath.

Ramp 9 – Raspberry WB - Minnesota NB Ramp

At the beginning of this ramp there is a high severity center crack with fatigue cracking forming in the right wheelpath. The conditions improve at the International Airport sign, although faint wheelpath cracking is beginning to form in areas.

Ramp 10 – Minnesota SB - Raspberry WB Ramp

The beginning of this ramp had high rut depths that received hot mix for rut fill prior to the micorsurfacing application. Farther down the ramp there was moderate to high severity longitudinal and transverse cracking with less severe rut depths.

Ramp 11 – Raspberry EB - Minnesota SB Ramp

The primary distresses on this ramp are a longitudinal joint crack and intermittent transverse cracks with associated potholes. The rut depths are minor with the exception of the southern end where traffic accelerates to begin merging with Minnesota where it nears ½" on average.

Ramp 12 – Minnesota SB - Strawberry Ramp

There are low rut depths on this ramp, but it does have high severity longitudinal cracking, transverse cracking and potholing that worsen towards the end of the ramp.

Ramp 13 – Dimond - Minnesota SB Ramp

There are moderate rut depths on the left portion of the ramp that accelerates and merges onto Minnesota, which received pre-level prior to the microsurfacing application. The rest of the ramp is in good condition with ruts less than half an inch and low severity raveling.

Ramp 14 – Minnesota SB - 100th Ramp

The ramp has isolated potholes, low rut depths but longitudinal and transverse cracking near 100th Avenue.

Ramp 15 – 100th Avenue Minnesota SB Ramp

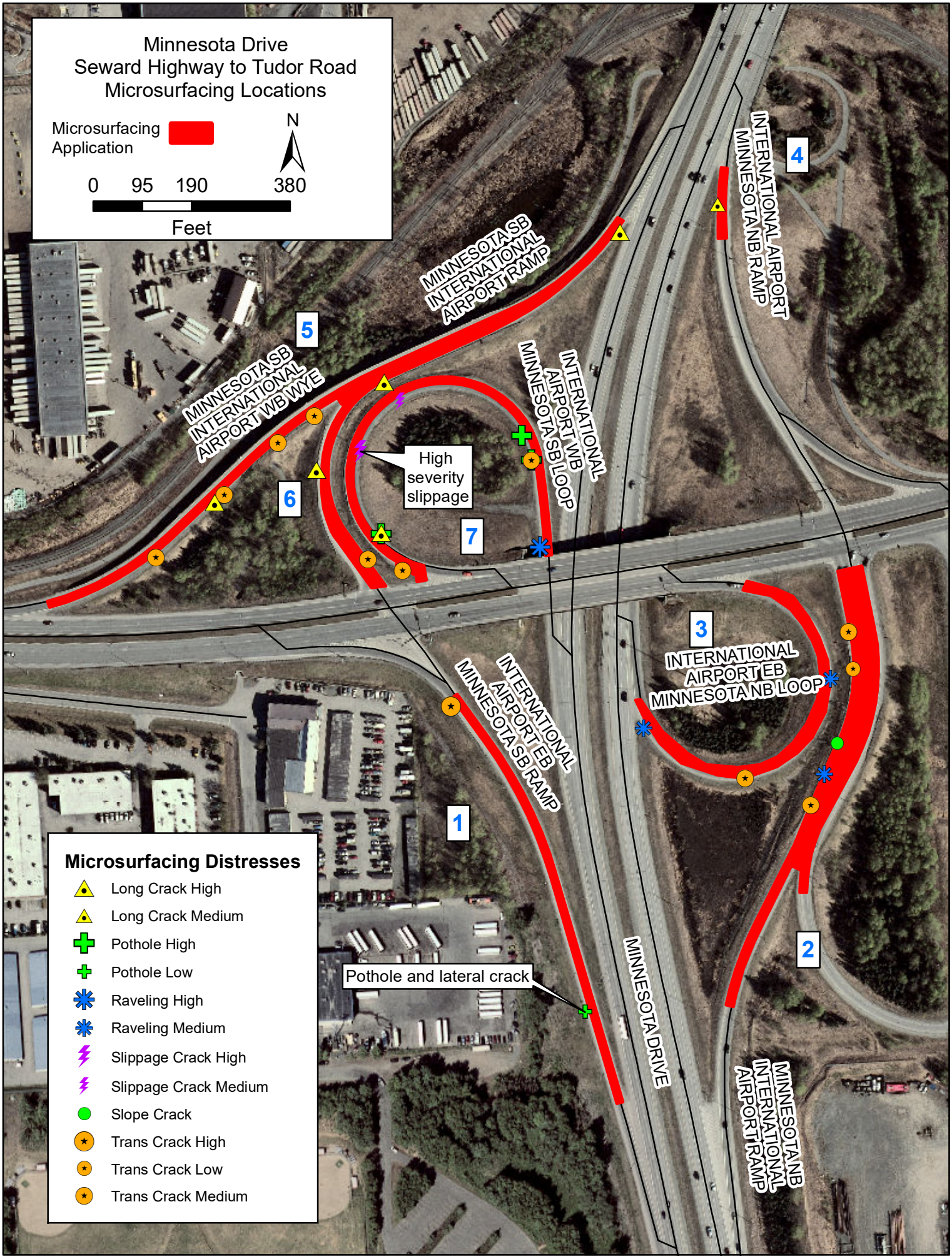
There is high severity longitudinal cracking and joint cracking near 100th Avenue that improves farther down the ramp

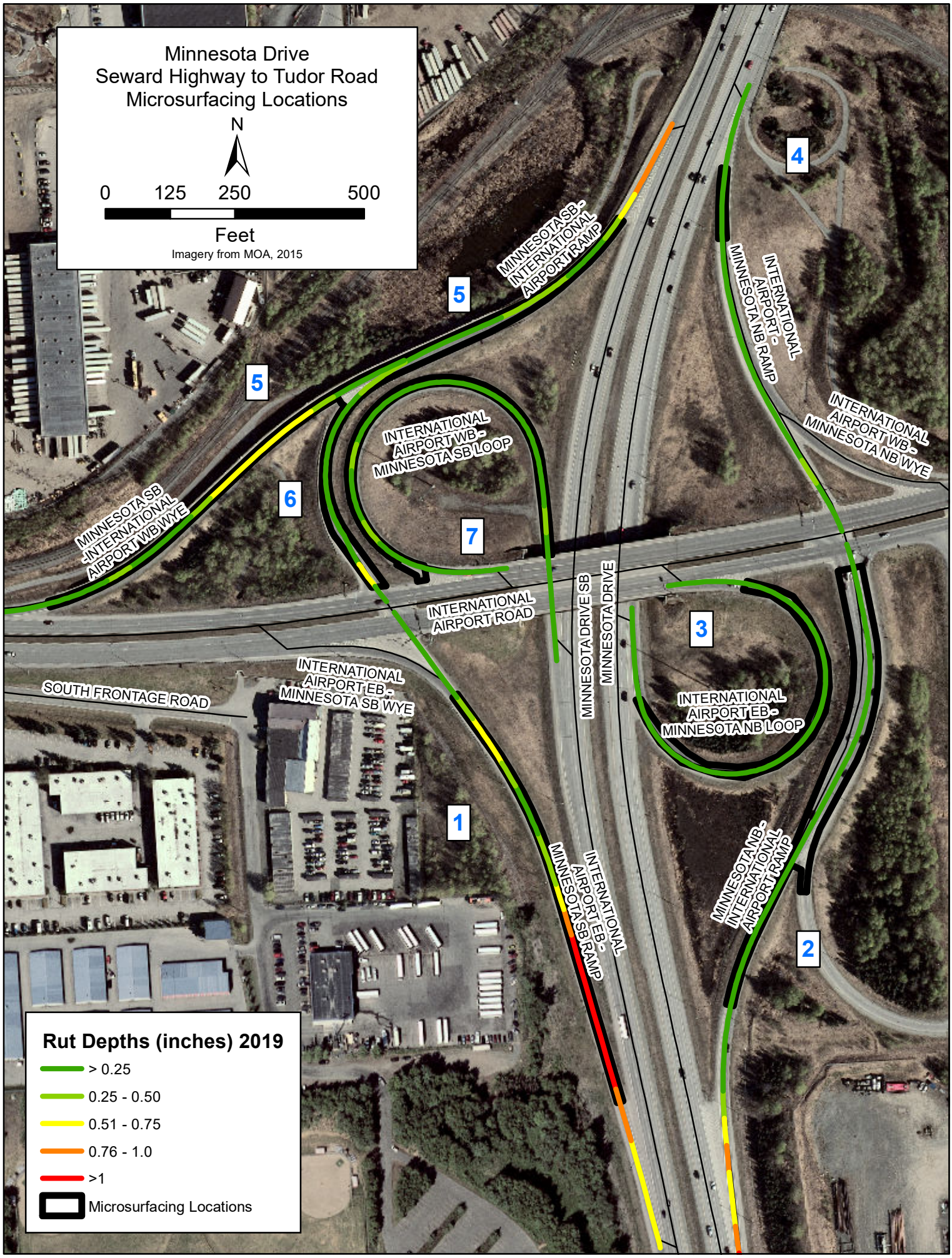
Ramp 16 – Minnesota NB - 100th Ramp

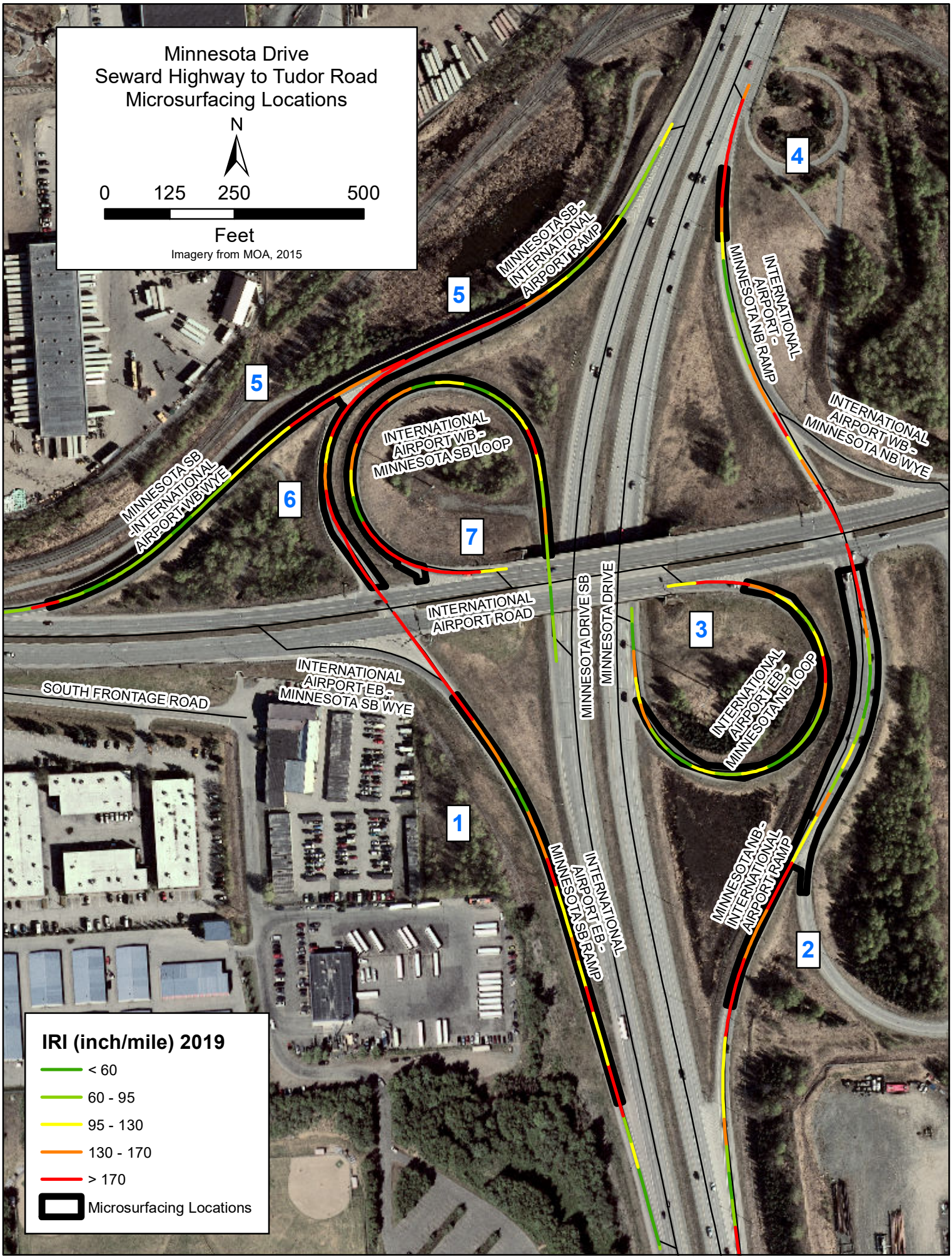
Near the beginning of the ramp there is low severity transverse cracking and raveling, but closer to 100th Avenue there is high severity longitudinal cracking.

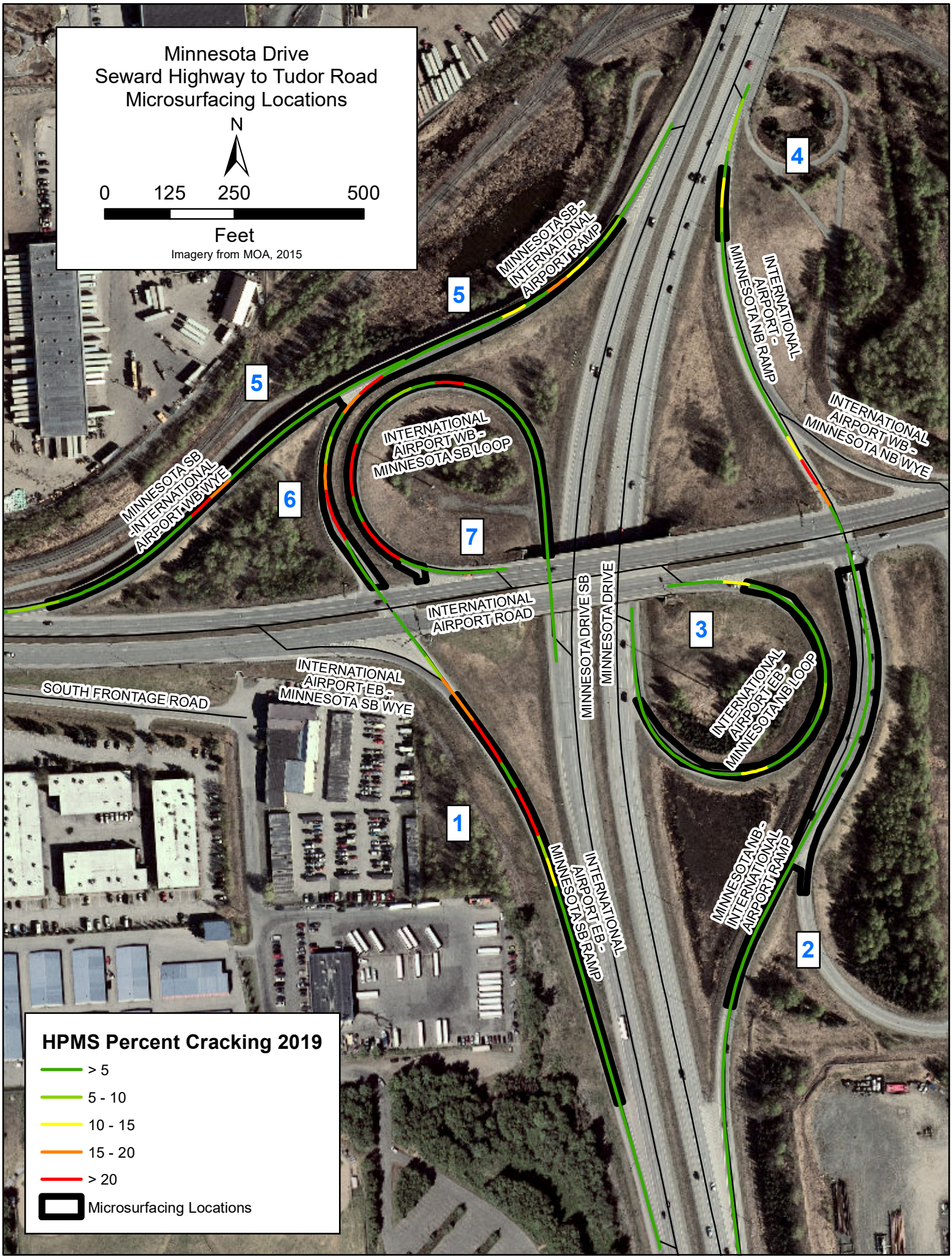
Ramp 17 – 100th Avenue - Minnesota NB Ramp

