**Appendix A: Johnson County, IA (52-I080-174)**

- ing_52-i080-174_cs56b-ingios01_2022_08_09_170036
- ing_52-i080-174_cs56b-ingios01_2022_08_09_171152
- ing_52-i080-174_cs56b-ingios01_2022_08_09_173544
- ing_52-i080-174_cs56b-ingios01_2022_08_09_175350
- ing_52-i080-174_cs56b-ingios01_2022_08_09_180902
- ing_52-i080-174_cs56b-ingios01_2022_08_09_181750
- ing_52-i080-174_cs56b-ingios01_2022_08_09_182712
- ing_52-i080-174_cs56b-ingios01_2022_08_09_190557
- ing_52-i080-174_cs56b-ingios01_2022_08_09_192938
- ing_52-i080-174_cs56b-ingios01_2022_08_09_194641
- ing_52-i080-174_cs56b-ingios01_2022_08_09_195429
- ing_52-i080-174_cs56b-ingios01_2022_08_10_125633
- ing_52-i080-174_cs56b-ingios01_2022_08_10_131843
- ing_52-i080-174_cs56b-ingios01_2022_08_10_134821
- ing_52-i080-174_cs56b-ingios01_2022_08_10_142134
- ing_52-i080-174_cs56b-ingios01_2022_08_10_162950
- ing_52-i080-174_cs56b-ingios01_2022_08_10_172102

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 5:00:36 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.109 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 7089 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 72.7 | 96.7 | 1.0 | 150.0 | 62.0 | 141.0 | 157.0 | 31.0 | 22.0 | -88.0 | -9.0 | 7.0 |
| Moisture Content | No | | | | | | | | | | | | |

### Mapped Area

| square feet | acres |
|---|---|
| 7089 | 0.163 |

### Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.5 | 4 |

### Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 764.04 | 766.12 | 768.03 |

### Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.4 | 5.0 | 6.0 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 7089 | 0.163 | 100.0 | 6778.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 1 | 1427 | 20.1 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

## Station

| Start | End |
|---|---|
| 1221+00 | 1223+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 5:00:36 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.109 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 7089 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| **96.7** | CQI > = 95 |
| **72.7** | 80% of k-Value MVs >= 150 |
| **22.0** | COV <= 30 |
| 20.1 | % i-Score Blob Area >= 1000 ft^2 |
| **0.0** | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

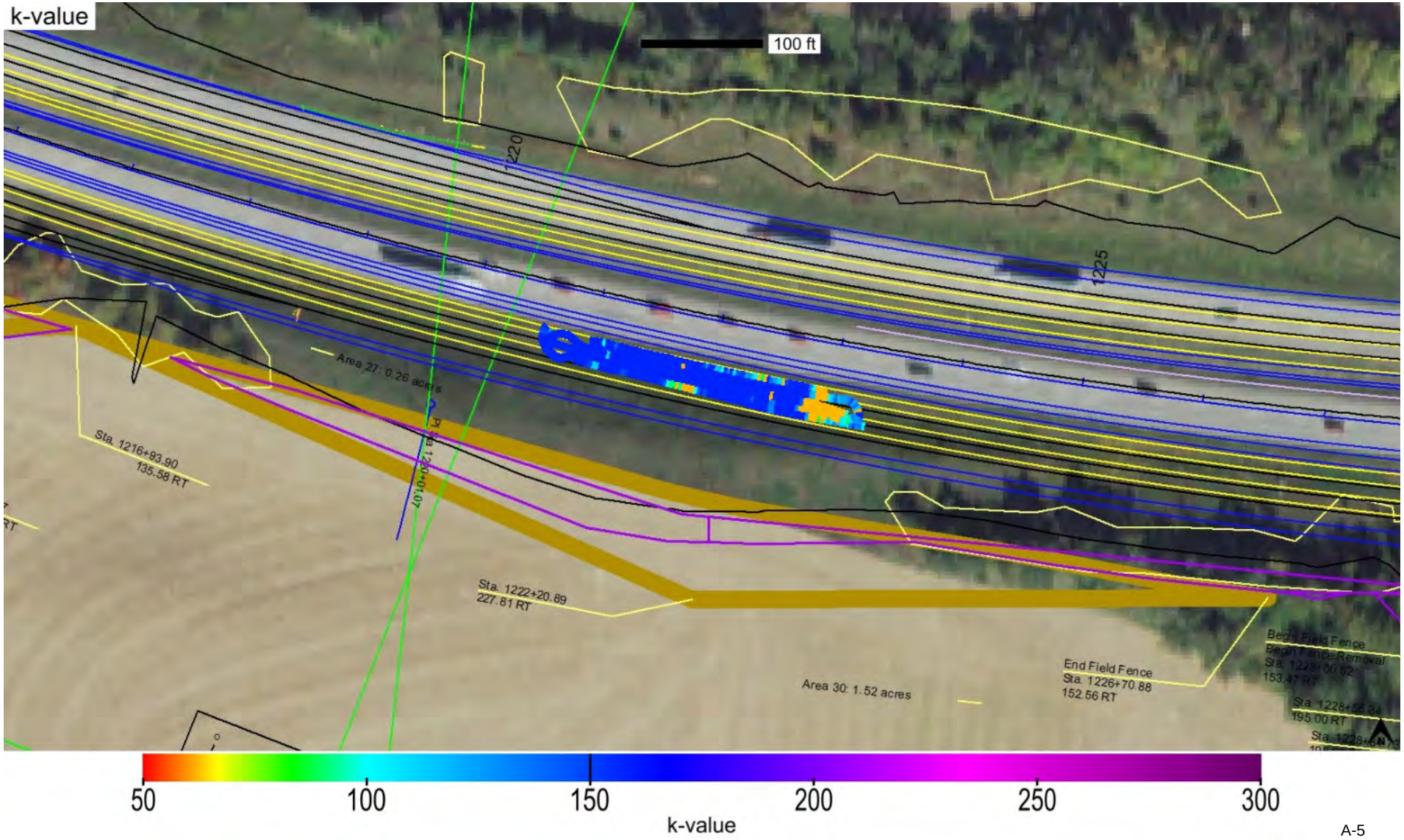


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 72.7 | 96.7 | 1.0 | 150.0 | 62.0 | 141.0 | 157.0 | 31.0 | 22.0 | -88.0 | -9.0 | 7.0 |



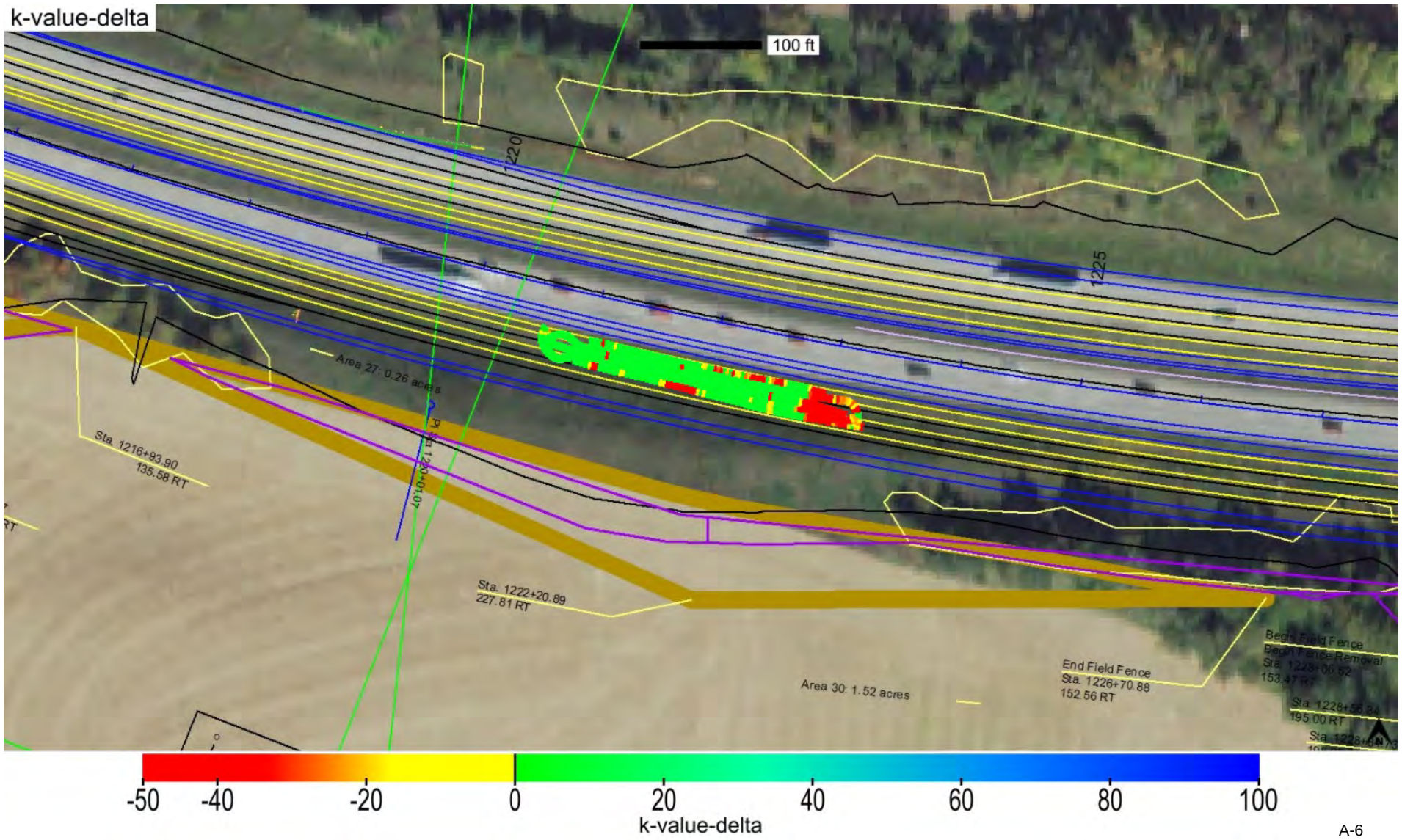



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 72.7 | 96.7 | 1.0 | 150.0 | 62.0 | 141.0 | 157.0 | 31.0 | 22.0 | -88.0 | -9.0 | 7.0 |



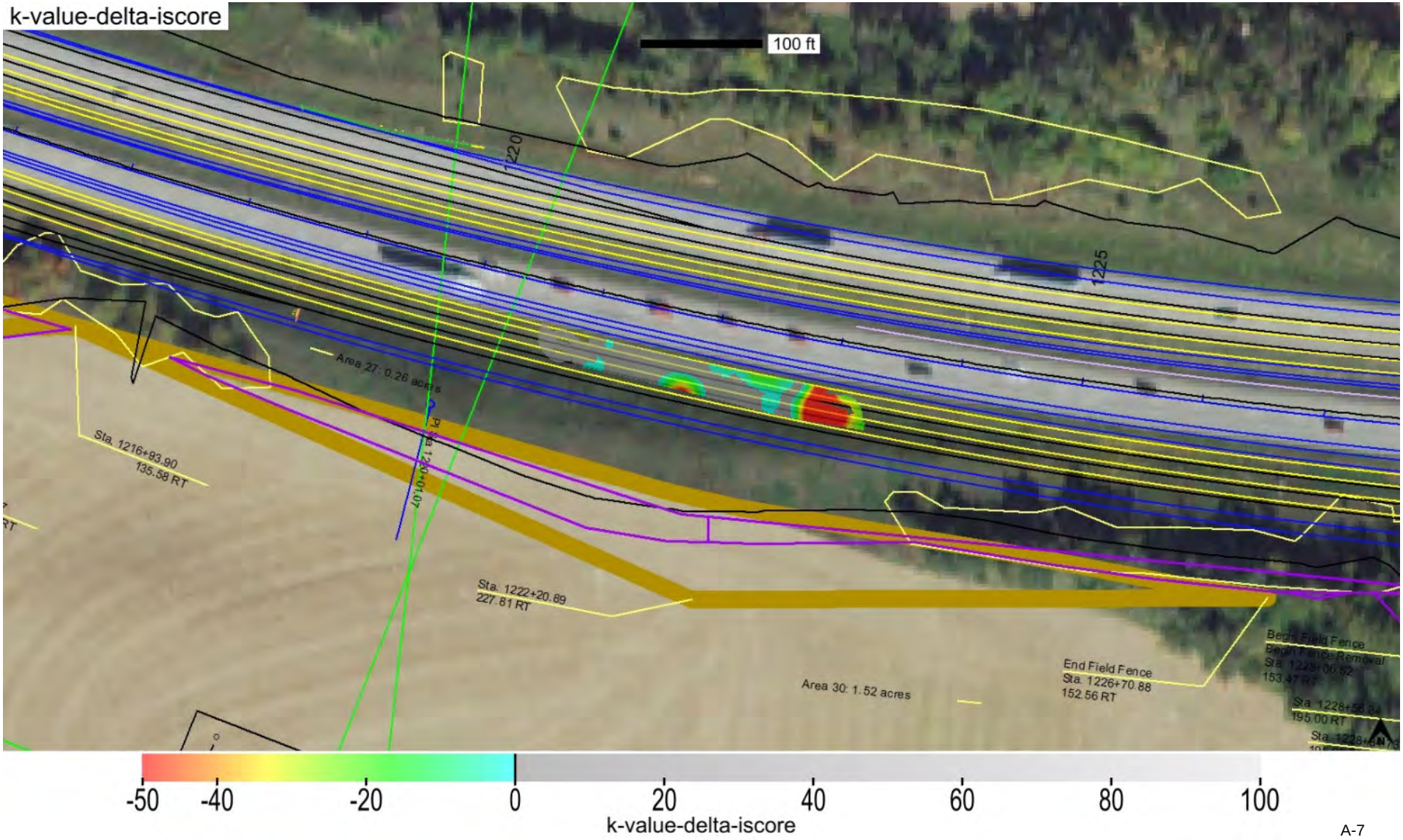



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 72.7 | 150.0 | -88.0 | -9.0 | 7.0 | -86.2 | -8.7 | 7.0 |



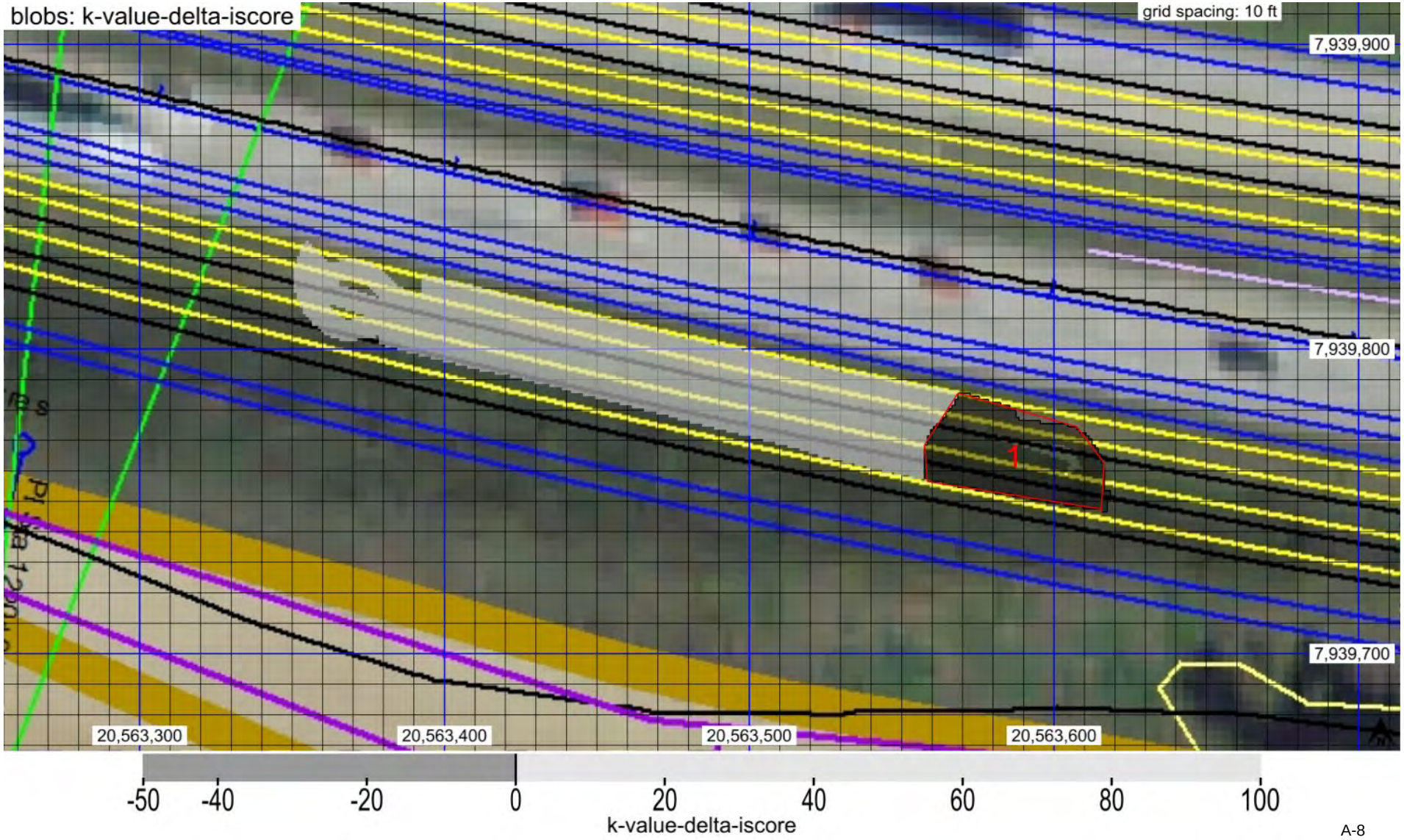



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 1 | 1427 | 20.1 | none | 0.0 | 4.0 |






This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 1427 | 100.0 | 7 | -86.2 | -49.1 | 0.0 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20563616 | **7939746** |
| 2 | **20563616** | 7939762 |
| 3 | 20563608 | 7939774 |
| 4 | 20563568 | **7939786** |
| 5 | **20563558** | 7939768 |
| 6 | 20563558 | 7939756 |
| 7 | 20563616 | 7939748 |
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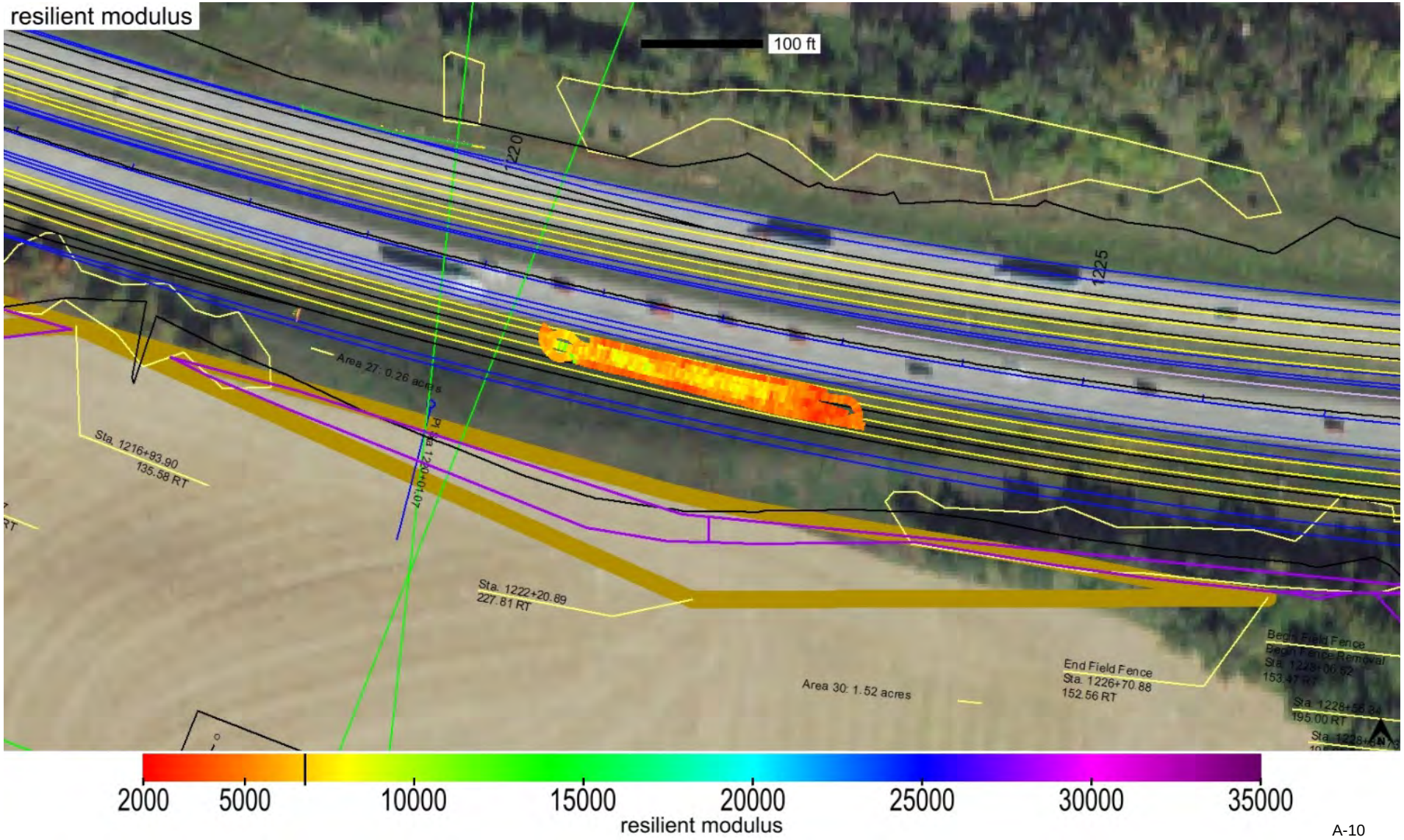


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 23.7 | 46.3 | 0.9 | 6778.0 | 2856.5 | 5638.3 | 11000.0 | 1397.0 | 24.8 | -3921.5 | -1139.7 | 4222.0 |



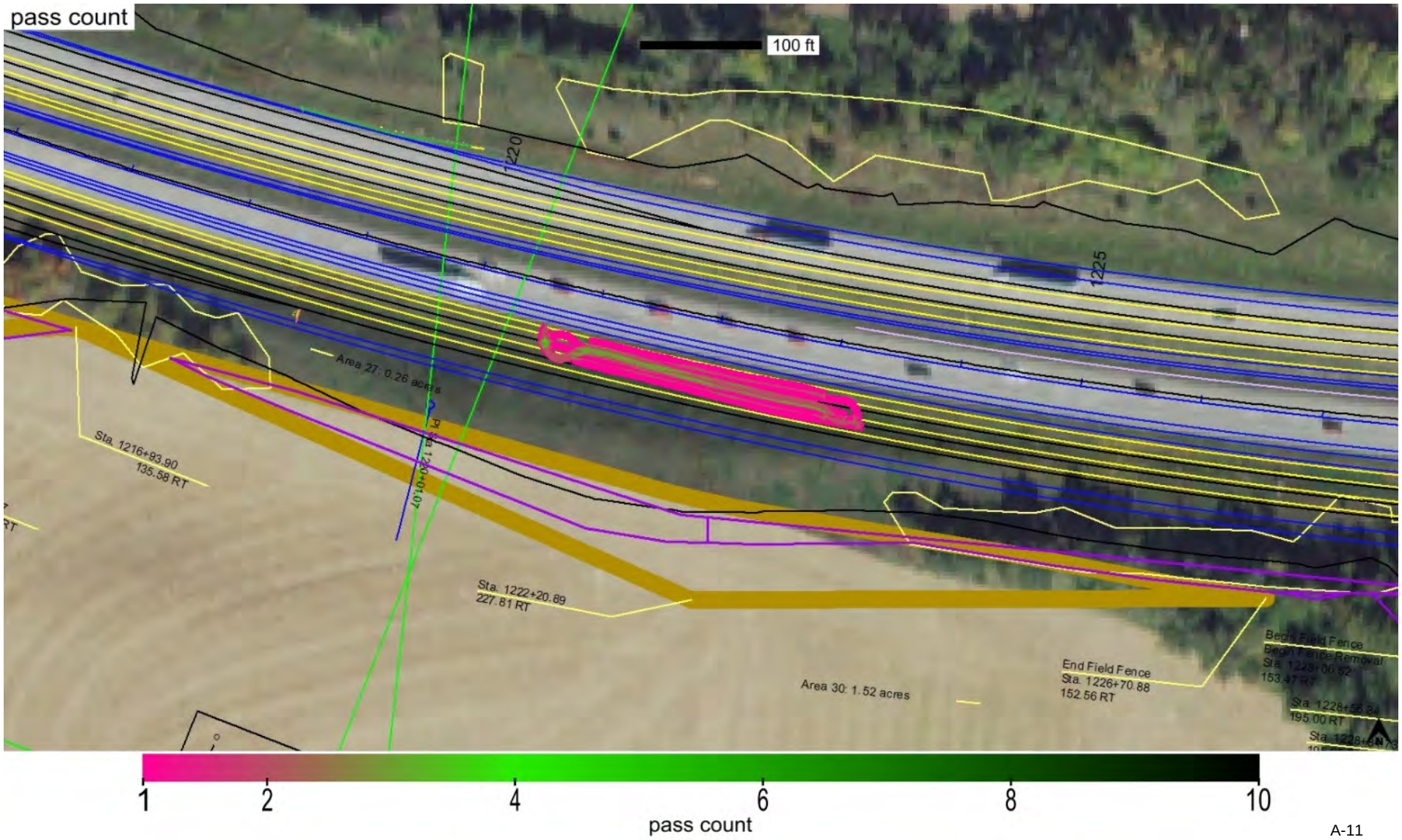



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.5 | 4 |



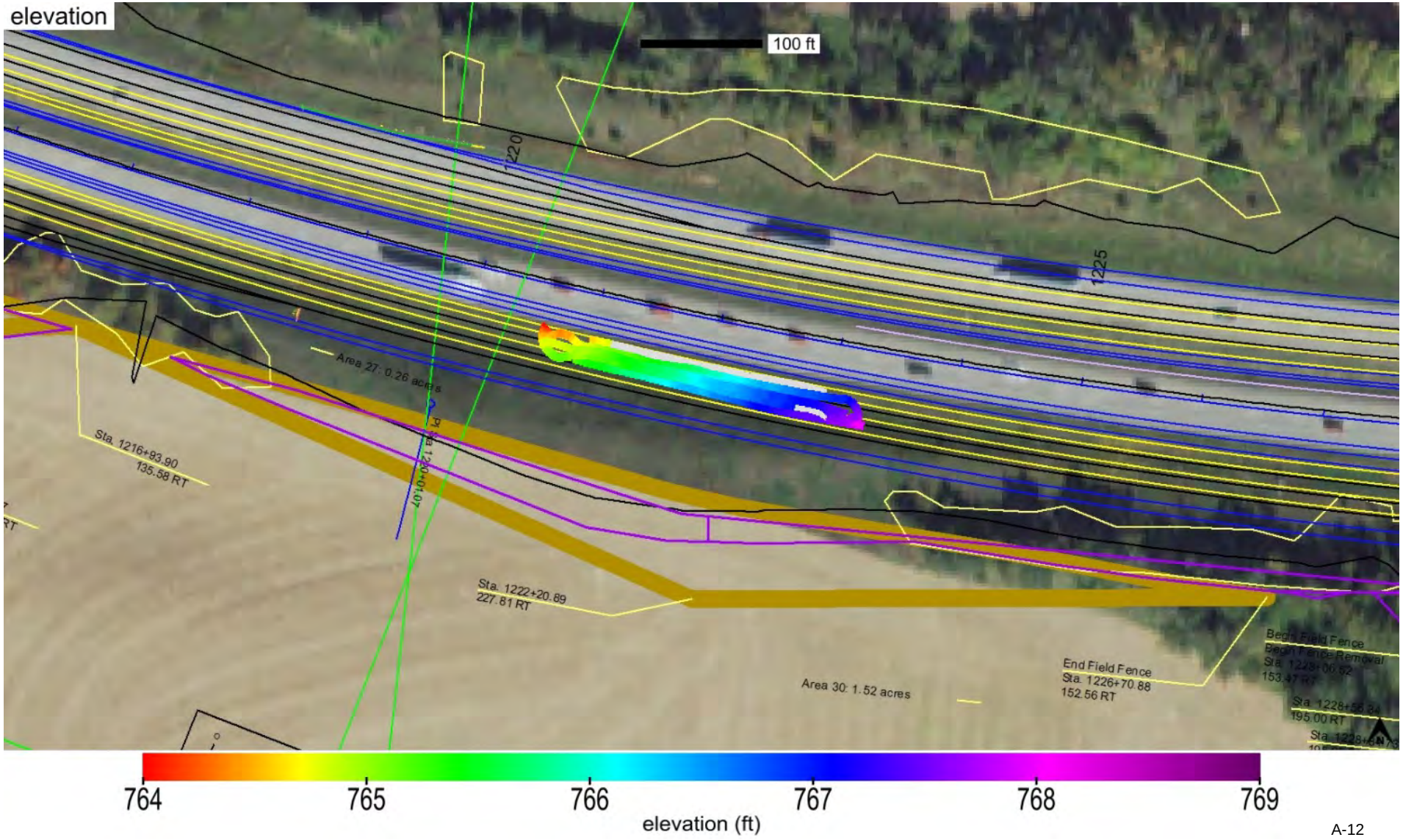



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 764.04 | 766.12 | 768.03 |



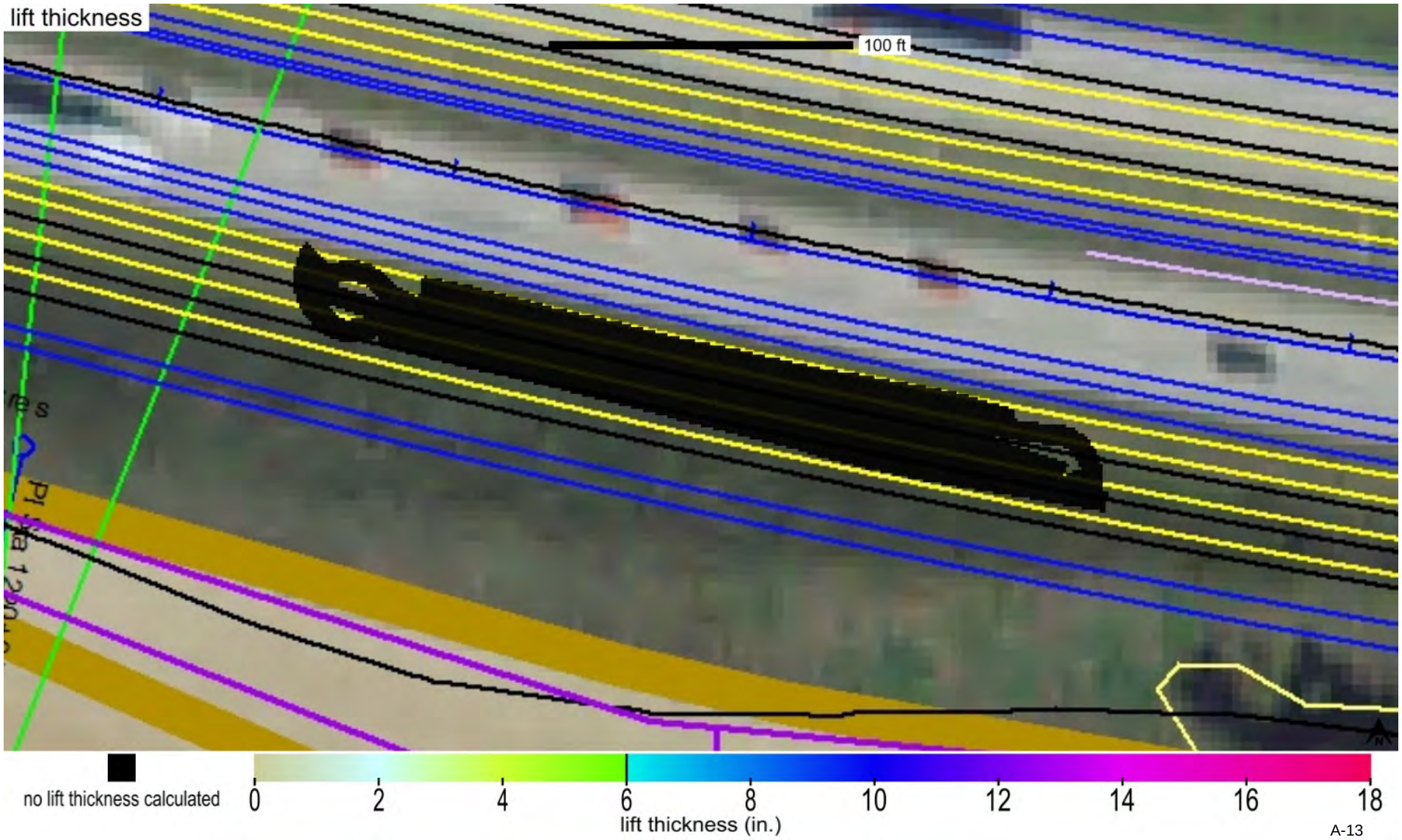



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |



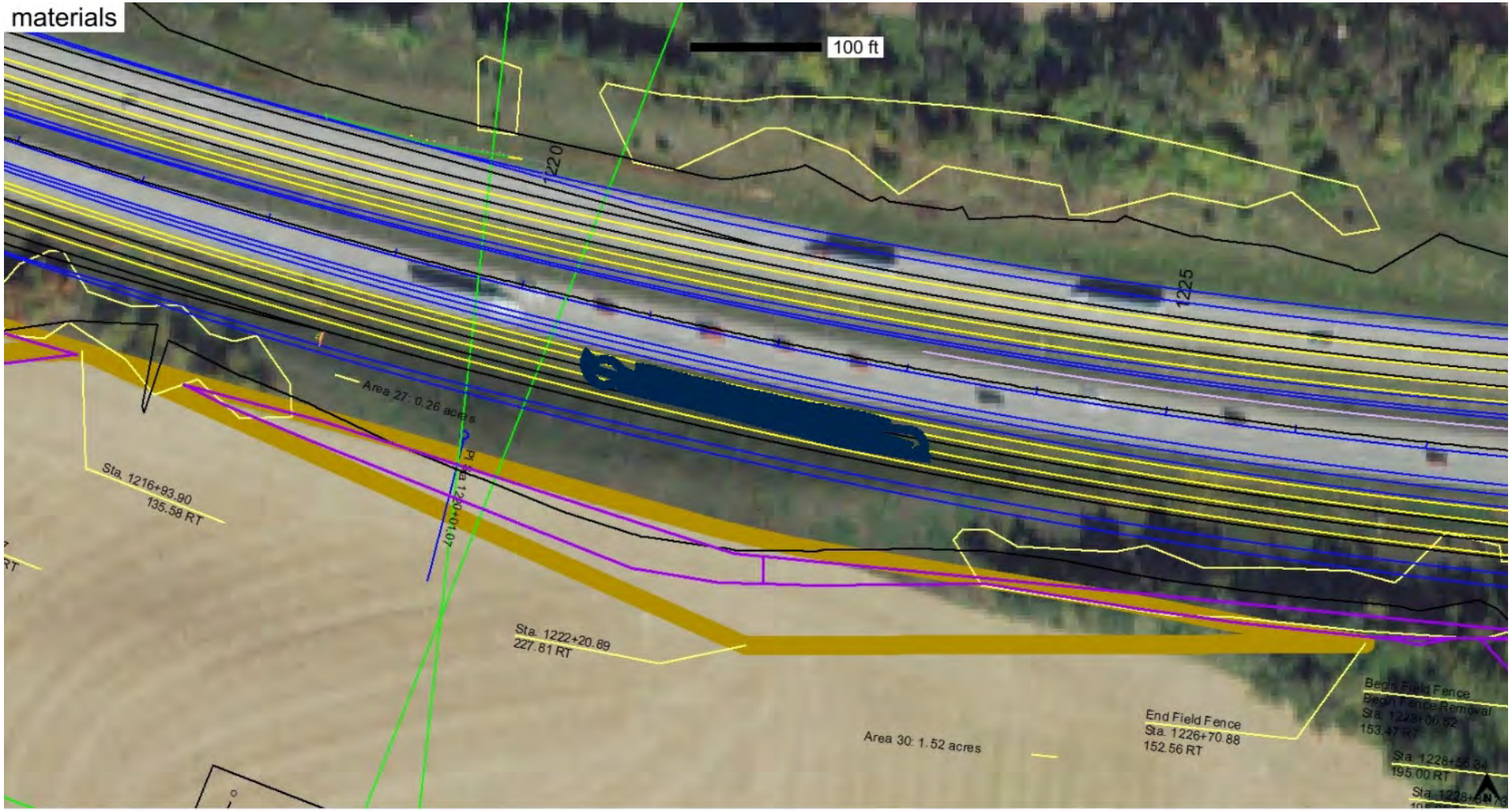



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 7089 | 0.163 | 100.0 | 6778.0 | 150.0 | 20.5 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