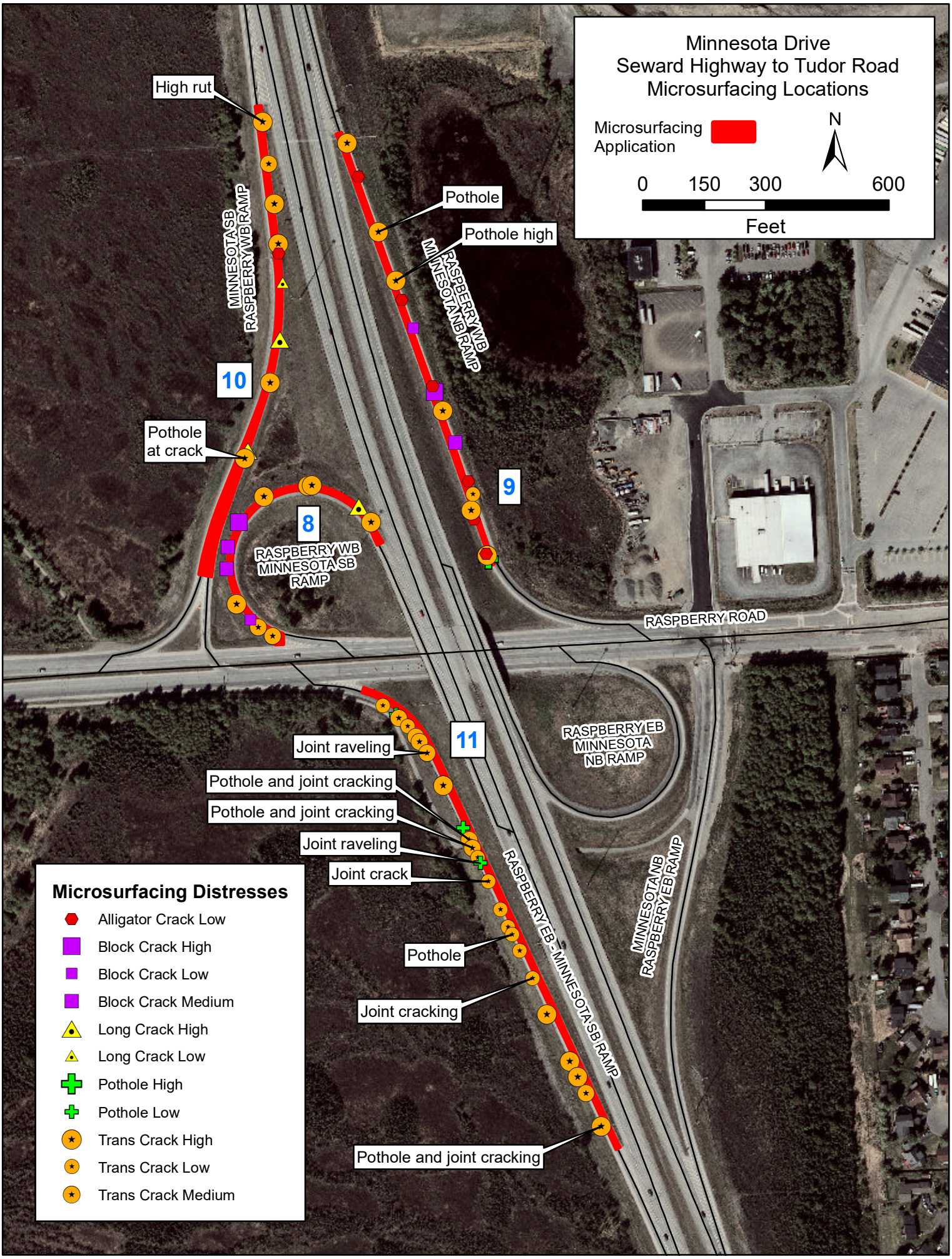
There is moderate longitudinal and transverse cracking near 100th Avenue with isolated potholes and some high severity transverse cracking where the ramp merges into Minnesota Drive.

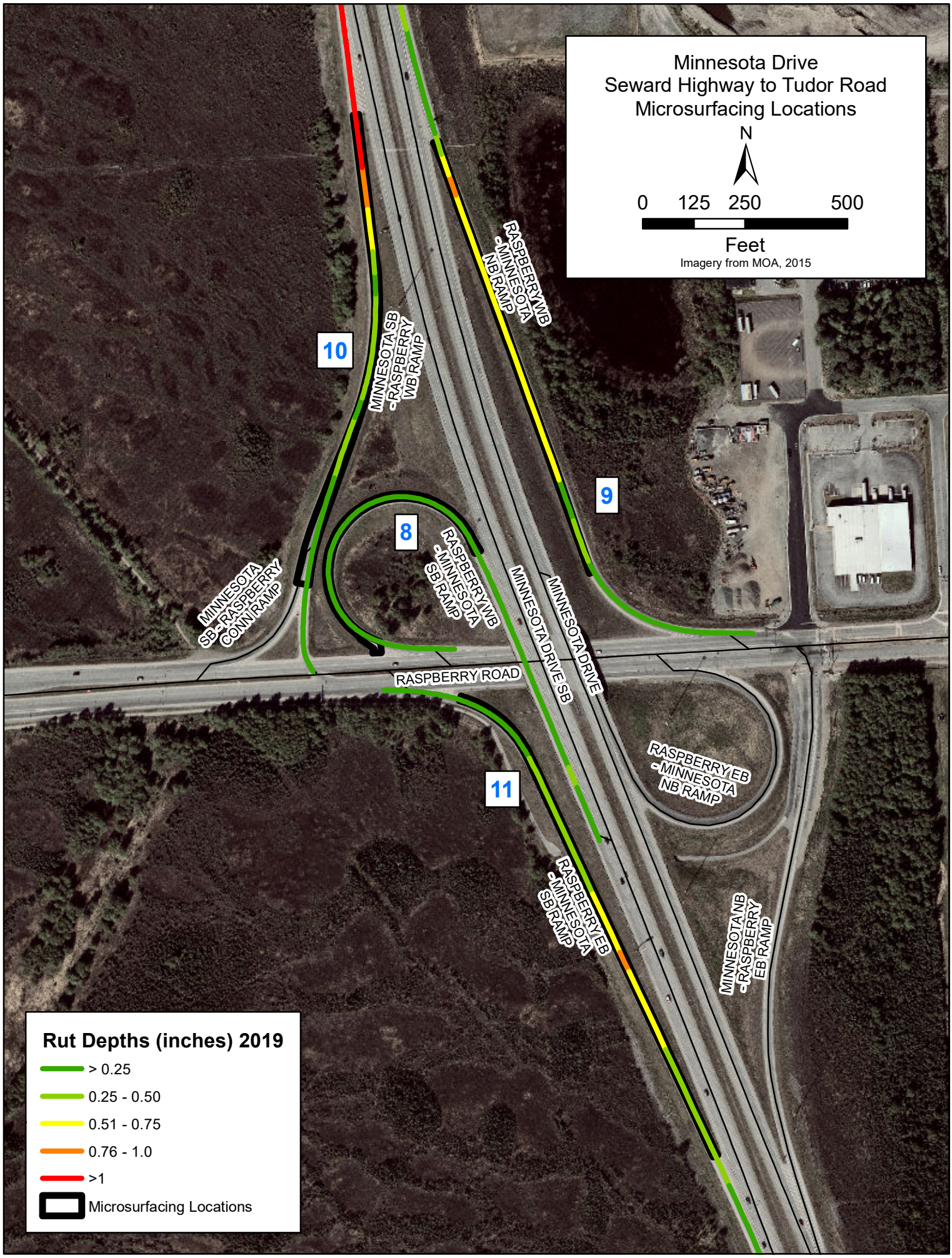

Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
Microsurfacing Application
N
0 95 190 380
Feet
MINNESOTA SB INTERNATIONAL AIRPORT RAMP
INTERNATIONAL AIRPORT MINNESOTA NB RAMP
4
5
MINNESOTA SB INTERNATIONAL AIRPORT WB WYE
INTERNATIONAL AIRPORT WB MINNESOTA SB LOOP
High severity slippage
6
7
3
INTERNATIONAL AIRPORT EB MINNESOTA NB LOOP
INTERNATIONAL AIRPORT EB MINNESOTA SB RAMP
1
2
Pothole and lateral crack
MINNESOTA DRIVE
MINNESOTA NB INTERNATIONAL AIRPORT RAMP
Microsurfacing Distresses
Long Crack High
Long Crack Medium
Pothole High
Pothole Low
Raveling High
Raveling Medium
Slippage Crack High
Slippage Crack Medium
Slope Crack
Trans Crack High
Trans Crack Low
Trans Crack Medium

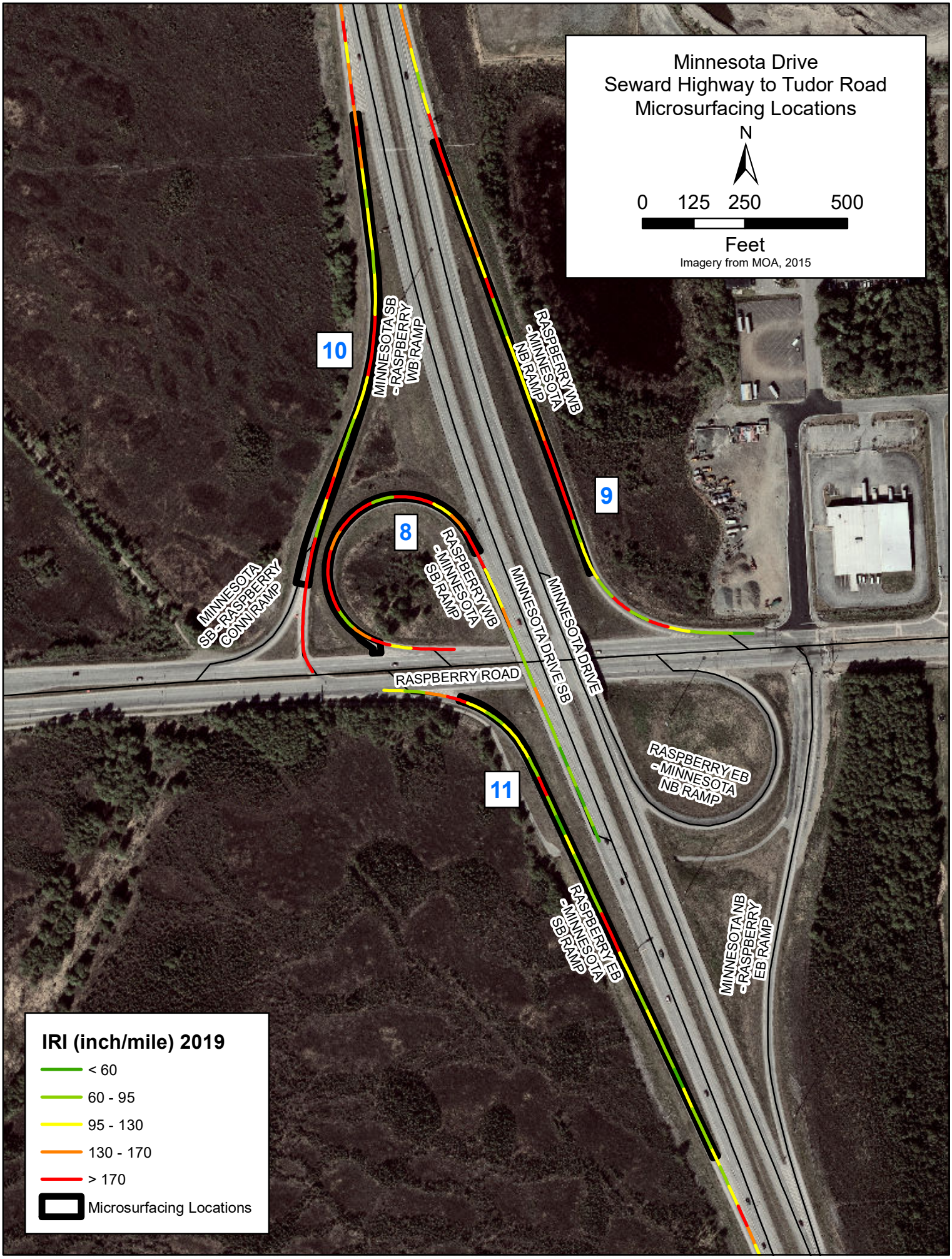

Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 125 250 500
Feet
Imagery from MOA, 2015
MINNESOTA SB - INTERNATIONAL AIRPORT RAMP
INTERNATIONAL AIRPORT - MINNESOTA NB RAMP
INTERNATIONAL AIRPORT WB - MINNESOTA NB WYE
INTERNATIONAL AIRPORT WB - MINNESOTA SB LOOP
MINNESOTA SB - INTERNATIONAL AIRPORT WB WYE
INTERNATIONAL AIRPORT ROAD
MINNESOTA DRIVE SB
MINNESOTA DRIVE
SOUTH FRONTAGE ROAD
INTERNATIONAL AIRPORT EB - MINNESOTA SB WYE
INTERNATIONAL AIRPORT EB - MINNESOTA NB LOOP
INTERNATIONAL AIRPORT EB - MINNESOTA SB RAMP
MINNESOTA NB - INTERNATIONAL AIRPORT RAMP
1
2
3
4
5
5
6
7
Rut Depths (inches) 2019
> 0.25
0.25 - 0.50
0.51 - 0.75
0.76 - 1.0
>1
Microsurfacing Locations

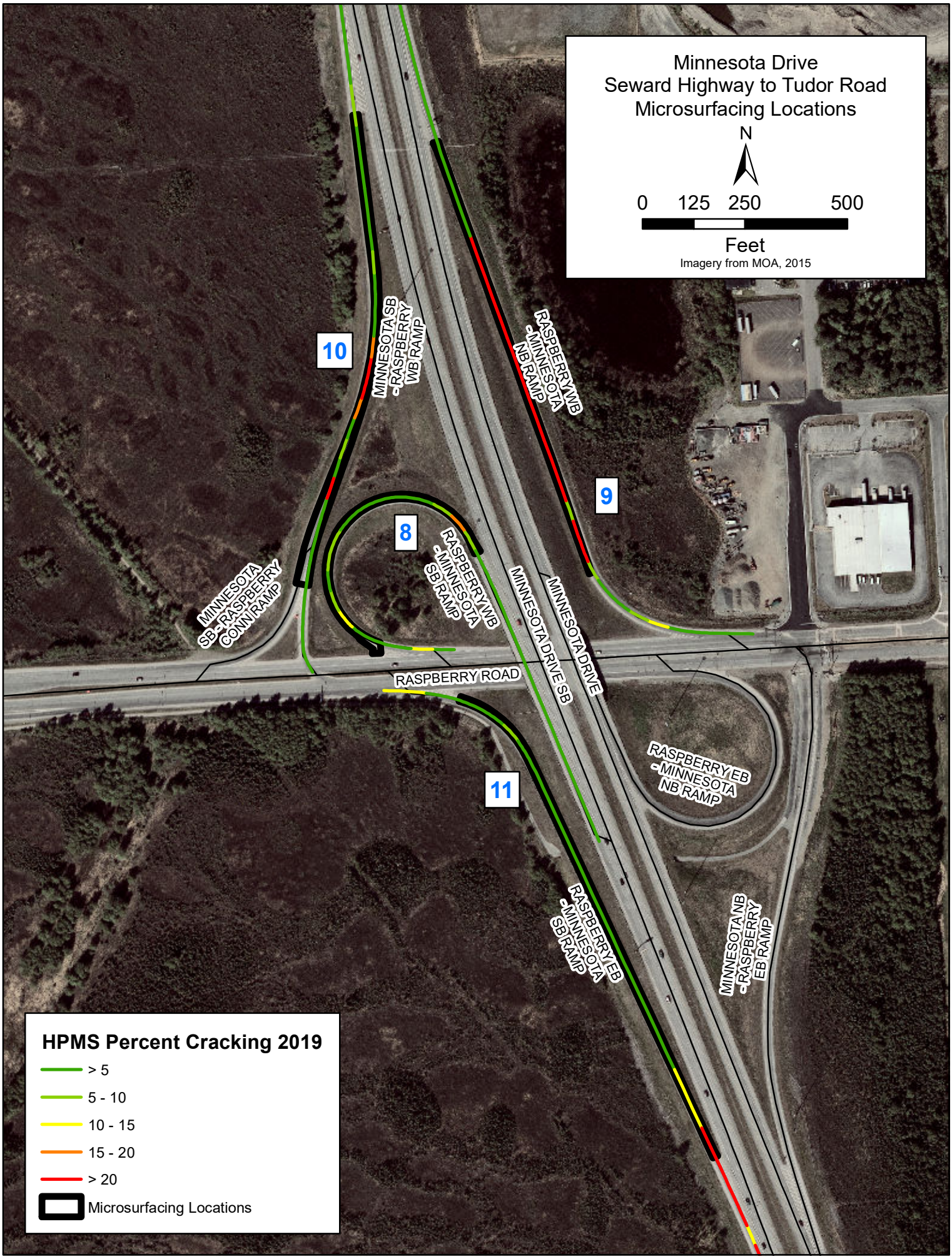

Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 125 250 500
Feet
Imagery from MOA, 2015
MINNESOTA SB - INTERNATIONAL AIRPORT RAMP
INTERNATIONAL AIRPORT - MINNESOTA NB RAMP
INTERNATIONAL AIRPORT WB - MINNESOTA NB WYE
INTERNATIONAL AIRPORT WB - MINNESOTA SB LOOP
MINNESOTA SB - INTERNATIONAL AIRPORT WB WYE
INTERNATIONAL AIRPORT ROAD
MINNESOTA DRIVE SB
MINNESOTA DRIVE
INTERNATIONAL AIRPORT EB - MINNESOTA NB LOOP
SOUTH FRONTAGE ROAD
INTERNATIONAL AIRPORT EB - MINNESOTA SB WYE
MINNESOTA NB - INTERNATIONAL AIRPORT RAMP
INTERNATIONAL AIRPORT EB - MINNESOTA SB RAMP
4
5
5
6
7
3
1
2
IRI (inch/mile) 2019
< 60
60 - 95
95 - 130
130 - 170
> 170
Microsurfacing Locations

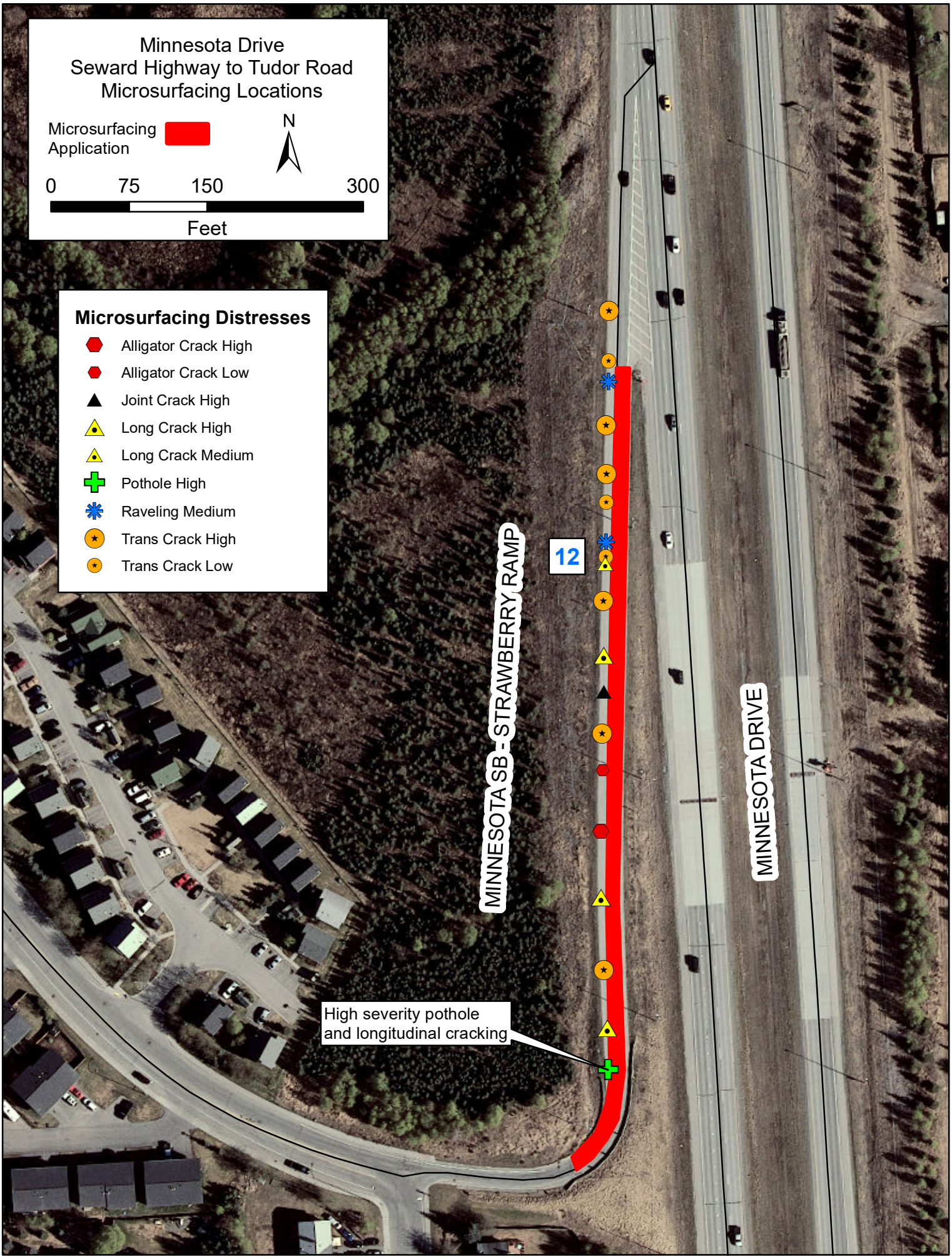

Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 125 250 500
Feet
Imagery from MOA, 2015
MINNESOTA SB - INTERNATIONAL AIRPORT RAMP
INTERNATIONAL AIRPORT - MINNESOTA NB RAMP
INTERNATIONAL AIRPORT WB - MINNESOTA NB WYE
INTERNATIONAL AIRPORT WB - MINNESOTA SB LOOP
MINNESOTA SB - INTERNATIONAL AIRPORT WB WYE
INTERNATIONAL AIRPORT ROAD
MINNESOTA DRIVE SB
MINNESOTA DRIVE
INTERNATIONAL AIRPORT EB - MINNESOTA NB LOOP
SOUTH FRONTAGE ROAD
INTERNATIONAL AIRPORT EB - MINNESOTA SB WYE
INTERNATIONAL AIRPORT EB - MINNESOTA SB RAMP
MINNESOTA NB - INTERNATIONAL AIRPORT RAMP
1
2
3
4
5
5
6
7
HPMS Percent Cracking 2019
> 5
5 - 10
10 - 15
15 - 20
> 20
Microsurfacing Locations

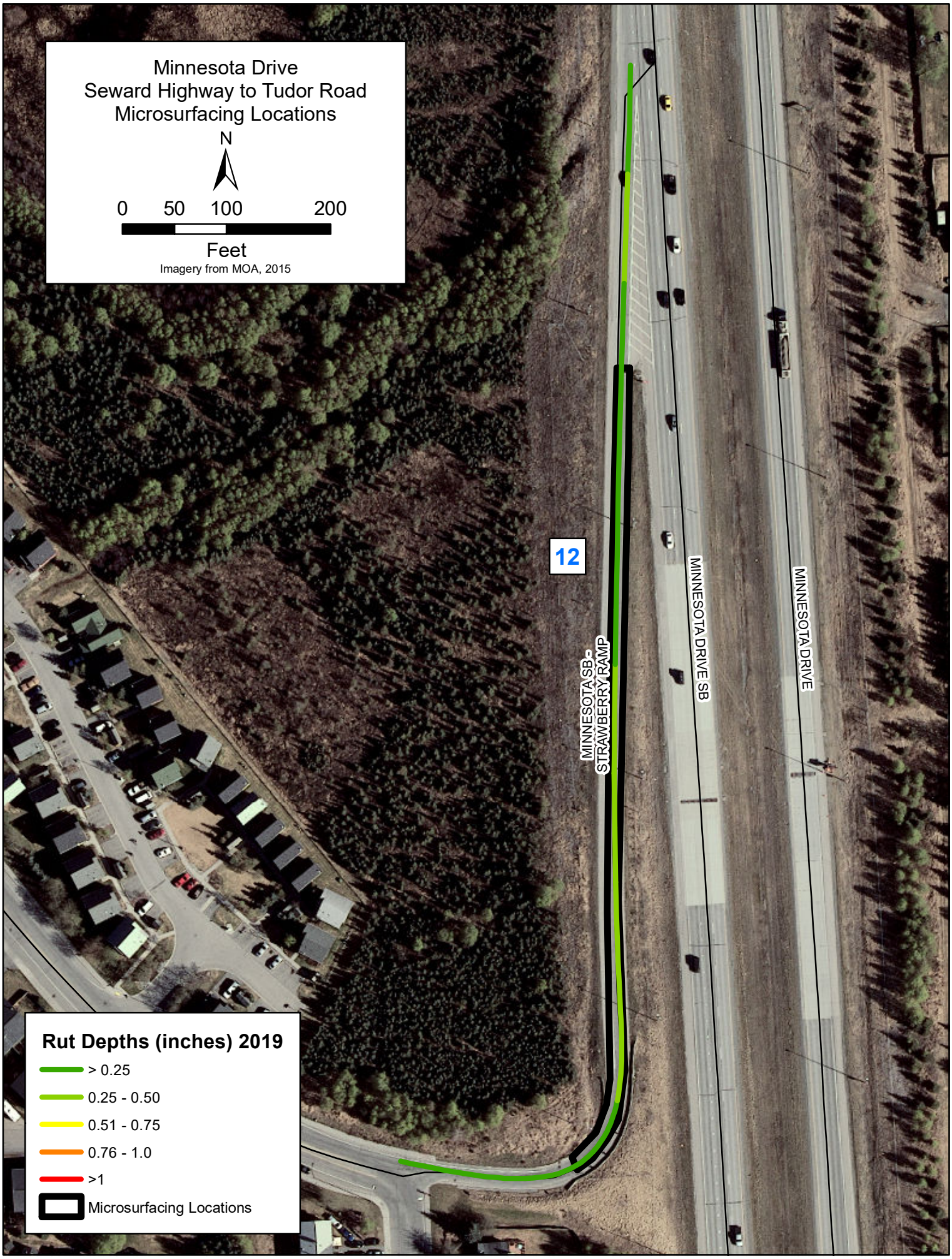

Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
Microsurfacing Application
N
0 150 300 600
Feet
High rut
Pothole
Pothole high
Pothole at crack
10
9
8
11
MINNESOTA SB RASPBERRY WB RAMP
RASPBERRY WB MINNESOTA NB RAMP
RASPBERRY WB MINNESOTA SB RAMP
RASPBERRY ROAD
RASPBERRY EB MINNESOTA NB RAMP
MINNESOTA NB RASPBERRY EB RAMP
RASPBERRY EB - MINNESOTA SB RAMP
Joint raveling
Pothole and joint cracking
Pothole and joint cracking
Joint raveling
Joint crack
Pothole
Joint cracking
Pothole and joint cracking
Microsurfacing Distresses
Alligator Crack Low
Block Crack High
Block Crack Low
Block Crack Medium
Long Crack High
Long Crack Low
Pothole High
Pothole Low
Trans Crack High
Trans Crack Low
Trans Crack Medium

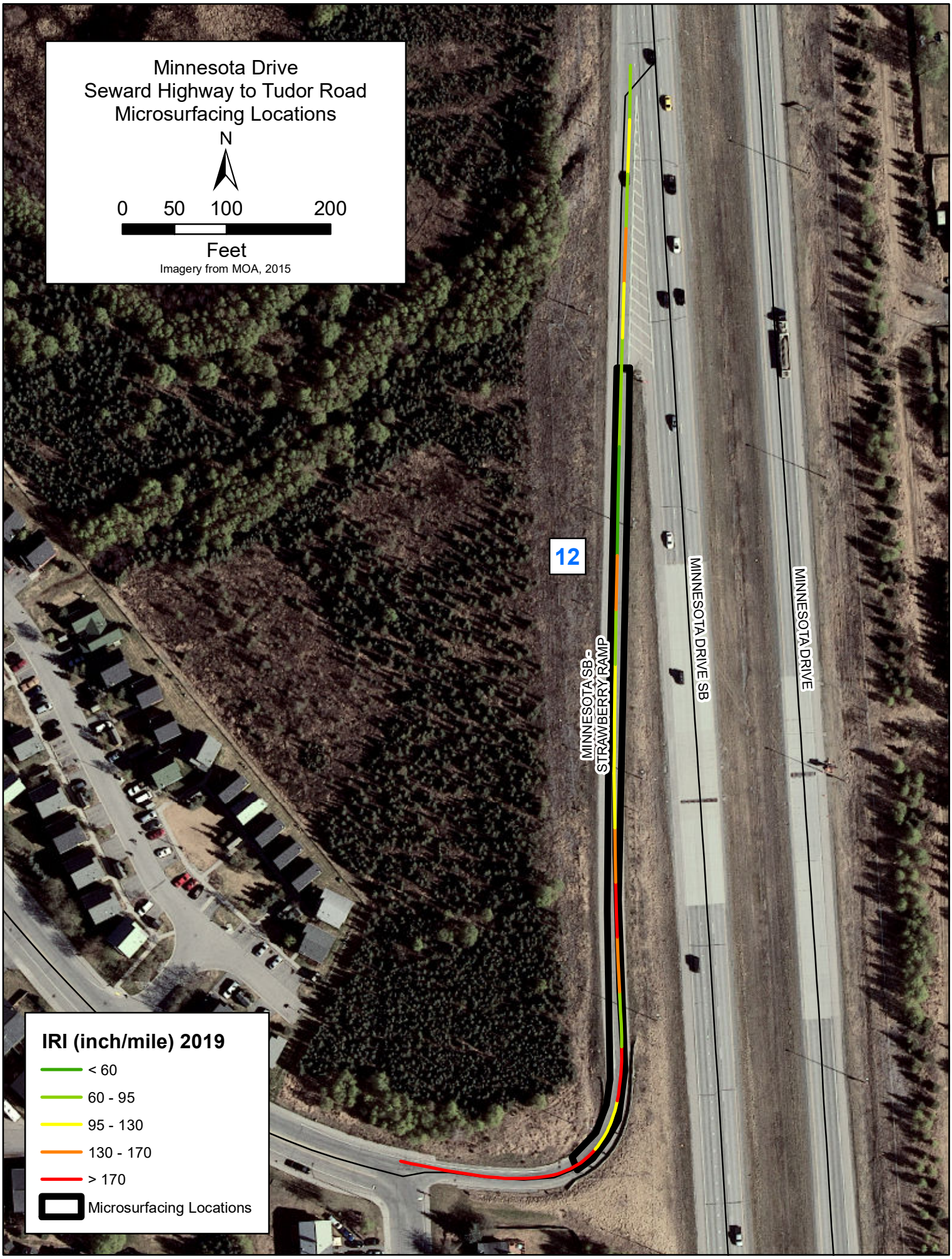

Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 125 250 500
Feet
Imagery from MOA, 2015
10
9
8
11
MINNESOTA SB - RASPBERRY WB RAMP
RASPBERRY WB - MINNESOTA NB RAMP
MINNESOTA SB - RASPBERRY CONN RAMP
RASPBERRY WB - MINNESOTA SB RAMP
MINNESOTA DRIVE SB
MINNESOTA DRIVE
RASPBERRY ROAD
RASPBERRY EB - MINNESOTA NB RAMP
RASPBERRY EB - MINNESOTA SB RAMP
MINNESOTA NB - RASPBERRY EB RAMP
Rut Depths (inches) 2019
> 0.25
0.25 - 0.50
0.51 - 0.75
0.76 - 1.0
>1
Microsurfacing Locations

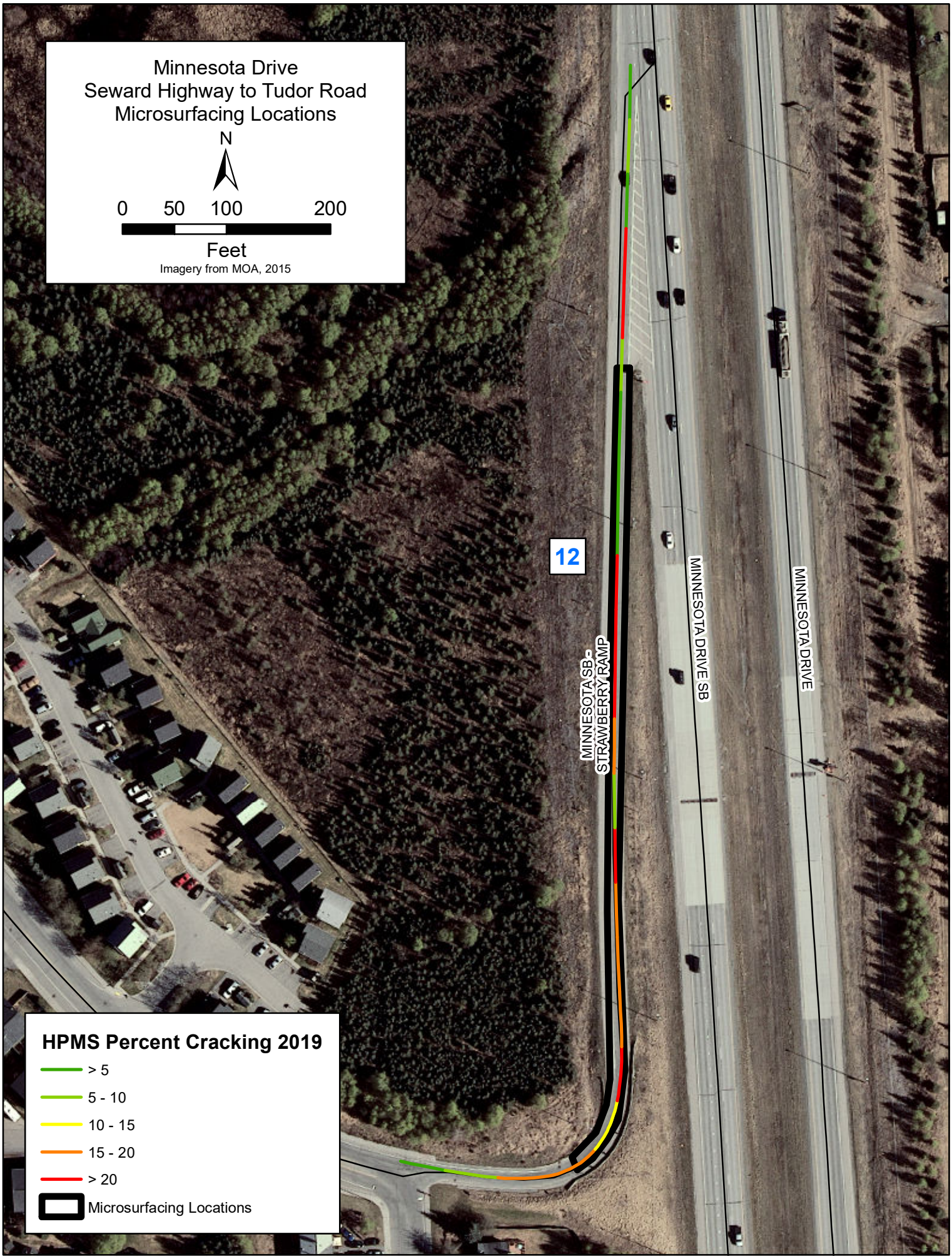

Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 125 250 500
Feet
Imagery from MOA, 2015
10
9
8
11
MINNESOTA SB -RASPBERRY WB RAMP
RASPBERRY WB -MINNESOTA NB RAMP
RASPBERRY WB -MINNESOTA SB RAMP
MINNESOTA SB -RASPBERRY CONN RAMP
MINNESOTA DRIVE SB
MINNESOTA DRIVE
RASPBERRY ROAD
RASPBERRY EB -MINNESOTA NB RAMP
RASPBERRY EB -MINNESOTA SB RAMP
MINNESOTA NB -RASPBERRY EB RAMP
IRI (inch/mile) 2019
< 60
60 - 95
95 - 130
130 - 170
> 170
Microsurfacing Locations