9/8/2022 2:55:27 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-17003.JPG



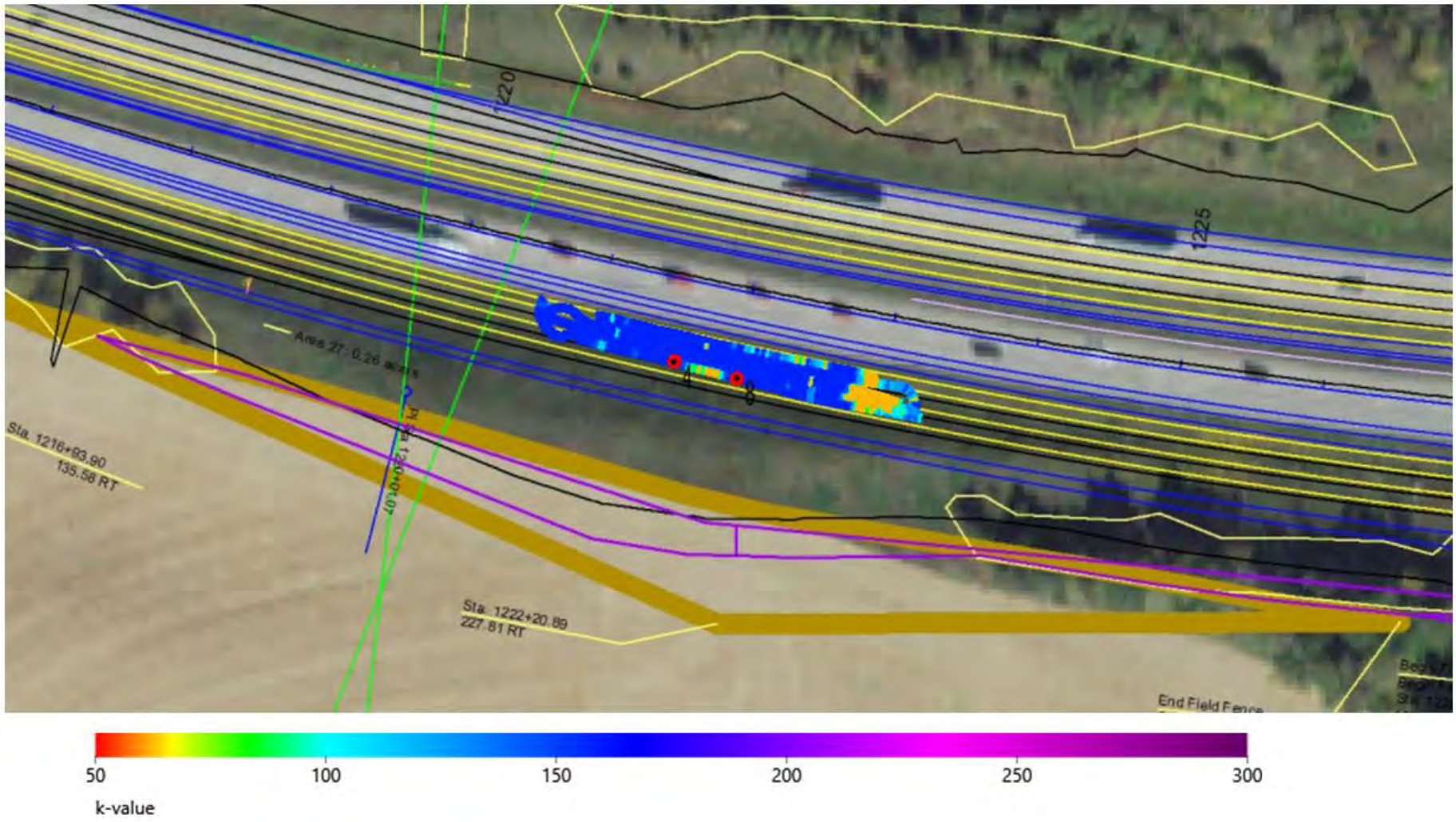


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_170036 Map Type: Verification Map Map Layer: Subbase 6 Inches

9/8/2022 3:21:57 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-170036-POINT-4-AND-8-3D-map-kvalue-w-legend.jpg






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9/8/2022 3:24:02 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-170036-DCP-I80-Johnson-20220811-PT4.jpg

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date of Test | 9/9/2022 | Test ID | PT_4 | Operator | CV | ASTM | D6951 |
| Easting (FT) | 20563446.5 | | Northing (FT) | 7939788.7 | | Elevation (ft) | 767.9 |
| Location | South Lane | | Station | 1221+50 | | | |
| Comments | Top of granular subbase layer over nominal 12 in. of special backfill layer with recycled asphalt pavement material. Subgrade layer beneath the special backfill layer is CL material. Testing performed after one compaction pass using the RT machine in vibratory mode. Difficulty in extracting the DCP rod. | | | | | | |

| Parameter | DPI (mm/blow) | CBR (%) | $E_{CBR}$, Elastic Modulus (ksi) (non stress-dependent) | $S_{u\,CBR}$, Bearing Capacity (psf) |
|---|---|---|---|---|
| Avg. Top Layer | 25.0 | 7.9 | 9.6 | 2,161 |
| Avg. Bottom Layer | 7.1 | 32.7 | 23.8 | 5,536 |
| Ratio of Avg. Top/Bottom Layer | 3.5 | 0.2 | 0.4 | 0.4 |
| Std.Dev. Top Layer | 14.6 | 5.5 | 7.6 | 1,686 |
| Std. Dev. Bottom Layer | 3.7 | 16.2 | 15.2 | 3,468 |

NOTE: *Top layer thickness assumed (nominal)*

NOTES:
Subgrade is classified as CL

[1] CBR = 292/DPI^1.12

[2] CBR = 1/(0.017(1/DPI))^2
for CL soils with CBR < 10

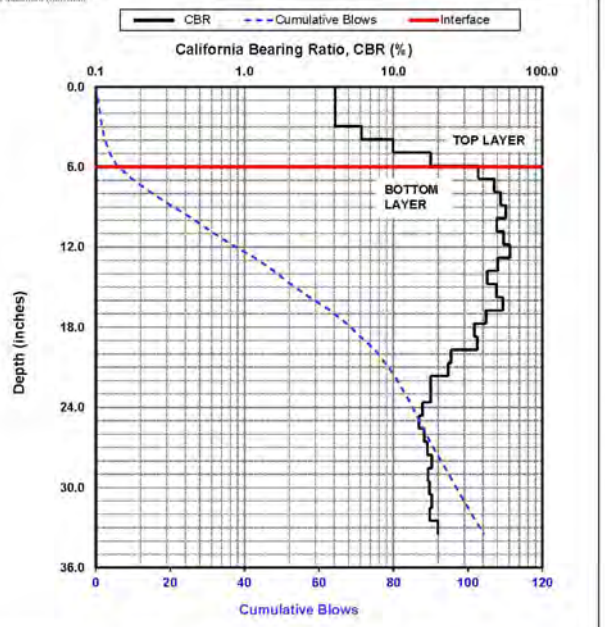
[3] E (ksi) = (17.6 CBR^0.64) x 0.1450377

[4] $S_u$ (psf) = (3.764 x CBR^0.705) x 144

[1] ASTM D6951-03

[2] Powell et al. (1955)

[3] Portland Cement Assoc. (1955)




**Dynamic Cone Penetrometer (DCP) Test Results**

| | |
|---|---|
| Project Name: | Johnson County I-80, IM-NHS-080-7(174)248--03-52 |
| Project ID: | SIA-00011 |
| Location: | I-80, Johnson County, Iowa |

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9/8/2022 3:24:47 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-170036-DCP-I80-Johnson-20220811-PT8.jpg

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date of Test | 8/9/2022 | Test ID | PT_8 | Operator | CV | ASTM | D6951 |
| Easting (FT) | 20563490.1 | | Northing (FT) | 7939777.4 | | Elevation (ft) | 770.5 |
| Location | South Lane | | Station | 1222+00 | | | |
| Comments | Top of granular subbase layer over nominal 12 in. of special backfill layer with recycled asphalt pavement material. Subgrade layer beneath the special backfill layer is CL material. Testing performed after one compaction pass using the RT machine in vibratory mode. Difficulty in extracting the DCP rod. | | | | | | |

| Parameter | DPI (mm/blow) | CBR (%) | $E_{CBR}$, Elastic Modulus (ksi) (non stress-dependent) | $S_{v\,CBR}$, Bearing Capacity (psf) |
|---|---|---|---|---|
| Avg. Top Layer | 23.1 | 8.7 | 10.2 | 2,294 |
| Avg. Bottom Layer | 8.7 | 25.8 | 20.4 | 4,727 |
| Ratio of Avg. Top/Bottom Layer | 2.6 | 0.3 | 0.5 | 0.5 |
| Std.Dev. Top Layer | 7.0 | 3.1 | 5.2 | 1,152 |
| Std. Dev. Bottom Layer | 5.2 | 13.5 | 13.5 | 3,072 |

NOTE: *Top layer thickness assumed (nominal)*

NOTES:
Subgrade is classified as CL

[1] CBR = 292/DPI^1.12

[2] CBR = 1/(0.017(1/DPI))^2
for CL soils with CBR < 10

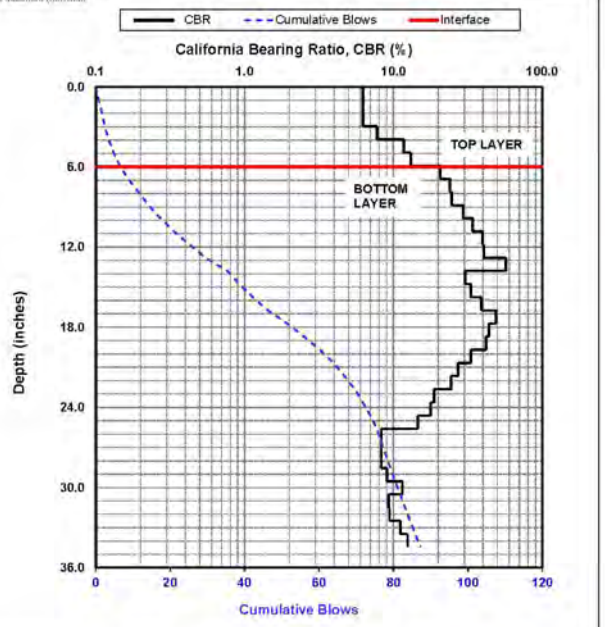
[3] E (ksi) = (17.6 CBR^0.64) x 0.1450377

[4] $S_v$ (psf) = (3.764 x CBR^0.705) x 144

[1] ASTM D6951-03

[2] Powell et al. (1955)

[3] Portland Cement Assoc. (1955)




**Dynamic Cone Penetrometer (DCP) Test Results**

| | |
|---|---|
| Project Name: | Johnson County I-80, IM-NHS-080-7(174)248--03-52 |
| Project ID: | SIA-00011 |
| Location: | I-80, Johnson County, Iowa |

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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 5:11:52 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.058 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 3129 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 81.1 | 105.6 | 1.0 | 150.0 | 62.0 | 143.7 | 157.0 | 30.2 | 21.0 | -88.0 | -6.3 | 7.0 |
| Moisture Content | No | | | | | | | | | | | | |

## Mapped Area

| square feet | acres |
|---|---|
| 3129 | 0.072 |

## Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.4 | 3 |

## Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 763.00 | 764.12 | 765.22 |

## Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.3 | 5.0 | 5.5 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 3129 | 0.072 | 100.0 | 3600.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 0 | 0 | 0.0 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

## Station

| Start | End |
|---|---|
| 1221+00 | 1223+00 |



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 5:11:52 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.058 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 3129 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| **105.6** | CQI > = 95 |
| **81.1** | 80% of k-Value MVs >= 150 |
| **21.0** | COV <= 30 |
| 0.0 | % i-Score Blob Area >= 1000 ft^2 |
| **0.0** | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

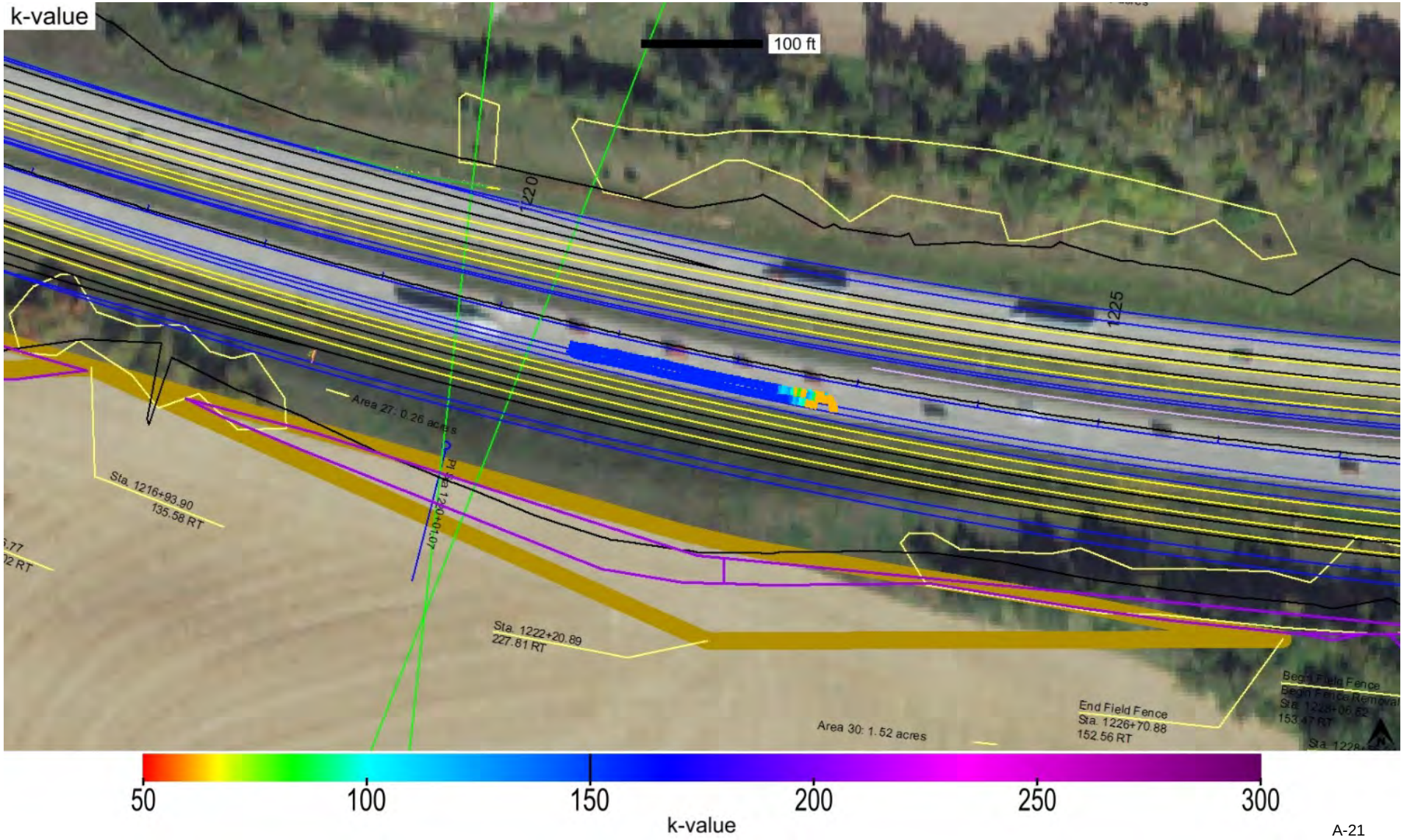


This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 81.1 | 105.6 | 1.0 | 150.0 | 62.0 | 143.7 | 157.0 | 30.2 | 21.0 | -88.0 | -6.3 | 7.0 |



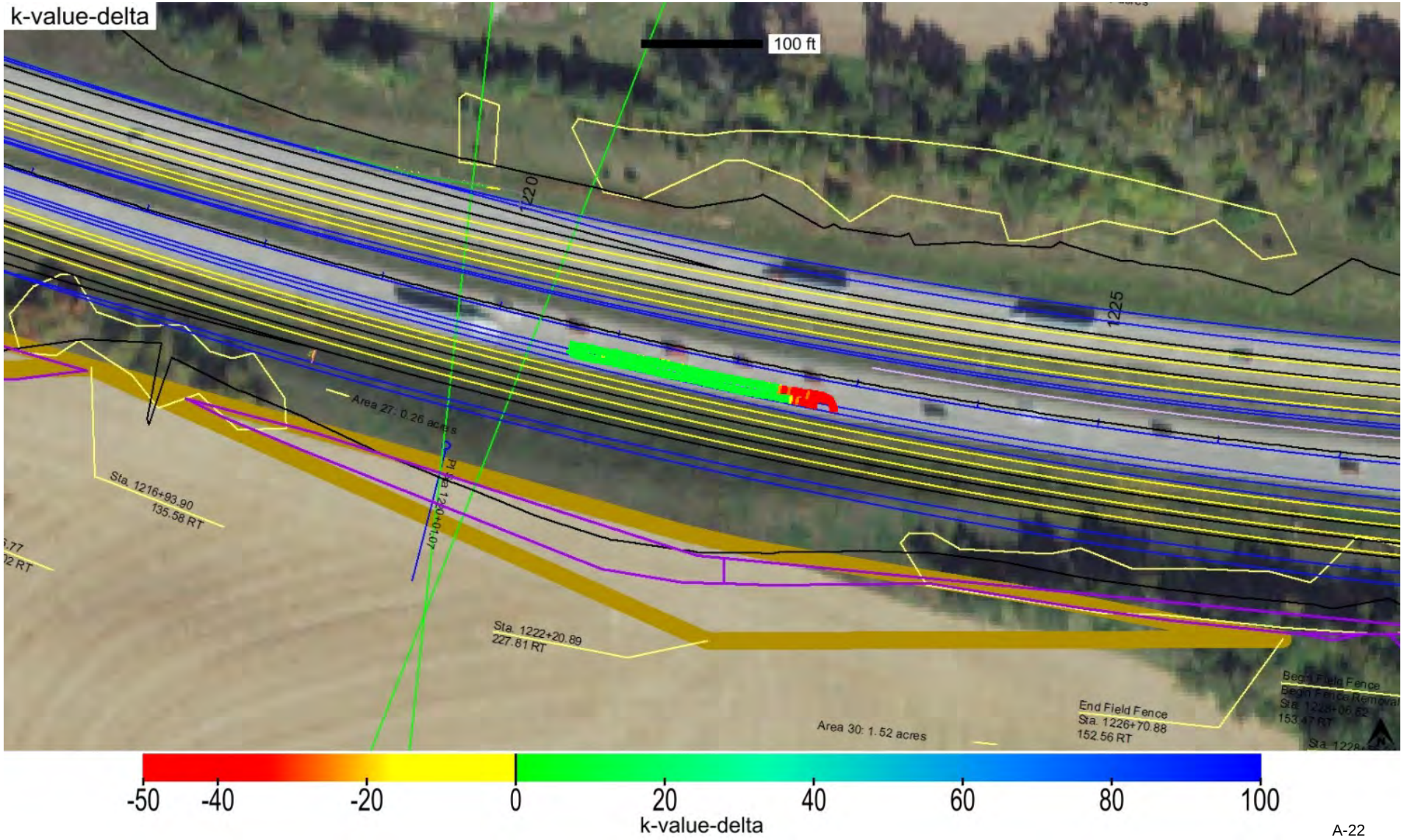



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 81.1 | 105.6 | 1.0 | 150.0 | 62.0 | 143.7 | 157.0 | 30.2 | 21.0 | -88.0 | -6.3 | 7.0 |



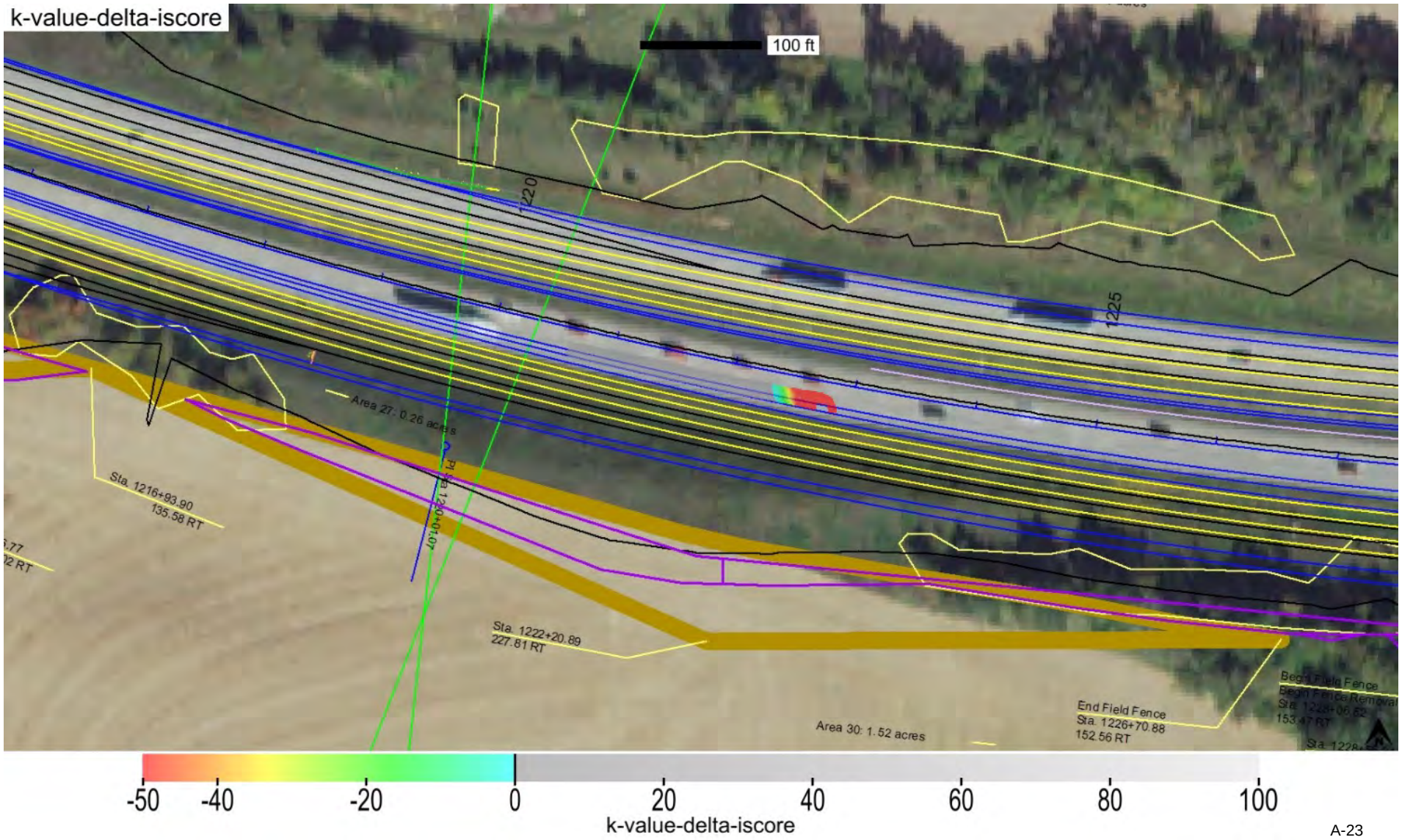



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 81.1 | 150.0 | -88.0 | -6.3 | 7.0 | -88.0 | -6.3 | 7.0 |



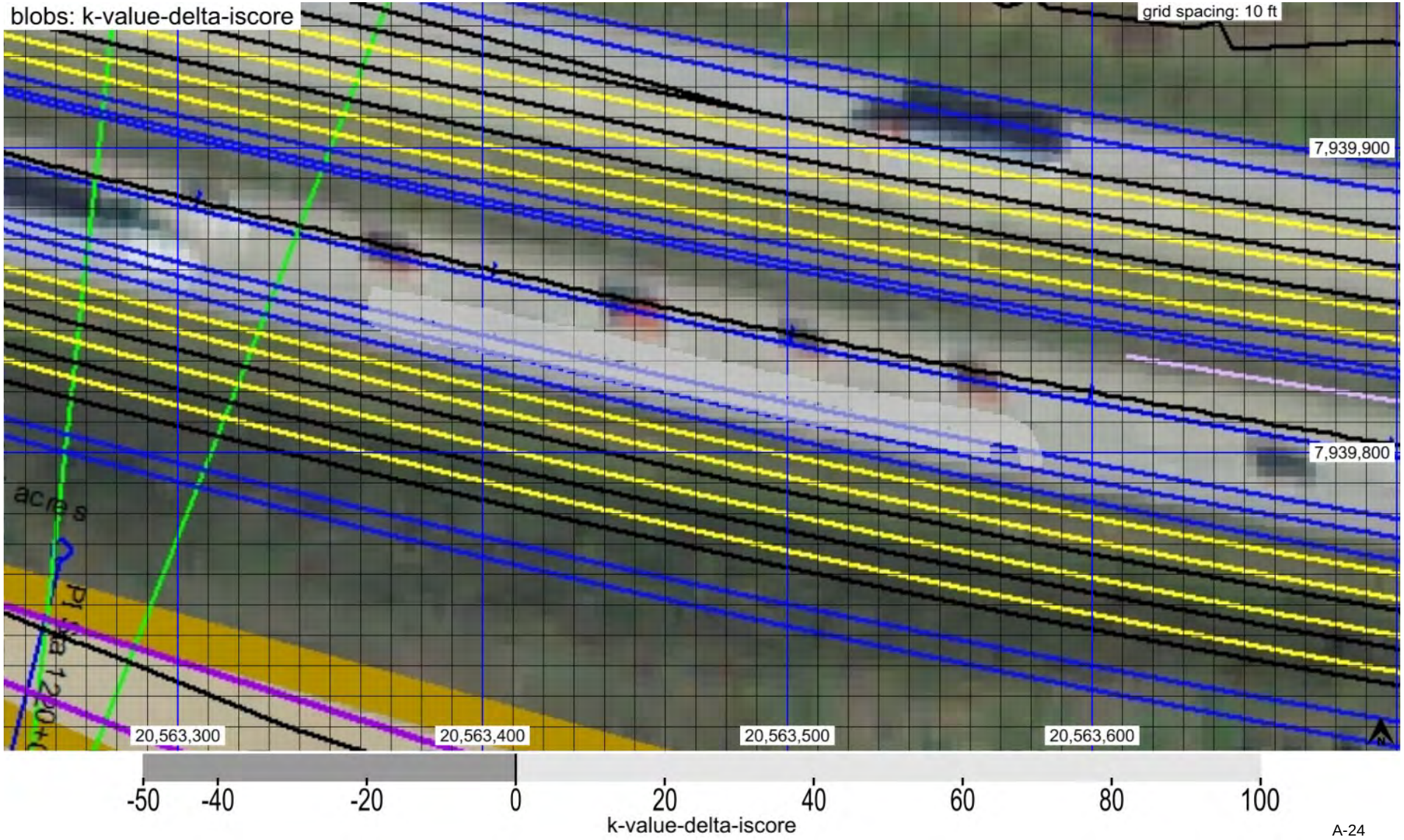



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000.0 | 0 | 0 | 0 | none | 0 | 4.0 |



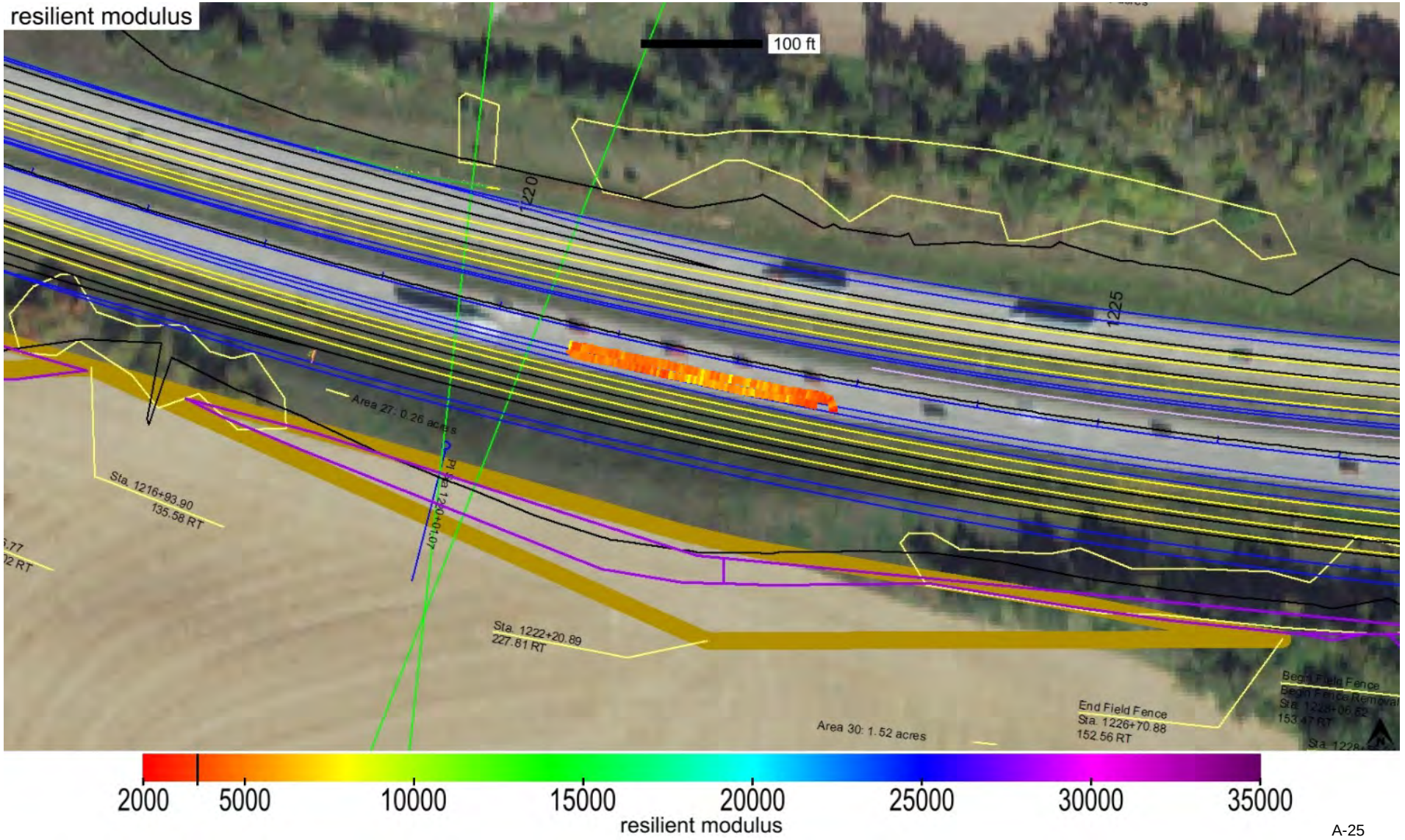



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 96.6 | 122.2 | 1.1 | 3600.0 | 2705.0 | 5076.7 | 8377.6 | 958.5 | 18.9 | -895.0 | 1476.7 | 4777.6 |