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 125 250 500
Feet
Imagery from MOA, 2015
10
9
8
11
MINNESOTA SB -RASPBERRY WB RAMP
RASPBERRY WB -MINNESOTA NB RAMP
RASPBERRY WB -MINNESOTA SB RAMP
MINNESOTA SB -RASPBERRY CONN RAMP
MINNESOTA DRIVE SB
MINNESOTA DRIVE
RASPBERRY ROAD
RASPBERRY EB -MINNESOTA NB RAMP
RASPBERRY EB -MINNESOTA SB RAMP
MINNESOTA NB -RASPBERRY EB RAMP
HPMS Percent Cracking 2019
> 5
5 - 10
10 - 15
15 - 20
> 20
Microsurfacing Locations


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
Microsurfacing Application
N
0
75
150
300
Feet
Microsurfacing Distresses
Alligator Crack High
Alligator Crack Low
Joint Crack High
Long Crack High
Long Crack Medium
Pothole High
Raveling Medium
Trans Crack High
Trans Crack Low
12
MINNESOTA SB - STRAWBERRY RAMP
MINNESOTA DRIVE
High severity pothole and longitudinal cracking


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 50 100 200
Feet
Imagery from MOA, 2015
12
MINNESOTA SB - STRAWBERRY RAMP
MINNESOTA DRIVE SB
MINNESOTA DRIVE
Rut Depths (inches) 2019
> 0.25
0.25 - 0.50
0.51 - 0.75
0.76 - 1.0
>1
Microsurfacing Locations


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 50 100 200
Feet
Imagery from MOA, 2015
12
MINNESOTA SB - STRAWBERRY RAMP
MINNESOTA DRIVE SB
MINNESOTA DRIVE
IRI (inch/mile) 2019
< 60
60 - 95
95 - 130
130 - 170
> 170
Microsurfacing Locations

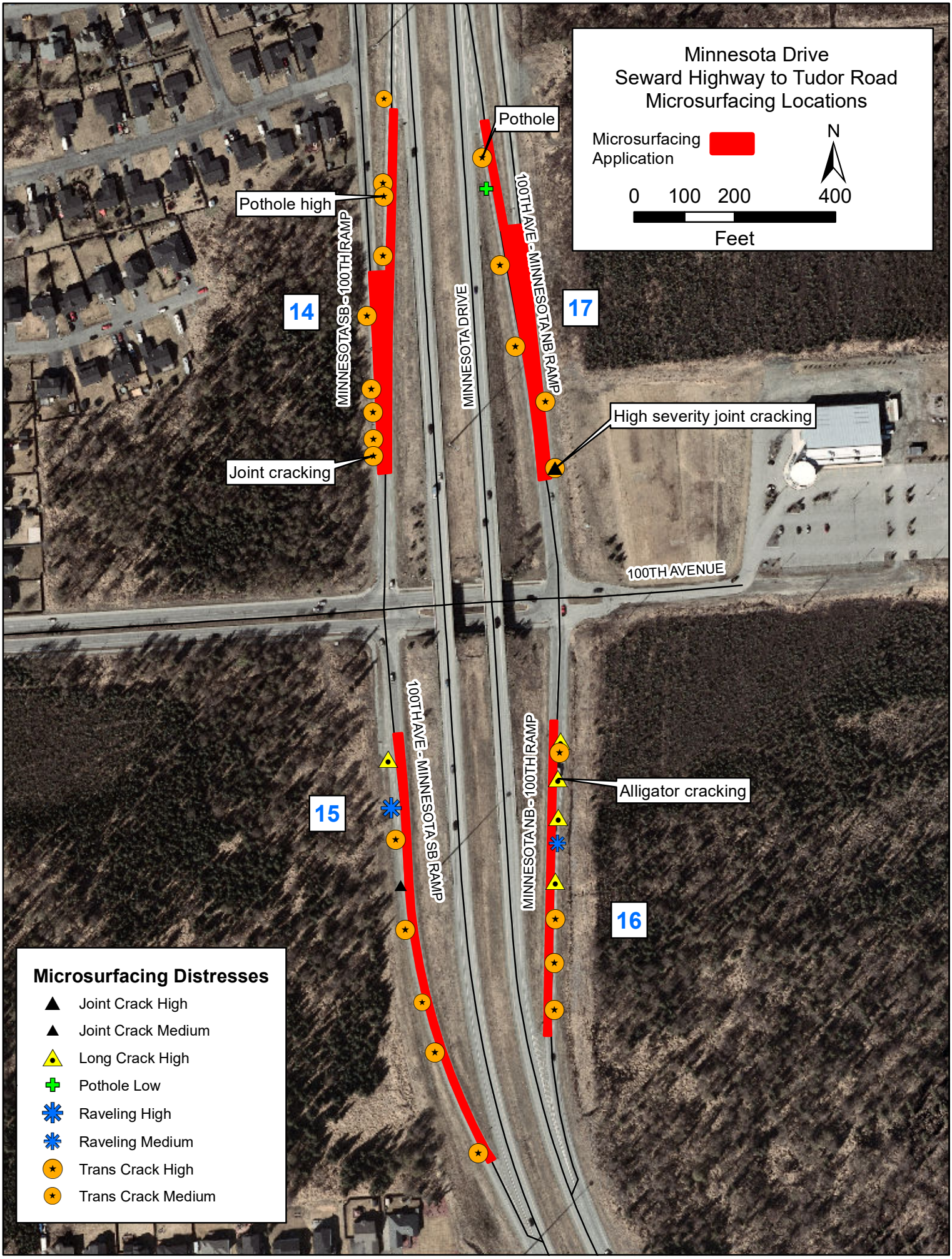

Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 50 100 200
Feet
Imagery from MOA, 2015
12
MINNESOTA SB - STRAWBERRY RAMP
MINNESOTA DRIVE SB
MINNESOTA DRIVE
HPMS Percent Cracking 2019
> 5
5 - 10
10 - 15
15 - 20
> 20
Microsurfacing Locations

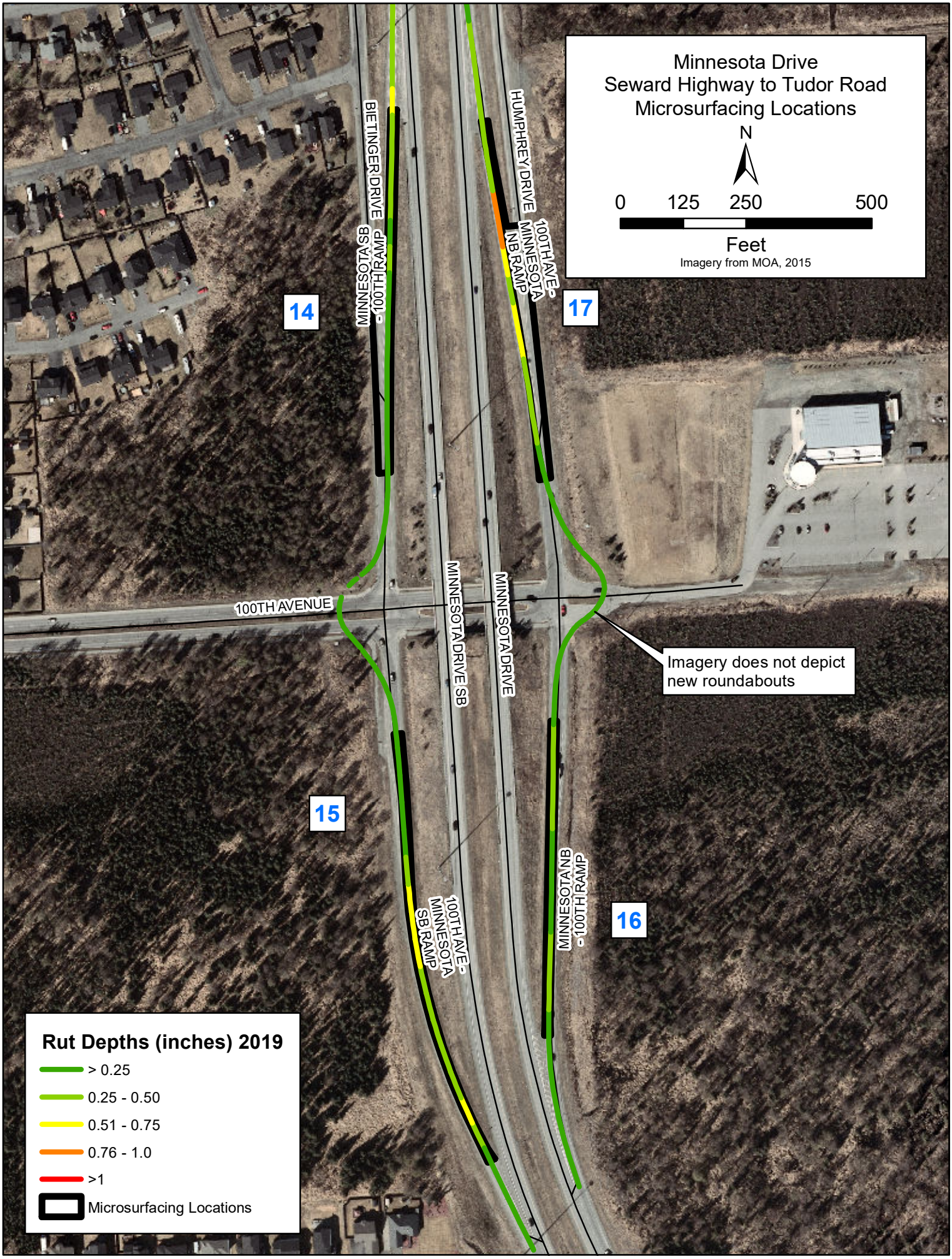

Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
Microsurfacing Application
N
0 75 150 300
Feet
DIMOND BOULEVARD
13
DIMOND - MINNESOTA SB RAMP
HUMPHREY DRIVE
Microsurfacing Distresses
Long Crack High
Trans Crack High
Trans Crack Medium

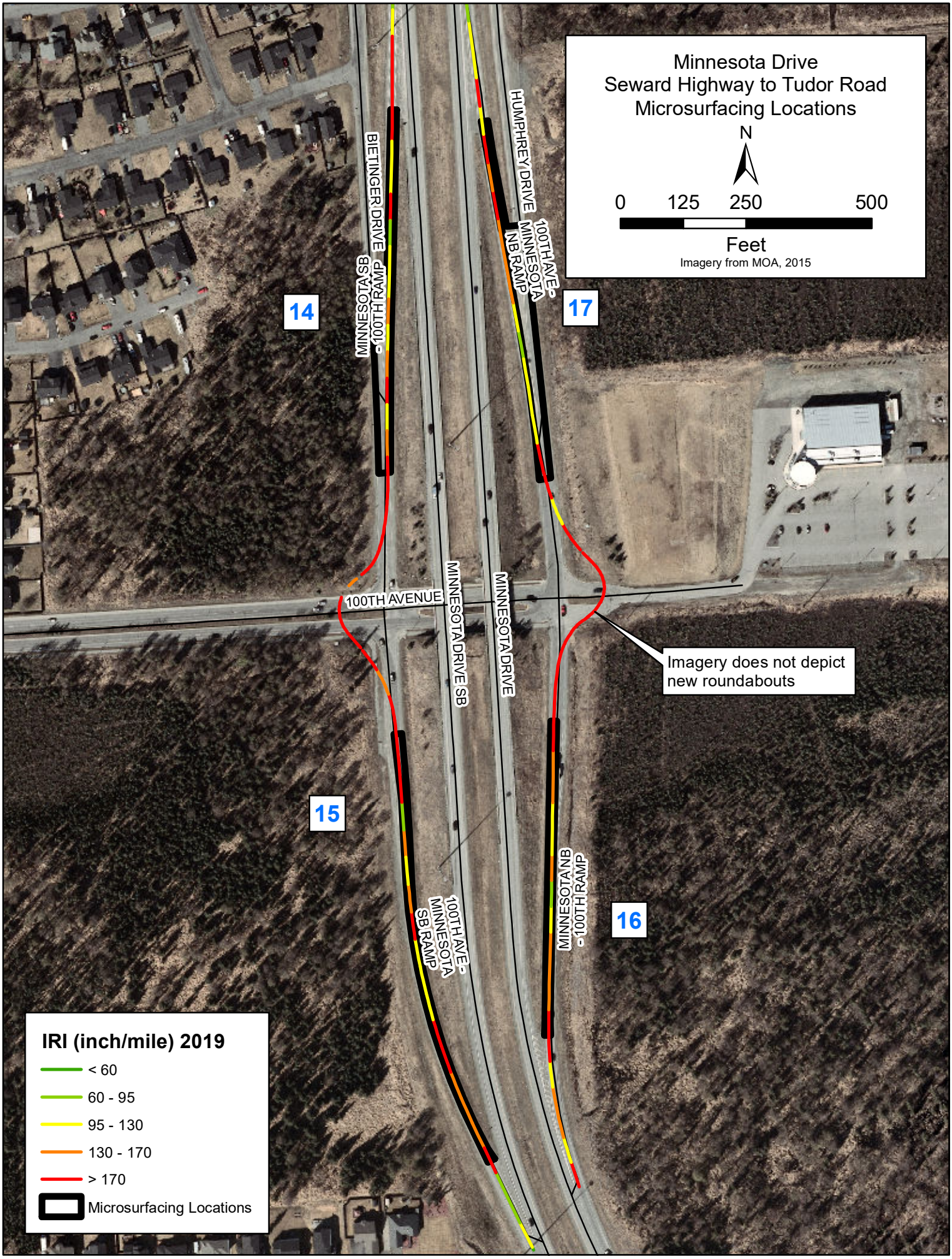

Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 75 150 300
Feet
Imagery from MOA, 2015
DIMOND BOULEVARD
DIMOND BOULEVARD
MINNESOTA SB - DIMOND RAMP
DIMOND EB - MINNESOTA SB WYE
13
MINNESOTA DRIVE SB
MINNESOTA DRIVE
HUMPHREY DRIVE
DIMOND - MINNESOTA SB RAMP
BIETINGER DRIVE
Rut Depths (inches) 2019
> 0.25
0.25 - 0.50
0.51 - 0.75
0.76 - 1.0
>1
Microsurfacing Locations

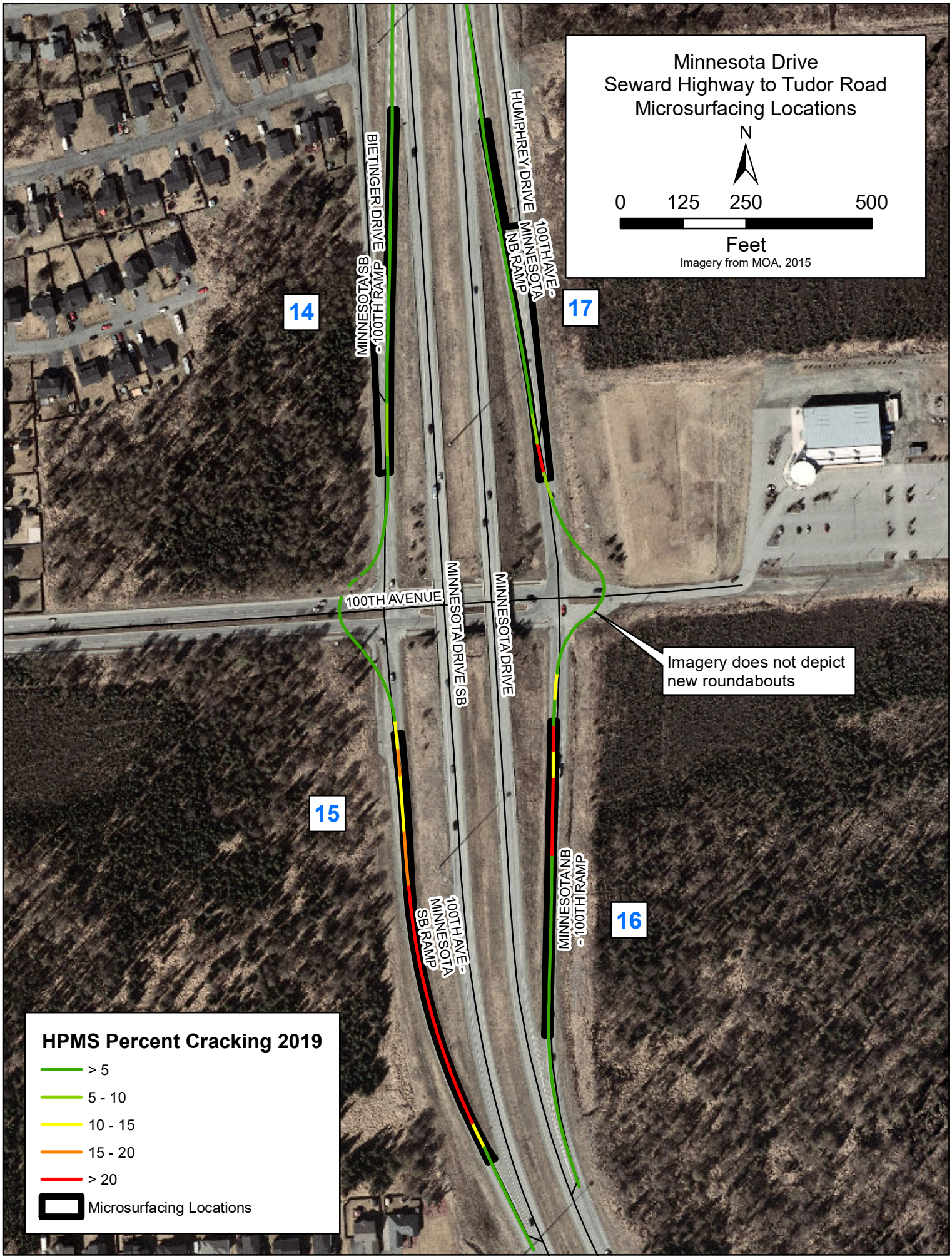

Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 75 150 300
Feet
Imagery from MOA, 2015
DIMOND BOULEVARD
DIMOND BOULEVARD
MINNESOTA SB - DIMOND RAMP
DIMOND EB - MINNESOTA SB WYE
13
MINNESOTA DRIVE SB
MINNESOTA DRIVE
HUMPHREY DRIVE
DIMOND - MINNESOTA SB RAMP
BIETINGER DRIVE
IRI (inch/mile) 2019
< 60
60 - 95
95 - 130
130 - 170
> 170
Microsurfacing Locations