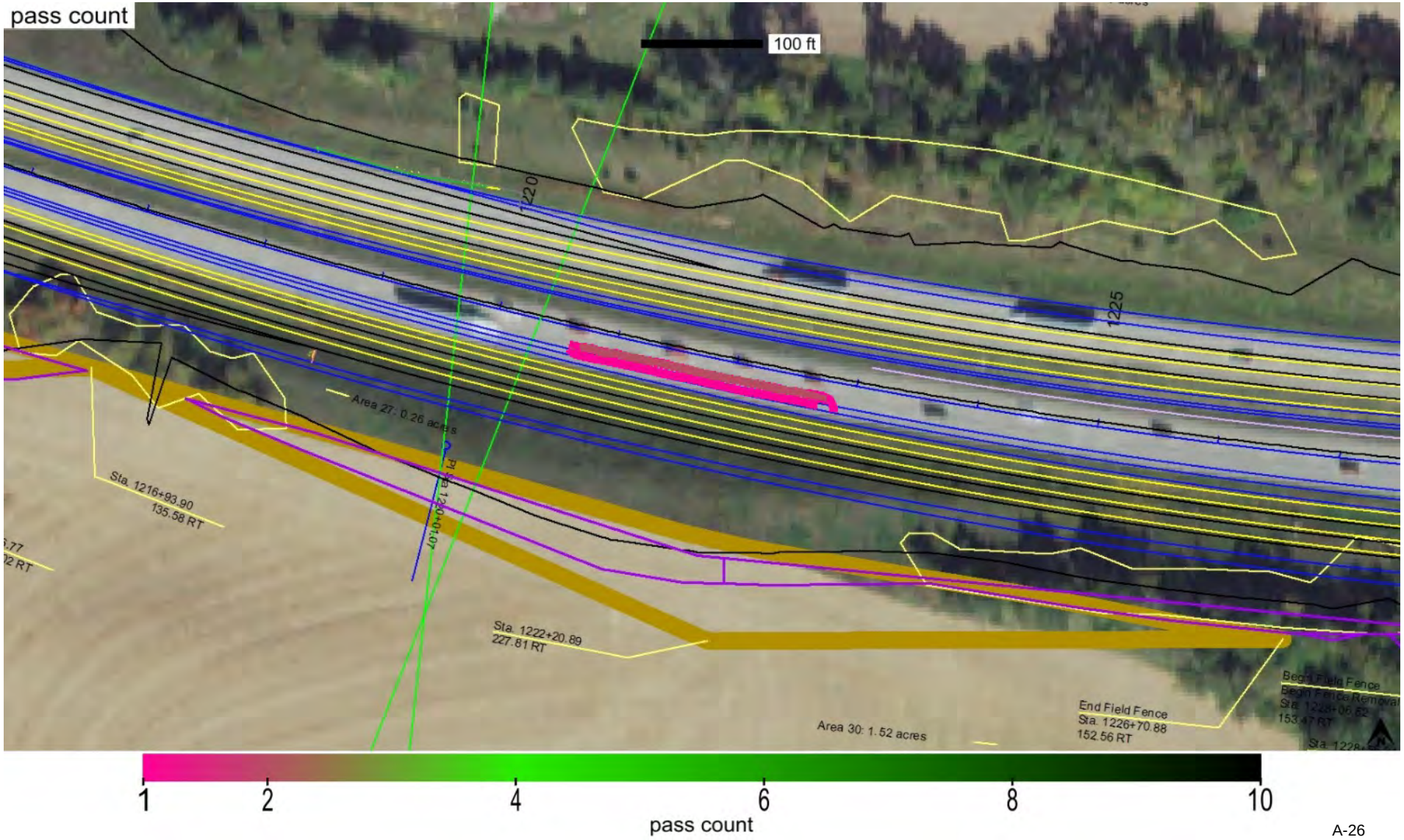



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.4 | 3 |



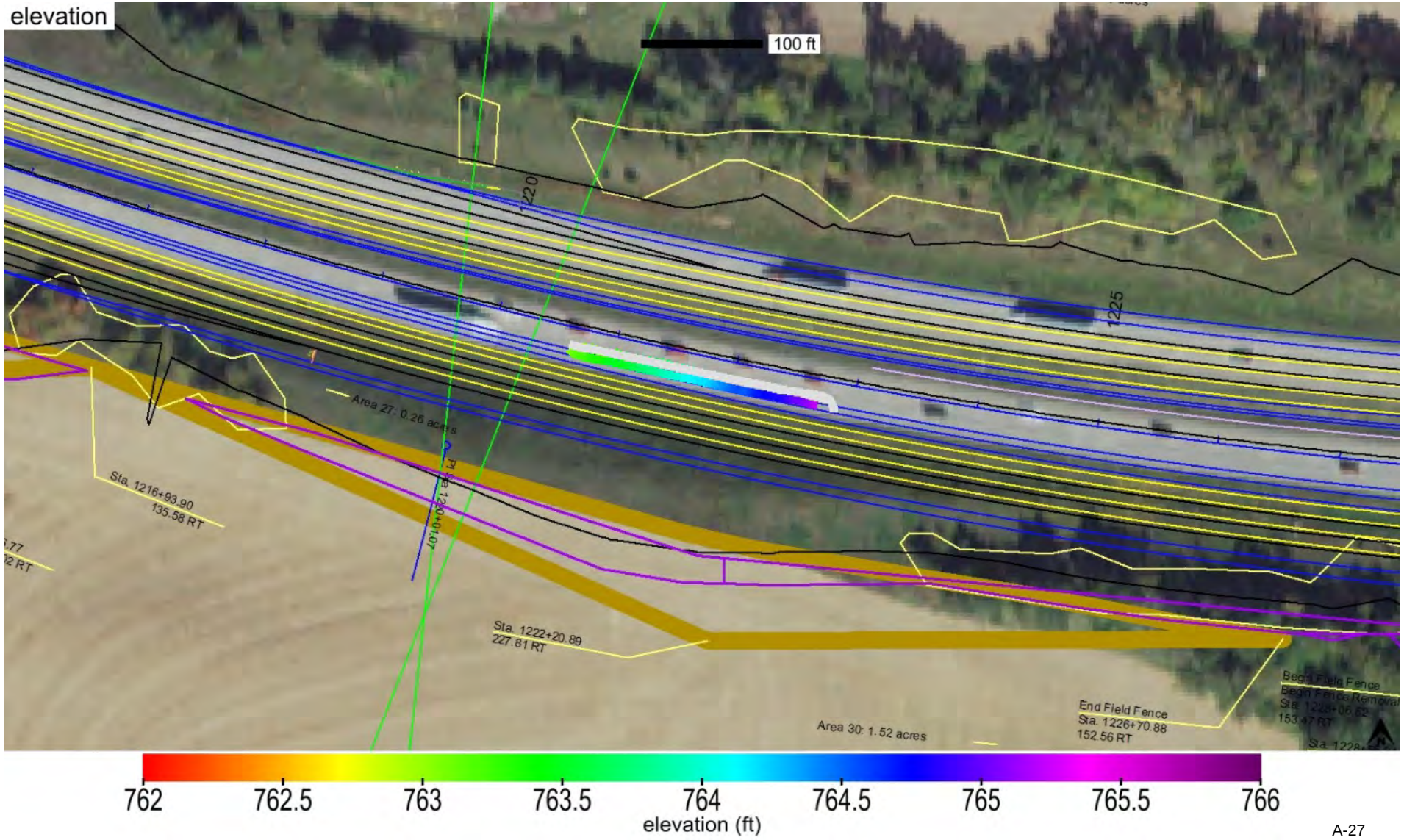



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 763.00 | 764.12 | 765.22 |



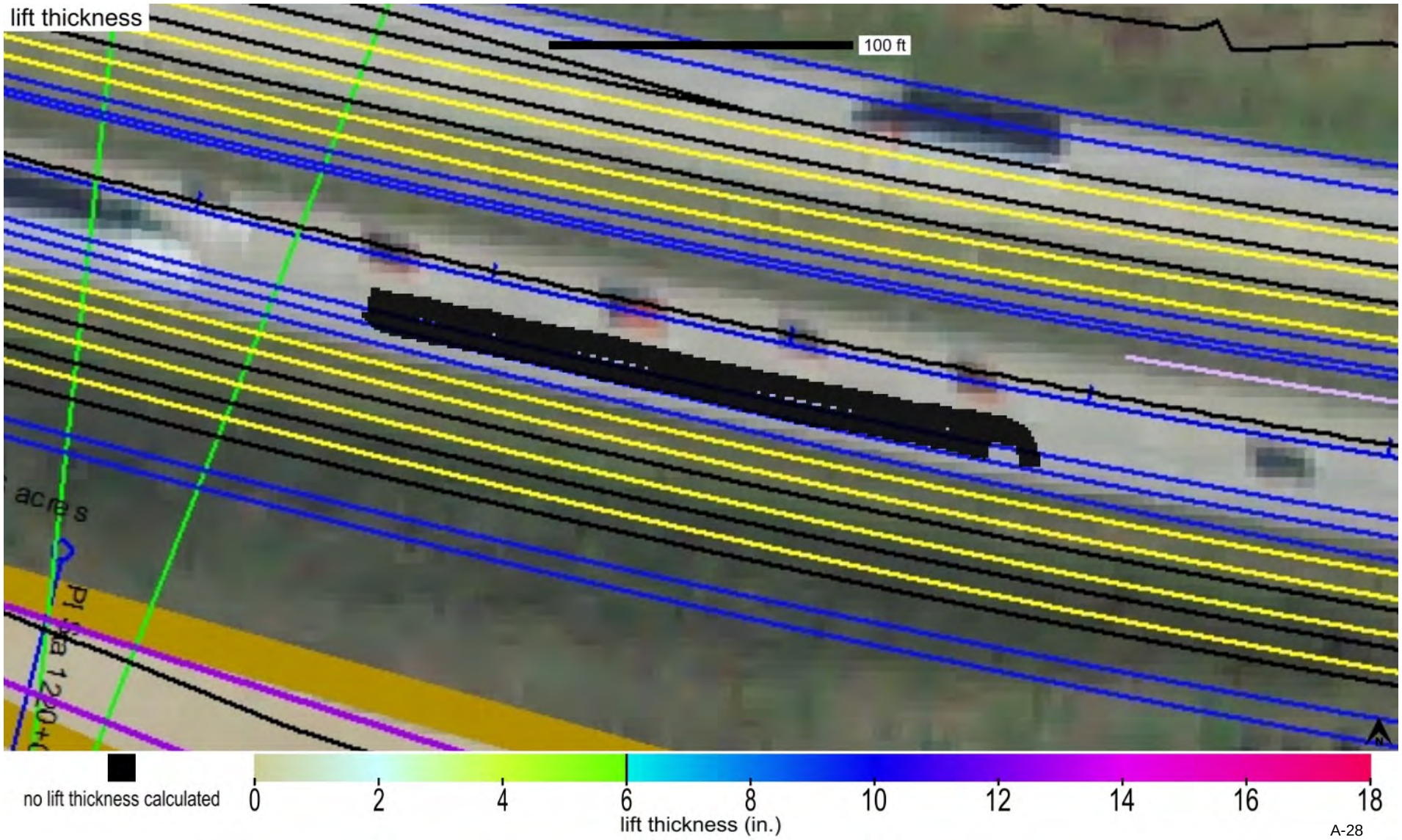



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 3129 | 0.072 | 100.0 | 3600.0 | 150.0 | 20.5 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

9/8/2022 2:56:45 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-171152.JPG



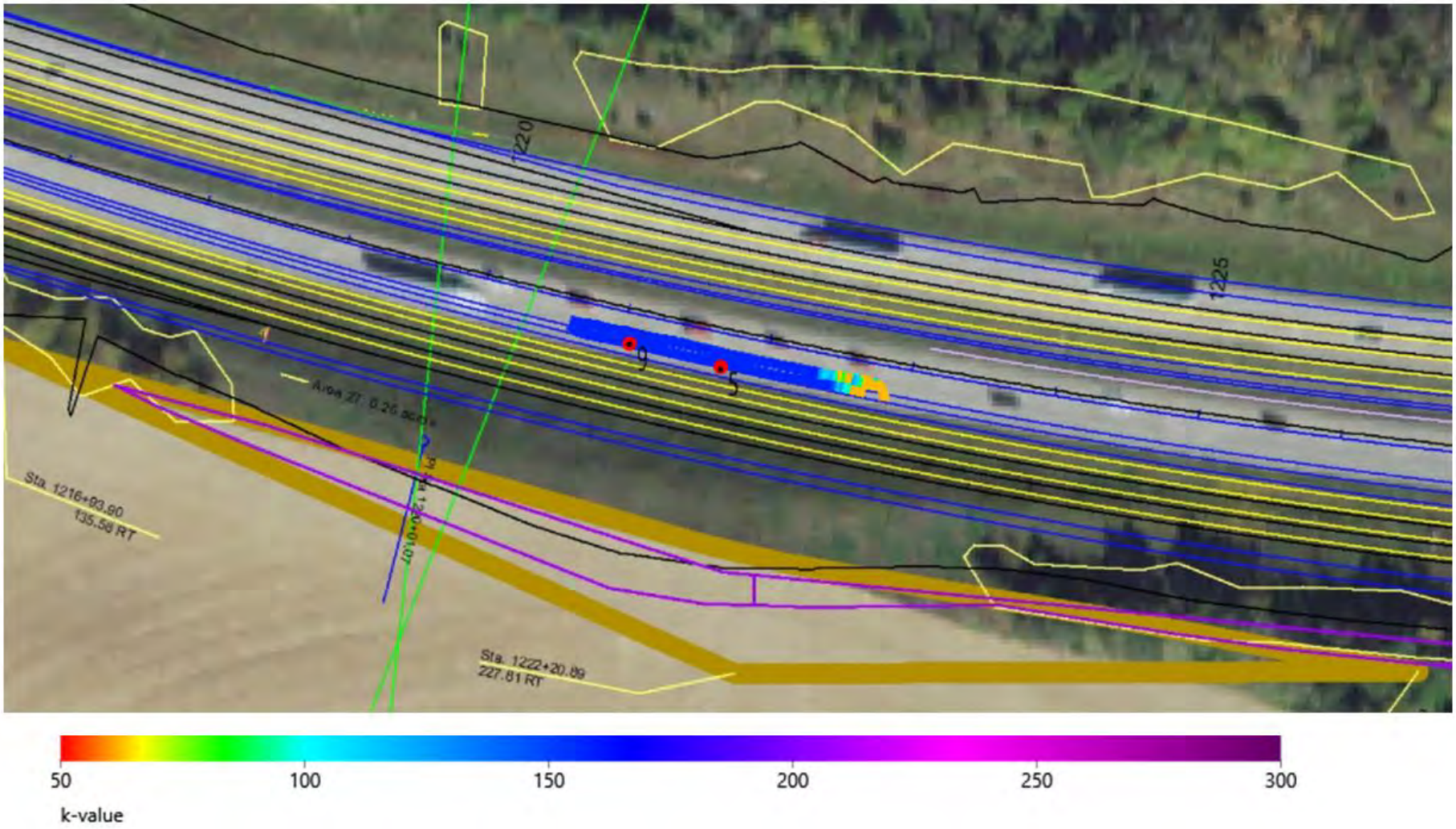


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_171152 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

9/8/2022 3:25:25 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-171152-POINT-5-AND-9-3D-map-kvalue-w-legend.jpg






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ingios GEOTECHNICS

9/8/2022 3:26:56 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-171152-DCP-I80-Johnson-20220811-PT5.jpg

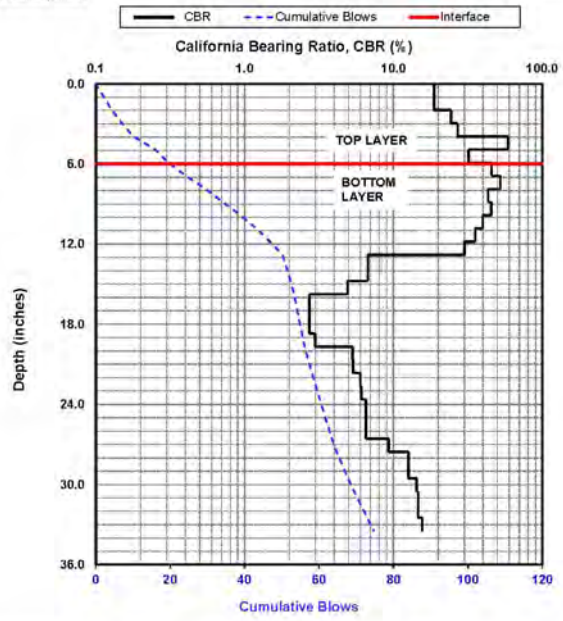
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date of Test | 9/9/2022 | Test ID | PT_5 | Operator | CV | ASTM | D6951 |
| Easting (FT) | 20563466.7 | | Northing (FT) | 7939817.2 | | Elevation (ft) | 765.0 |
| Location | Inside Shoulder | | Station | 1221+75 | | | |
| Comments | Top of granular subbase layer over nominal 12 in. of special backfill layer with recycled asphalt pavement material. Subgrade layer beneath the special backfill layer is CL material. Testing performed after one compaction pass using the RT machine in vibratory mode. Difficulty in extracting the DCP rod. | | | | | | |

| Parameter | DPI (mm/blow) | CBR (%) | $E_{CBR}$, Elastic Modulus (ksi) (non stress-dependent) | $S_{v\,CBR}$, Bearing Capacity (psf) |
|---|---|---|---|---|
| Avg. Top Layer | 7.7 | 29.9 | 22.4 | 5,212 |
| Avg. Bottom Layer | 12.7 | 16.9 | 15.6 | 3,576 |
| Ratio of Avg. Top/Bottom Layer | 0.6 | 1.8 | 1.4 | 1.5 |
| Std.Dev. Top Layer | 2.8 | 15.0 | 14.4 | 3,299 |
| Std. Dev. Bottom Layer | 10.5 | 17.0 | 15.7 | 3,588 |

NOTE: *Top layer thickness assumed (nominal)*

NOTES:
Subgrade is classified as CL
[1] CBR = 292/DPI^1.12
[2] CBR = 1/(0.017610(DPI))^2
for CL soils with CBR < 10
[3] E (ksi) = (17.6 CBR^0.64) x 0.1450377
[4] $S_v$ (psf) = (3.764 x CBR^0.705) x 144

[1] ASTM D6951-03
[2] Powell et al. (1984)
[3] Portland Cement Assoc. (1984)




**Dynamic Cone Penetrometer (DCP) Test Results**

| | |
|---|---|
| Project Name: | Johnson County I-80, IM-NHS-080-7(174)248--03-52 |
| Project ID: | SIA-00011 |
| Location: | I-80, Johnson County, Iowa |

ingios GEOTECHNICS



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ingios GEOTECHNICS

9/8/2022 3:28:55 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-171152-DCP-I80-Johnson-20220811-PT9.jpg

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date of Test | 8/9/2022 | Test ID | PT_9 | Operator | CV | ASTM | D6951 |
| Easting (FT) | 20563403.8 | | Northing (FT) | 7939834.7 | | Elevation (ft) | 765.5 |
| Location | Inside Shoulder | | Station | 1221+00 | | | |
| Comments | Top of granular subbase layer over nominal 12 in. of special backfill layer with recycled asphalt pavement material. Subgrade layer beneath the special backfill layer is CL material. Testing performed after one compaction pass using the RT machine in vibratory mode. Difficulty in extracting the DCP rod. | | | | | | |

| Parameter | DPI (mm/blow) | CBR (%) | $E_{CBR}$, Elastic Modulus (ksi) (non stress-dependent) | $S_{y\,CBR}$, Bearing Capacity (psf) |
|---|---|---|---|---|
| Avg. Top Layer | 5.9 | 40.2 | 27.2 | 6,352 |
| Avg. Bottom Layer | 9.8 | 22.7 | 18.8 | 4,340 |
| Ratio of Avg. Top/Bottom Layer | 0.6 | 1.8 | 1.4 | 1.5 |
| Std.Dev. Top Layer | 1.2 | 10.0 | 11.1 | 2,519 |
| Std. Dev. Bottom Layer | 8.0 | 18.6 | 16.6 | 3,808 |

NOTE: *Top layer thickness assumed (nominal)*

NOTES:

Subgrade is classified as CL

[1] $CBR = 292/DPI^{1.12}$

[2] $CBR = 1/(0.017019*DPI)^2$

for CL soils with CBR < 10

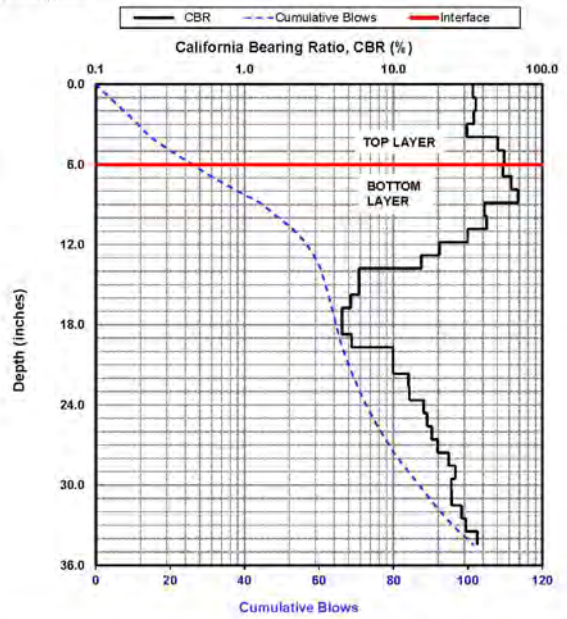
[3] $E_{CBR}$ (ksi) = $(17.6 * CBR^{0.64}) * 0.1450377$

[4] $S_{y\,CBR}$ (psf) = $(3794 * CBR^{0.64}) * 144$

[1] ASTM D6951-03

[2] Powell et al. (1984)

[3] Portland Cement Assoc. (1955)




**Dynamic Cone Penetrometer (DCP) Test Results**

| | |
|---|---|
| Project Name: | Johnson County I-80, IM-NHS-080-7(174)248--03-52 |
| Project ID: | SIA-00011 |
| Location: | I-80, Johnson County, Iowa |

ingios



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 5:35:44 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.141 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 11120 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 96.7 | 130.1 | 7.2 | 150.0 | 62.0 | 156.2 | 157.0 | 4.9 | 3.2 | -88.0 | 6.2 | 7.0 |
| Moisture Content | No | | | | | | | | | | | | |

### Mapped Area

| square feet | acres |
|---|---|
| 11120 | 0.255 |

### Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.5 | 3 |

### Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 760.17 | 762.87 | 765.68 |

### Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.3 | 5.0 | 5.9 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 11120 | 0.255 | 100.0 | 6778.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 0 | 0 | 0.0 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

## Station

| Start | End |
|---|---|
| 1216+00 | 1221+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 5:35:44 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.141 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 11120 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| **130.1** | CQI > = 95 |
| **96.7** | 80% of k-Value MVs >= 150 |
| **3.2** | COV <= 30 |
| 0.0 | % i-Score Blob Area >= 1000 ft^2 |
| **0.0** | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

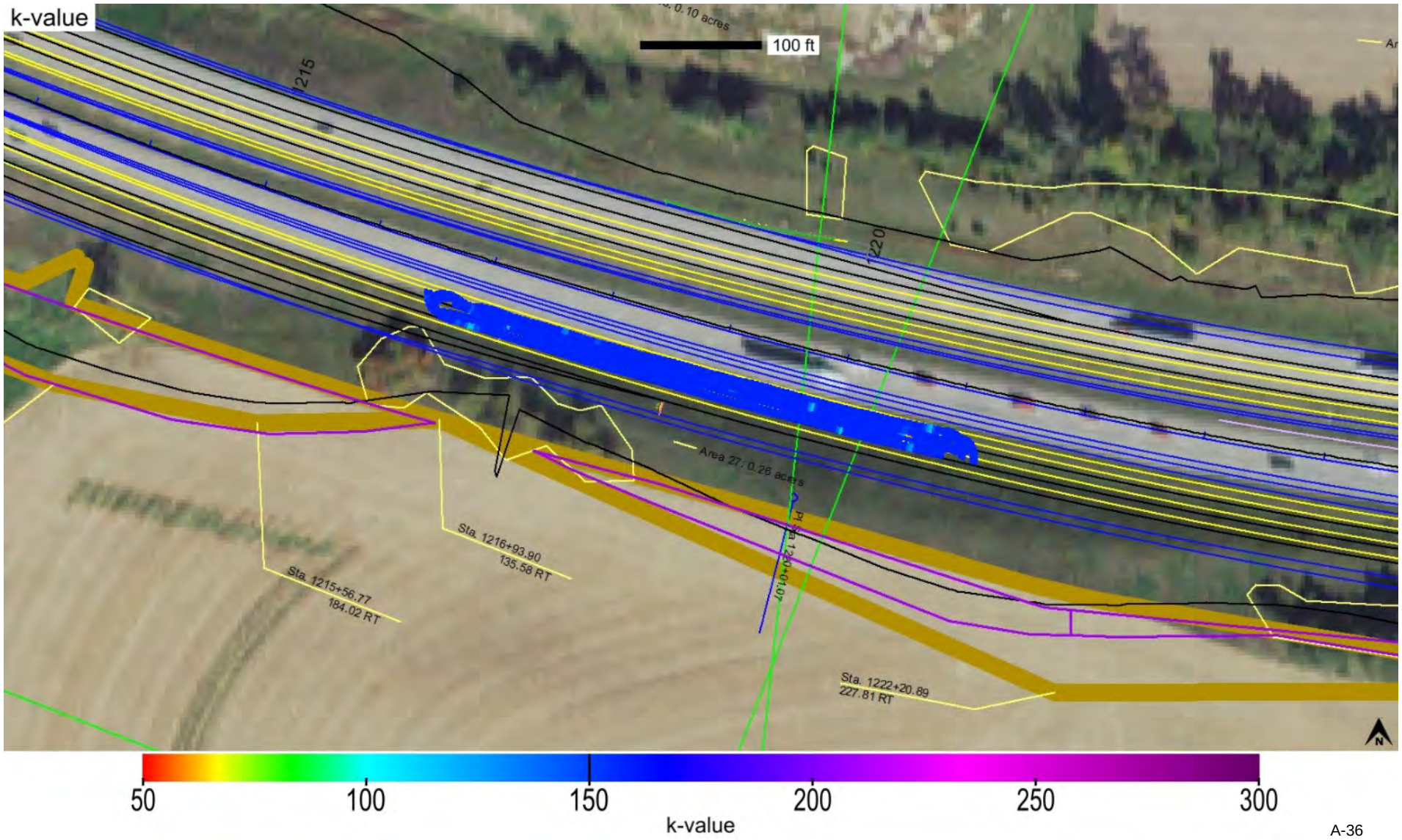


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 96.7 | 130.1 | 7.2 | 150.0 | 62.0 | 156.2 | 157.0 | 4.9 | 3.2 | -88.0 | 6.2 | 7.0 |



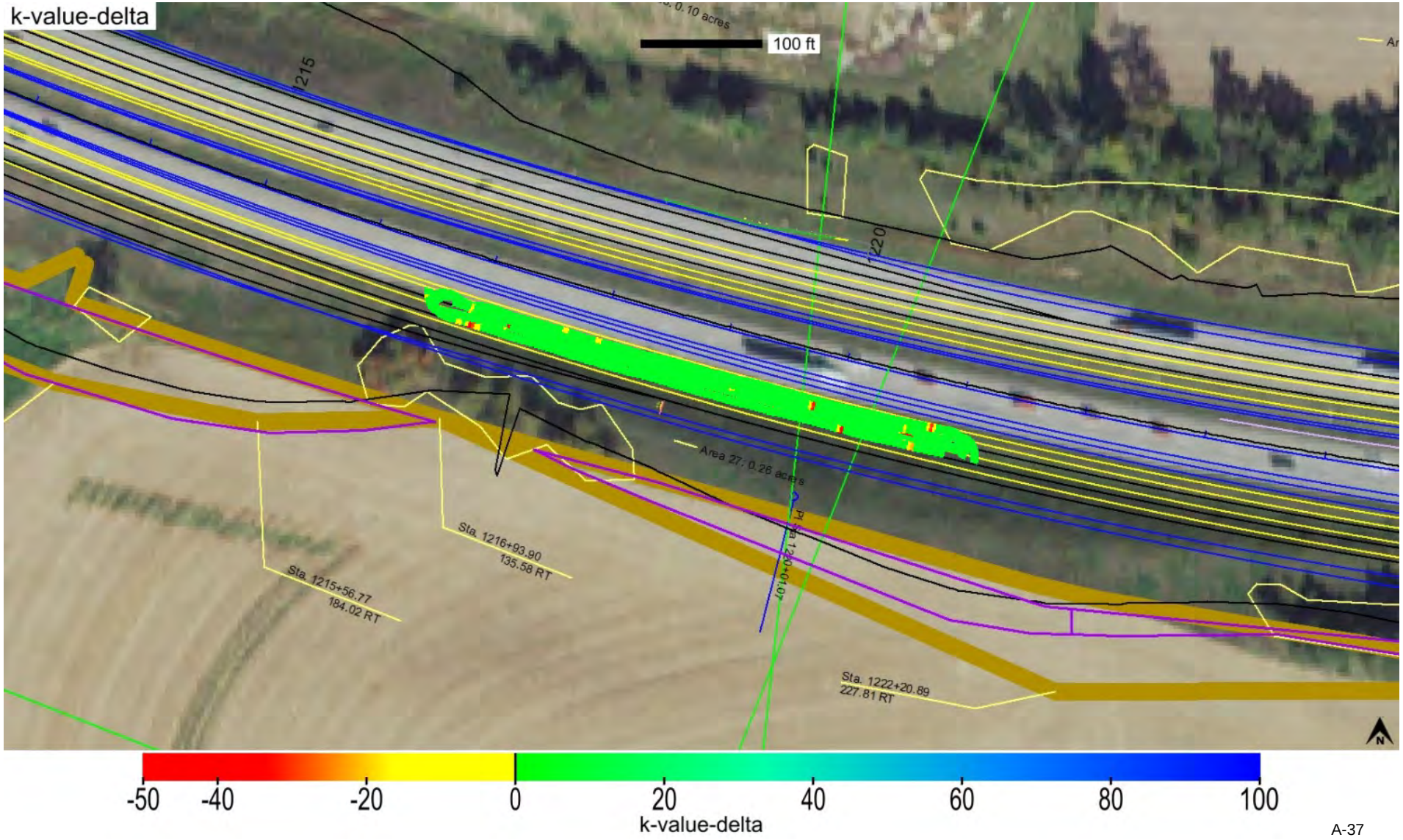



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 96.7 | 130.1 | 7.2 | 150.0 | 62.0 | 156.2 | 157.0 | 4.9 | 3.2 | -88.0 | 6.2 | 7.0 |



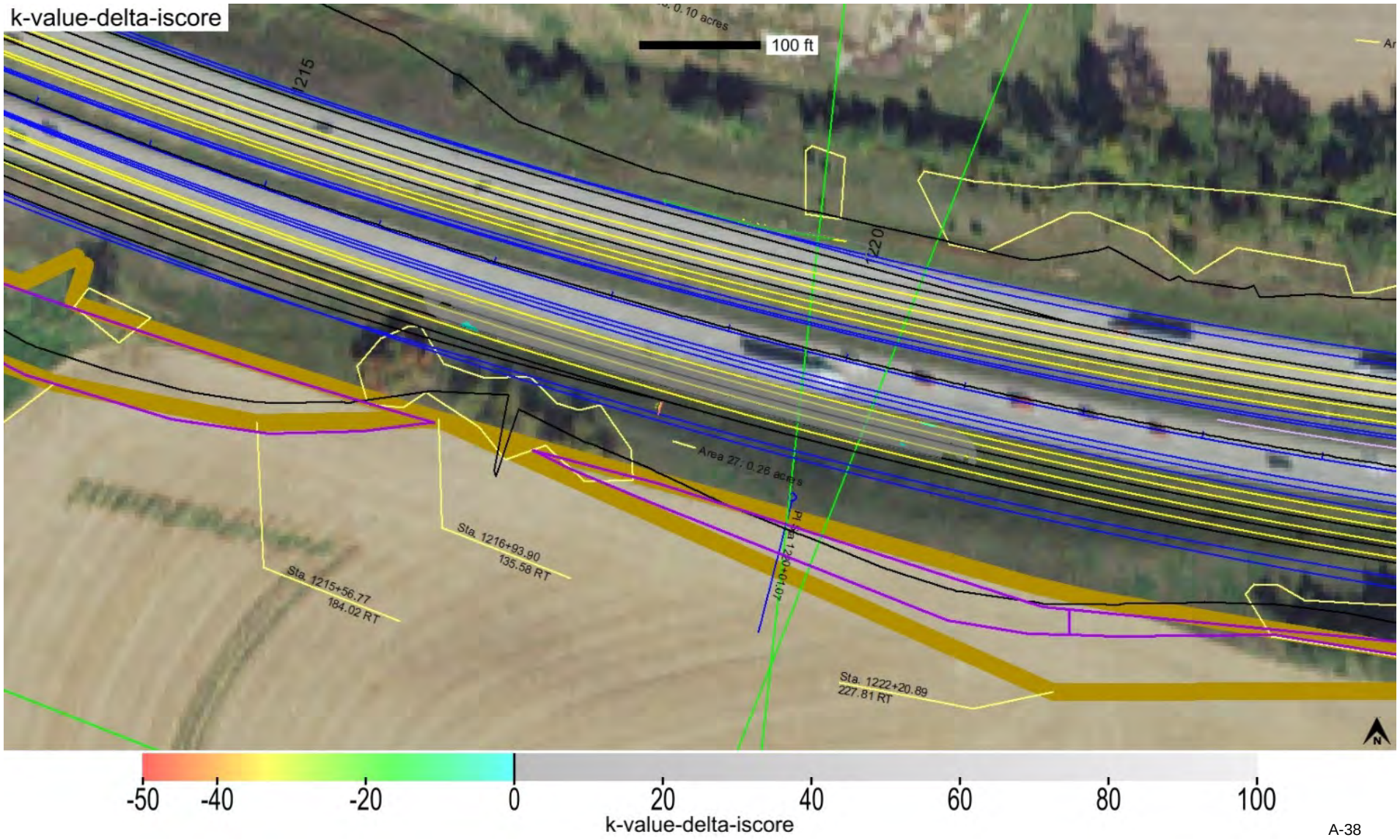



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 96.7 | 150.0 | -88.0 | 6.2 | 7.0 | -3.1 | 6.2 | 7.0 |