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0 75 150 300
Feet
Imagery from MOA, 2015
DIMOND BOULEVARD
DIMOND BOULEVARD
MINNESOTA SB - DIMOND RAMP
DIMOND EB - MINNESOTA SB WYE
13
MINNESOTA DRIVE SB
MINNESOTA DRIVE
HUMPHREY DRIVE
DIMOND - MINNESOTA SB RAMP
BIETINGER DRIVE
HPMS Percent Cracking 2019
> 5
5 - 10
10 - 15
15 - 20
> 20
Microsurfacing Locations


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
Microsurfacing Application
N
0 100 200 400
Feet
Pothole
Pothole high
Joint cracking
High severity joint cracking
Alligator cracking
MINNESOTA SB - 100TH RAMP
MINNESOTA DRIVE
100TH AVE - MINNESOTA NB RAMP
100TH AVENUE
100TH AVE - MINNESOTA SB RAMP
MINNESOTA NB - 100TH RAMP
14
15
16
17
Microsurfacing Distresses
Joint Crack High
Joint Crack Medium
Long Crack High
Pothole Low
Raveling High
Raveling Medium
Trans Crack High
Trans Crack Medium


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0
125
250
500
Feet
Imagery from MOA, 2015
BIETINGER DRIVE
MINNESOTA SB - 100TH RAMP
HUMPHREY DRIVE
100TH AVE - MINNESOTA NB RAMP
14
17
100TH AVENUE
MINNESOTA DRIVE SB
MINNESOTA DRIVE
Imagery does not depict new roundabouts
15
16
100TH AVE - MINNESOTA SB RAMP
MINNESOTA NB - 100TH RAMP
Rut Depths (inches) 2019
> 0.25
0.25 - 0.50
0.51 - 0.75
0.76 - 1.0
>1
Microsurfacing Locations


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0
125
250
500
Feet
Imagery from MOA, 2015
BIETNIGER DRIVE
MINNESOTA SB -100TH RAMP
HUMPHREY DRIVE
100TH AVE-MINNESOTA NB RAMP
14
17
100TH AVENUE
MINNESOTA DRIVE SB
MINNESOTA DRIVE
Imagery does not depict new roundabouts
15
16
100TH AVE-MINNESOTA SB RAMP
MINNESOTA NB -100TH RAMP
IRI (inch/mile) 2019
< 60
60 - 95
95 - 130
130 - 170
> 170
Microsurfacing Locations


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
N
0
125
250
500
Feet
Imagery from MOA, 2015
BIETINGER DRIVE
MINNESOTA SB -100TH RAMP
HUMPHREY DRIVE
100TH AVE-MINNESOTA NB RAMP
14
17
100TH AVENUE
MINNESOTA DRIVE SB
MINNESOTA DRIVE
Imagery does not depict new roundabouts
15
16
100TH AVE-MINNESOTA SB RAMP
MINNESOTA NB -100TH RAMP
HPMS Percent Cracking 2019
> 5
5 - 10
10 - 15
15 - 20
> 20
Microsurfacing Locations

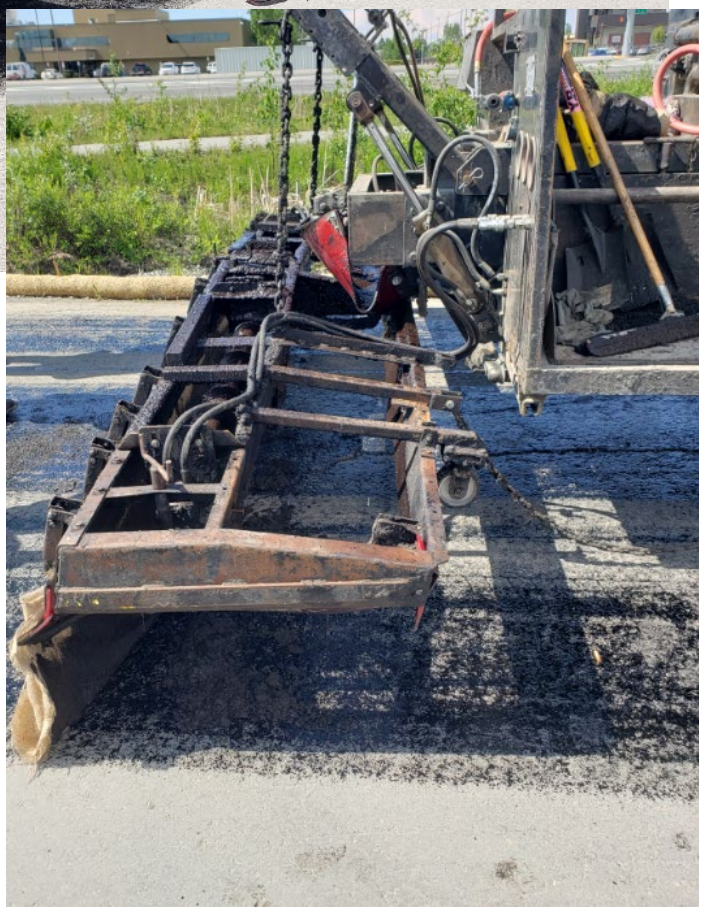
Appendix B

Construction Photolog

Test Strip

Macropaver equipment with burlap sack for secondary strike off for surface texture

A view of the spreader box with burlap sack. In later photos it can be observed that the spreader box was witched and instead of burlap is appears that canvas was used for secondary strike off.



Hand working a portion of the application.

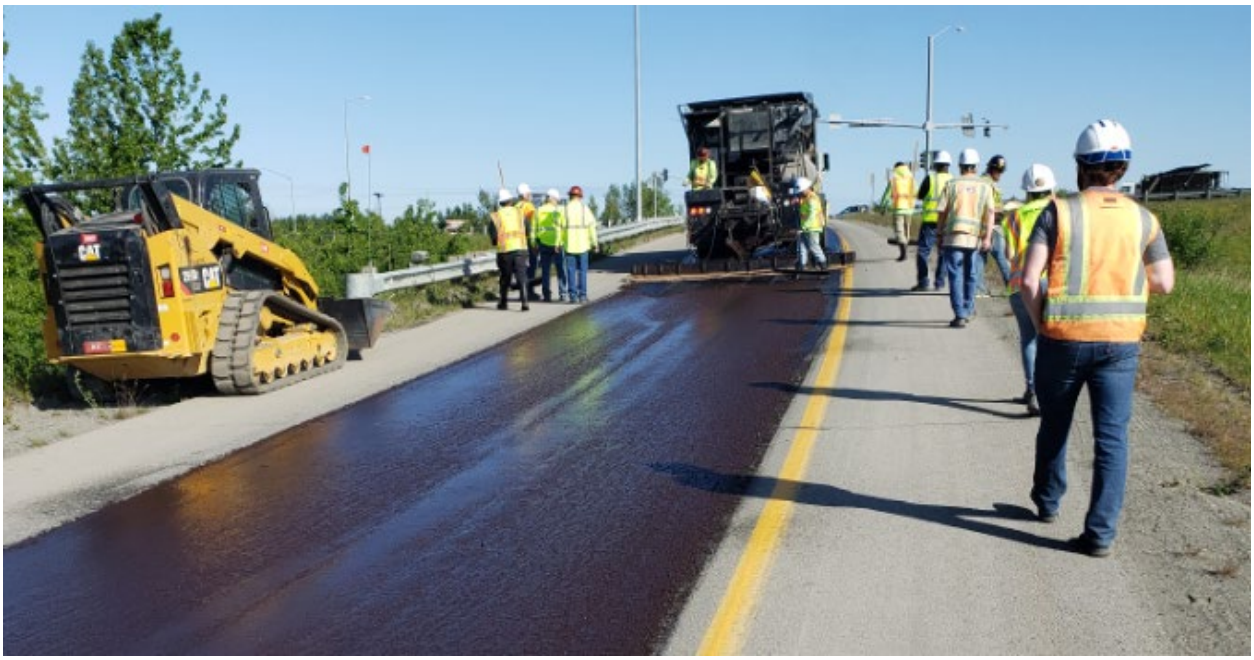
Microsurfacing slurry as it is setting on tack coated pavement

The pneumatic roller mechanically forcing the water out of the system to improve the set time. The water is visible/shiny on the surface after the roller passes over.

A mask on the microsurfacing test strip after the roller has made its passes and it has set.

Production

Scratch course being placed on Ramp 1



Ramp 1 – Hand worked portion at the joint where the aggregate bin ran out on the first Macropaver and the second Macropaver took over application while it was refilling.

Scratch course on Ramp 1 prior to rolling. It can be observed where the water escaping is shiny in the ruts. The shininess ends where the ruts were filled by hot mix at the base of the ramp.

Scratch course on Ramp 1 after rolling. Production was halted after rolling this ramp and placing scratch course on Ramps 5 and 6 due to the set time issues and the time it took to get the pneumatic roller on these ramps.

Scratch course being placed over tack coat on Ramp 6

Scratch course placed on Ramp 5 prior to stopping production.

Second day of production on Ramp 11, the Minnesota SB On Ramp off of Raspberry. The spreader box was changed out from the first day of production along with the canvas in place of the burlap sack.

A hand worked area on the right side of the ramp on the scratch course on Ramp 11.

A pneumatic roller finishing a portion of Ramp 6 that was unable to be completed on the first day of production due to the crude source changing for the emulsion. The ramps were able to be rolled and opened to traffic in between 1.5 -2 hours instead of the 4 hours it was taking the first day of production.

Hand worked areas on the scratch course on Ramp 3 on the fourth day of production.

There was some pickup by traffic on the scratch course on Ramp 2 on the fourth day of production. This is at the signalized intersection that the major pickup and deformation occurred on the surface course.

Construction continued on the surface course without issue until Sautrday, June 13th when distress was reported on the surface course of Ramps 1 and 2 at International Airport Road. The flushing distress on Ramp 1 at the transition of the rut fill that extends down the ramp as indicated by QAP mark on the left.

Ramp 2, shown below, had extreme flushing and pickup, caused by the static loading and turning motion of trucks hauling material to the Anchorage International Airport.

Ramp 3 was reviewed while out looking at Ramps 1 and 2 and no flushing, bleeding or other distresses were present on the ramp. This is the same location that was hand worked in the previous photos.

Appendix C

Mix Design, Materials Testing and Specification

State of Alaska
Department of Transportation & Public Facilities
Central Materials Lab
5750 East Tudor Road
Anchorage, AK 99507
Phone (907) 269-6200 FAX (907) 269-6201

Laboratory Report

Quality

Laboratory No.: 2020A-1494

Name: Minnesotta Dr: Seward to Tudor Pavement Pres. Project No.: 00106 / 0421098
Sample: Microsurfacing Mix Design Item/Spec No.: 413(2) Field No.: Q-MSII-MD-2
Sampled From: Manufacturers Stock Submitted By: Emulsion Products Date Sampled: 07/04/2020
Source: Emulsion Products/QAP Sampled By: Emulsion Products Date Received: 07/24/2020
Location: Cst / Viking Dr. / Anchorage Quantity Represented: Source Date Completed: 07/24/2020
Examined For: Report of Supplier Submitted Mix Design Date Reported: 07/24/2020

Mix Parameters

Material Component	Target	Source	Allowable Range
Aggregate	Type II Grade	AGGPRO/ Mp 78 Parks Highway/ Cst	(See table)
CSS-1P (PG 64-34 base)	16.0%	Emulsion Products, Viking Dr., Anchorage	15.9%-16.9%
Residual AC content of CSS-1P	64%		63%-66%
Portland Type I/II Cement (ABI)	2.0%	QAP	0.5% - 11.5%
Aluminium Sulfate (48% sol)	1.0%	QAP	10.0%-11.2%
Residual AC in Mix	10.5%		10.0%-11.2%
Total Water	11.6%		

Test	Lab Result	Spec	Standard
Wet Stripping	95% +	≥ 90%	ISSA TB-114
Wet Track Abrasion loss, 1hr soak	177	≤ 538 g/m	ISSA TB-100
Wet Track Abrasion loss, 6 day soak	1116	≤ 807 g/m^2	ISSA TB-100
Saturated abrasion Compatability	0.9	≤ 3 g los	ISSA TB-144
Mix Time @ 77° F	160s	Controllable to ≥ 120s	ISSA TB-113
Mix Time @ 100° F		Controllable to ≥ 35s	ISSA TB-113
Wet Cohesion	16	12 kg-cm min @ 30 min	ISSA TB-139
	18	20 kg-cm min @ 60 min	
Lateral Displacement SpG	1.70%	5% max	ISSA TB-147
after 1000 cycles of 145 lb		2.10 max	
Excess Asphalt by LWT Sand Adhesion	35.8	50 g/ft^2 max	ISSA TB-109

Aggregate Gradation

Seive	% Passing	Spec Range
1/2" (12.5mm)	100	
3/8" (9.5mm)	100	100
#4 (4.75mm)	96	91-100
#8 (2.38mm)	70	65-75
#16 (1.18mm)	48	45-53
#30 (600µm)	35	30-40
#50 (300µm)	23	19-27
#100 (150µm)	16	13-19
#200 (075µm)	10.5	8.5-12.5

Aggregate Qualities

Wet Stripping

Remarks:

Mix design technical expert relays that Lateral Displacement does not accurately predict mix performance due to high binder content. Mix time @ 100°F not applicable with regional climate.

D1 The Material as Submitted Conforms to Specifications
Yes [X] No [ ] NA [ ]

THE TEST RESULTS ARE ONLY REPRESENTATIVE OF THE MATERIAL AS SUBMITTED

Signature:

Mike Yerkes, P.E.
Regional Materials Engineer

State of Alaska
Department of Transportation & Public Facilities
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5750 East Tudor Road
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Phone (907) 269-6200 FAX (907) 269-6201

Laboratory Report

Acceptance

Laboratory No.: 2020A-0769

Name: Minnesotta Dr: Seward to Tudor Pavement Pres. Project No.: 00106 / 0421098
Sample: Micro Surfacing Emulsion Item/Spec No.: 413.2000.0000 Field No.: MSE-1
Sampled From: Flowline on delivery truck Submitted By: R. Kelley #1058 Date Sampled: 06/07/2020
Source: Emulsion Products Sampled By: R. Kelley #1058 Date Received: 06/08/2020
Location: Anchorage Quantity Represented: 1/day Date Completed: 06/09/2020
Examined For: Conformance Date Reported: 06/09/2020

AASHTO T59

TEST	RESULT	SPECIFICATION
Specific Gravity @ 60°F	**1.005**	
Lbs. per Gal. @ 60°F	**8.370**	
Viscosity, Saybolt 77°F	**17**	**20-100**
Sieve Test, % Retained	**0.04**	**0.10 max.**
Particle Charge, at 8 mA	**Positive**	**Positive**
Settlement, % @ 1 Day		
Settlement, % @ 5 Days		
Demulsibility %		
Percent of Oil Distillate, (0.1)	**0.5**	
Percent of Residue, (0.1)	**60.3**	**62 min**
Tests on Residue		
Penetration, 77°F, 100gm		
Original	**167**	**100-250**
Aged		
Aged/Original Ratio, %		

Remarks:

T-350 MSCR results : Creep Recovery - 96.9% (95%min)
3200Jnr - 0.07 (0.1 max)

Percent residue result acceptale pending successful application in the field.

D1 The Material as Submitted Conforms to Specifications
Yes [ ] No [**X**] NA [ ]

THE TEST RESULTS ARE ONLY REPRESENTATIVE OF THE MATERIAL AS SUBMITTED

DRAFT

Signature: _____

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Laboratory Report

Acceptance

Laboratory No.: **2020A-0770**

Name: **Minnesotta Dr: Seward to Tudor Pavement Pres.** Project No.: **00106 / 0421098**

Sample: **Micro Surfacing Emulsion** Item/Spec No.: **413.2000.0000** Field No.: **MSE-2**

Sampled From: **Delivery Truck On-site SB Inter off-ramp** Submitted By: **R. Kelley #1058** Date Sampled: **06/07/2020**

Source: **Emulsion Products** Sampled By: **Schmidtkunz #125** Date Received: **06/08/2020**

Location: **Anchorage** Quantity Represented: **1/day** Date Completed: **06/09/2020**

Examined For: **Conformance** Date Reported: **06/09/2020**

AASHTO T59

TEST	RESULT	SPECIFICATION
Specific Gravity @ 60°F	**1.003**	
Lbs. per Gal. @ 60°F	**8.353**	
Viscosity, Saybolt 77°F	**22**	**20-100**
Sieve Test, % Retained	**0.05**	**0.10 max.**
Particle Charge, at 8 mA	**Positive**	**Positive**
Settlement, % @ 1 Day		
Settlement, % @ 5 Days		
Demulsibility %		
Percent of Oil Distillate, (0.1)	**0.3**	
Percent of Residue, (0.1)	**62.2**	**62 min**
Tests on Residue		
Penetration, 77°F, 100gm		
Original	**157**	
Aged		
Aged/Original Ratio, %		

Remarks:

T-350 MSCR results : Creep Recovery - 95.1% (95%min)
3200Jnr - 0.14 (0.1 max)

DRAFT

D1 The Material as Submitted Conforms to Specifications
Yes [X] No [ ] NA [ ]

THE TEST RESULTS ARE ONLY REPRESENTATIVE OF THE MATERIAL AS SUBMITTED

Signature: _____

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Laboratory Report

Acceptance

Laboratory No.: 2020A-0825

Name: Minnesotta Dr: Seward to Tudor Pavement Pres. Project No.: 00106 / 0421098

Sample: Micro Surfacing Emulsion Item/Spec No.: 413.2000.0000 Field No.: MSE-5

Sampled From: Macropaver, distributor Submitted By: E. McMahon #128 Date Sampled: 06/11/2020

Source: Emulsion Products Sampled By: E. McMahon #128 Date Received: 06/11/2020

Location: Anchorage Quantity Represented: 200 tons Date Completed: 06/12/2020

Examined For: Conformance Date Reported: 06/12/2020

AASHTO T59

TEST	RESULT	SPECIFICATION
Specific Gravity @ 60°F	**1.004**	
Lbs. per Gal. @ 60°F	**8.361**	
Viscosity, Saybolt 77°F	**23**	**20-100**
Sieve Test, % Retained	**0.09**	**0.10 max.**
Particle Charge, at 8 mA	**Positive**	**Positive**
Settlement, % @ 1 Day		
Settlement, % @ 5 Days		
Demulsibility %		
Percent of Oil Distillate, (0.1)	**0.5**	
Percent of Residue, (0.1)	**63.2**	**62 min.**
Tests on Residue		
Penetration, 77°F, 100gm		
Original	**216**	**100-250**
Aged		
Aged/Original Ratio, %		

Remarks:

T-350 MSCR results : Creep Recovery - 96.6% (95%min)
3200Jnr - 0.09 (0.1 max)

D1 The Material as Submitted Conforms to Specifications
Yes [X] No [ ] NA [ ]

THE TEST RESULTS ARE ONLY REPRESENTATIVE OF THE MATERIAL AS SUBMITTED

Signature:

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Regional Materials Engineer

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Laboratory Report

Acceptance

Laboratory No.: 2020A-0826

Name: Minnesotta Dr: Seward to Tudor Pavement Pres. Project No.: 00106 / 0421098

Sample: Micro Surfacing Emulsion Item/Spec No.: 413.2000.0000 Field No.: MSE-6

Sampled From: Plant Supply truck Submitted By: E. McMahon #128 Date Sampled: 06/11/2020

Source: Emulsion Products Sampled By: E. McMahon #128 Date Received: 06/11/2020

Location: Anchorage Quantity Represented: 200 tons Date Completed: 06/12/2020

Examined For: Conformance Date Reported: 06/12/2020

AASHTO T59

TEST	RESULT	SPECIFICATION
Specific Gravity @ 60°F	**0.997**	
Lbs. per Gal. @ 60°F	**8.303**	
Viscosity, Saybolt 77°F	**22**	**20-100**
Sieve Test, % Retained	**0.13**	**0.10 max.**
Particle Charge, at 8 mA	**Positive**	**Positive**
Settlement, % @ 1 Day		
Settlement, % @ 5 Days		
Demulsibility %		
Percent of Oil Distillate, (0.1)	**0.5**	
Percent of Residue, (0.1)	**64.7**	**62 min**
Tests on Residue		
Penetration, 77°F, 100gm		
Original	**169**	**100-250**
Aged		
Aged/Original Ratio, %		

Remarks:

T-350 MSCR results : Creep Recovery - 95.97% (95%min)
3200Jnr - 0.01 (0.1 max)
Sieve test may be waived if successful application is achieved in the field.

D1 The Material as Submitted Conforms to Specifications
Yes [X] No [ ] NA [ ]

THE TEST RESULTS ARE ONLY REPRESENTATIVE OF THE MATERIAL AS SUBMITTED

Signature:

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Laboratory Report

Acceptance

Laboratory No.: **2020A-0852**

Name: **Minnesotta Dr: Seward to Tudor Pavement Pres.** Project No.: **00106 / 0421098**

Sample: **Micro Surfacing Emulsion** Item/Spec No.: **413.2000.0000** Field No.: **MSE-7**

Sampled From: **Macro Paver On Grade Distributor** Submitted By: **E. McMahon #128** Date Sampled: **06/12/2020**

Source: **Emulsion Products** Sampled By: **E. McMahon #128** Date Received: **06/12/2020**

Location: **Anchorage** Quantity Represented: **200 tons** Date Completed: **06/15/2020**

Examined For: **Conformance** Date Reported: **06/15/2020**

AASHTO T59

TEST	RESULT	SPECIFICATION
Specific Gravity @ 60°F	**1.003**	
Lbs. per Gal. @ 60°F	**8.353**	
Viscosity, Saybolt 77°F	**20**	**20-100**
Sieve Test, % Retained	**0.18**	**0.10 max.**
Particle Charge, at 8 mA	**Positive**	**Positive**
Settlement, % @ 1 Day		
Settlement, % @ 5 Days		
Demulsibility %		
Percent of Oil Distillate, (0.1)	**0.5**	
Percent of Residue, (0.1)	**64.0**	**62 min**
Tests on Residue		
Penetration, 77°F, 100gm		
Original	**186**	**100-250**
Aged		
Aged/Original Ratio, %		

Remarks:

T-350 MSCR results : Creep Recovery - 95.8% (95%min)
3200Jnr - 0.011 (0.1 max)

Sieve test may be waived if successful application achieved in field.

D1 The Material as Submitted Conforms to Specifications
Yes [X] No [ ] NA [ ]

THE TEST RESULTS ARE ONLY REPRESENTATIVE OF THE MATERIAL AS SUBMITTED

Signature: _____
Mike Yerkes, P.E.
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Laboratory Report

Acceptance

Laboratory No.: 2020A-0853

Name: Minnesotta Dr: Seward to Tudor Pavement Pres. Project No.: 00106 / 0421098

Sample: Micro Surfacing Emulsion Item/Spec No.: 413.2000.0000 Field No.: MSE-8

Sampled From: Supply Truck at Plant Submitted By: E. McMahon #128 Date Sampled: 06/12/2020

Source: Emulsion Products Sampled By: E. McMahon #128 Date Received: 06/12/2020

Location: Anchorage Quantity Represented: 200 tons Date Completed: 06/15/2020

Examined For: Conformance Date Reported: 06/15/2020

AASHTO T59

TEST	RESULT	SPECIFICATION
Specific Gravity @ 60°F	**1.002**	
Lbs. per Gal. @ 60°F	**8.345**	
Viscosity, Saybolt 77°F	**24**	**20-100**
Sieve Test, % Retained	**0.06**	**0.10 max.**
Particle Charge, at 8 mA	**Positive**	**Positive**
Settlement, % @ 1 Day		
Settlement, % @ 5 Days		
Demulsibility %		
Percent of Oil Distillate, (0.1)	**0.5**	
Percent of Residue, (0.1)	**64.2**	**62 min.**
Tests on Residue		
Penetration, 77°F, 100gm		
Original	**161**	**100-250**
Aged		
Aged/Original Ratio, %		

Remarks:

T-350 MSCR results : Creep Recovery - 96.1% (95%min)
3200Jnr - 0.10 (0.1 max)

D1 The Material as Submitted Conforms to Specifications
Yes [X] No [ ] NA [ ]

THE TEST RESULTS ARE ONLY REPRESENTATIVE OF THE MATERIAL AS SUBMITTED

Signature:

Mike Yerkes, P.E.
Regional Materials Engineer

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Laboratory Report

Acceptance

Laboratory No.: 2020A-0874

Name: Minnesotta Dr: Seward to Tudor Pavement Pres. Project No.: 00106 / 0421098

Sample: Micro Surfacing Emulsion Item/Spec No.: 413.2000.0000 Field No.: MSE-9

Sampled From: Plant Suppy Truck Submitted By: Schmidtkunz #125 Date Sampled: 06/13/2020

Source: Emulsion Products Sampled By: Schmidtkunz #125 Date Received: 06/15/2020

Location: Anchorage Quantity Represented: 1/day Date Completed: 06/18/2020

Examined For: Conformance Date Reported: 06/18/2020

AASHTO T59

TEST	RESULT	SPECIFICATION
Specific Gravity @ 60°F	**1.001**	
Lbs. per Gal. @ 60°F	**8.336**	
Viscosity, Saybolt 77°F	**27**	**20-100**
Sieve Test, % Retained	**0.03**	**0.10 max.**
Particle Charge, at 8 mA	**Positive**	**Positive**
Settlement, % @ 1 Day		
Settlement, % @ 5 Days		
Demulsibility %		
Percent of Oil Distillate, (0.1)	**0.5**	
Percent of Residue, (0.1)	**64.2**	62 ~~max~~ MSV.
Tests on Residue		
Penetration, 77°F, 100gm		
Original	**177**	**100-250**
Aged		
Aged/Original Ratio, %		

Remarks:

T-350 MSCR results : Creep Recovery - 96.0% (95%min)
3200Jnr - 0.10 (0.1 max)

D1 The Material as Submitted Conforms to Specifications
Yes [X] No [ ] NA [ ]

THE TEST RESULTS ARE ONLY REPRESENTATIVE OF THE MATERIAL AS SUBMITTED

Signature:

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Laboratory Report

Acceptance

Laboratory No.: 2020A-0875

Name: Minnesotta Dr: Seward to Tudor Pavement Pres. Project No.: 00106 / 0421098

Sample: Micro Surfacing Emulsion Item/Spec No.: 413.2000.0000 Field No.: MSE-10

Sampled From: Macropaver, distributor Submitted By: Schmidtkunz #125 Date Sampled: 06/13/2020

Source: Emulsion Products Sampled By: Schmidtkunz #125 Date Received: 06/15/2020

Location: Anchorage Quantity Represented: 1/day Date Completed: 06/18/2020

Examined For: Conformance Date Reported: 06/18/2020

AASHTO T59

TEST	RESULT	SPECIFICATION
Specific Gravity @ 60°F	**1.003**	
Lbs. per Gal. @ 60°F	**8.353**	
Viscosity, Saybolt 77°F	**26**	**20-100**
Sieve Test, % Retained	**-0.06**	**0.10 max.**
Particle Charge, at 8 mA	**Positive**	**Positive**
Settlement, % @ 1 Day		
Settlement, % @ 5 Days		
Demulsibility %		
Percent of Oil Distillate, (0.1)	**0.5**	
Percent of Residue, (0.1)	**64.3**	**62 min**
Tests on Residue		
Penetration, 77°F, 100gm		
Original	**169**	**100-250**
Aged		
Aged/Original Ratio, %		

Remarks:

T-350 MSCR results : Creep Recovery - 96.3% (95%min)
3200Jnr - 0.10 (0.1 max)

D1 The Material as Submitted Conforms to Specifications
Yes [X] No [ ] NA [ ]

THE TEST RESULTS ARE ONLY REPRESENTATIVE OF THE MATERIAL AS SUBMITTED

Signature: _____

Mike Yerkes, P.E.
Regional Materials Engineer

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Department of Transportation & Public Facilities
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Laboratory Report

Acceptance

Laboratory No.: 2020A-0880

Name: **Minnesotta Dr: Seward to Tudor Pavement Pres.** Project No.: **00106 / 0421098**

Sample: **Micro Surfacing Emulsion** Item/Spec No.: **413.2000.0000** Field No.: **MSE-11**

Sampled From: **Macropaver, distributor** Submitted By: **Schmidtkunz #125** Date Sampled: **06/14/2020**

Source: **Emulsion Products** Sampled By: **E. McMahon #128** Date Received: **06/15/2020**

Location: **Anchorage** Quantity Represented: **1/day** Date Completed: **06/19/2020**

Examined For: **Conformance** Date Reported: **06/19/2020**

AASHTO T59

TEST	RESULT	SPECIFICATION
Specific Gravity @ 60°F	**1.004**	
Lbs. per Gal. @ 60°F	**8.361**	
Viscosity, Saybolt 77°F	**23**	**20-100**
Sieve Test, % Retained	**0.07**	**0.10 max.**
Particle Charge, at 8 mA	**Positive**	**Positive**
Settlement, % @ 1 Day		
Settlement, % @ 5 Days		
Demulsibility %		
Percent of Oil Distillate, (0.1)	**0.5**	
Percent of Residue, (0.1)	**64.0**	**62 min**
Tests on Residue		
Penetration, 77°F, 100gm		
Original	**187**	**100-250**
Aged		
Aged/Original Ratio, %		

Remarks:

T-350 MSCR results : Creep Recovery - 96.2% (95%min)
3200Jnr - 0.10 (0.1 max)

D1 The Material as Submitted Conforms to Specifications
Yes [X] No [ ] NA [ ]

THE TEST RESULTS ARE ONLY REPRESENTATIVE OF THE MATERIAL AS SUBMITTED

Signature:

Mike Yerkes, P.E.
Regional Materials Engineer

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Laboratory Report

Acceptance

Laboratory No.: 2020A-0881

Name: Minnesotta Dr: Seward to Tudor Pavement Pres. Project No.: 00106 / 0421098
Sample: Micro Surfacing Emulsion Item/Spec No.: 413.2000.0000 Field No.: MSE-12
Sampled From: Delivery Truck at plant Submitted By: Schmidtkunz #125 Date Sampled: 06/14/2020
Source: Emulsion Products Sampled By: E. McMahon #128 Date Received: 06/15/2020
Location: Anchorage Quantity Represented: 1/day Date Completed: 06/19/2020
Examined For: Conformance Date Reported: 06/19/2020

AASHTO T59

TEST	RESULT	SPECIFICATION
Specific Gravity @ 60°F	**1.004**	
Lbs. per Gal. @ 60°F	**8.361**	
Viscosity, Saybolt 77°F	**25**	**20-100**
Sieve Test, % Retained	**0.09**	**0.10 max.**
Particle Charge, at 8 mA	**Positive**	**Positive**
Settlement, % @ 1 Day		
Settlement, % @ 5 Days		
Demulsibility %		
Percent of Oil Distillate, (0.1)	**0.5**	
Percent of Residue, (0.1)	**64.7**	**62 min.**
Tests on Residue		
Penetration, 77°F, 100gm		
Original	**179**	**100-250**
Aged		
Aged/Original Ratio, %		

Remarks:

T-350 MSCR results : Creep Recovery - 96.0% (95%min)
3200Jnr - 0.011 (0.1 max)

D1 The Material as Submitted Conforms to Specifications
Yes [X] No [ ] NA [ ]

THE TEST RESULTS ARE ONLY REPRESENTATIVE OF THE MATERIAL AS SUBMITTED

Signature: _____
Mike Yerkes, P.E.
Regional Materials Engineer

Appendix D

Ramp Removal Photolog and Friction Tests

On August 10th construction determined there had been a loss of friction on Ramps 1, 2, 5, 10 and 13 and friction testing were performed to confirm this. The locations with flushing and loss of friction are shown on the following pages. Ramp 1 is below.

The flushing distress and pickup by traffic can be observed on Ramp 2

The deformation of the micorsurfacing created a hump where the pen is placed in the photo below. This deformation was not observed on any other ramps where flushing was present, likely because Ramp 2 is the only ramp that has static loading on the microsurfacing.

Ramp 5 had some minor flushing on the portion closest to Minnesota shown in the first photo below that was placed over moderate to major severity longitudinal cracks.

More severe flushing was visible in the area closer to merging onto International.

Ramp 10 had been noted to be a part of a haul route, as Ramps 1 and 2 were, so it was investigated as well. There was minimal flushing over the initial part of the ramp that received rut fill.

This turned into more severe flushing after the rut-filled area going into the curve.

Ramp 13 had the least visible flushing and was placed over a rut filled area, but given the distresses on the other ramps and the shininess visible on the surface it was determined to pursue removal while out performing other milling operations.

Friction values measured on the distressed ramps are below.

Ramp Number	Distressed Micro	Non-Distressed Micro	Hot Mix
1	0.31	0.54	0.54
2	0.28	0.45	0.47
5	0.28	0.47	0.48
10	0.35	0.53	0.55
13	0.45	0.52	0.57
Average:	0.33	0.50	0.52

Appendix E

Experimental Feature Workplan

Work Plan For

Minnesota Drive Ramps
Micro-surfacing Monitoring Project

Alaska Department of Transportation & Public Facilities

Andrew Pavey
Statewide Asset Management
Pavement Management Engineer

January 2019

Introduction

Central Region Alaska Department of Transportation and Public Facilities (DOT&PF) will be installing the first application of micro-surfacing in Central Region during the 2019 construction season. Micro-surfacing is a preservation treatment that can be applied in thin lifts (1/3" or less), offering significant cost savings over typical hot mix asphalt that requires between a 1" to 2" thick application. The micro-surfacing system proposed in this project is composed of fine aggregate and emulsion. The aggregate is ISSA (International Slurry Seal Association) Type II aggregate, which is 3/8" minus, with the aggregate primarily passing the #8 sieve. The emulsion used is highly polymer modified, coming from a base oil meeting PG64-40E.

Although this treatment has been widely used in the lower 48 states, it has not been used on roads in Central Region of Alaska to date due to poor historical prall testing (lab test to simulate studded tire wear) results on micro-surfacing samples. However, Central Region has tested a new micro-surfacing formulation that performed well on the prall test. This confirmation of performance has made Central Region comfortable with testing micro-surfacing on low to moderate volume roads using ISSA Type II aggregate and the highly polymer modified emulsion.