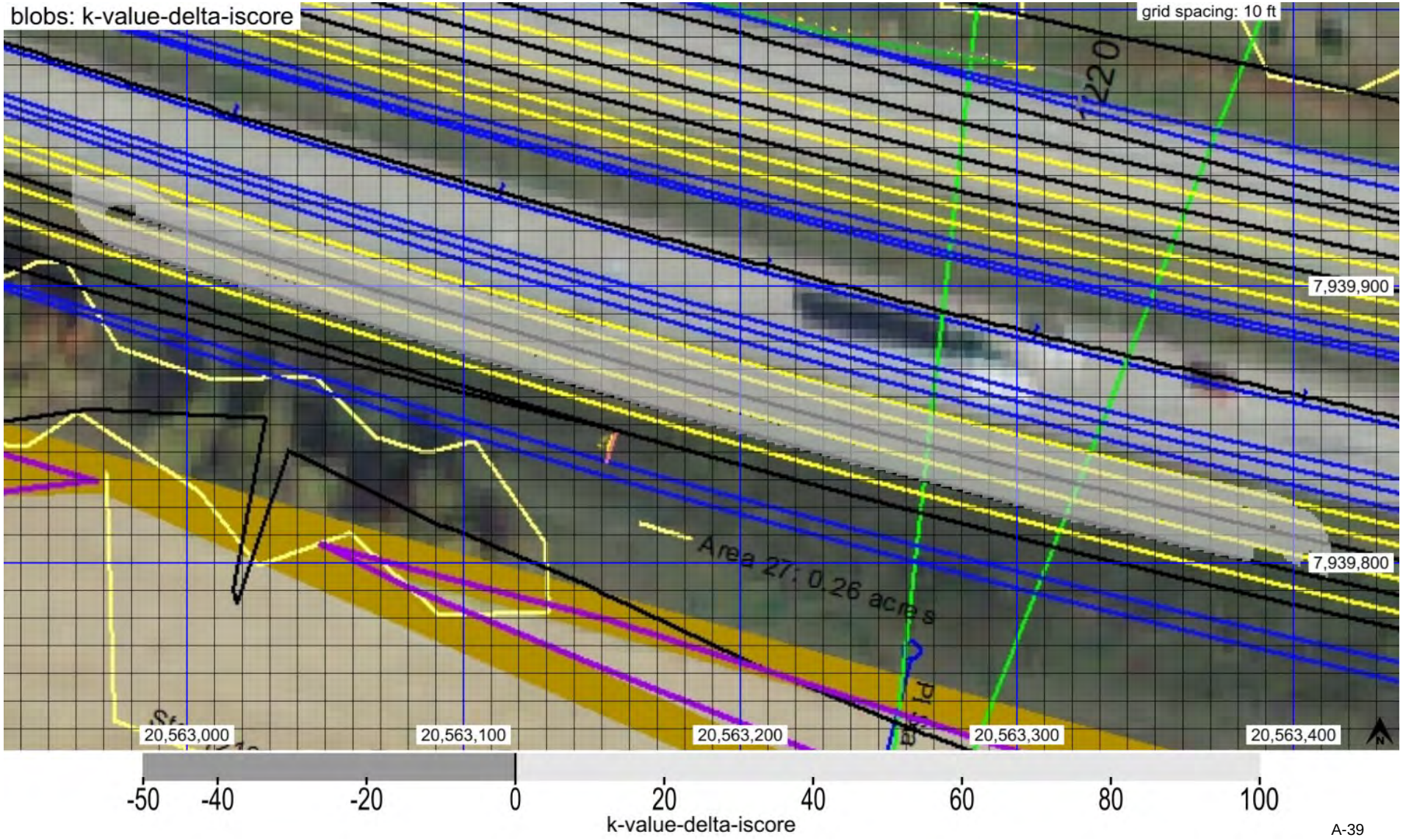



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544 Map Type: Verification Map Map Layer: Subbase 6 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000.0 | 0 | 0 | 0 | none | 0 | 4.0 |



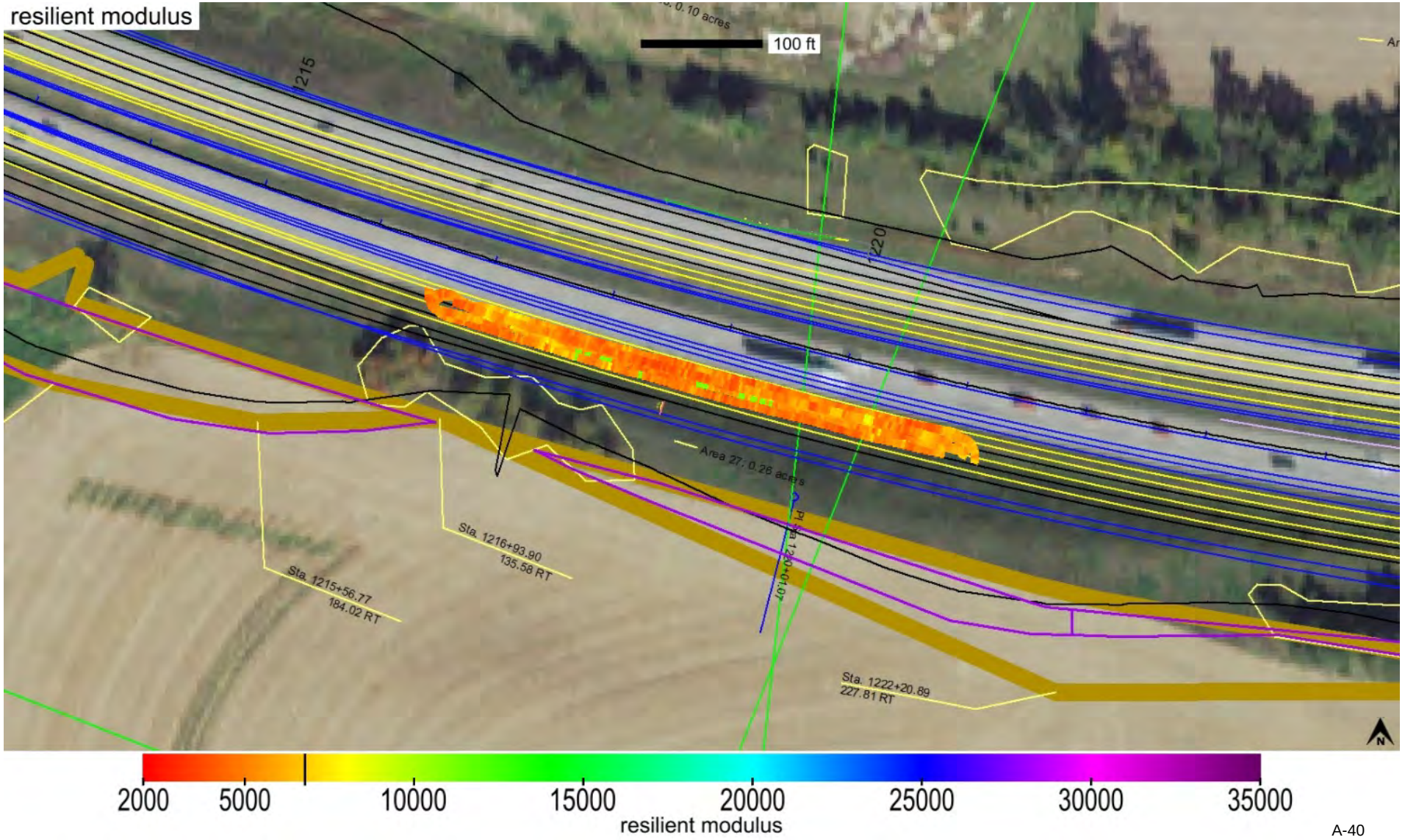



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 6.2 | 30.4 | 1.0 | 6778.0 | 3396.5 | 5346.9 | 11000.0 | 1153.8 | 21.6 | -3381.5 | -1431.1 | 4222.0 |



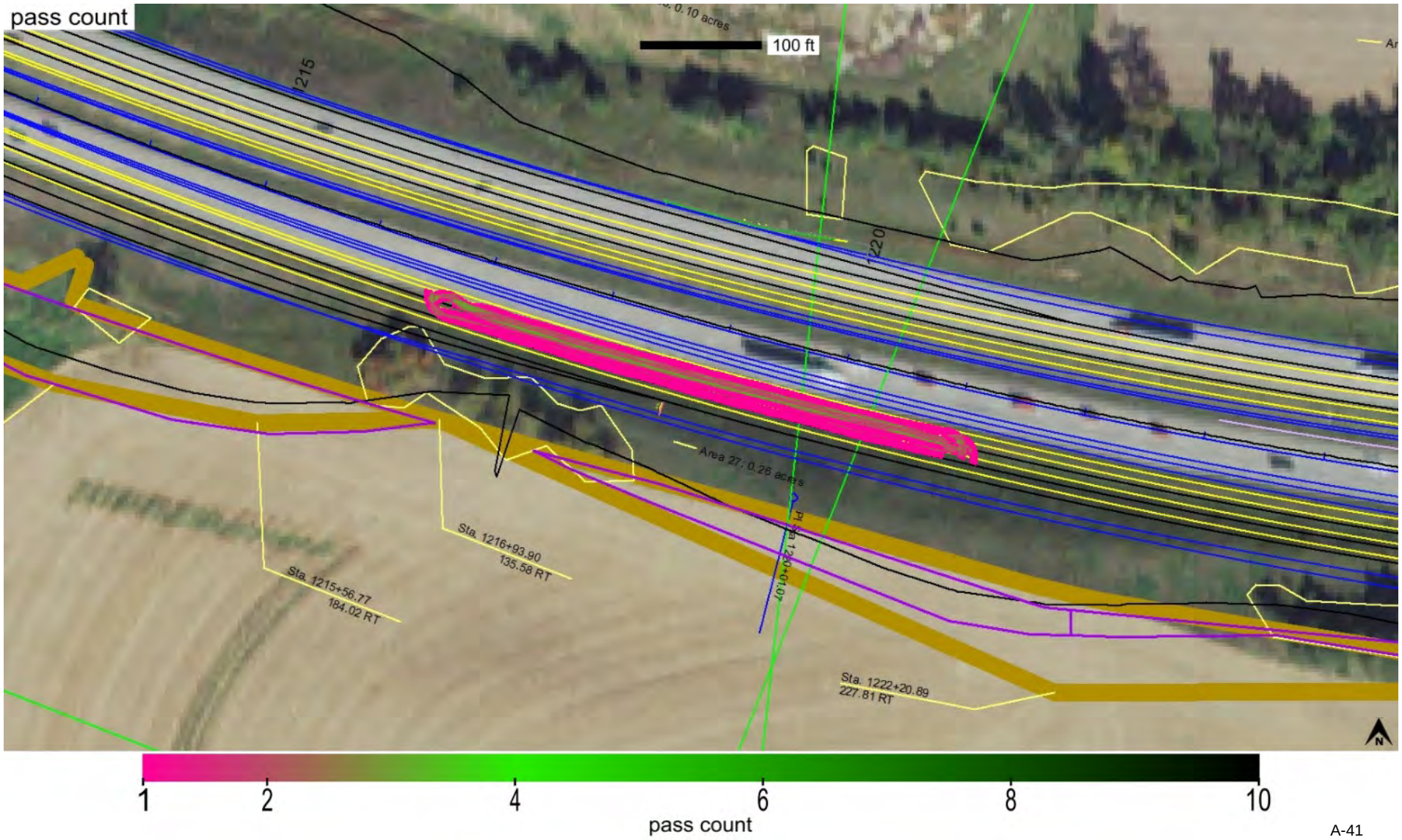



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.5 | 3 |



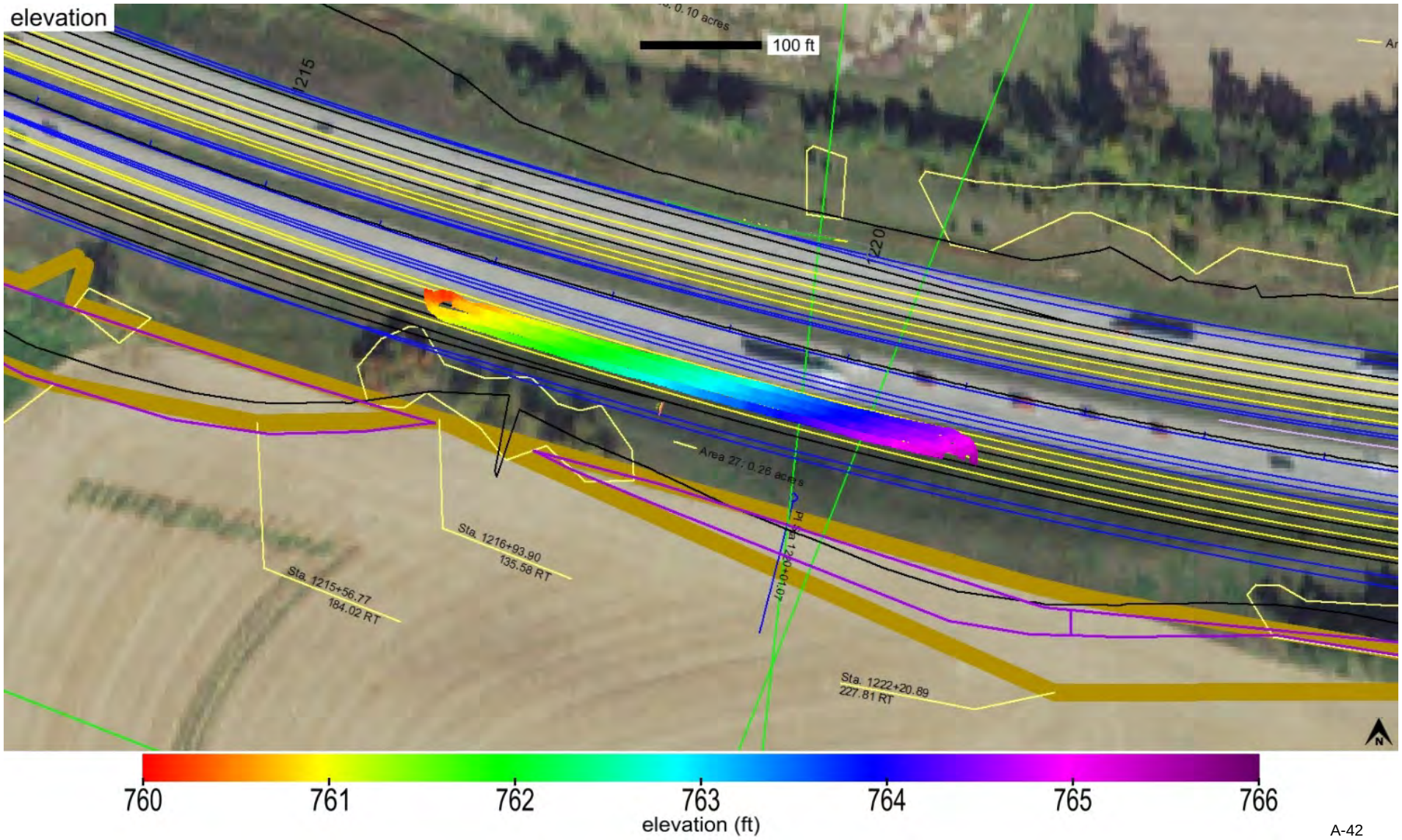



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 760.17 | 762.87 | 765.68 |



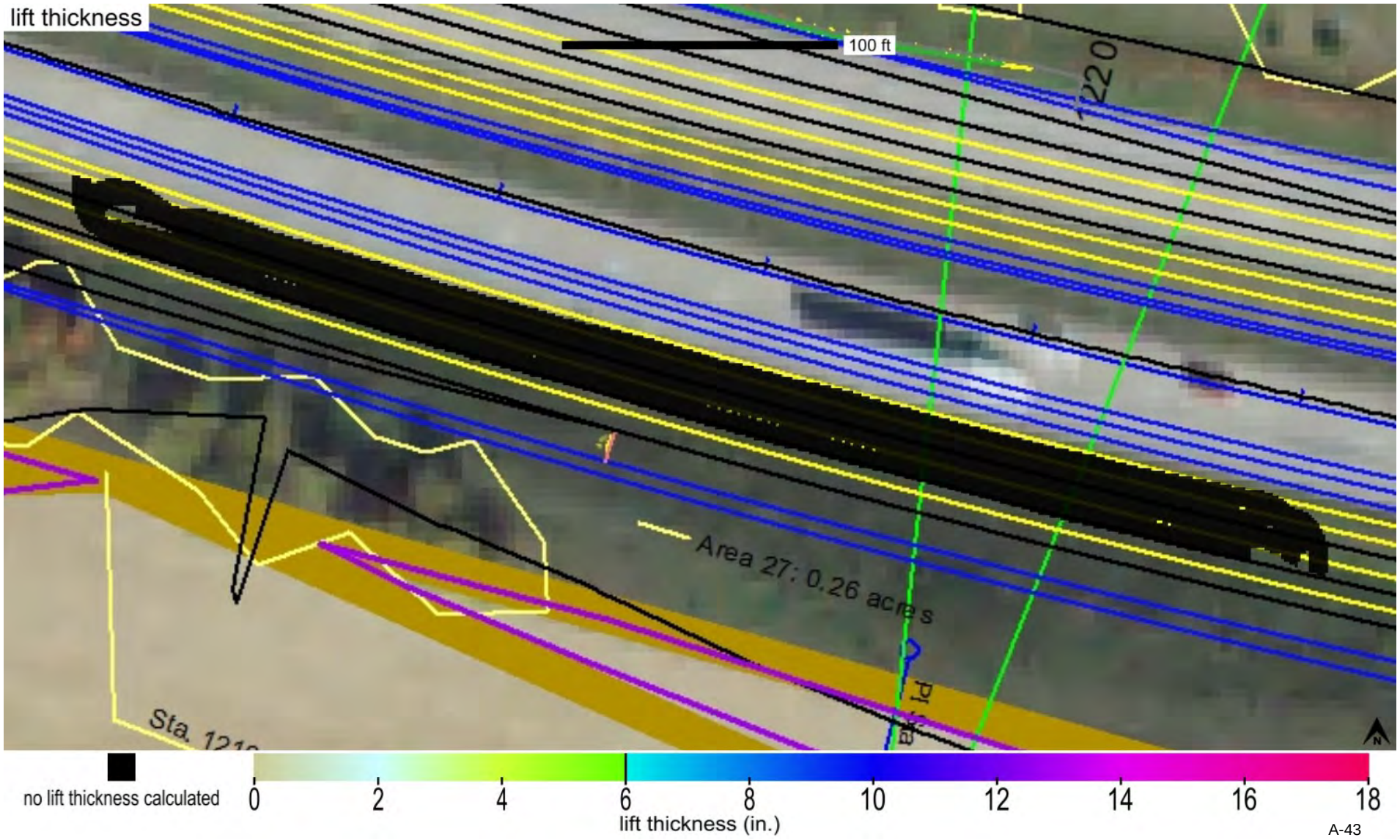



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544 Map Type: Verification Map Map Layer: Subbase 6 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |



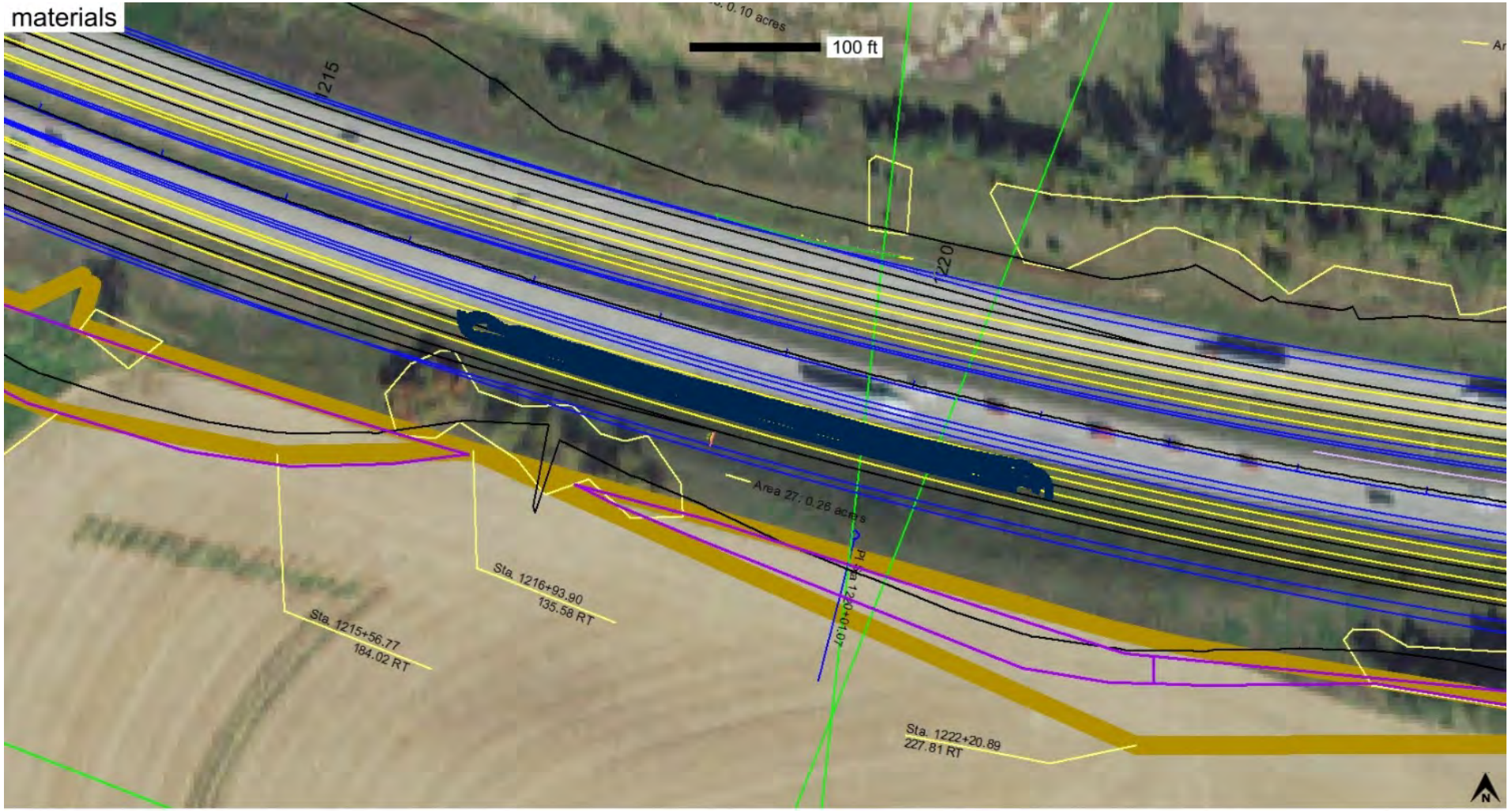



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544 Map Type: Verification Map Map Layer: Subbase 6 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 11120 | 0.255 | 100.0 | 6778.0 | 150.0 | 20.5 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_173544 Map Type: Verification Map Map Layer: Subbase 6 Inches

9/8/2022 2:57:10 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-173544.JPG





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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 5:53:50 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.207 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 24679 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 5.3 | 22.5 | 0.4 | 150.0 | 62.0 | 83.7 | 157.0 | 29.8 | 35.6 | -88.0 | -66.3 | 7.0 |
| Moisture Content | No | | | | | | | | | | | | |

## Mapped Area

| square feet | acres |
|---|---|
| 24679 | 0.567 |

## Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.0 | 1 |

## Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 766.50 | 774.88 | 780.95 |

## Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.6 | 5.1 | 5.3 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 24679 | 0.567 | 100.0 | 6778.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 2 | 24265 | 98.3 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |

## Station

| Start | End |
|---|---|
| 1223+00 | 1240+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 5:53:50 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.207 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 24679 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 22.5 | CQI > = 95 |
| 5.3 | 80% of k-Value MVs >= 150 |
| 35.6 | COV <= 30 |
| 98.3 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

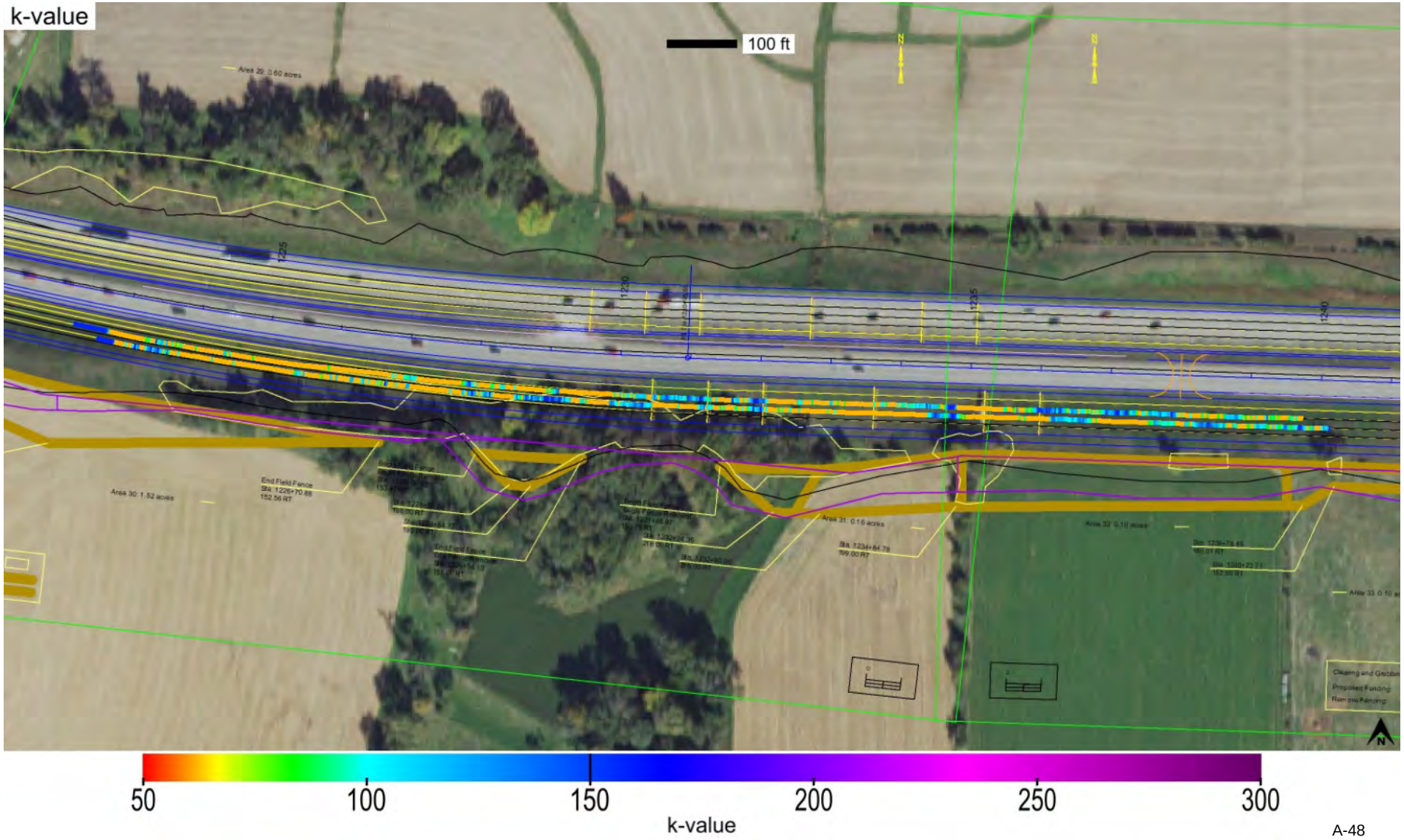


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 5.3 | 22.5 | 0.4 | 150.0 | 62.0 | 83.7 | 157.0 | 29.8 | 35.6 | -88.0 | -66.3 | 7.0 |



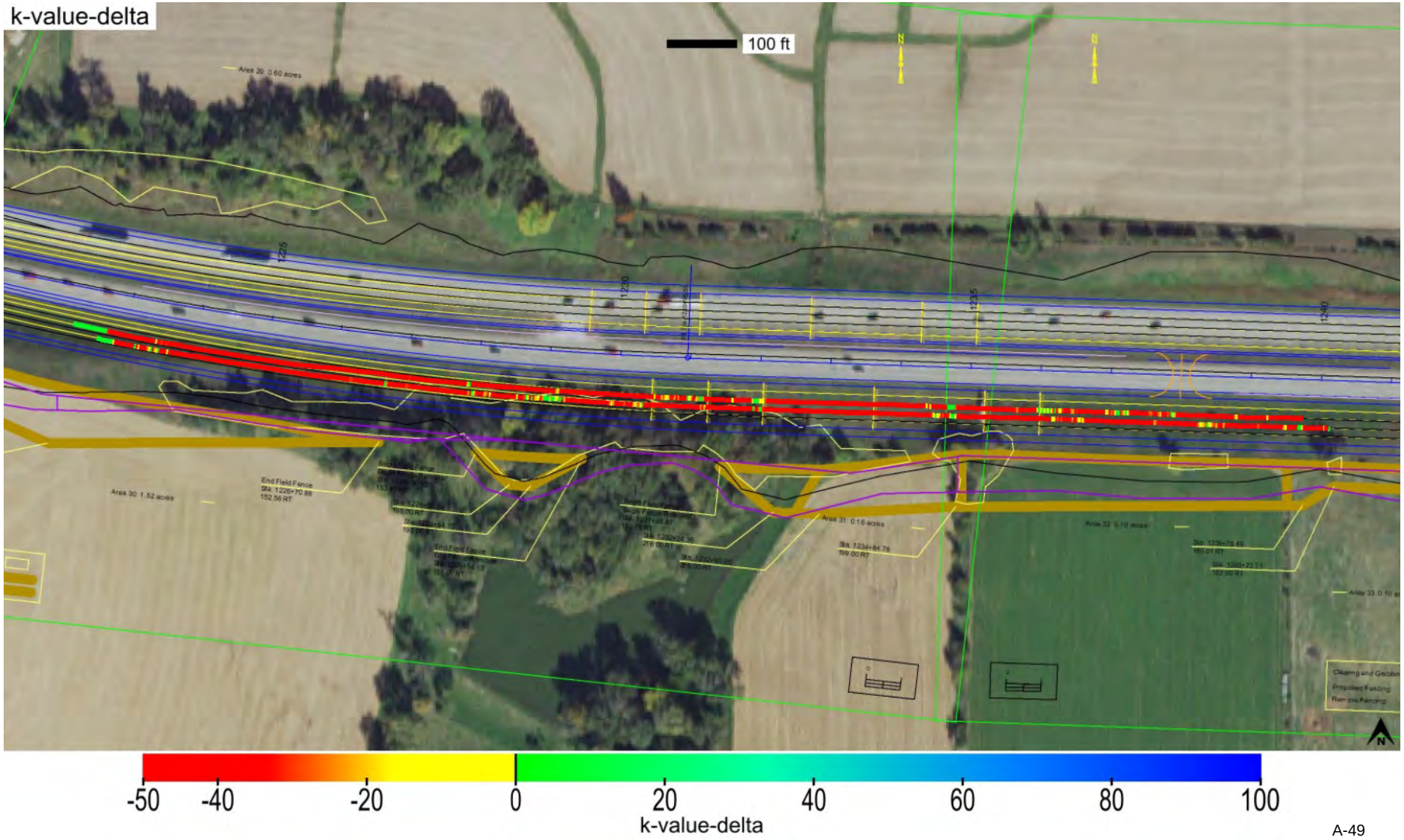



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 5.3 | 22.5 | 0.4 | 150.0 | 62.0 | 83.7 | 157.0 | 29.8 | 35.6 | -88.0 | -66.3 | 7.0 |



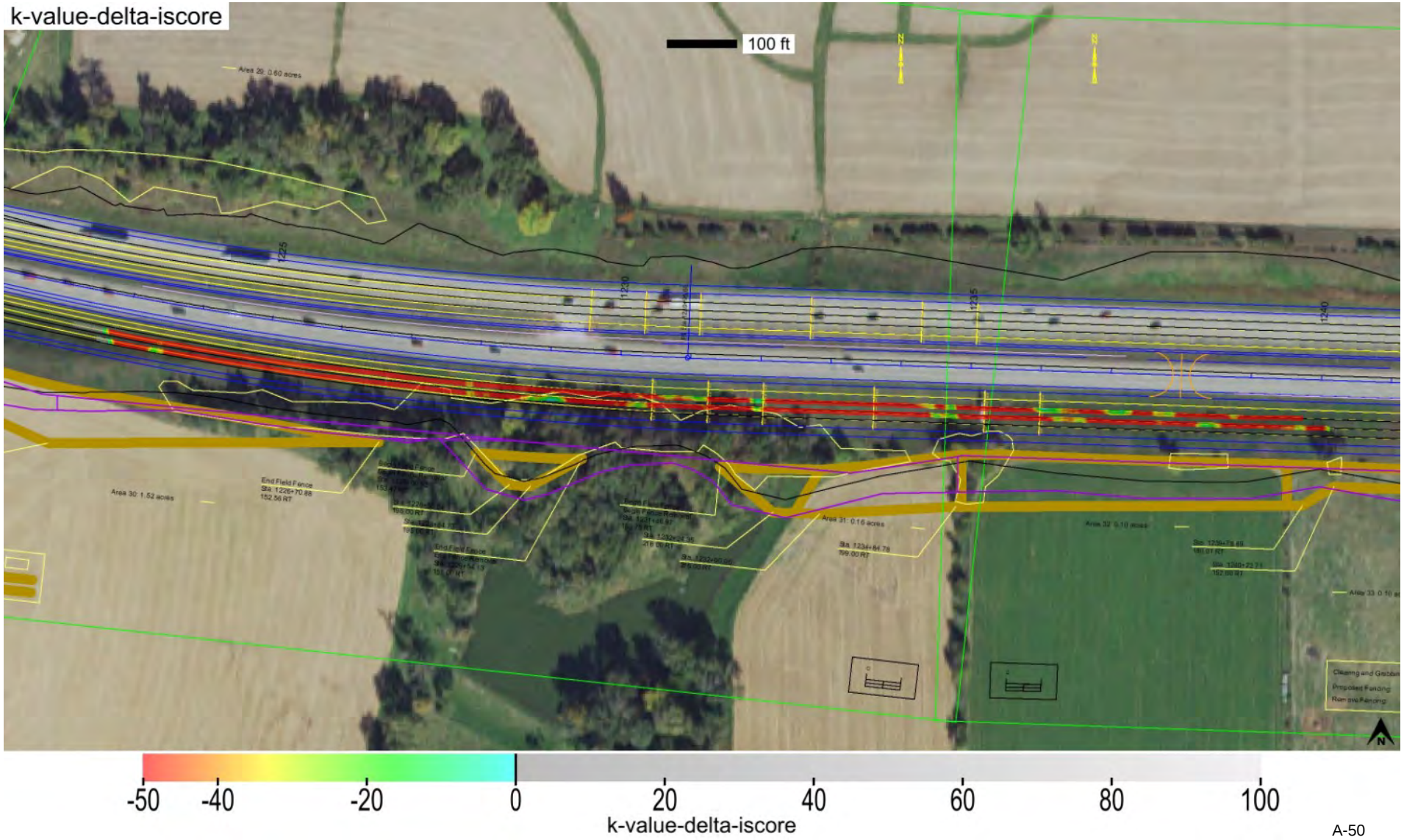



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 5.3 | 150.0 | -88.0 | -66.3 | 7.0 | -88.0 | -66.3 | 7.0 |