Background / History

Micro-surfacing is a pavement preservation treatment that has been used widely across the country. It offers the advantages of being a thin application that can be used to fill ruts and provide a new wearing course without requiring the milling and thicker pavement applications that come with Type II and Type V hot mix asphalts. Micro-surfacing is an emulsion that is polymer modified, mixed with aggregate that creates a dense graded, cold mixed, quick setting asphalt surfacing material. It uses additives that changes it from a semi-liquid material to a dense material that can carry traffic loading within one hour of application.

Mill/fill treatments have been used on Anchorage roads for decades due to more economical preservation solutions not being able to handle the high traffic volumes with studded tire use in the Anchorage area. Prall testing was performed on micro-surfacing samples at multiple times in the past decade, but in all cases the samples were destroyed prior to the completion of the test, and based on those results micro-surfacing was never applied on Anchorage roads.

Central Region Materials has experimented with multiple methods of combating studded tire wear. The first method was the use of hard aggregate, which is typically imported by train from Cantwell in Northern Region. While the use of hard aggregate has slowed the rate of rutting, Central Region Materials felt the rate of rutting may be slowed through the use of different asphalt binders. After experimenting with different grades of oil it was observed that lowering the bottom end of the oil to a minus 40 significantly improved prall results.

Upon these findings micro-surfacing specimens were made using emulsion from a

PG 64-40E base oil, and submitted to the materials lab in Southcoast Region for prall testing. These specimens passed the prall testing with results similar to hot mix asphalt using local aggregate and Central Region was comfortable with applying micro-surfacing on low to moderate volume roads based on the results using the highly polymer modified emulsion.

Objectives and Scope

Micro-surfacing will be applied at 16 locations on Minnesota Drive Ramps for a total area of 26,300 square yards.

The primary objectives of the Micro-surfacing Monitoring project are the following:

1. Assess existing asphalt surface conditions prior to construction

For this project, DOT&PF is proposing to assess the existing asphalt conditions by performing the following:

- Collect pavement condition data on the ramps using an inertial profiler and laser crack measurement system (LCMS). Prior to construction this system will collect rut depths (inches), roughness (IRI), pattern cracking (square feet), transverse cracking (liner feet) and longitudinal cracking (liner feet) on each ramp. Cracking data will also contain the average crack width for each category, being pattern, longitudinal and transverse. Photos will also be taken at each ramp prior to the application.

- Perform a visual inspection prior to construction to take photos of existing conditions and locate high severity cracks or other distresses that may reflect through the micro-surfacing application.

2. Access Micro-surfacing as constructed condition

Micro-surfacing conditions will be documented as constructed with photographs. The resulting surface texture should be consistently 1/3” in thickness, with no drag marks, washboarding, uneven surfaces or raveling.

Construction methods will be documented as well as mix design properties. Cores will be taken after construction for prall testing for testing of projected studded tire wear and Haumberg testing for plastic deformation resistance.

3. Long-term performance monitoring under Alaska Conditions

For the long-term we are proposing that these micro-surfacing sites be monitored for a period of three years. Within the three-year period from construction DOT&PF anticipates all testing and analysis be completed for inclusion in a final report.

This project’s 16 locations are located in urban Anchorage area on ramps off of

Minnesota Drive ramps are subject to the following cold climate conditions:

- Seasonal studded tire wear between September and May;
- Winter plowing operations;
- Anti-icing and de-icing applications, and;
- A freeze-thaw pavement cycle.

If the micro-surfacing shoves from plastic deformation, or erodes from studded tire wear to where the underlying pavement is visible prior to the three year monitoring period the micro-surfacing will be considered a failure at that location. It will be determined if the failure was specific to that location due to abrasion from high speed studded tire wear, or plastic deformation caused by shoving action in curves, which will help determine what conditions micro-surfacing can survive in Alaska. It is expected that existing cracks will reflect through the micro-surfacing within two or three years, and reflective cracking will not be considered failure. If failures are widespread from studded tire wear or deformation then this micro-surfacing formulation will not be suited for Alaska's climactic conditions.

Micro-surfacing will be considered successful if there is minimal raveling and no underlying pavement is visible (less than 0.3" rutting) after the three years of post-construction monitoring. The micro-surfacing is being applied to ramps of varying traffic volumes, speeds and curves. The degree of success, or failure, may vary between the ramps which will be documented in the final report.

Work Plan

1. Micro-Surfacing Site Description and Construction Procedure

Location maps, a summary table, and as-advertised plans showing the proposed Micro-surfacing locations are included in Appendix A. The project title is: Minnesota Drive: Seward to Tudor Pavement Preservation Project No. 0421098/CFHWY00106.

Construction, materials, and methods used will conform to Section 413 of the "Special Provisions" of the project "Contract Documents and Specifications". The project calls for the placement of approximately 26,300 square yards of Micro-surfacing on the 16 ramps.

2. Method of Evaluation

A) Prior to and during construction, DOT&PF staff will document ramp surface conditions, including:

- The pavement condition at the time of Micro-surfacing application including ruts, cracks, etc. and whether the application was on existing aged pavement or new pavement;

- Weather and temperature conditions at the time of Micro-surfacing application;
- The production rates for the automated lay down equipment and equipment model information, and;
- Amount of time before roadway is opened to traffic.

B) Post-construction evaluation will consist of monitoring the condition and friction of the Micro-surfacing treated areas over a three-year period. Monitoring will include summer evaluation of:

- Overall pavement condition;
- Pavement rut depths, cracking, IRI (from annual Pavement Management System survey);
- Extent of micro-surfacing raveling, shoving (from visual inspections) and;
- Micro-surfacing friction compared to time of application and control points on ramps;
- Performance of micro-surfacing placed over existing pavement to that placed over new pavement.

Reporting

Construction of Micro-surfacing will be completed by September 30th, 2019 and a post construction report will be submitted by December 30th, 2019.

Interim reports will be submitted at the end of each of the three evaluation years. A final report, summarizing previous reports will be submitted by the end of 2022. At the end of the evaluation period, a synopsis will be provided that will provide a recommendation whether the use of Micro-surfacing should continue in Alaska. If studded tires wear through the micro-surfacing within the three year monitoring (rut greater than 0.3 inches), or the micro-surfacing suffers from widespread raveling or delamination's it will not be recommended for continued use. It will also contain information concerning what pitfalls or construction/maintenance issues could have been avoided through improved specifications, construction plans and practices.

Schedule

- Construction completion of all Micro-surfacing sites: Fall 2019
- Post construction report submitted to FHWA: December 2019
- First year survey and report submitted to FHWA: December 2020
- Second year survey and report submitted to FHWA: December 2021
- Third year survey and final report submitted to FHWA: December 2022

Budget

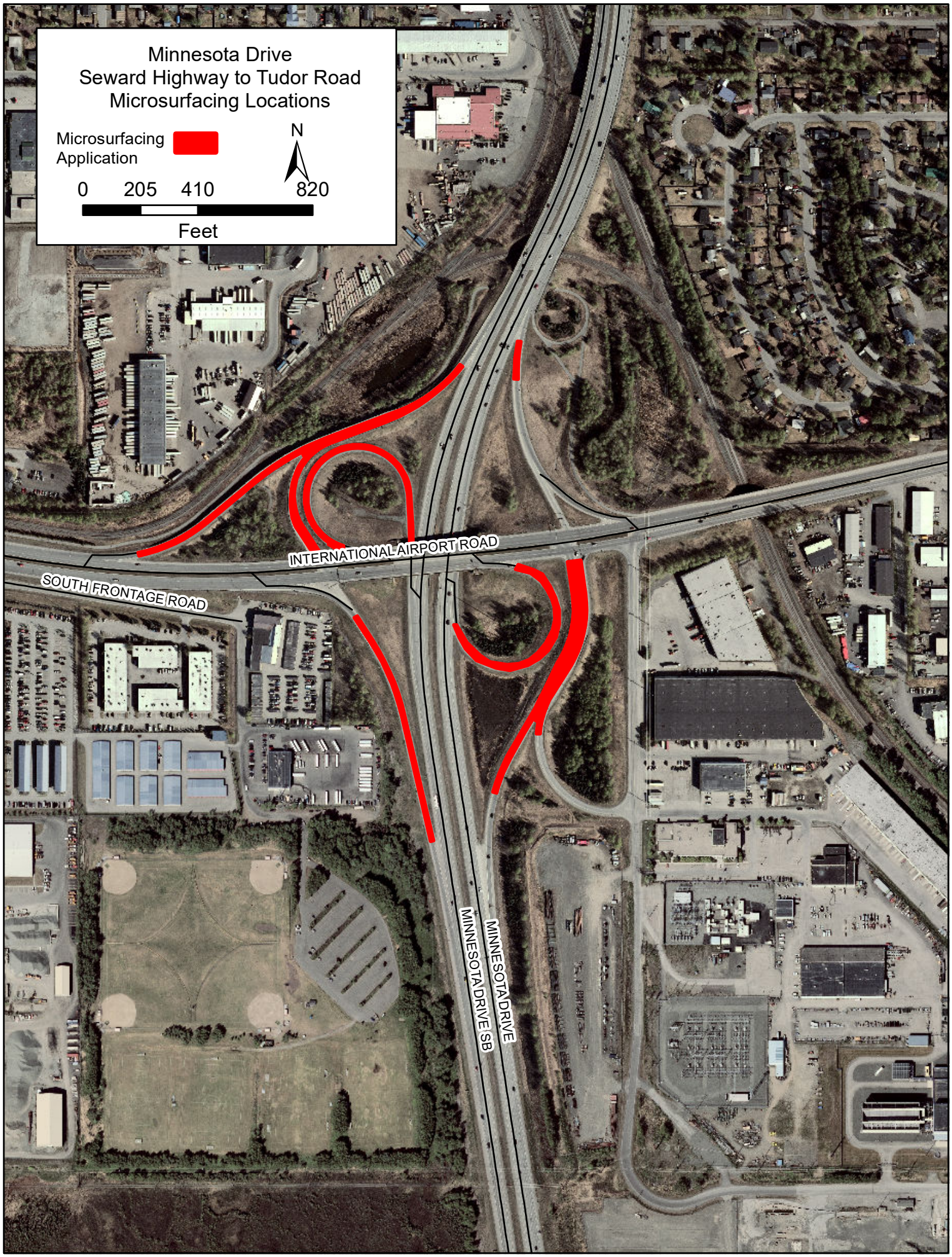
No additional cost will be incurred for pavement rutting, cracking, or IRI data collection, as the annual Pavement Management System (PMS) survey will document pavement performance after initial construction testing is complete.

There will be a cost associated with the initial friction testing and post construction friction testing, coring and lab testing and Micro-surfacing evaluation. DOT&PF Materials staff will perform the pavement coring, lab testing and friction testing. A budget of $100,000 is requested which includes traffic control operations, ICAP, equipment use, reporting, and staff time. See Appendix B for detailed cost estimate.

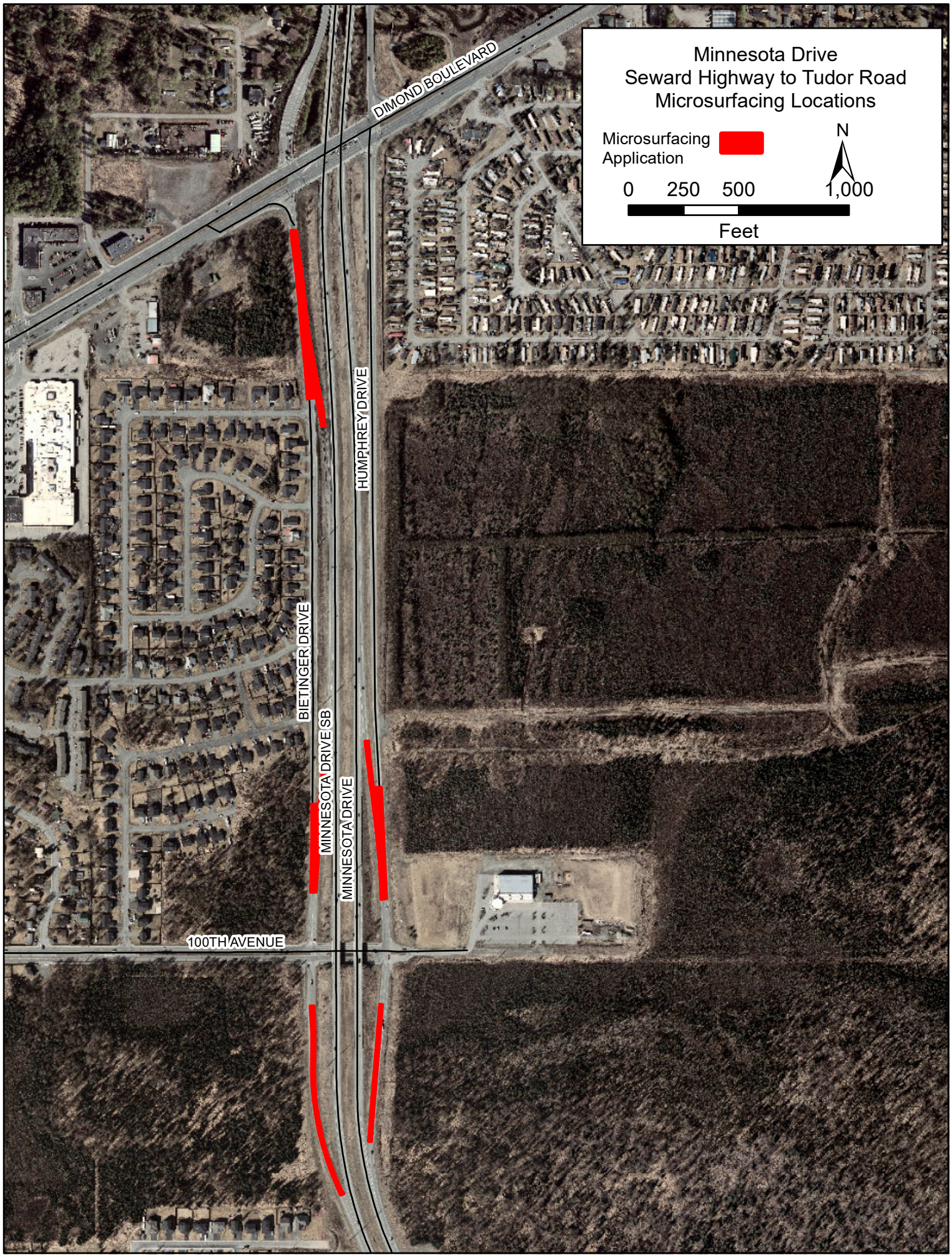
Appendix A

Micro-surfacing Location Maps

Micro-surfacing Section 413 Specification


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
Microsurfacing Application
N
0 205 410 820
Feet
INTERNATIONAL AIRPORT ROAD
SOUTH FRONTAGE ROAD
MINNESOTA DRIVE SB
MINNESOTA DRIVE


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
Microsurfacing Application
N
0 250 500 1,000
Feet
RASPBERRY ROAD
MINNESOTA DRIVE SB
STRAWBERRY ROAD
76TH AVENUE
NORTHWOOD STREET
MINNESOTA DRIVE


Minnesota Drive
Seward Highway to Tudor Road
Microsurfacing Locations
Microsurfacing Application
N
0 250 500 1,000
Feet
DIMOND BOULEVARD
HUMPHREY DRIVE
BIETINGER DRIVE
MINNESOTA DRIVE SB
MINNESOTA DRIVE
100TH AVENUE

Special Provision

Add the following Section:

SECTION 413
MICRO-SURFACING

413-1.01 DESCRIPTION. This work consists of constructing micro-surfacing on a prepared pavement within the existing pavement markings. Micro-surfacing is a mixture of: polymer modified asphalt emulsion, well-graded crushed mineral aggregate, mineral filler, water and other additives.

Provide an experienced foreman to supervise the construction with a minimum of 5 successful projects and provide a resume documenting the projects.

Provide the Engineer who designed the micro-surface mix design, or technical representative, on site, to supervise the duration of the micro-surfacing.

MATERIALS

413-2.01 EMULSIFIED ASPHALT. Provide a polymer-modified CQS-1P or CSS-1P for emulsified asphalt for micro-surfacing that meets the requirements in the table below. The supplier must certify the oil used to produce the emulsion meets the requirements for PG 64E-40 in table 702-2.01-1 and provide lab test results to the Engineer. Recover residual asphalt for testing per AASHTO PP72-11, Procedure B.

A one gallon sample of the binder used to produce the emulsified asphalt will be provided with the mix design and production certification, and one gallon sample of the emulsified asphalt will be provided for testing.

Tests on Emulsified Asphalt		
Test	**Test Method**	**Specification**
Viscosity, Saybolt Furol, 25°C	AASHTO T 59	20 to 100 seconds
Particle charge test	AASHTO T 59	Positive
Sieve test, %	AASHTO T 59	0.10 maximum
Distillation of emulsified asphalt at 175°C, %	AASHTO T 59	62 minimum
Tests on Emulsified Asphalt Residue		
Test	**Test Method**	**Specification**
Jnr at 3.2 kPa, 3.2 kPa at 64°C, kPa^{-1}	AASHTO T 350	0.1 maximum
Average percent recovery at 3.2 kPa, %	AASHTO T 350	95 minimum

413-2.02 AGGREGATE. Provide aggregate in accordance with Table 413-1 Micro-Surfacing Aggregates.