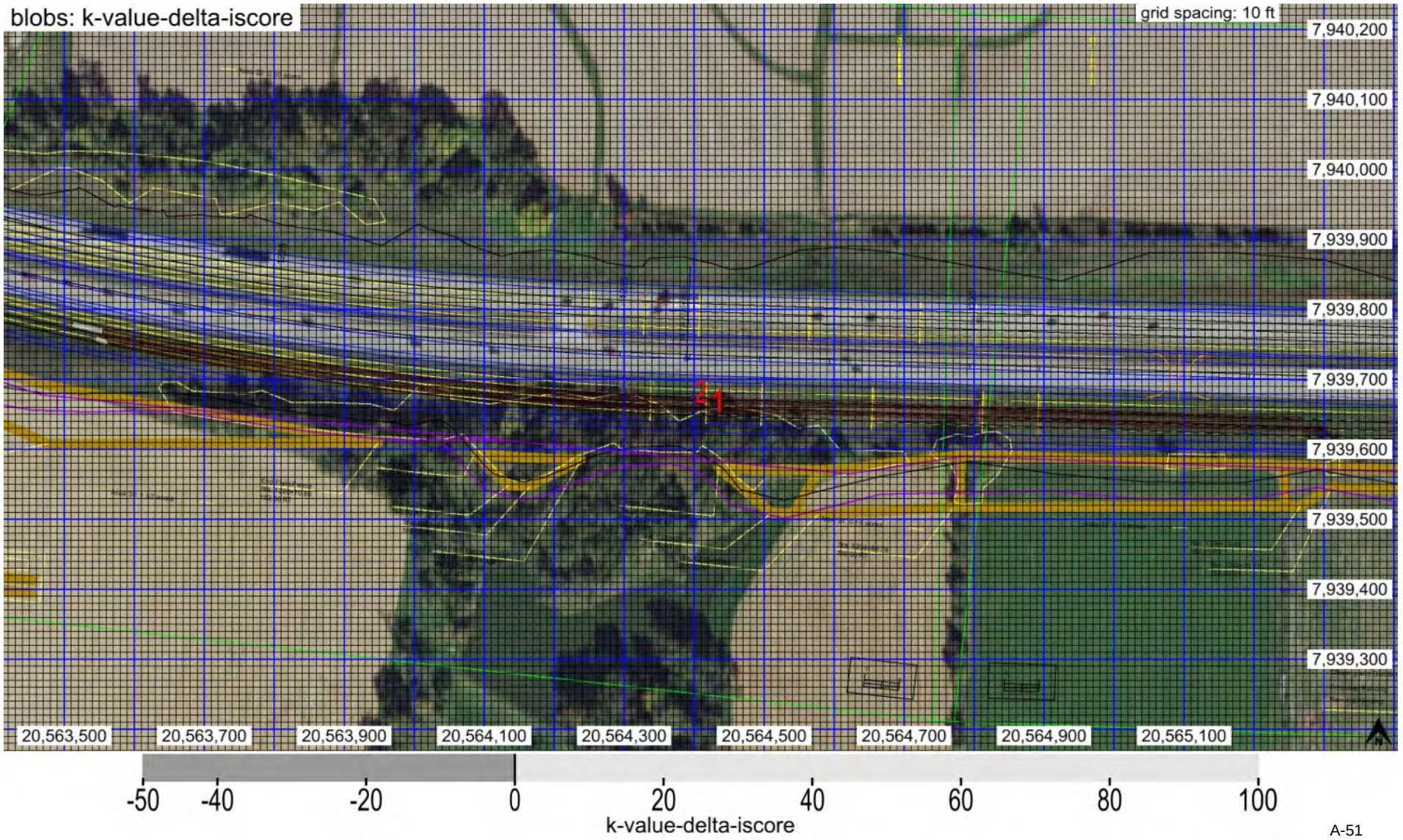



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 2 | 24265 | 98.3 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 12239 | 50.4 | 13 | -88.0 | -67.0 | 0.0 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20565302 | **7939624** |
| 2 | **20565306** | 7939630 |
| 3 | 20565302 | 7939632 |
| 4 | 20564316 | 7939666 |
| 5 | 20564120 | 7939678 |
| 6 | 20563854 | 7939708 |
| 7 | **20563560** | **7939758** |
| 8 | 20563562 | 7939750 |
| 9 | 20563582 | 7939746 |
| 10 | 20563832 | 7939704 |
| 11 | 20564120 | 7939672 |
| 12 | 20564316 | 7939658 |
| 13 | 20565302 | 7939626 |
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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 2 | 12026 | 49.6 | 13 | -88.0 | -68.1 | -0.6 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20565250 | **7939640** |
| 2 | **20565268** | 7939642 |
| 3 | 20565250 | 7939648 |
| 4 | 20564442 | 7939672 |
| 5 | 20564182 | 7939686 |
| 6 | 20563824 | 7939724 |
| 7 | **20563554** | **7939770** |
| 8 | 20563556 | 7939764 |
| 9 | 20563596 | 7939756 |
| 10 | 20563818 | 7939718 |
| 11 | 20564194 | 7939678 |
| 12 | 20564442 | 7939666 |
| 13 | 20565250 | 7939640 |
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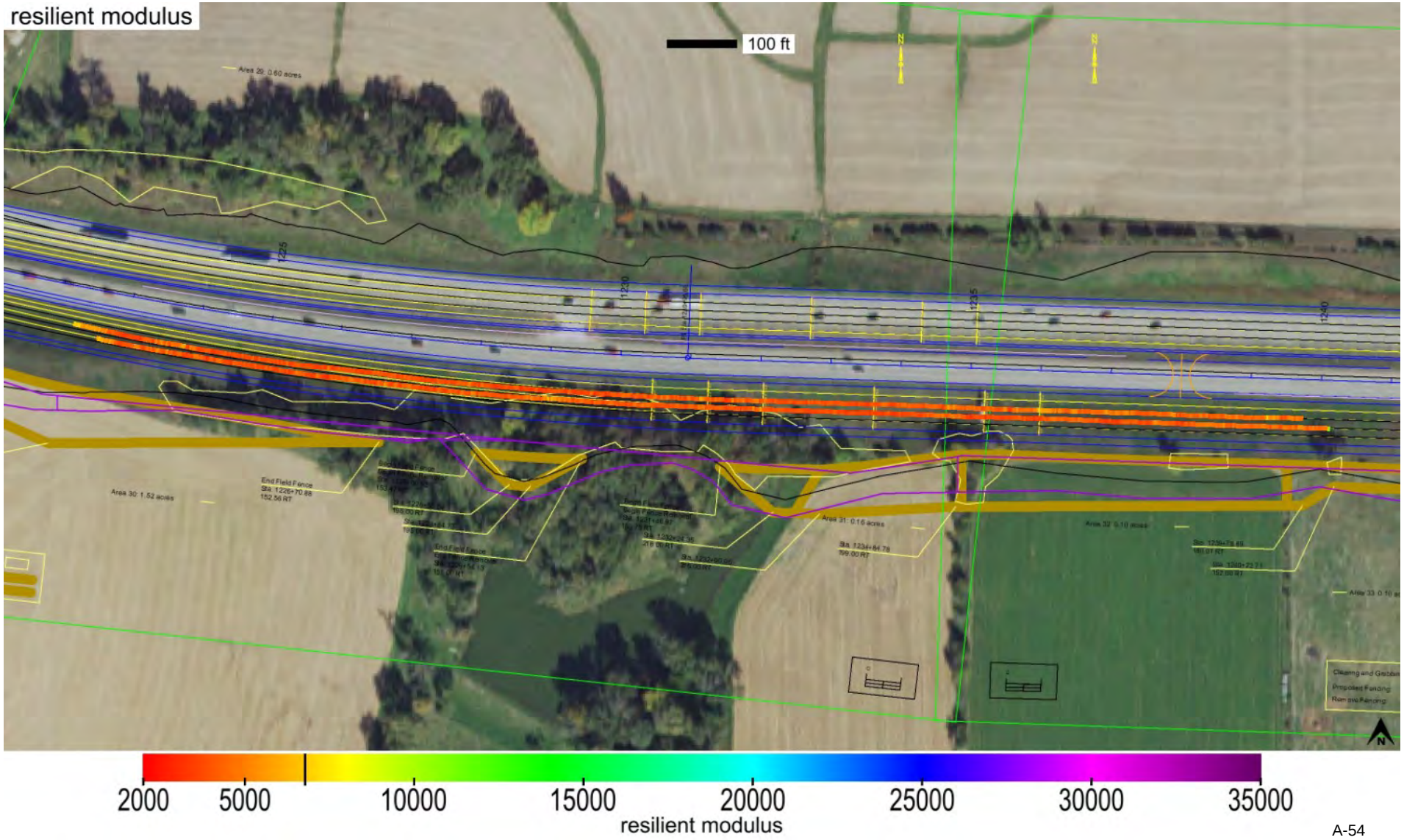


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 0.5 | 27.8 | 1.1 | 6778.0 | 2893.5 | 4182.2 | 11000.0 | 637.7 | 15.3 | -3884.5 | -2595.8 | 4222.0 |



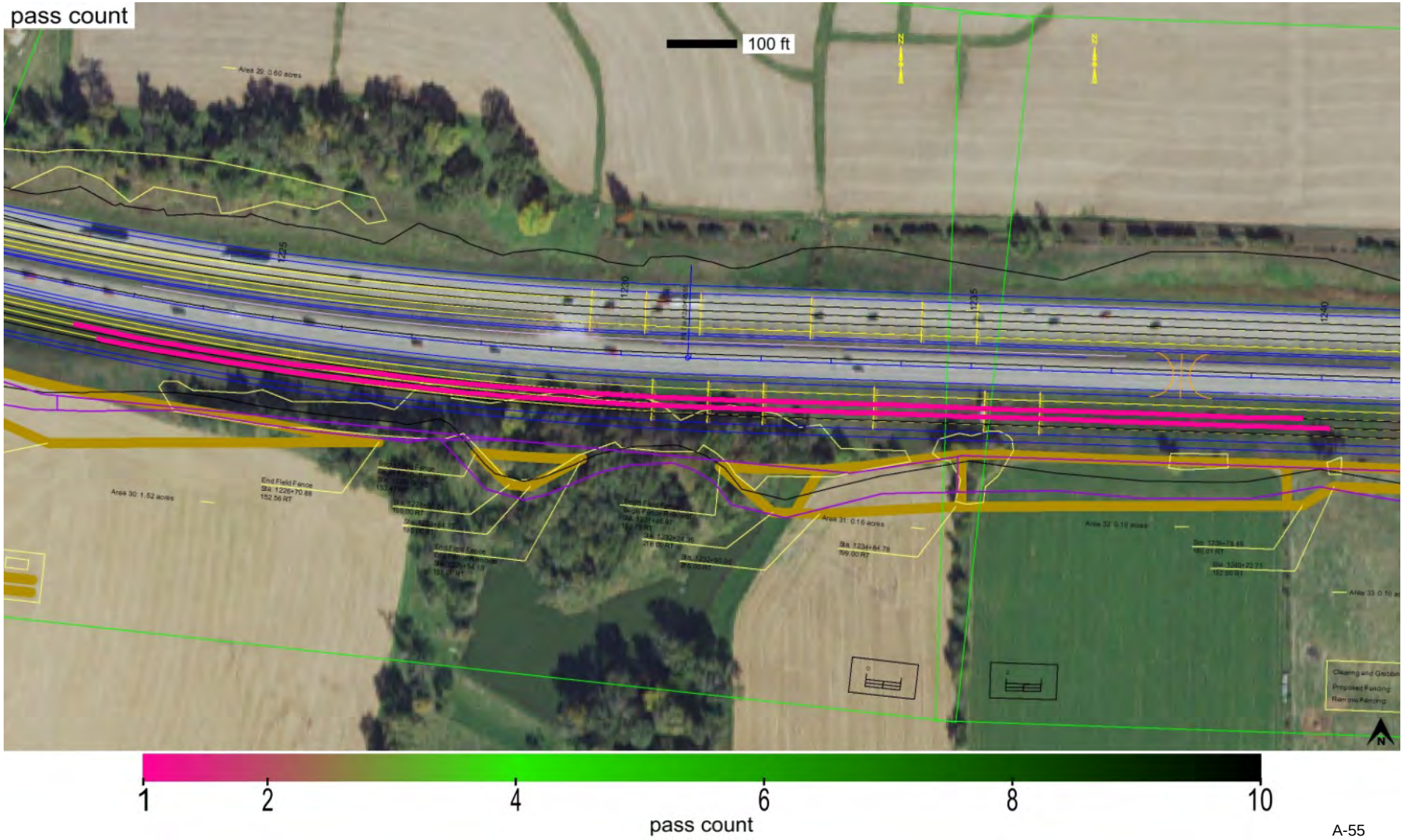



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.0 | 1 |



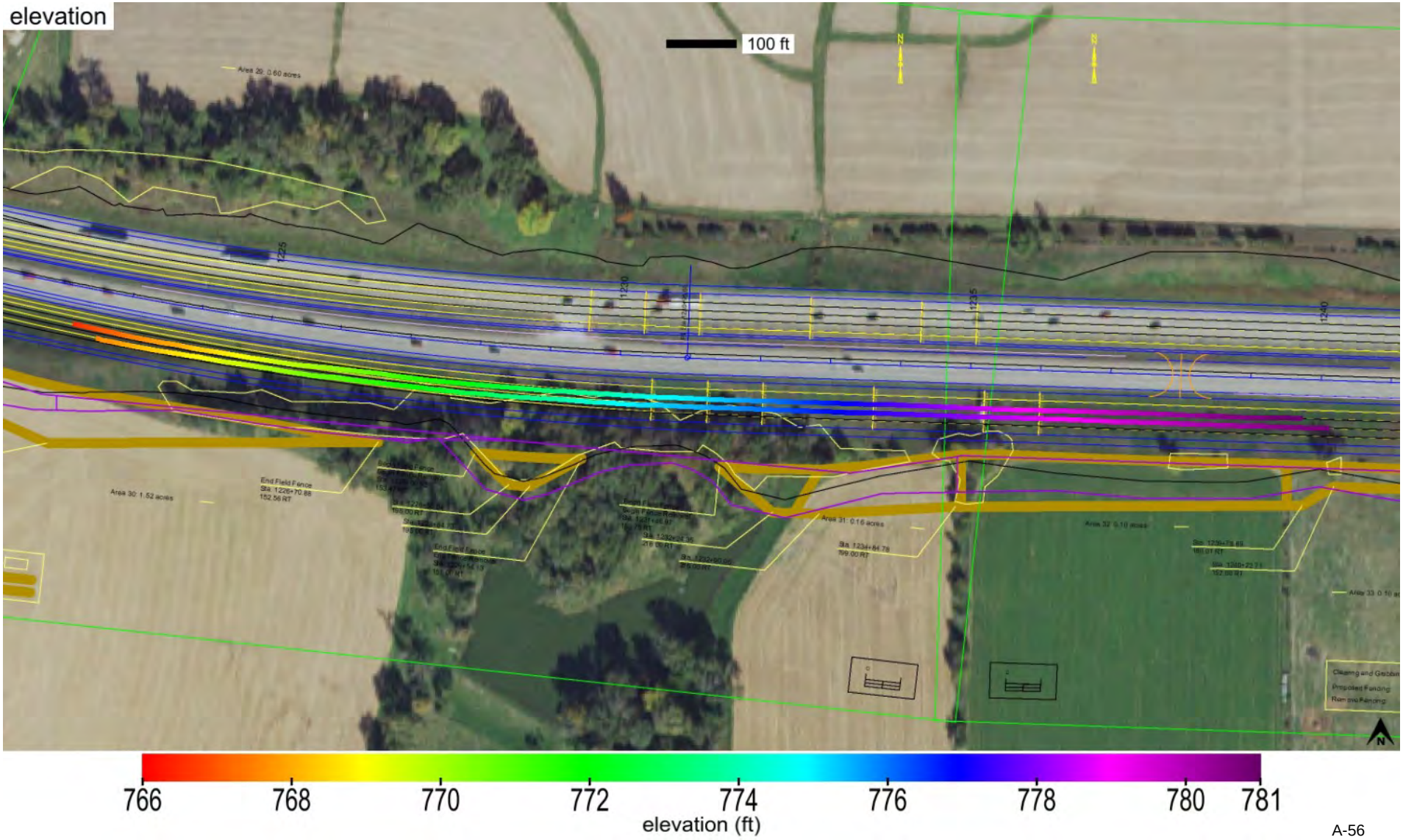



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 766.50 | 774.88 | 780.95 |



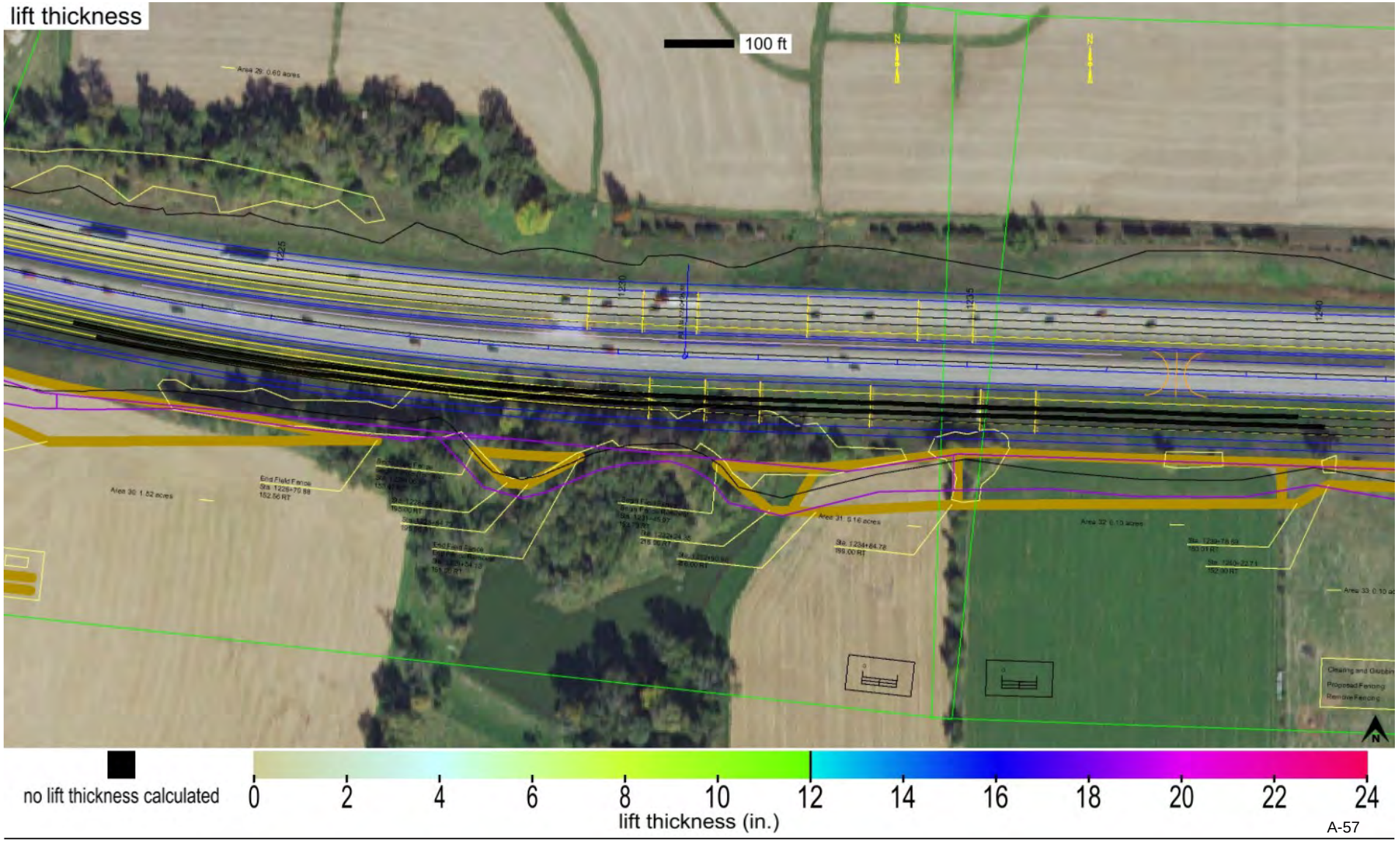



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |



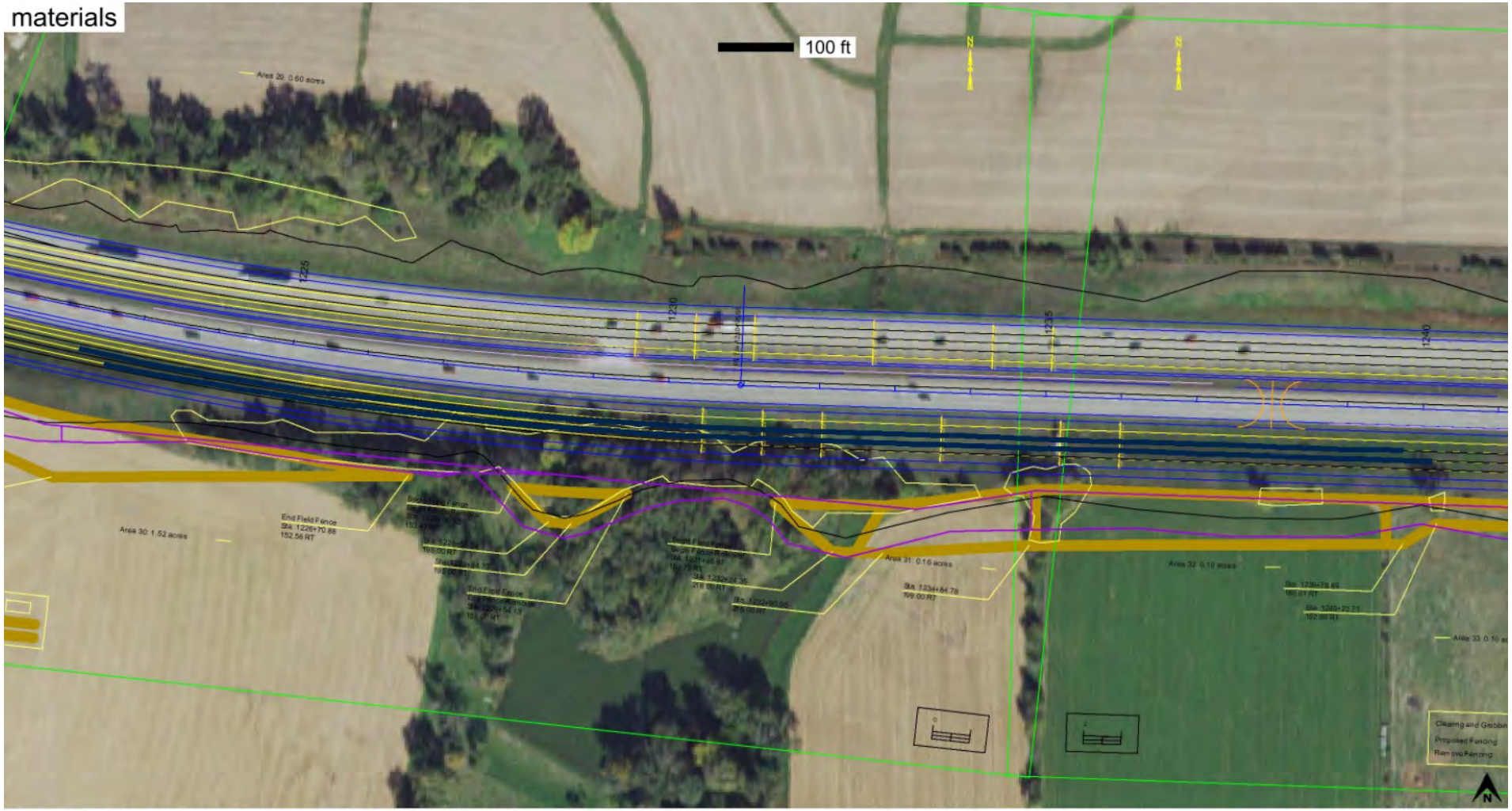



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 24679 | 0.567 | 100.0 | 6778.0 | 150.0 | 20.5 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

9/8/2022 2:57:34 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-175350.JPG



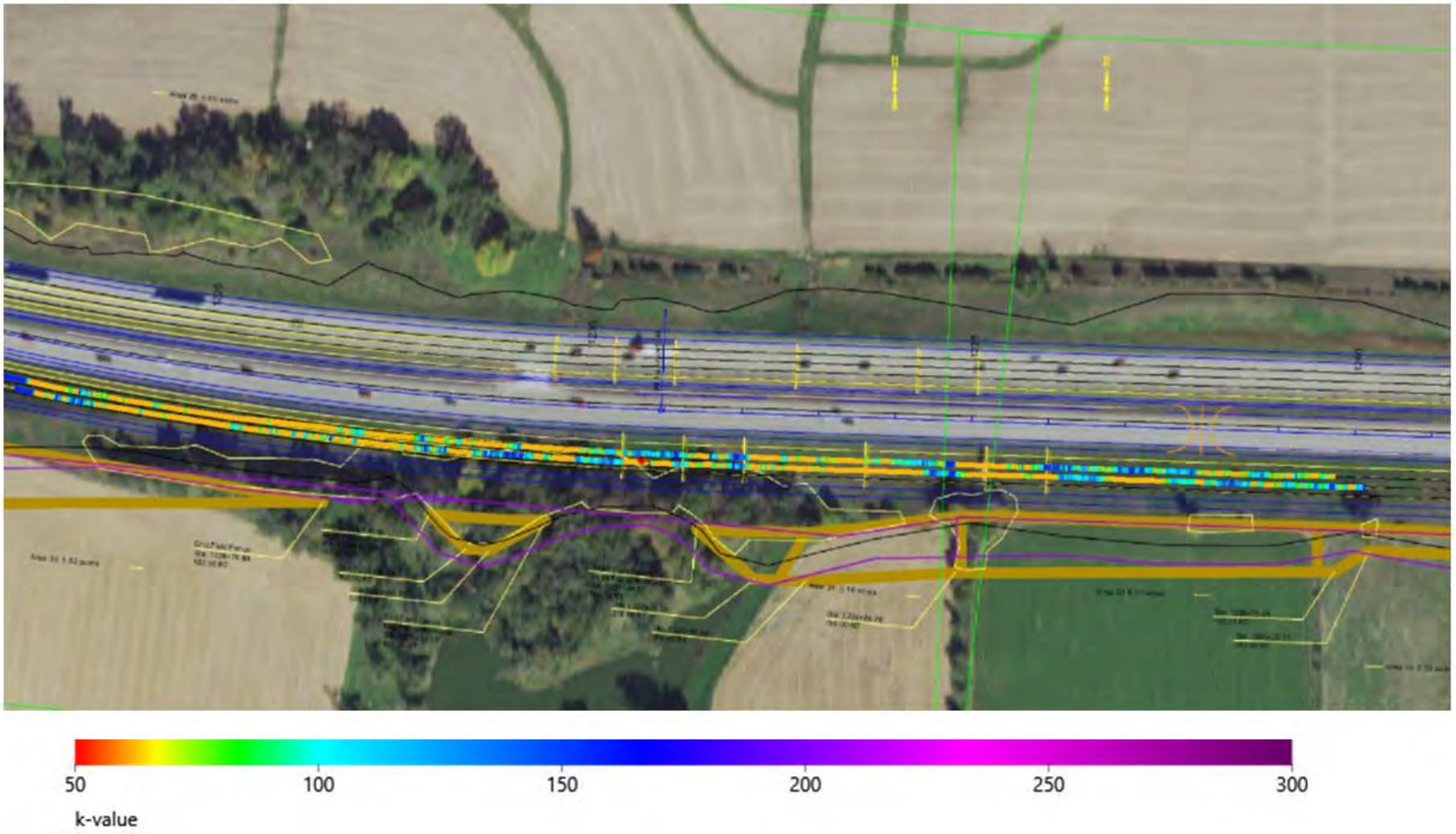


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_175350 Map Type: Verification Map Map Layer: Subbase 6 Inches

9/8/2022 3:29:32 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-175350-POINT-3-3D-map-kvalue-w-legend.jpg






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ingios GEOTECHNICS

9/8/2022 3:30:41 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-175350-DCP-I80-Johnson-20220811-PT3.jpg

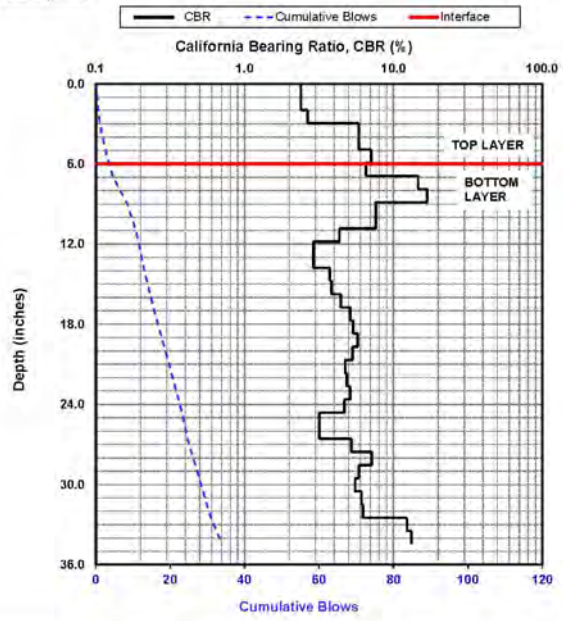
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date of Test | 9/9/2022 | Test ID | PT_3 | Operator | CV | ASTM | D6951 |
| Easting (FT) | 20564362.6 | | Northing (FT) | 7939686.2 | | Elevation (ft) | 774.5 |
| Location | West of Wapsie Ave. | | Station | 1230+75 | | | |
| Comments | Top of granular subbase layer underlain by select subgrade. Bottom layer consists of CL material. Testing performed after one compaction pass using the RT machine in vibratory mode. | | | | | | |

| Parameter | DPI (mm/blow) | CBR (%) | $E_{CBR}$, Elastic Modulus (ksi) (non stress-dependent) | $S_{v\,CBR}$, Bearing Capacity (psf) |
|---|---|---|---|---|
| Avg. Top Layer | 42.5 | 4.4 | 6.6 | 1,456 |
| Avg. Bottom Layer | 24.4 | 5.8 | 7.9 | 1,756 |
| Ratio of Avg. Top/Bottom Layer | 1.7 | 0.8 | 0.8 | 0.8 |
| Std.Dev. Top Layer | 21.9 | 2.1 | 4.1 | 897 |
| Std. Dev. Bottom Layer | 5.4 | 3.3 | 5.5 | 1,212 |

NOTE: *Top layer thickness assumed (nominal)*

NOTES:
Subgrade is classified as CL
[1] CBR = 292/DPI^1.12
[2] CBR = 1/(0.017610(DPI))^2
for CL soils with CBR < 10
[3] E (ksi) = (17.6 CBR^0.64) x 0.1450377
[4] $S_v$ (psf) = (3.764 x CBR^0.705) x 144

[1] ASTM D6951-03
[2] Powell et al. (1984)
[3] Portland Cement Assoc (1985)




**Dynamic Cone Penetrometer (DCP) Test Results**

| | |
|---|---|
| Project Name: | Johnson County I-80, IM-NHS-080-7(174)248--03-52 |
| Project ID: | SIA-00011 |
| Location: | I-80, Johnson County, Iowa |

ingios



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 6:09:02 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.113 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 8314 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 8.2 | 23.6 | 0.5 | 150.0 | 20.0 | 109.0 | 184.6 | 42.7 | 39.2 | -130.0 | -41.0 | 34.6 |
| Moisture Content | No | | | | | | | | | | | | |

### Mapped Area

| square feet | acres |
|---|---|
| 8314 | 0.191 |

### Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.6 | 3 |

### Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 756.09 | 760.23 | 763.61 |

### Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.5 | 5.1 | 6.5 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 8314 | 0.191 | 100.0 | 3600.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 2 | 8183 | 98.4 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

## Station

| Start | End |
|---|---|
| 1216+00 | 1221+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 6:09:02 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.113 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 8314 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 23.6 | CQI > = 95 |
| 8.2 | 80% of k-Value MVs >= 150 |
| 39.2 | COV <= 30 |
| 98.4 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

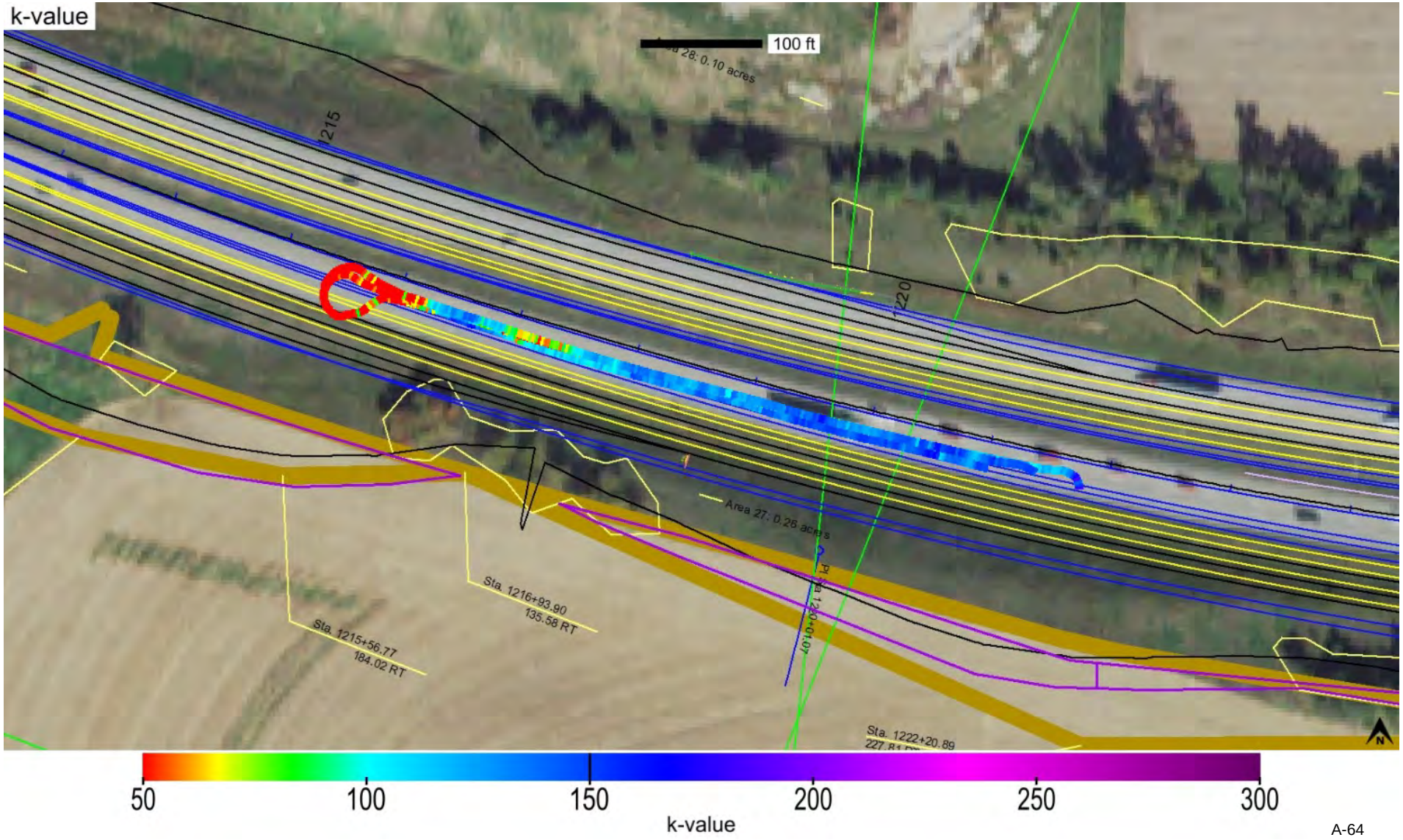


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 8.2 | 23.6 | 0.5 | 150.0 | 20.0 | 109.0 | 184.6 | 42.7 | 39.2 | -130.0 | -41.0 | 34.6 |



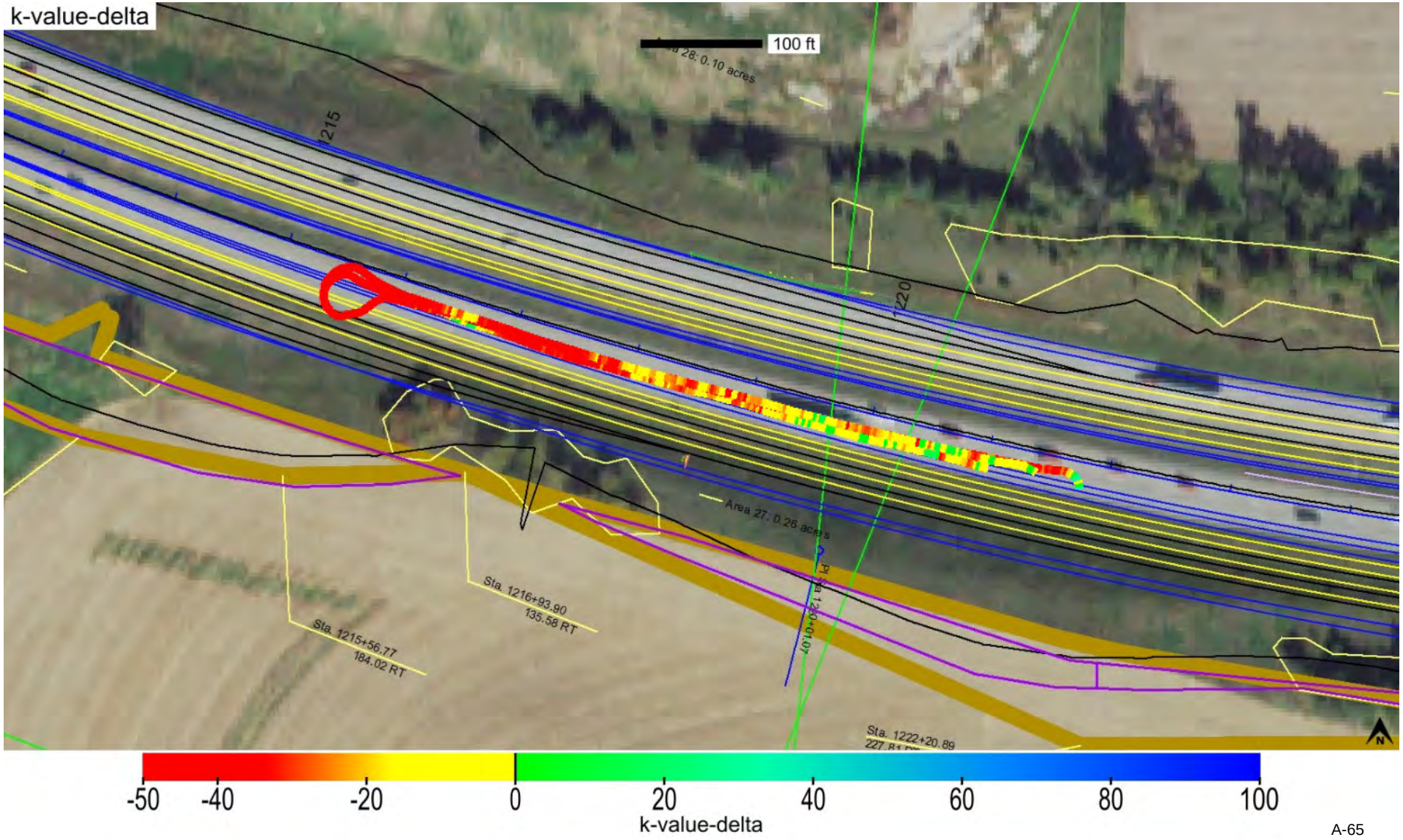



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 8.2 | 23.6 | 0.5 | 150.0 | 20.0 | 109.0 | 184.6 | 42.7 | 39.2 | -130.0 | -41.0 | 34.6 |



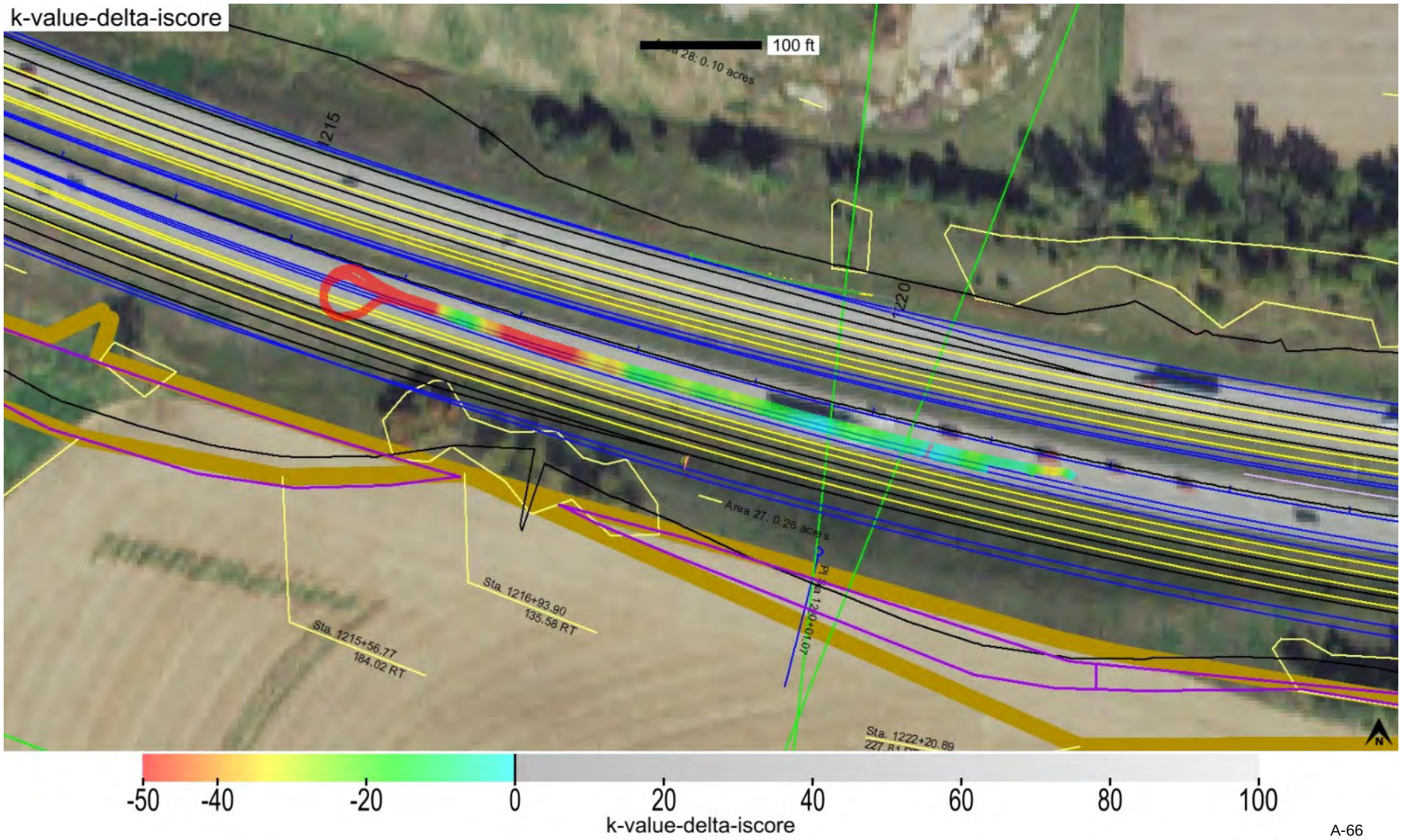



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 8.2 | 150.0 | -130.0 | -41.0 | 34.6 | -130.0 | -41.2 | 15.4 |



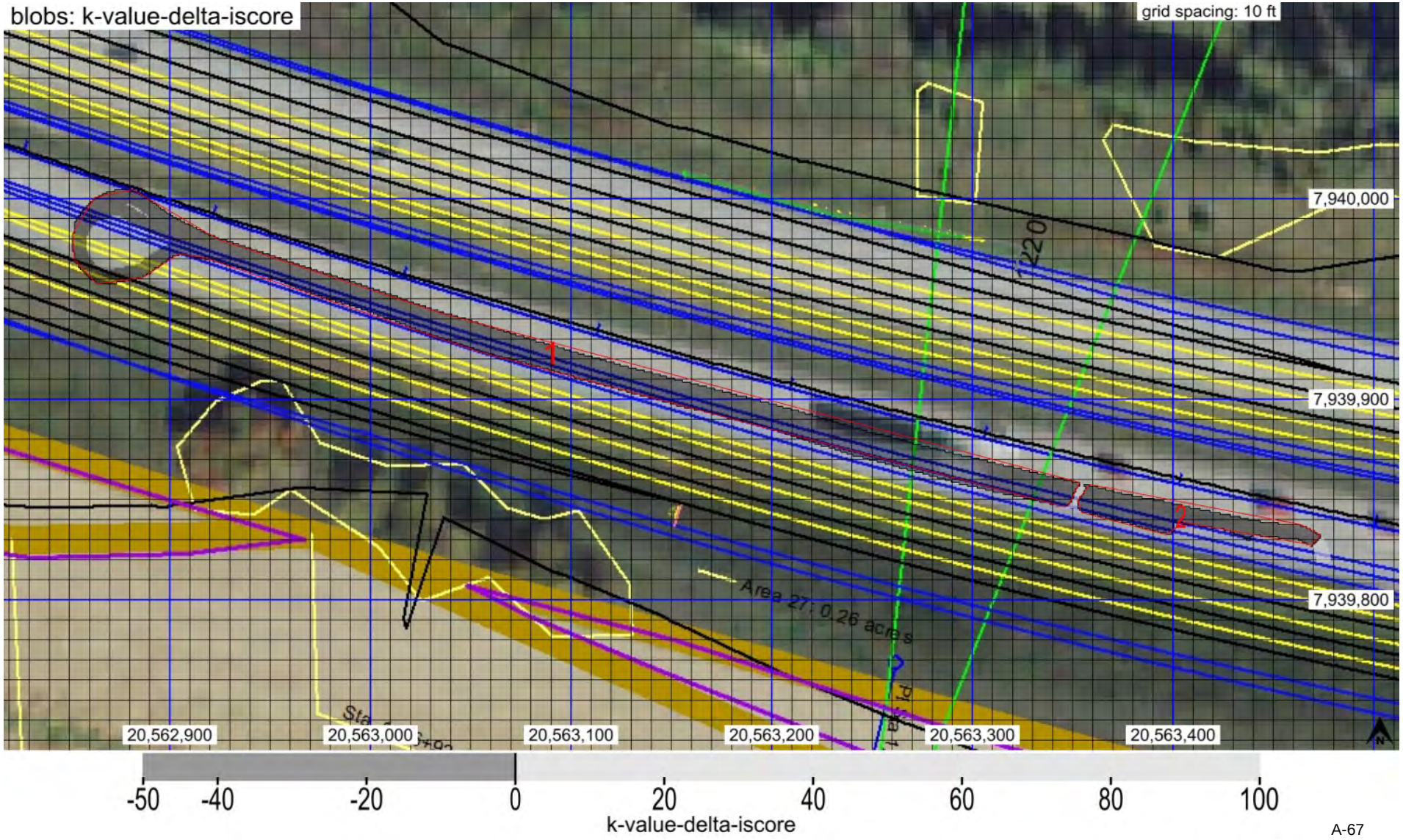



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 2 | 8183 | 98.4 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 6946 | 84.9 | 15 | -130.0 | -47.1 | -0.2 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20563342 | **7939846** |
| 2 | 20563348 | 7939846 |
| 3 | **20563354** | 7939858 |
| 4 | 20563036 | 7939942 |
| 5 | 20562924 | 7939980 |
| 6 | 20562882 | **7940004** |
| 7 | 20562862 | 7940000 |
| 8 | **20562852** | 7939982 |
| 9 | 20562852 | 7939970 |
| 10 | 20562864 | 7939958 |
| 11 | 20562886 | 7939960 |
| 12 | 20562904 | 7939972 |
| 13 | 20562918 | 7939970 |
| 14 | 20563054 | 7939924 |
| 15 | 20563342 | 7939848 |
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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 2 | 1237 | 15.1 | 9 | -35.2 | -12.6 | -0.1 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20563468 | **7939826** |
| 2 | **20563474** | 7939832 |
| 3 | 20563464 | 7939838 |
| 4 | 20563358 | **7939858** |
| 5 | **20563352** | 7939850 |
| 6 | 20563354 | 7939844 |
| 7 | 20563396 | 7939832 |
| 8 | 20563406 | 7939838 |
| 9 | 20563468 | 7939828 |

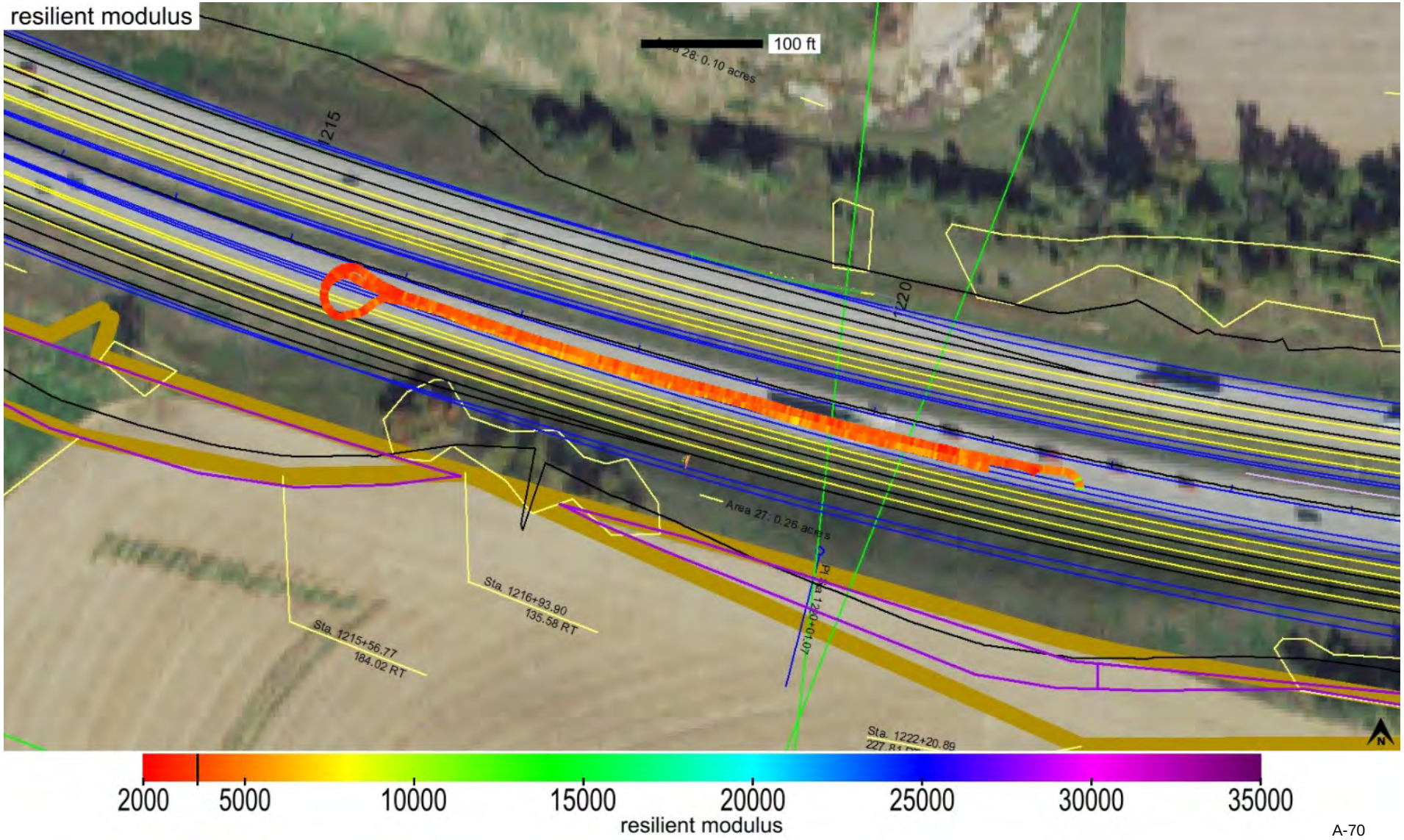


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 82.1 | 106.4 | 0.8 | 3600.0 | 2555.0 | 4382.6 | 11000.0 | 941.4 | 21.5 | -1045.0 | 782.6 | 7400.0 |



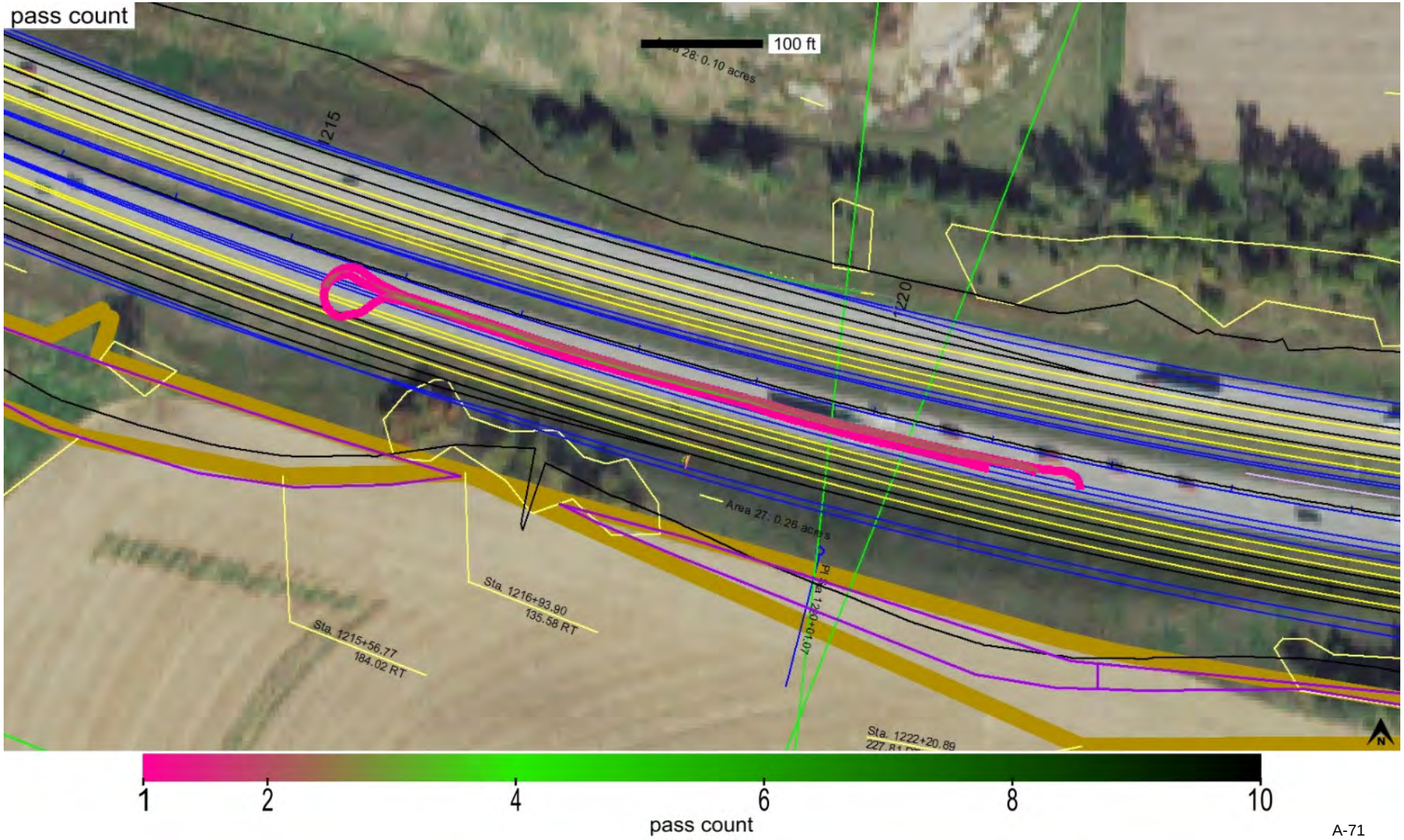



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.6 | 3 |



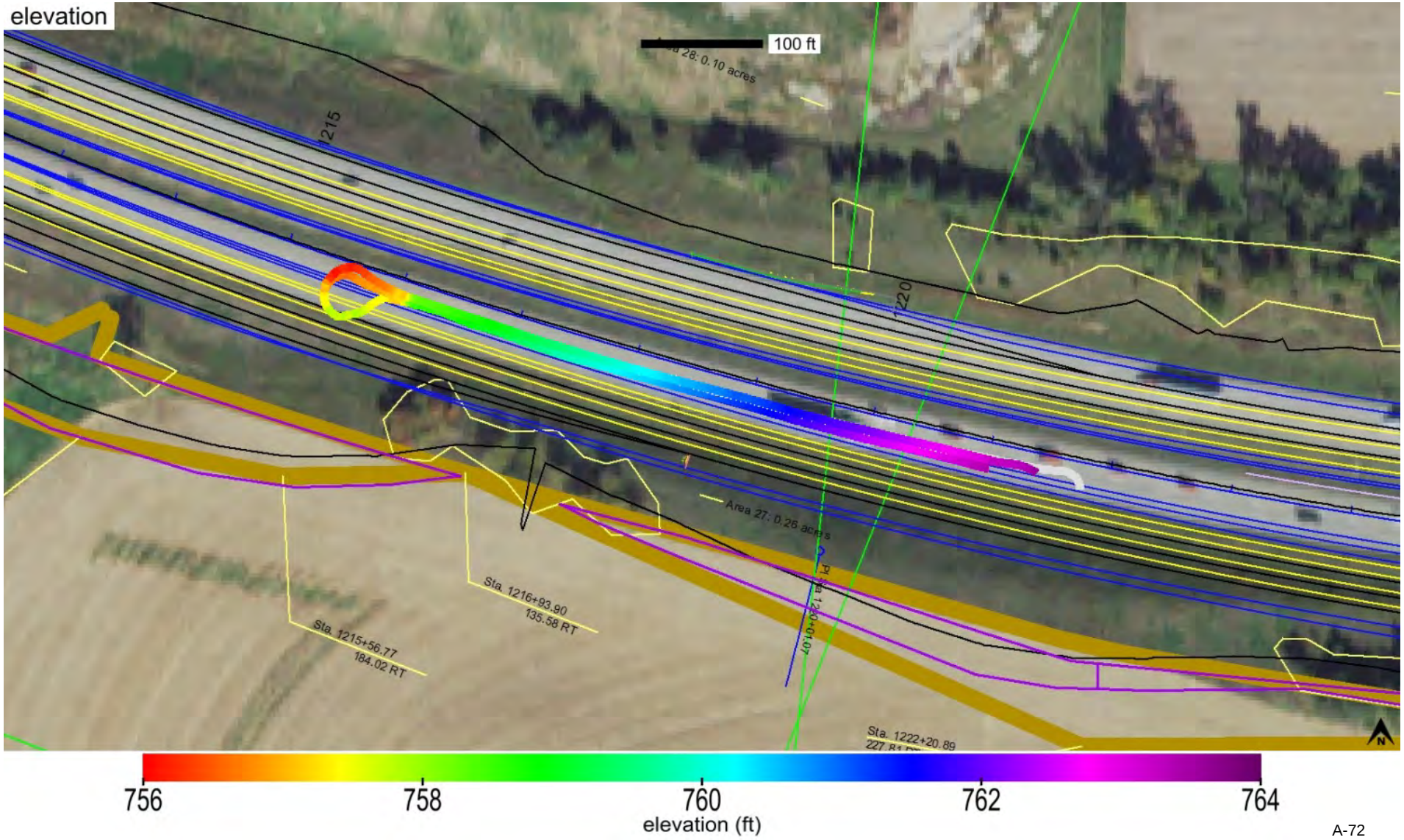



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 756.09 | 760.23 | 763.61 |



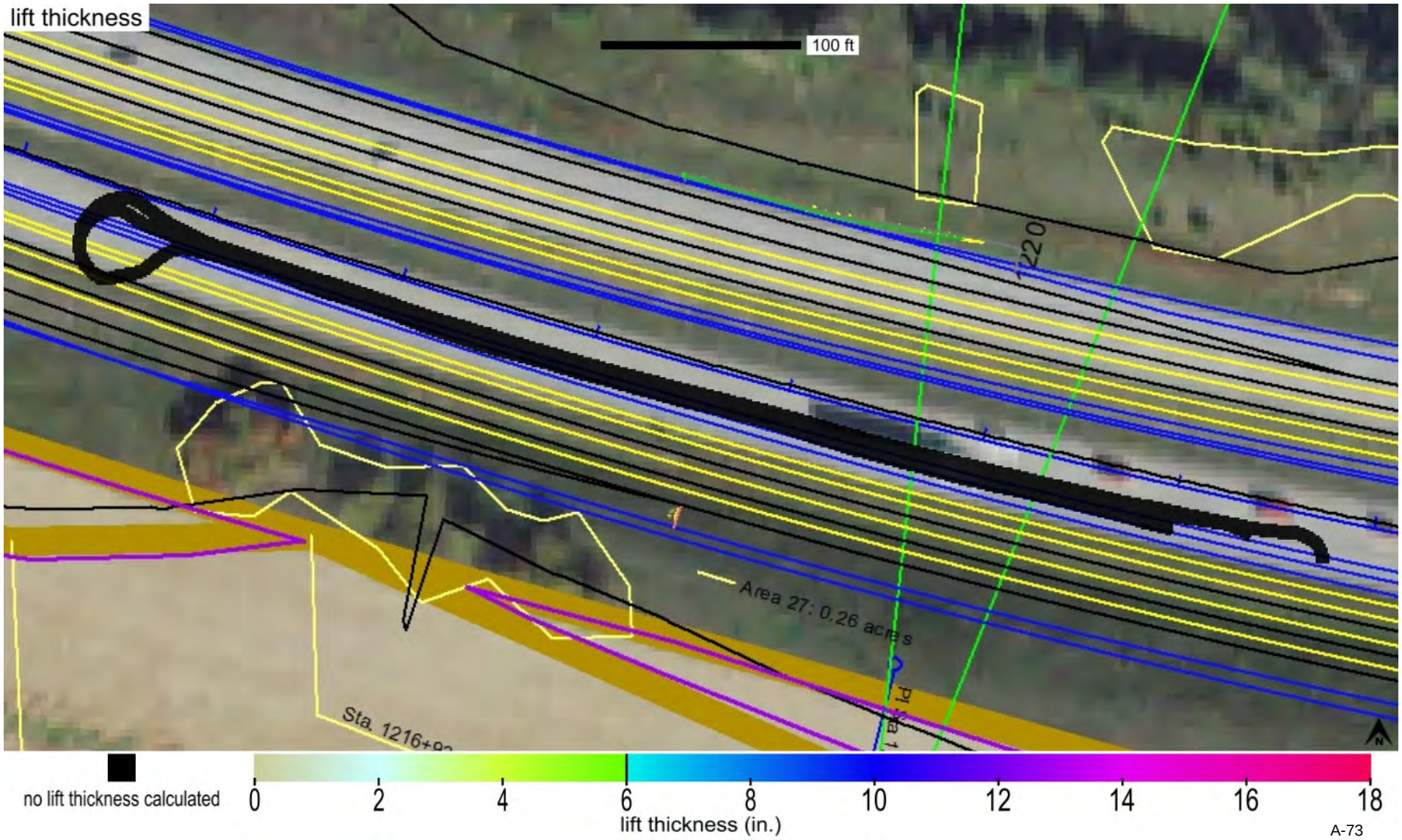



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |



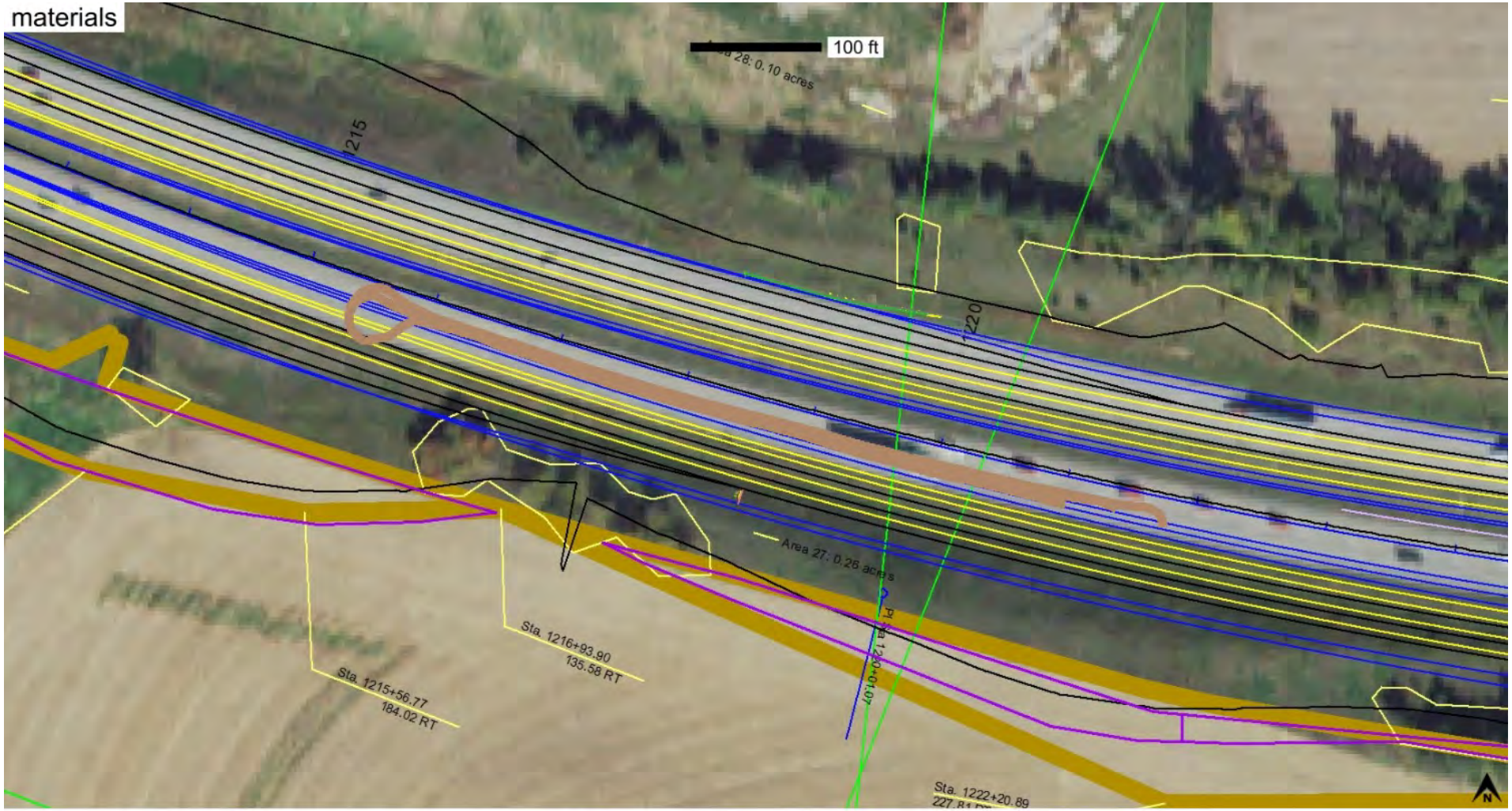



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 8314 | 0.191 | 100.0 | 3600.0 | 150.0 | 20.5 |




Subgrade_Treatment Special Backfill RAP_IADOT



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_180902 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

9/8/2022 2:58:08 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-180902.JPG





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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 6:17:50 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.086 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 5762 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 9.7 | 26.2 | 0.5 | 150.0 | 20.0 | 103.4 | 189.0 | 38.2 | 36.9 | -130.0 | -46.6 | 39.0 |
| Moisture Content | No | | | | | | | | | | | | |

### Mapped Area

| square feet | acres |
|---|---|
| 5762 | 0.132 |

### Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.8 | 2 |

### Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 760.44 | 764.14 | 767.51 |

### Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.3 | 5.1 | 6.1 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 5762 | 0.132 | 100.0 | 3600.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 2 | 5366 | 93.1 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

## Station

| Start | End |
|---|---|
| 1216+00 | 1223+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 6:17:50 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.086 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 5762 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 26.2 | CQI > = 95 |
| 9.7 | 80% of k-Value MVs >= 150 |
| 36.9 | COV <= 30 |
| 93.1 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

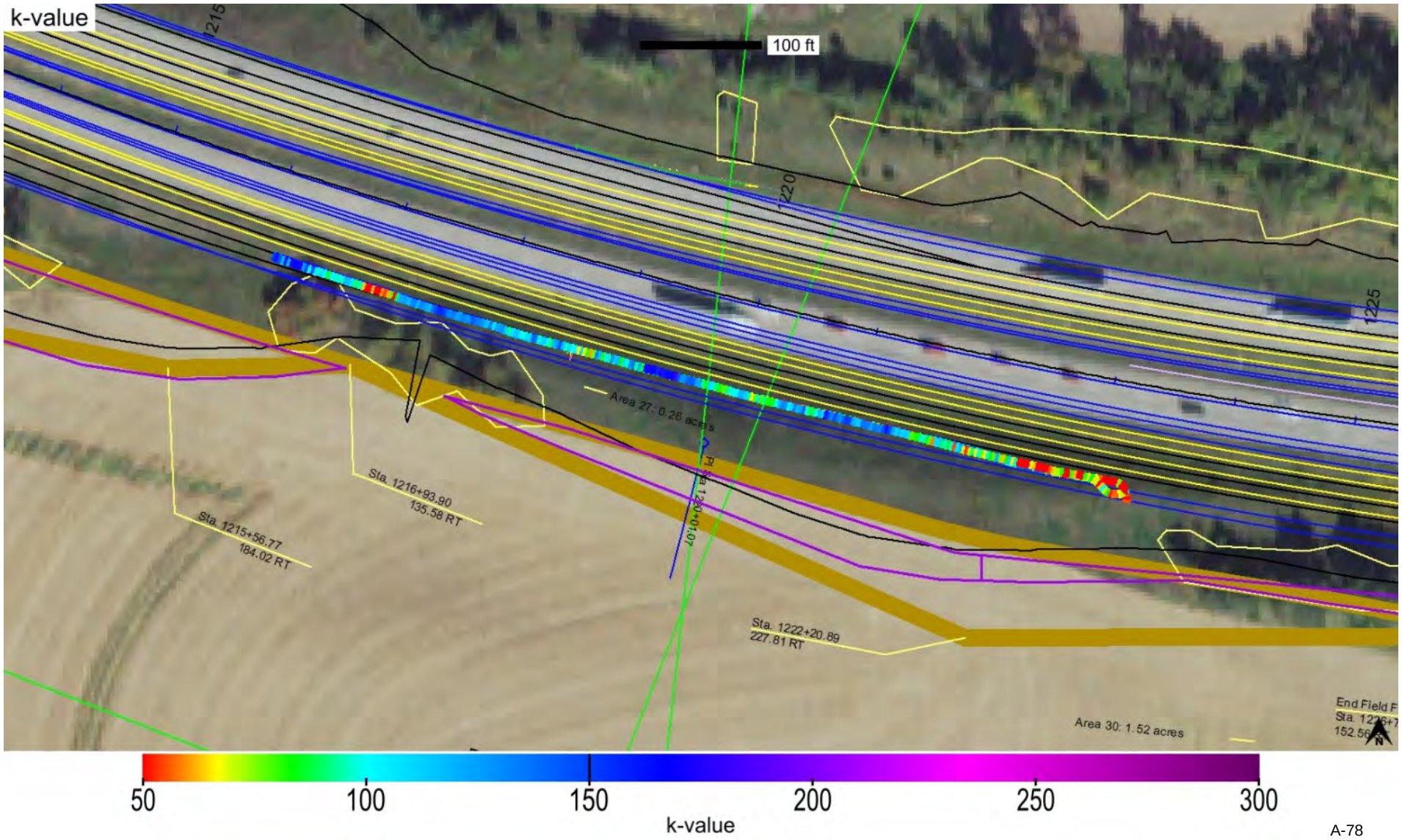


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 9.7 | 26.2 | 0.5 | 150.0 | 20.0 | 103.4 | 189.0 | 38.2 | 36.9 | -130.0 | -46.6 | 39.0 |



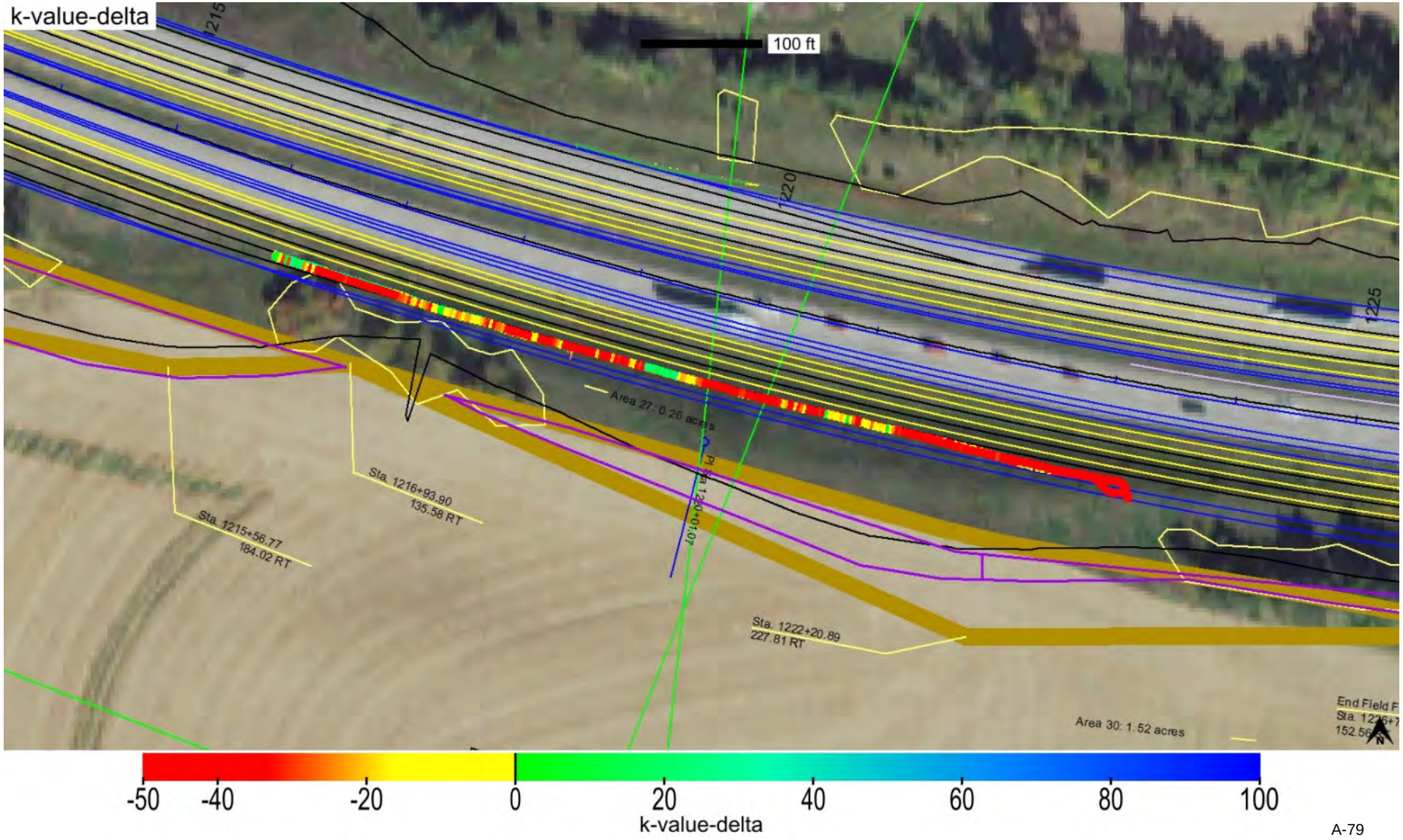



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 9.7 | 26.2 | 0.5 | 150.0 | 20.0 | 103.4 | 189.0 | 38.2 | 36.9 | -130.0 | -46.6 | 39.0 |



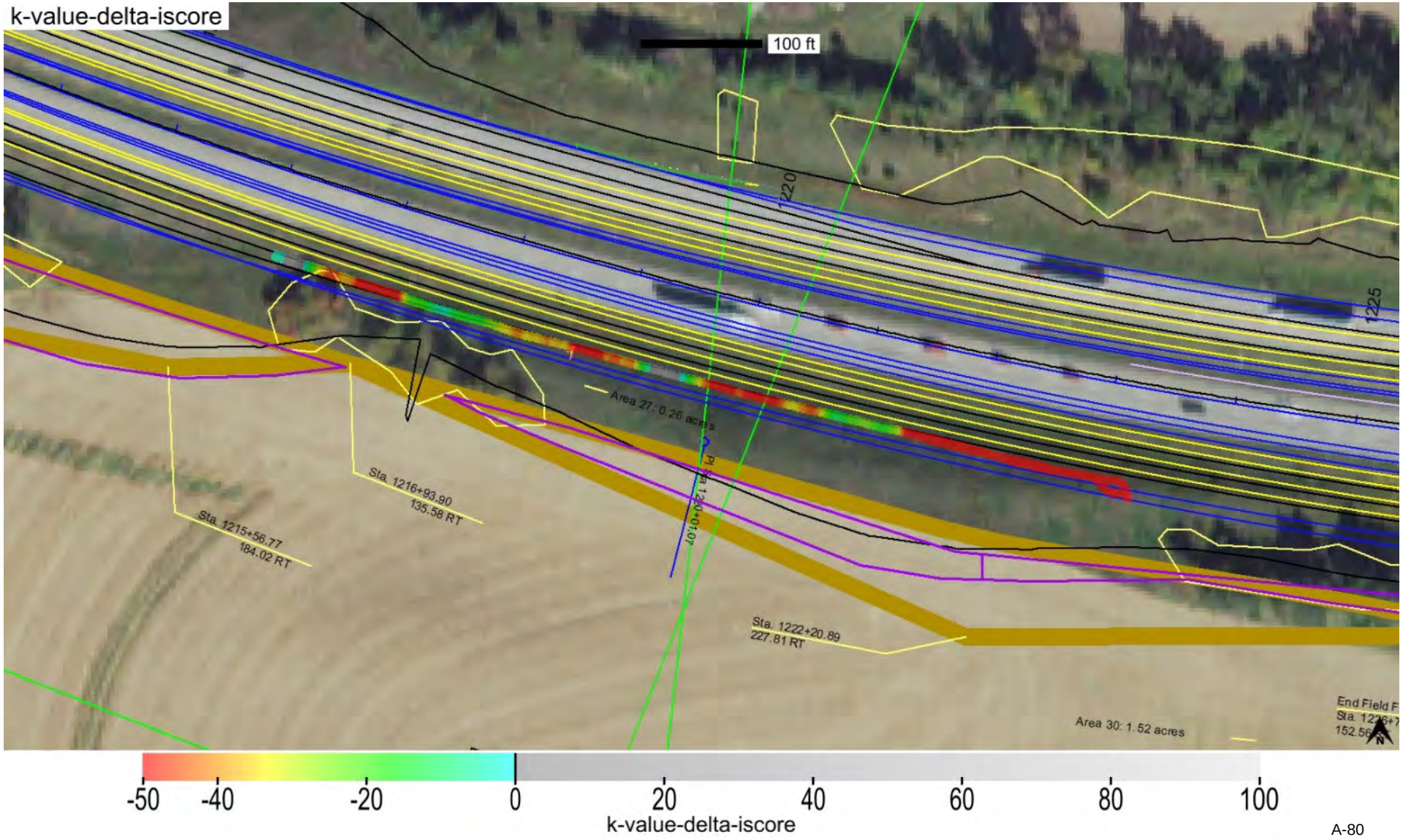



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 9.7 | 150.0 | -130.0 | -46.6 | 39.0 | -118.5 | -46.6 | 17.2 |



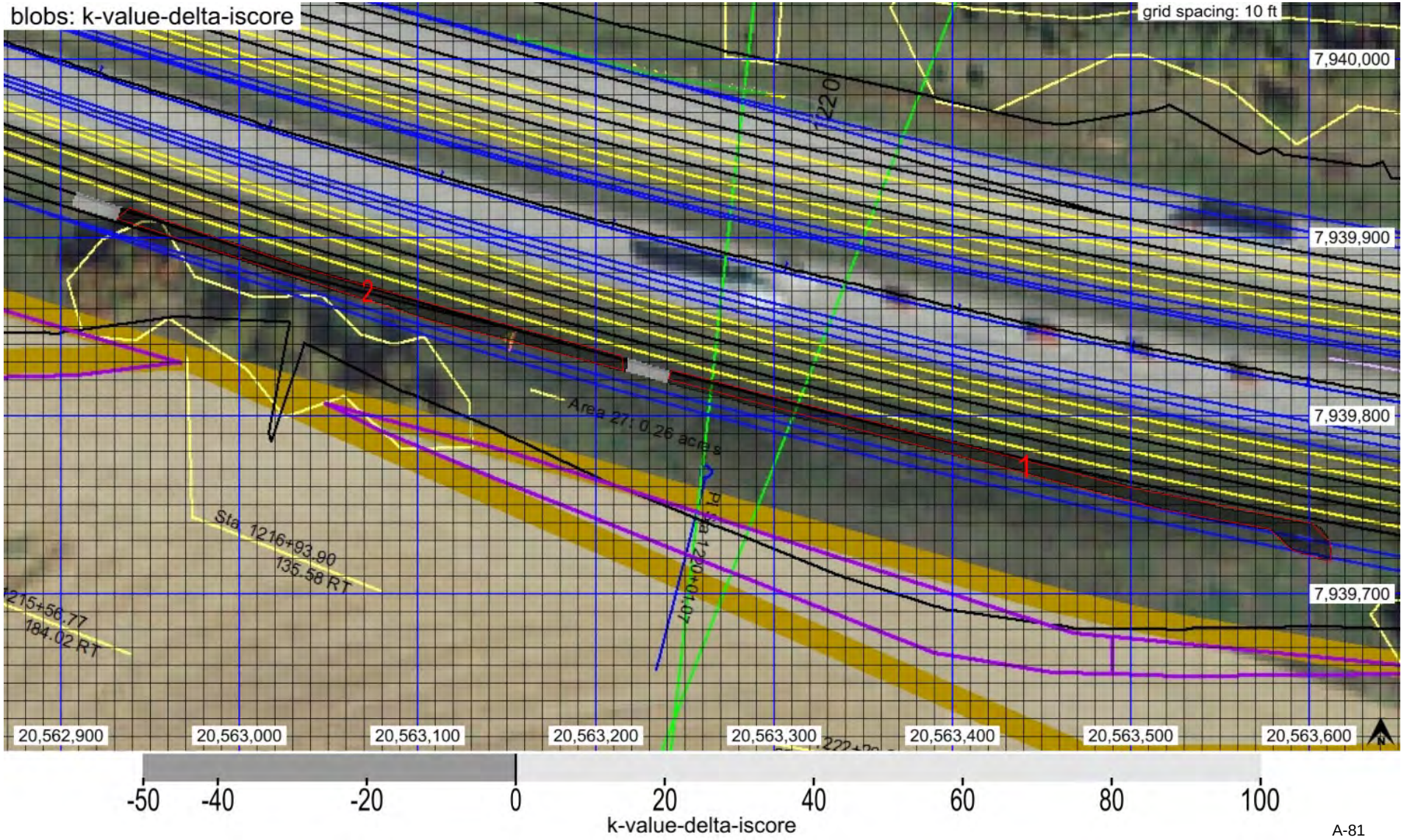



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 2 | 5366 | 93.1 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 3097 | 57.7 | 11 | -118.5 | -60.1 | -0.5 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20563608 | **7939718** |
| 2 | **20563612** | 7939718 |
| 3 | 20563612 | 7939730 |
| 4 | 20563602 | 7939740 |
| 5 | 20563500 | 7939760 |
| 6 | 20563242 | **7939826** |
| 7 | **20563240** | 7939820 |
| 8 | 20563516 | 7939748 |
| 9 | 20563578 | 7939736 |
| 10 | 20563590 | 7939724 |
| 11 | 20563608 | 7939720 |
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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 2 | 2269 | 42.3 | 7 | -94.0 | -37.3 | -0.1 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | **20563216** | **7939824** |
| 2 | 20563214 | 7939834 |
| 3 | 20563044 | 7939880 |
| 4 | 20562938 | **7939916** |
| 5 | **20562932** | 7939910 |
| 6 | 20563106 | 7939854 |
| 7 | 20563216 | 7939826 |
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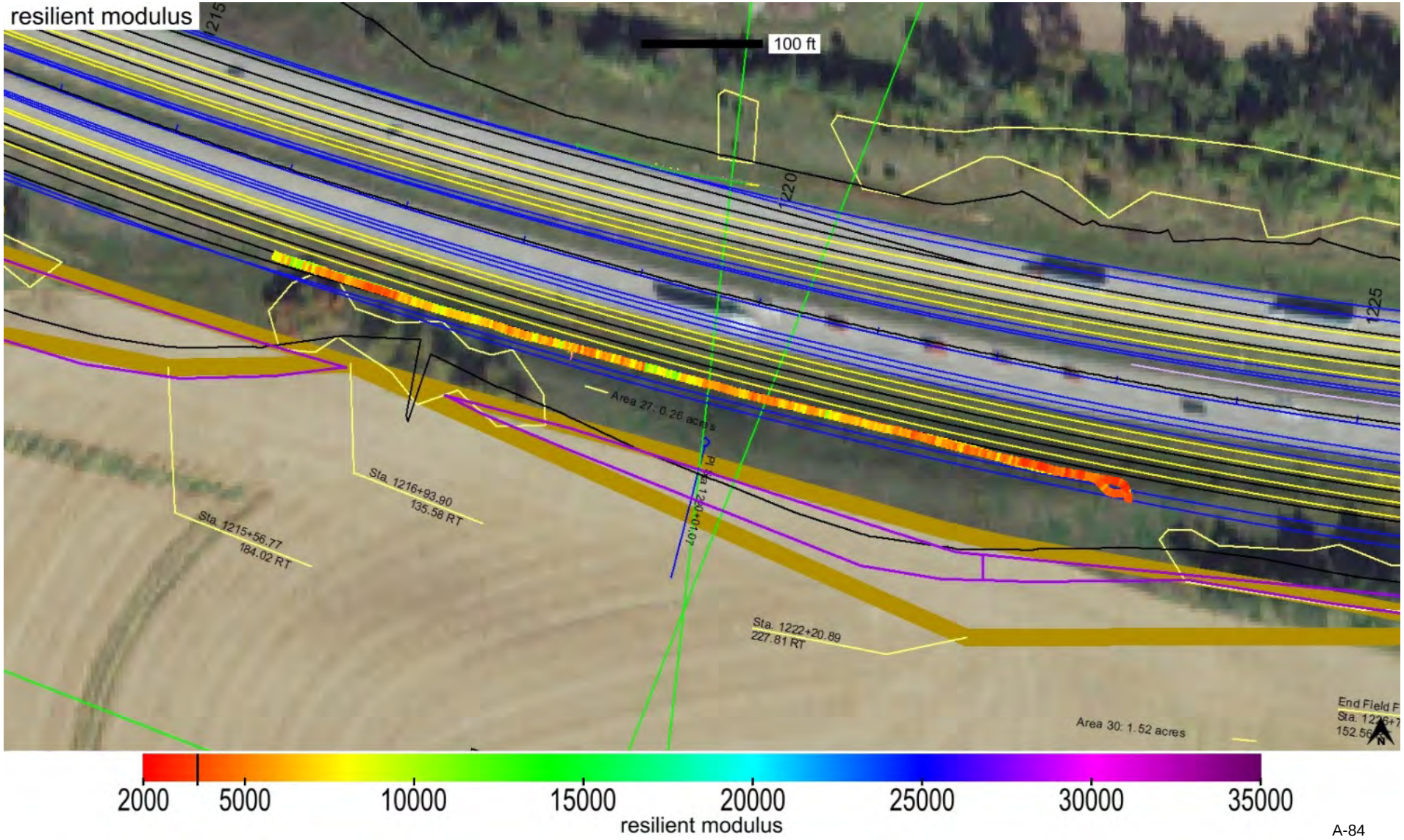


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 94.7 | 115.2 | 0.8 | 3600.0 | 2857.4 | 6046.8 | 11000.0 | 1754.9 | 29.0 | -742.6 | 2446.8 | 7400.0 |



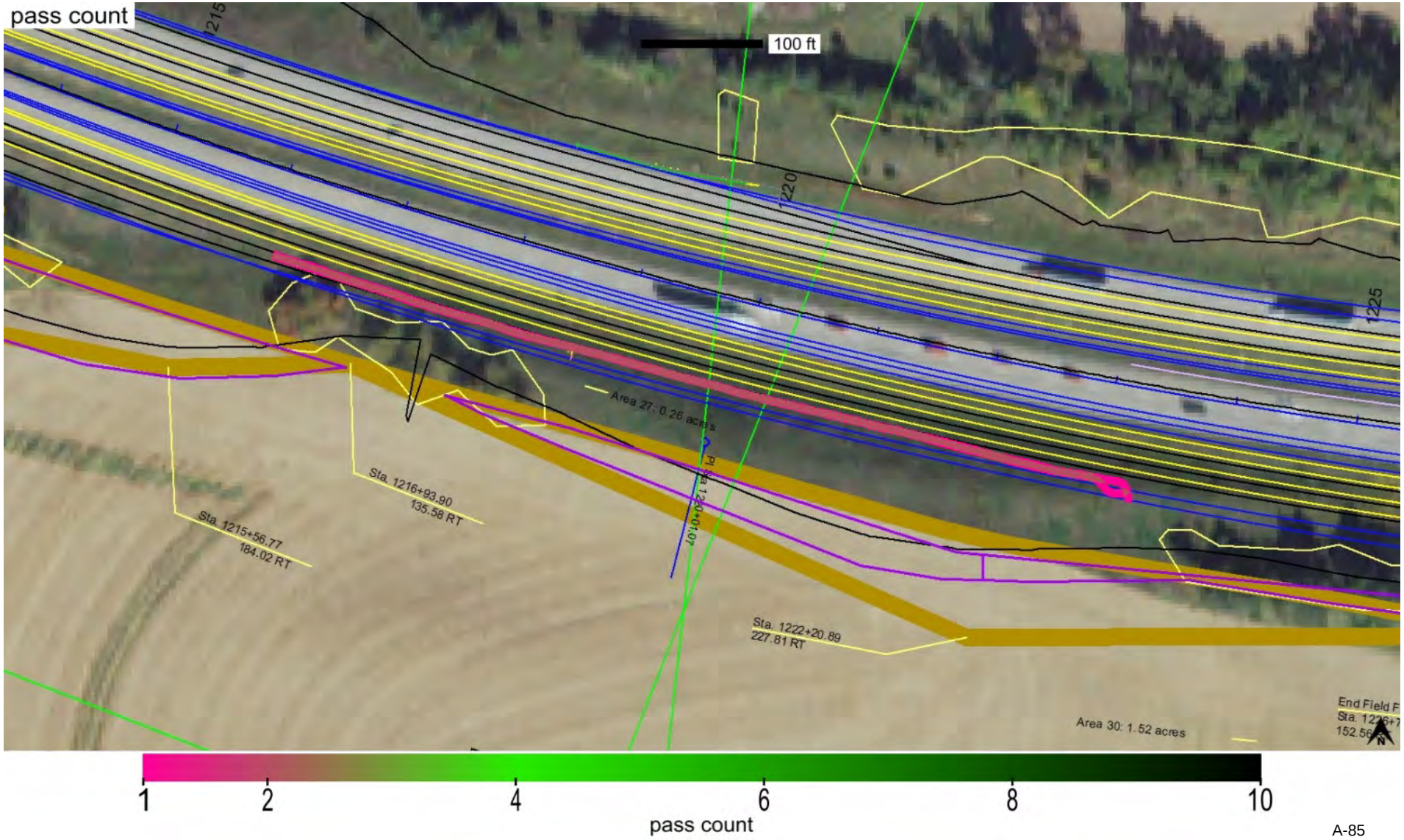



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.8 | 2 |



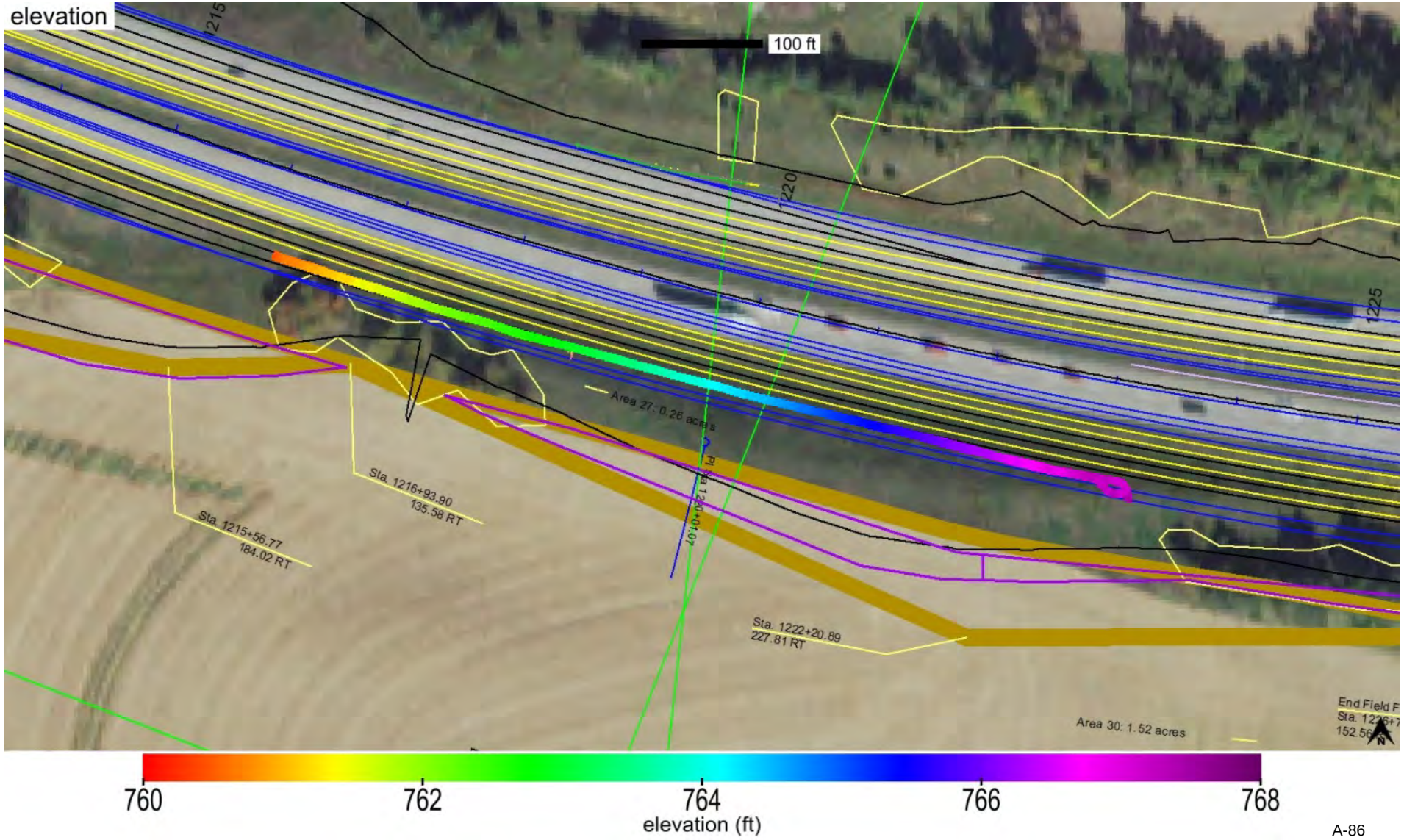



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 760.44 | 764.14 | 767.51 |



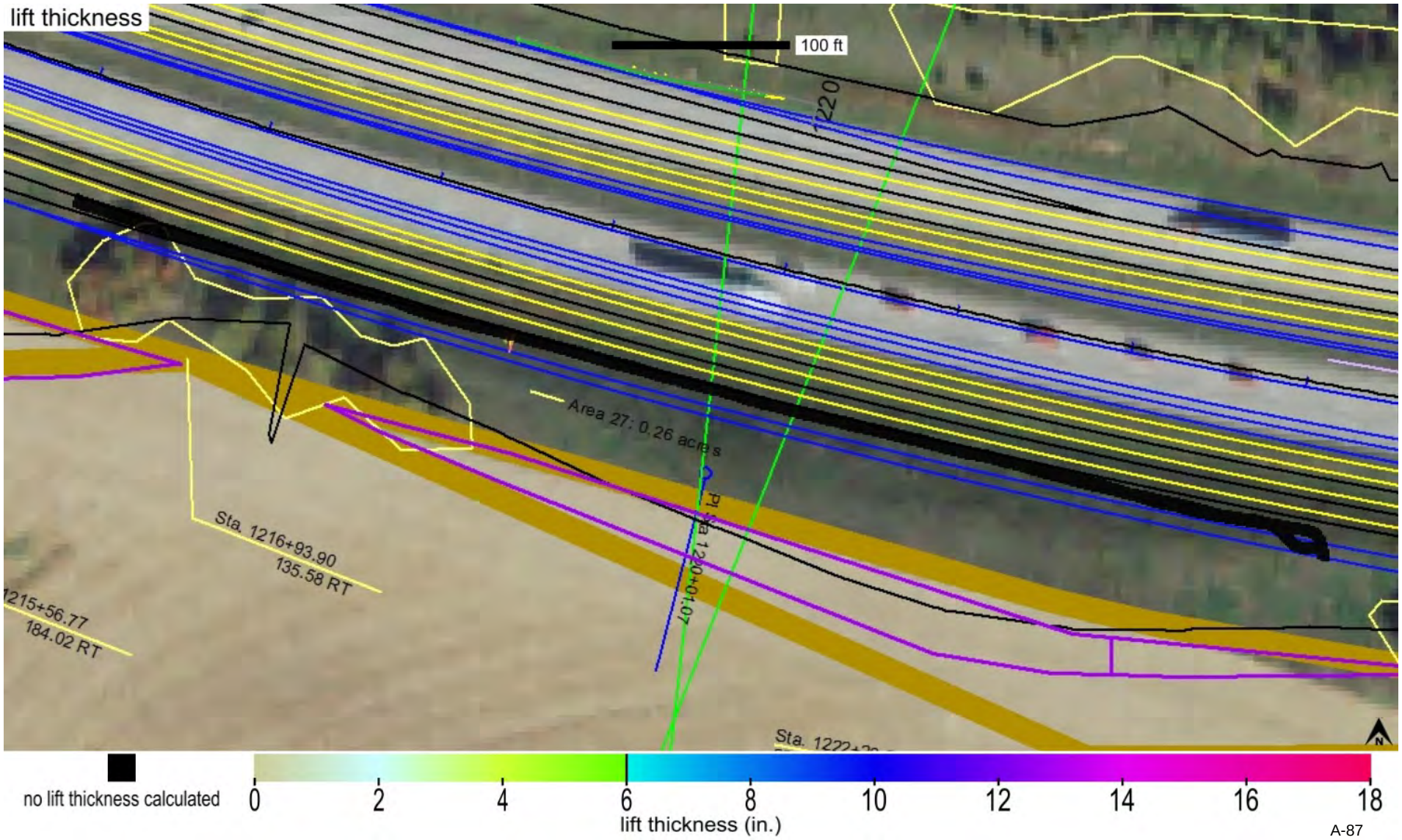



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |



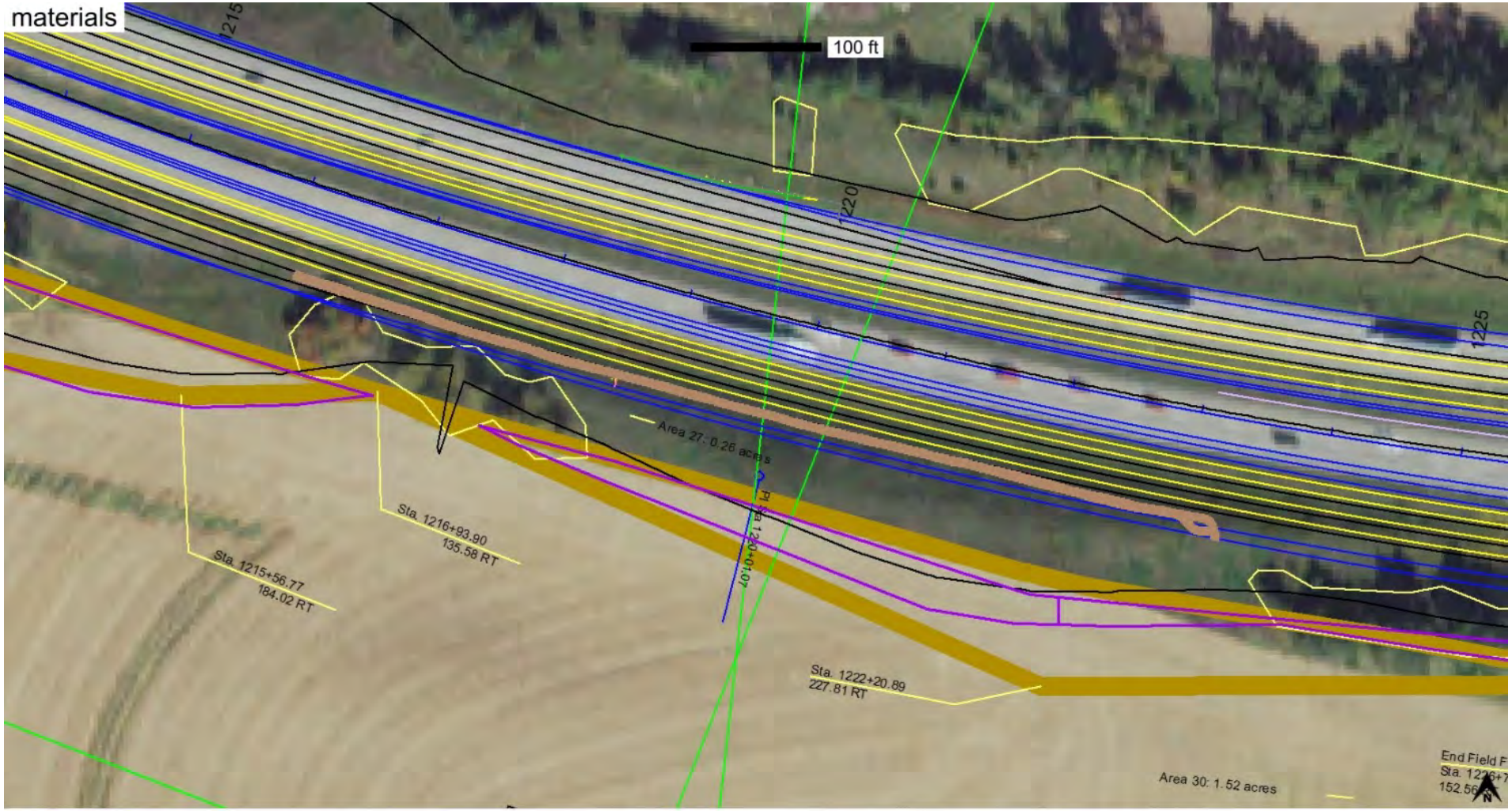



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 5762 | 0.132 | 100.0 | 3600.0 | 150.0 | 20.5 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_181750 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