Table 413-1
Micro-Surfacing Aggregates

Sieve Size	Type 2 (ISSA Type II)	Type 3 ISSA Type III	QC TOLERANCES Percent for each sieve size
9.5 mm **[3/8 inch]**	100	100	
4.75 mm **[# 4]**	90 – 100	70 – 90	±5
2.38 mm **[# 8]**	65 – 90	45 – 70	±5
1.18 mm **[# 16]**	45 –70	28 – 50	±5
600 µm **[# 30]**	30 – 50	19 – 34	±5
300 µm **[#50]**	18 – 30	12 – 25	±4
150 µm **[#100]**	10 – 21	7 – 18	±3
75 µm **[#200]**	9 – 15	5 – 15	±2

413-2.03 MINERAL FILLER. Provide Portland cement or hydrated lime, based on the mix design results and in accordance with the following:

a. Portland cement, Type I or II per Section 701 or
b. Hydrated lime, conform to AASHTO M 17.

These will be considered part of the aggregate gradation.

413-2.04 WATER. Provide potable water used for concrete in accordance with 712-2.01.

413-2.05 ADDITIVES. Additives may be used to accelerate or retard the break/set of the micro-surfacing. Appropriate additives, and their applicable use range, should be approved by the laboratory as part of the mix design.

413-2.06 MIX DESIGN. Submit a complete mix design 10 business days before beginning production. List the source of materials used for the mix design. Provide informational test results on the mix design for the ISSA tests in Table 413-2 Testing procedures may be obtained from the International Slurry Surfacing Association (ISSA) or as approved by the Engineer.

Table 413-2
Mix Design Test Requirements

Test	Description	Specification
ISSA TB-114	Wet stripping	≥ 90%
ISSA TB-100	Wet track abrasion loss, 1 h soak	≤ 1.8 oz/sq. ft [538 g/sq. m]
ISSA TB-100	Wet track abrasion loss, 6 day soak	≤ 2.6 oz/sq. ft [807 g/sq. m]
ISSA TB-144	Saturated abrasion compatibility	≤ 3 g loss
ISSA TB-113	Mix time at 77 °F [25° C]	Controllable to ≥120 s
ISSA TB-113	Mix time at 100 °F [37.4° C]	Controllable to ≥35 s

Provide a mix design containing from 10.0 percent to 11.0 percent of residual asphalt by dry weight of aggregate and 0 percent to 3.0 percent mineral filler by dry weight of aggregate. Micro-surfacing will be applied at night and mix set time is to be adjusted to be applied at 50° degrees F.

Submit a mix design to the Engineer, if aggregate source, aggregate blend, cement, additives or asphalt emulsion sources change.

Submit the final mix design with information in the following format:

1. Source of each individual material.

2. Aggregate:
   2.1 Gradation
   2.2 Sand equivalent
   2.3 Abrasion resistance
   2.4 Soundness.

3. Field simulation tests:
   3.1 Wet stripping test
   3.2 Wet track abrasion loss (1 hour & 6 day)
   3.3 Saturated abrasion compatibility
   3.4 Trial mix time at 50°F [10 °C] and 70 °F [21 °C]

4. Interpretation of results and the determination of a mix design:
   4.1 Minimum and maximum percentage of mineral filler
   4.2 Minimum and maximum percentage of water, including aggregate moisture
   4.3 Percentage of mix set additive (if necessary)
   4.4 Percentage of modified emulsion
   4.5 Residual asphalt content of modified emulsion

4.6 Percentage of residual asphalt

5. Signature and date.

CONSTRUCTION REQUIREMENTS

413-3.01 MIXING EQUIPMENT. Conform to ISSA A143.

413-3.02 PROPORTIONING DEVICES. Conform to ISSA A143.

413-3.03 WEIGHTING EQUIPMENT. Use calibrated portable scales to weigh material certified in accordance with Section 109, and as modified as follows:

(1) Re-certify the scale after any change in location and
(2) Randomly spot check the scale once per week or once per project, whichever is greater.

413-3.04 SPREADING EQUIPMENT. Conform to ISSA A143 with the exception that augers within the spreader box are not required.

413-3.05 SWEEPER.

1. Self-propelled;
2. Vertical broom pressure control
3. Vacuum capability

413-3.06 AUXILLARY EQUIPMENT. Furnish hand squeegees, shovels, and other equipment necessary to perform the work. Provide power brooms, air compressors, water flushing equipment, and hand brooms to clean the pavement surface.

413-3.07 MICRO-SURFACING TYPES (all within the existing pavement markings)

1. Rut Fill - Type 3. Rut fill pavement segments longer than 1,000 feet, if the average rut depth is greater than ½ inch. Provide a rut box for each designated wheel track. Provide a clean overlap and straight edges between wheel tracks. Construct each rutted wheel track with a crown ¼ inch per inch of rut depth to allow for proper consolidation by traffic. (not required for this project)

2. Scratch Course- Type 2 or Type 3. Apply full lane width in one course. Use a metal strike off bar on the spreader box. Do not allow excess buildup or uncovered areas.

3. Surface Course - Type 2. Apply full lane width in one course. Do not allow excess buildup or uncovered areas.

413-3.08 PRE-PAVING MEETING. Hold a pre-paving meeting with the Engineer on-site before beginning work to discuss the following:

(1) Mix design review with the engineer who designed the mix. Mix design engineer is required to attend
(2) Equipment condition
(3) Equipment calibration
(4) Test strips
(5) Detailed work schedule and daily quantity and process control records
(6) Traffic control plan

413-3.09 CALIBRATION. Calibrate each mixing machine before use. Maintain documentation showing individual calibrations of each material at various settings relating to the machine's metering devices. Supply materials and equipment, including scales and containers for calibration (ISSA MA 1). Recalibrate machines on the project after a change in aggregate, asphalt emulsion source, or repairs are made to the aggregate feeding belt, gate or emulsion pump.

413-3.10 TEST STRIP. Construct a test strip in a location approved by the Engineer.

For each machine used, construct a one-lane wide test strip 300 feet long. Compare the machines for variances in surface texture and appearance.

Do not construct the test strip until the emulsion temperature falls below 122 °F unless recommended by the Engineer that developed the mix design.

If any of the following elements of the system used with a mix design change or field evidence shows that the system is out of control, construct a new test strip:

(1) Type of emulsion,
(2) Type and size of aggregate
(3) Type of mineral filler and
(4) The lay down machine.

Allow traffic on the test strip within 1 hour after application; the Engineer will evaluate whether any damage occurs. The Engineer will inspect the completed test strip again after 12 hours of traffic to determine if it is acceptable. The Contractor may begin full production after the Engineer accepts a test strip.

The Engineer will consider any spot check or test strip failure as unacceptable work in accordance with 105-1.11.

413-3.11 SURFACE PREPERATION. Clean the surface immediately before placing the micro-surfacing. Clean the surface of all loose material, vegetation, plastic markings, and other objectionable material. Clean loose material from cracks. Fill the cleaned cracks, wider than ¾ inch, with HMA tamped in place. Surface preparation of the roadway surface is incidental to the cost of Micro-surfacing.

413-3.12 FOG SEAL OR TACK COAT. Apply fog seal to surfaces before the first course of micro-surfacing. Provide and apply a CSS-1 or STE-1 emulsion and the following:

1. Apply the emulsion at a rate of 0.05 gallon per square yard to 0.10 gallon per square yard.

2. Limit the daily application of fog seal to the pavement area receiving micro-surfacing that day. Do not open fog sealed areas to traffic until after applying and curing the first course of micro-surfacing. Allow the fog seal to cure before applying micro-surfacing.

3. Protect drainage structures, monument boxes and water shut-offs during the application of the fog seal and during micro-surfacing.

413-3.13 SURFACE QUALITY. Except for areas within 12 inch of the edge line, lane line, or center line, ensure the transverse cross section of the restored pavement surface is no greater than ⅜ inch if measured using a 10-foot straight edge or 3/16 inch if measured with a 6-foot straight edge.

Construct the surface course without excessive scratch marks, tears, rippling, and other surface irregularities. Repair tear marks wider than ½ inch and longer than 4 inch and tear marks wider than 1 inch and longer than 1 inch. Repair transverse ripples or streaks deeper than ¼ inch as measured by a 10-foot straight edge.

Construct longitudinal joints with no greater than ¼ inch overlap thickness if measured with a 10 foot straight edge, and less than 3 inch overlap on adjacent passes. Locate longitudinal construction joints and lane edges to coincide with the proposed painted lane lines shown on the plans or as directed by the Engineer. Place overlapping passes on the uphill side to prevent water from ponding.

Construct transverse joints with no greater than ⅛ inch difference in elevation across the joint if measured with a 10-foot straight edge.

Construct edge lines along curbs and shoulders, with no greater than 2 inch of horizontal variance in any 100 feet length. Do not allow runoff in these areas.

Stop micro-surfacing work, if the system is out of control and cannot meet the requirements of this section. Correct the micro-surfacing system, as approved by the Engineer, before resuming work.

Protect drainage structures, monument boxes and water shut-offs.

Make repairs to micro-surfacing defects to the full width of paving pass with spreader box. Do not perform hand repairs after micro surfacing mix has set.

413-3.14 TRAFFIC LOADING. Do not open the micro-surface to traffic until the micro-surface cures sufficiently to prevent pickup by vehicle tires. The Department considers properly constructed micro-surface as micro-surface capable of carrying normal traffic within 1-hour of application without damage. Confirm that the micro-surfacing cured within 1-hour on the first day of production, after the construction of the test strip. The Engineer will conduct three 1-hour spot checks. If a spot check fails, stop work and construct a new test strip.

Protect the new surface from potential damage at intersections and driveways. Repair damage to the surface caused by traffic at no additional cost to the Department.

413-3.15 WEATHER AND TIME LIMITATIONS. Begin construction when the air and pavement surface temperatures are at least 50 °F and rising. Do not place micro-surfacing during rain, or if the forecast indicates a temperature below 40 °F within 48-hour of the planned micro-surfacing. Do not start work after September 15 or if freezing temperatures are possible within 24 hours after application.

413-3.16 CONTRACTOR QUALITY CONTROL (QC) AND DOCUMENTATION. Perform Quality Control (QC) sampling and testing. Sample and test according to 413-3.21.

1. Emulsion. Provide a material Bill of Lading (BOL) for each batch of emulsion used. Include the supplier‘s name, plant location, emulsion grade, residual asphalt content, volume (gross and net, gallons) and batch number.

2. Aggregate. Provide QC test results daily to the Engineer and a summary upon completion of the work.

    a. Gradation and Mix Design Tolerance. Provide companion samples to the Engineer. The QC tolerances for the mix design are listed in Table 413-1. The tolerance range may not exceed the limits set in 413-1.

    b. Sand Equivalent Test. The Sand Equivalent quality control tolerance is ±7% of the value established in the mix design (60% minimum) as determined by ATM 307.

    c. Moisture Content. Determine the moisture content of the aggregate in accordance with ATM 202. Perform additional testing upon a visible change in moisture. Use the average daily moisture to calculate the oven dry weight of the aggregate.

413-3.17 ASPHALT CONTENT. Calculate and record the percent asphalt content of the mixture from the equipment counter readings, randomly, a minimum of three times a day. The quality control tolerance is ±0.5 percent for a single test and the average daily asphalt content is ±0.2 percent from the mix design.

413-3.18 DESIGN APPLICATION RATE. The design application rate shall be the total amount of micro-surfacing material placed to meet the requirements for cross section and surfacing. This amount will be the combination of all courses placed.

413-3.19 DOCUMENTATION. Provide a daily report containing the following information to the Engineer within one working day:

(1) Date and air temperature at work start up

(2) Beginning and ending locations for the day‘s work

(3) Length, width, total area (square yards) covered for the day

(4) Application rate (pounds per square yard) of aggregate
(5) Daily asphalt spot check reports, gallons of emulsion, weight of emulsion (pounds per gallon)
(6) Asphalt emulsion bill of lading
(7) Beginning, ending, and total counter readings
(8) Control settings, calibration values, percent residue in emulsion
(9) Percent of each material, percent of asphalt binder
(10) Calibration forms
(11) Aggregate certification or shipment of tested stock report
(12) Contractor's authorized signature.

413-3.20 MICRO-SURFACING MIX DESIGN ENGINEER OR TECHNICAL REPRESENTATIVE. The Contractor shall provide the Engineer than designed the mix or a technical representative to supervise the micro-surfacing process and the related process control of the product on the test strip and for the full duration of production. This Engineer, or representative, shall have a minimum of 5 years supervising successful projects using micro-surfacing with similar base material and equipment. The representative must be qualified to develop a micro-surfacing mix design and supervise the process control.

Provide a submittal that includes the following information:

1. Resume of Engineer or representative
2. A list of successful projects**;** provide owners contact, address, and telephone number**;** location of projects.
3. Description of micro-surfacing equipment used on the project.

413-3.21 AGENCY QUALITY ACCEPTANCE (QA) TESTING. Sample and test according to the following:

1. Asphalt Emulsion (1 per day at point of shipment or delivery, 1 from distributor truck)
2. Aggregate Gradation (2 per day per stockpile), as determined by ATM 304
3. Moisture Content of the Aggregate (2 per day), as determined by ATM 202

The Engineer may request additional testing at any time.

413-3.22 HOLD POINT. Any failing test creates a Hold Point, whereby no additional material may be placed until Corrective action and passing retest(s) have occurred, or accepted by the Engineer. All additional material placed before corrective action and passing retest(s) occur constitutes Unauthorized Work.

413-4.01 METHOD OF MEASUREMENT. By the ton and square yard per Section 109. Provide weight tickets for:

1. Micro-Surfacing Emulsion

413-5.01 BASIS OF PAYMENT. Fog seal or tack coat shall be paid in accordance with Section 402 if pay item exists otherwise it is subsidiary to pay item 413(2) Micro-Surfacing Surface Course.

Payment will be made under:

Pay Item No.	Pay Item	Pay Unit
413(1)	Micro-Surfacing Emulsion	Ton
413(2)	Micro-Surfacing Surface Course	Square Yard
413(3)	Micro-Surfacing Scratch Course	Square Yard
413(4)	Micro-Surfacing Mobilization & Demobilization	Lump Sum

CFHWY00106

Appendix B

Detailed Cost Estimate

MEMORANDUM

Department of Transportation and Public Facilities
Central Region Materials
5750 EAST TUDOR ROAD
ANCHORAGE, AK 99507-1225
Tel. 269-6200 Fax 269-6201

TO: Anna Bosin, P.E.
Research Project Manager

THRU: Newton Bingham, P.E. Newt
Regional Materials Engineer

FROM: Andrew Pavey AP
Engineering Assistant

Date: January 29th, 2018

PROJECT NO: CFHWY00106

SUBJECT: Minnesota Drive Ramp Microsurfacing Monitoring Plan

Central Region Materials offers the following geotechnical services:

TASK	Dates		Cost
Signed SSB from Project Manager	TBD		n/a
ADMINISTRATION: Gather data, prepare exploration plan, traffic control contract, etc.	TBD		$10,000
CONSTRAINTS: See below.	TBD		n/a
FIELD INVESTIGATION: (2 days per year)			n/a
Traffic Control Contractor	TBD		$20,000
CRM Engineer and Assistant Pavement coring and site investigation	TBD		$30,000
Lab Testing	TBD		$10,000
REPORTING:	**Draft**	**Final**	
Monitoring Plan Reports Total of two draft reports documenting annual testing and third final report presenting conclusions of microsurfacing	Annually after field investigations and processing lab data	After third year of data collection	$30,000
Total Estimated Cost			**$100,000**

Note: ICAP and CR Cap costs are included in the labor charges.

Overview of Field Work: Perform a pre-construction site investigation to document existing conditions, then post-construction site visit to document immediate conditions and take pavement cores to run lab testing. Field investigations will be performed in 2019, 2020 and 2021.

Schedule for Field Investigations and Reporting:

- The initial field investigation will be performed the summer of 2018 prior to construction. This will document initial conditions with photos and analyze Pavement Management System (PMS) data for rut depths, roughness and cracking. Pavement condition data will be compared to the annually collected conditions for the following 3 years to determine rut performance and the rate of crack propagation through the microsurfacing.
- The post construction field investigation will be performed the fall of 2018. Photos will document existing conditions and a minimum of 9 cores will be taken for lab testing.
- Annual field investigations will be performed with traffic control in 2019, 2020 and 2021 to document and monitor performance of the microsurfacing.

- A draft report will be compiled in 2019 to document the pre-construction conditions and microsurfacing performance one year after construction. This report will be updated in 2020 to document conditions two years after construction. The final report will be completed in 2021 after the third year of monitoring that presents the final site conditions and microsurfacing performance. Recommendations for future microsurfacing mix designs and specifications will be included in the final report.
    - Microsurfacing performance will be based on rut rates (compared to traditional HMA) and the rate of crack propagation through the new microsurfacing layer.
    - Microsurfacing will be determined a failure on a ramp if the existing HMA layer under the microsurfacing is visible within 3 years of application.

Microsurfacing sites identified for field investigations and possible pavement coring:

Northbound:

- 100th Avenue Off Ramp
- 100th Avenue On Ramp
- Dimond Boulevard On Ramp
- Raspberry Road On Ramp
- International Airport Road Off Ramp
- International Airport Road On Ramp

Southbound

- International Airport Road Off Ramp
- International Airport Road On Ramp (Cloverleaf)
- Raspberry Road Off Ramp
- Raspberry Road On Ramp
- Raspberry Road On Ramp (Cloverleaf)
- Strawberry Road Off Ramp
- Dimond Boulevard Off Ramp
- Dimond Boulevard On Ramp
- 100th Avenue Off Ramp
- 100th Avenue On Ramp

Traffic control will be performed by a contractor during the annual field investigations in 2019, 2020 and 2021. It is anticipated initial site documentation and coring will be performed with traffic control provided by the construction project.

Constraints by others: Contracts Section (Traffic control contract), Traffic Control Plan review and approval (Traffic Section).

Thank you for allowing us to present our estimate. Please sign below for approval to proceed:

Anna Bosin, P.E. – Research Project Manager _____ Date