9/8/2022 2:58:30 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-181750.JPG





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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 6:27:12 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.225 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 25779 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 24 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 0.0 | 18.4 | 0.0 | 150.0 | 35.0 | 52.1 | 146.5 | 17.3 | 33.3 | -115.0 | -97.9 | -3.5 |
| Moisture Content | No | | | | | | | | | | | | |

## Mapped Area

| square feet | acres |
|---|---|
| 25779 | 0.592 |

## Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.0 | 1 |

## Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 767.02 | 774.97 | 780.46 |

## Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.5 | 5.1 | 6.7 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Select Cohesive_IADOT | 24006 | 100.0 | 25779 | 0.592 | 100.0 | 3600.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 2 | 25779 | 100.0 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

## Station

| Start | End |
|---|---|
| 1223+00 | 1241+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 6:27:12 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.225 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 25779 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 24 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 18.4 | CQI > = 95 |
| 0.0 | 80% of k-Value MVs >= 150 |
| 33.3 | COV <= 30 |
| 100.0 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

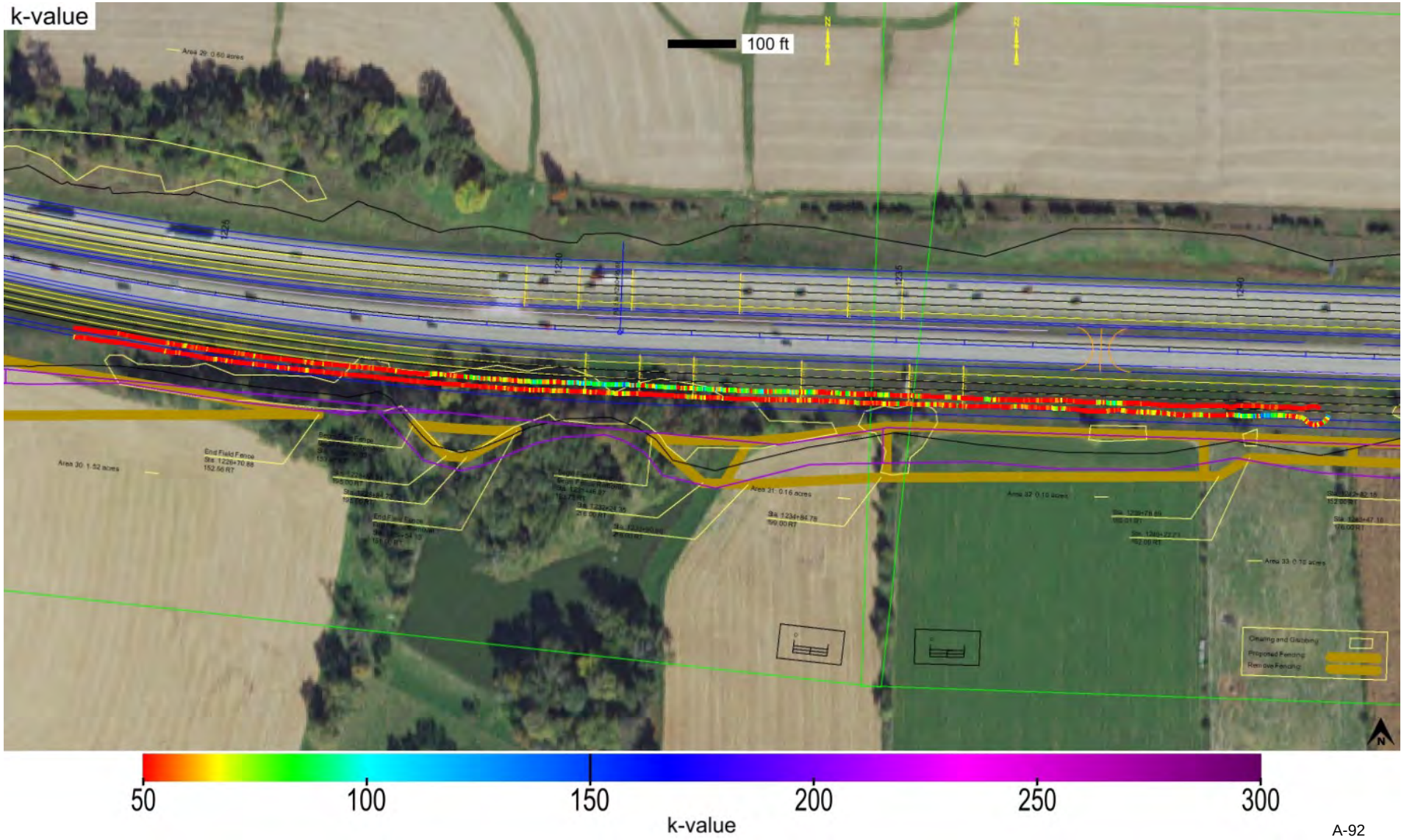


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.0 | 18.4 | 0.0 | 150.0 | 35.0 | 52.1 | 146.5 | 17.3 | 33.3 | -115.0 | -97.9 | -3.5 |



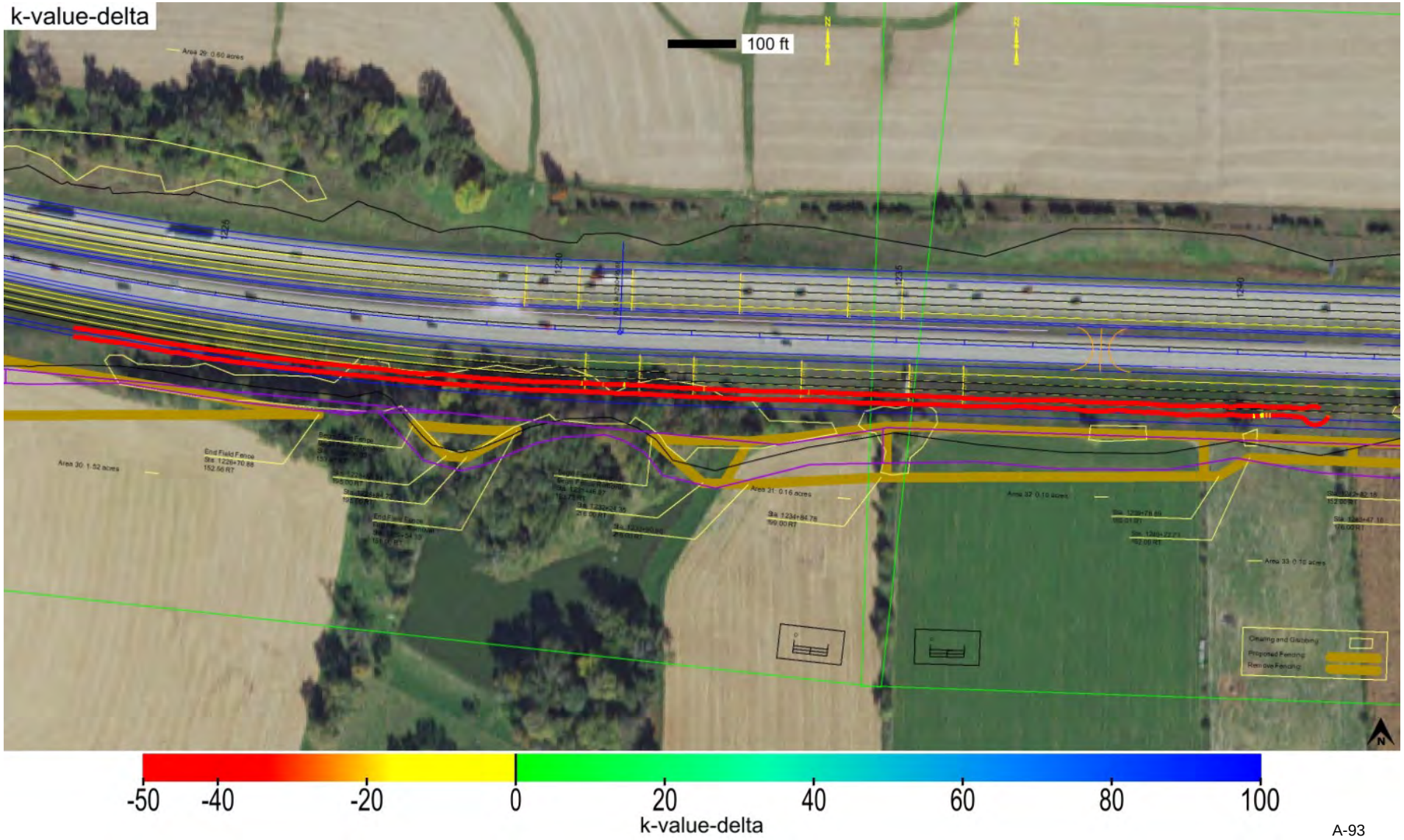



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.0 | 18.4 | 0.0 | 150.0 | 35.0 | 52.1 | 146.5 | 17.3 | 33.3 | -115.0 | -97.9 | -3.5 |



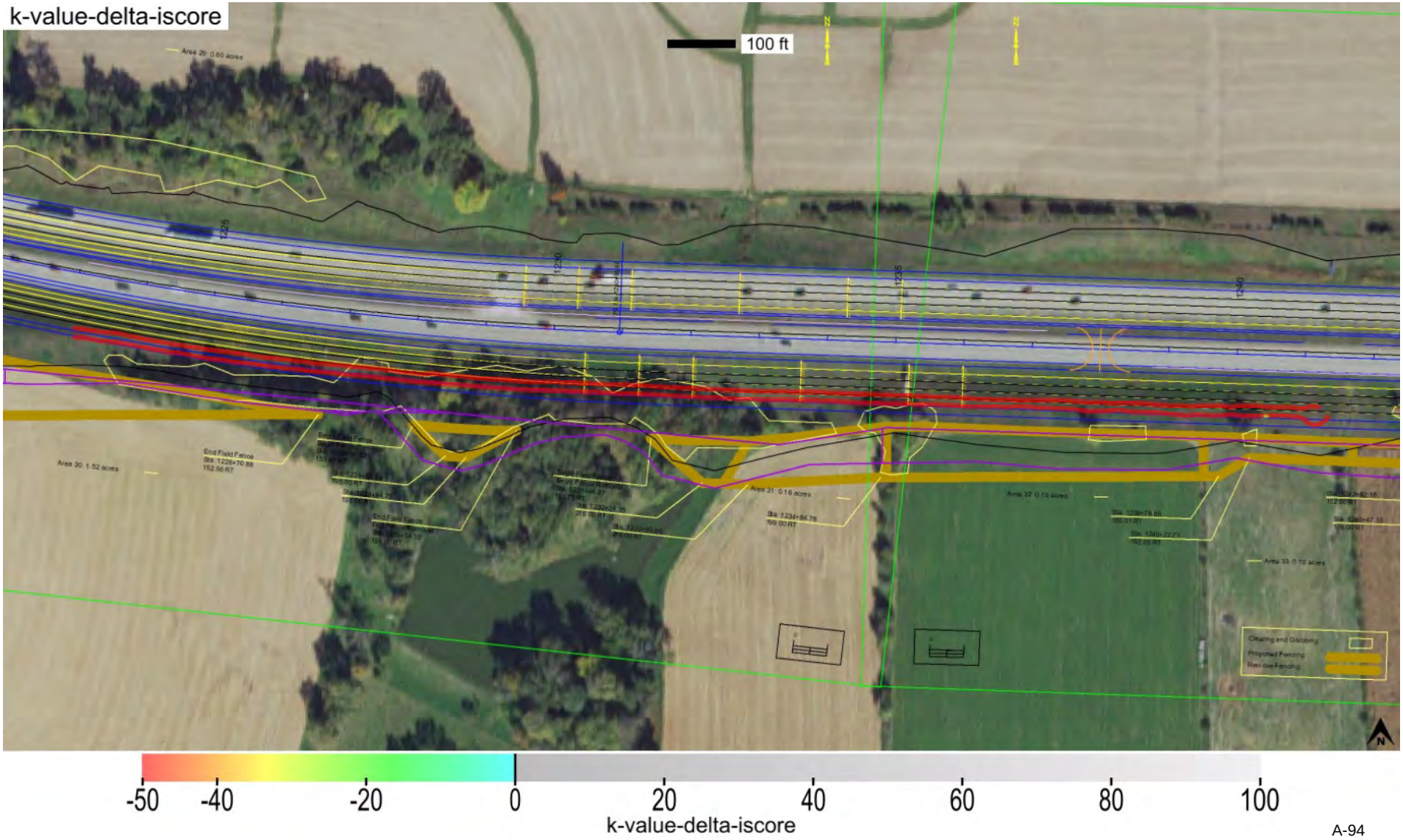



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.0 | 150.0 | -115.0 | -97.9 | -3.5 | -115.0 | -97.9 | -32.4 |



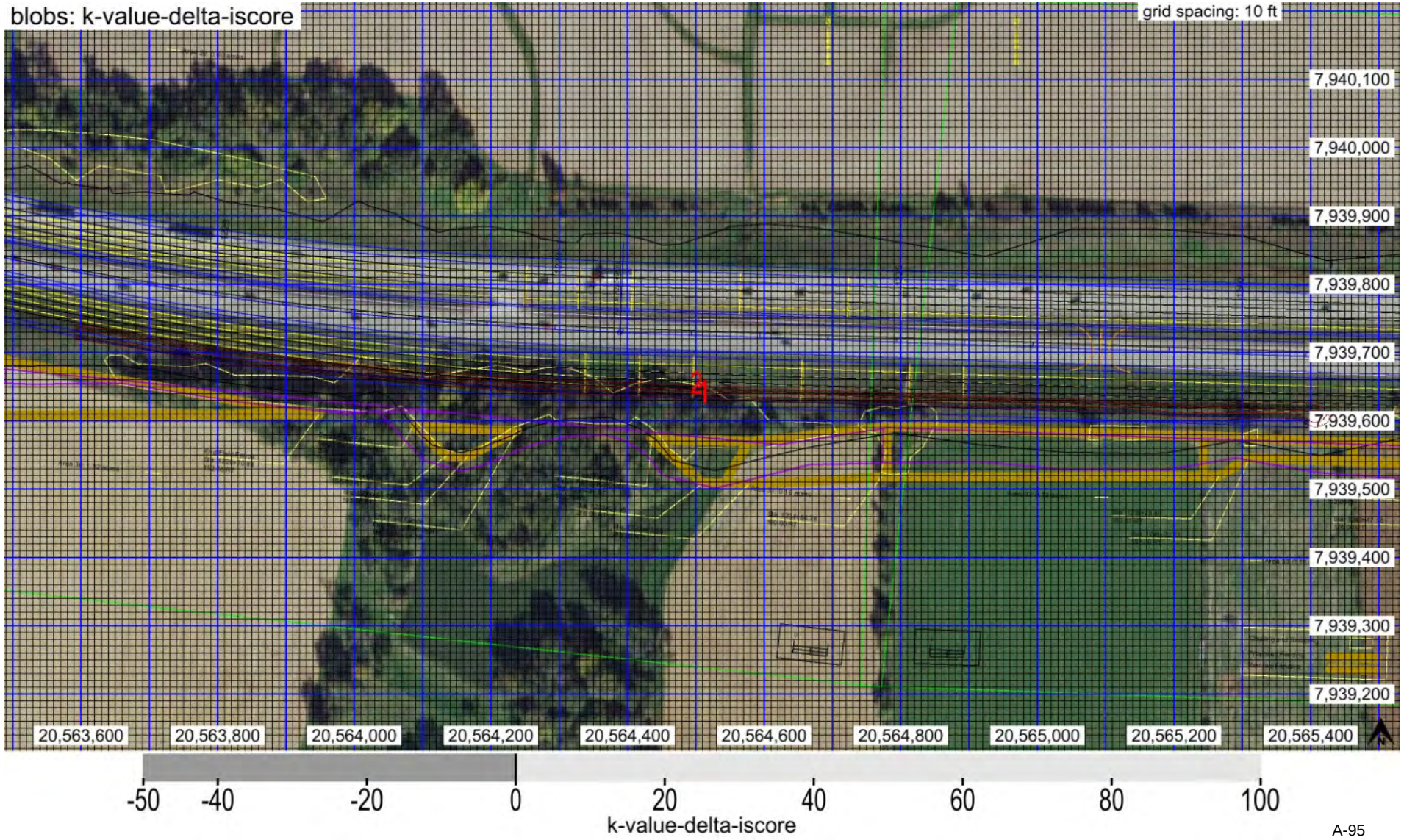



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 2 | 25779 | 100.0 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 12958 | 50.3 | 21 | -115.0 | -99.3 | -32.4 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20565404 | **7939590** |
| 2 | 20565424 | 7939596 |
| 3 | **20565430** | 7939606 |
| 4 | 20565424 | 7939610 |
| 5 | 20565416 | 7939600 |
| 6 | 20565404 | 7939598 |
| 7 | 20565388 | 7939608 |
| 8 | 20565362 | 7939612 |
| 9 | 20565212 | 7939612 |
| 10 | 20565120 | 7939620 |
| 11 | 20564236 | 7939650 |
| 12 | 20563888 | 7939682 |
| 13 | **20563588** | **7939724** |
| 14 | 20563592 | 7939718 |
| 15 | 20563816 | 7939684 |
| 16 | 20564236 | 7939642 |
| 17 | 20565120 | 7939612 |
| 18 | 20565212 | 7939604 |
| 19 | 20565362 | 7939604 |
| 20 | 20565388 | 7939602 |
| 21 | 20565404 | 7939592 |
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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 2 | 12821 | 49.7 | 14 | -115.0 | -96.5 | -46.4 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20565382 | **7939614** |
| 2 | 20565412 | 7939616 |
| 3 | **20565416** | 7939622 |
| 4 | 20565410 | 7939624 |
| 5 | 20565220 | 7939624 |
| 6 | 20564240 | 7939662 |
| 7 | 20563942 | 7939688 |
| 8 | 20563740 | 7939714 |
| 9 | 20563652 | 7939732 |
| 10 | 20563594 | **7939740** |
| 11 | **20563588** | 7939736 |
| 12 | 20563866 | 7939690 |
| 13 | 20564240 | 7939654 |
| 14 | 20565382 | 7939616 |
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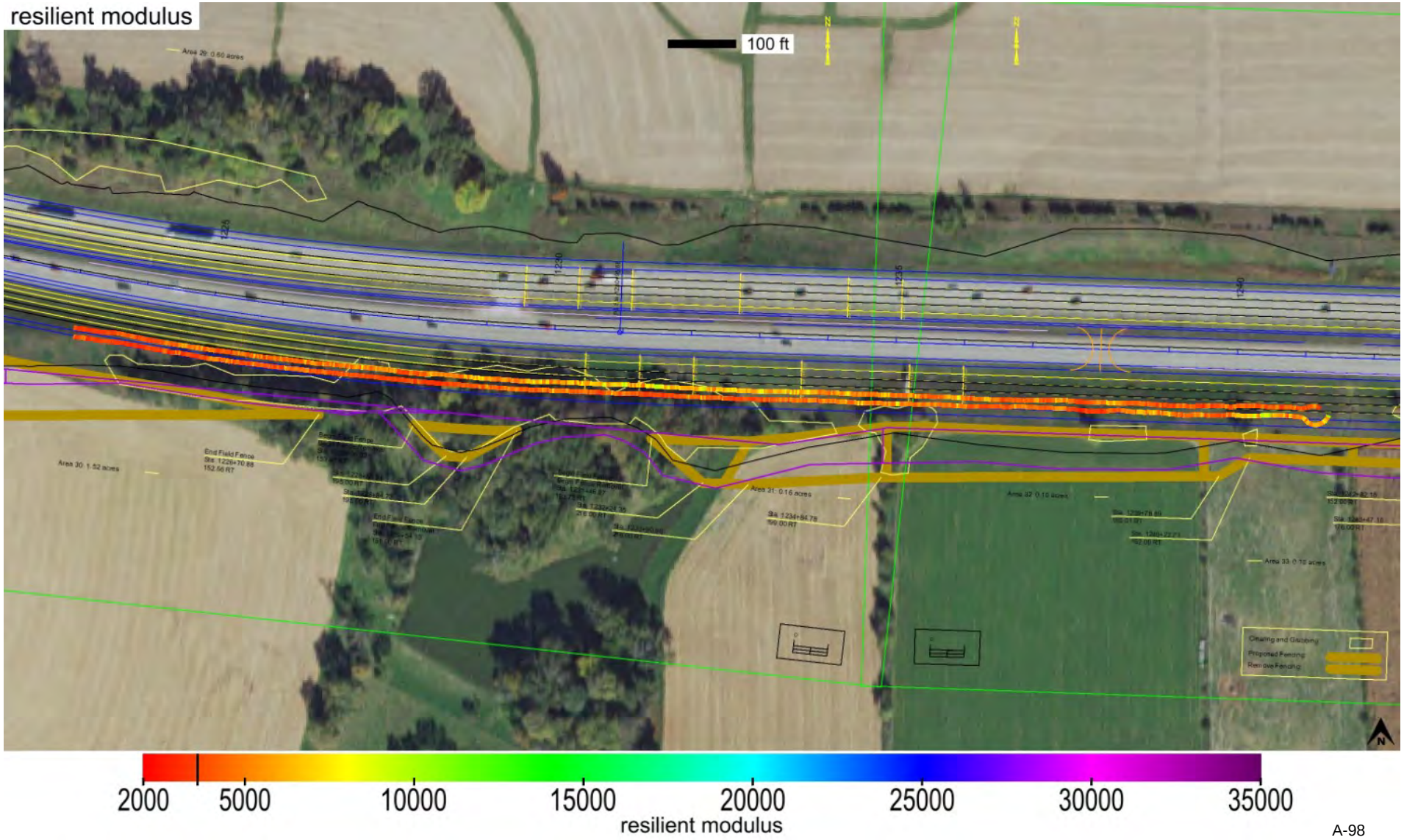


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 85.3 | 107.4 | 0.8 | 3600.0 | 2642.7 | 4824.6 | 10821.8 | 1246.2 | 25.8 | -957.3 | 1224.6 | 7221.8 |



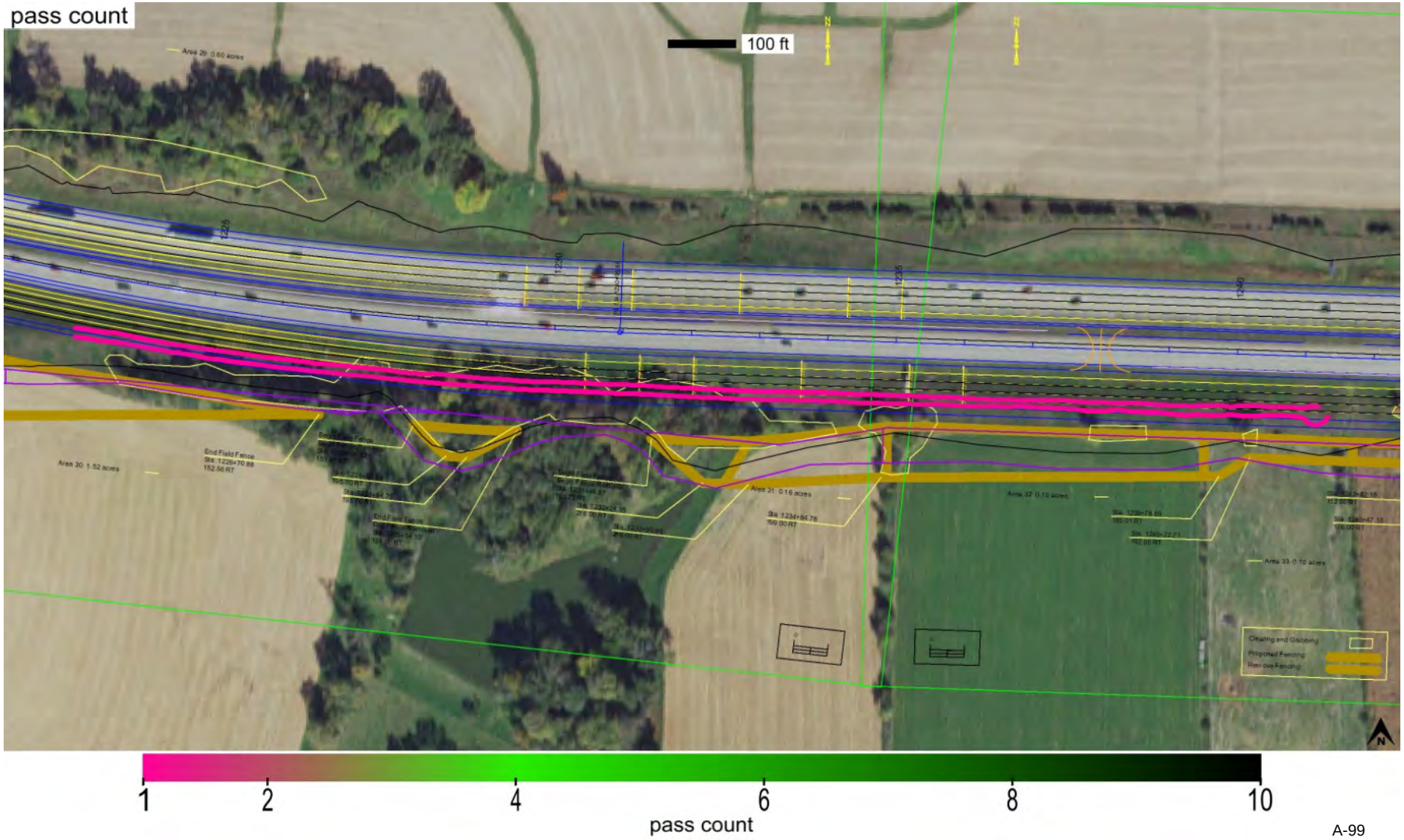



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.0 | 1 |



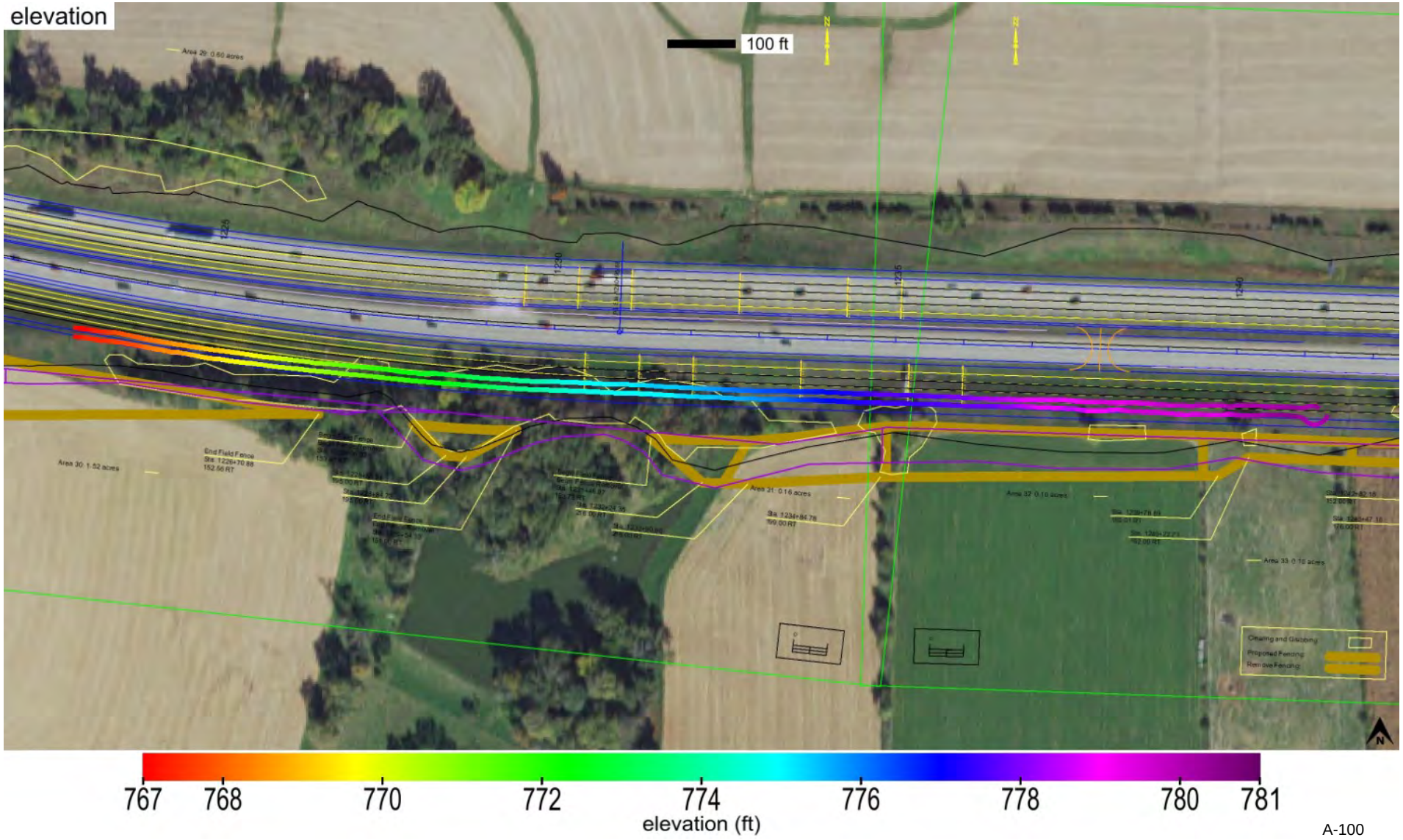



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| minimum | average | maximum |
|---|---|---|
| 767.02 | 774.97 | 780.47 |



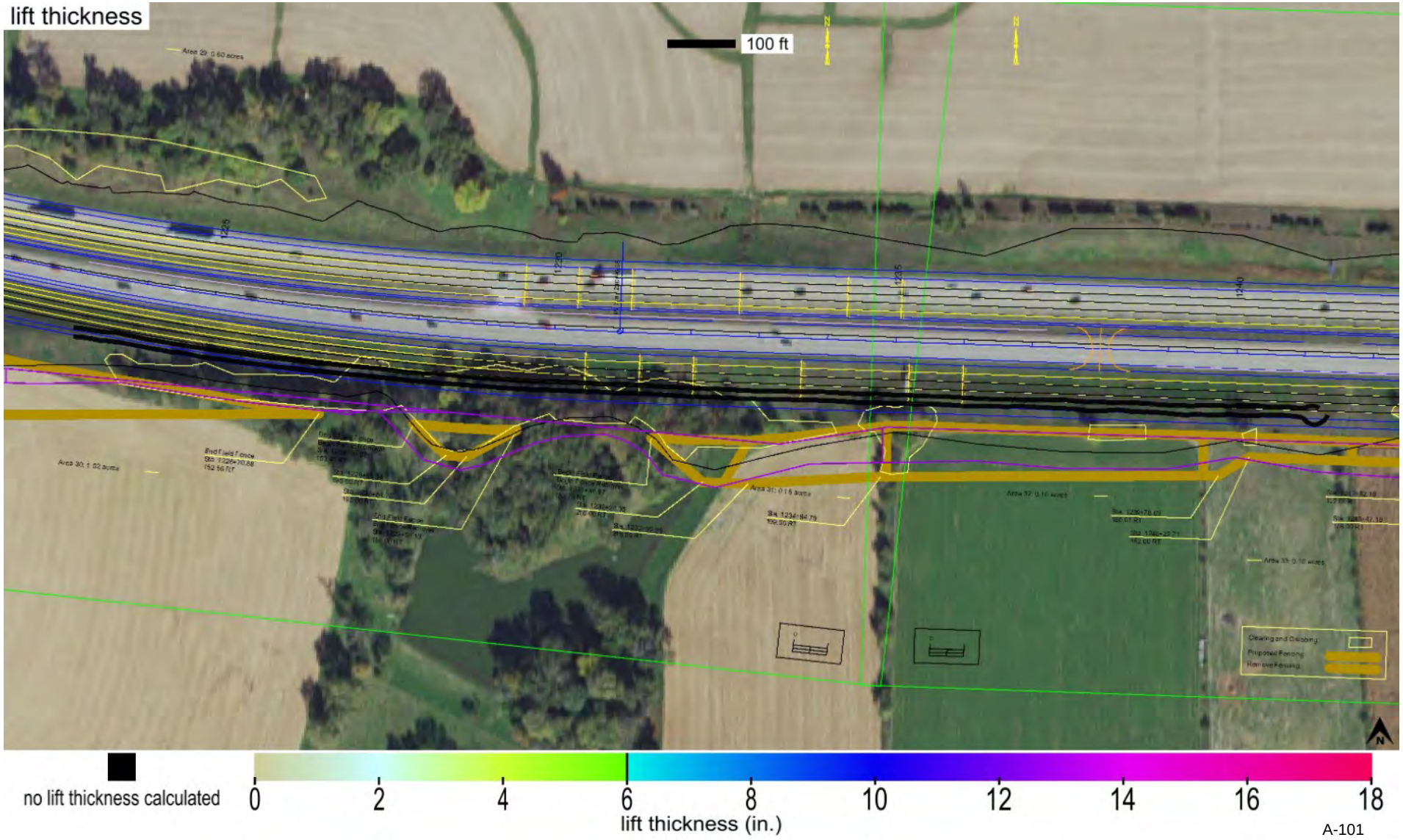



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |



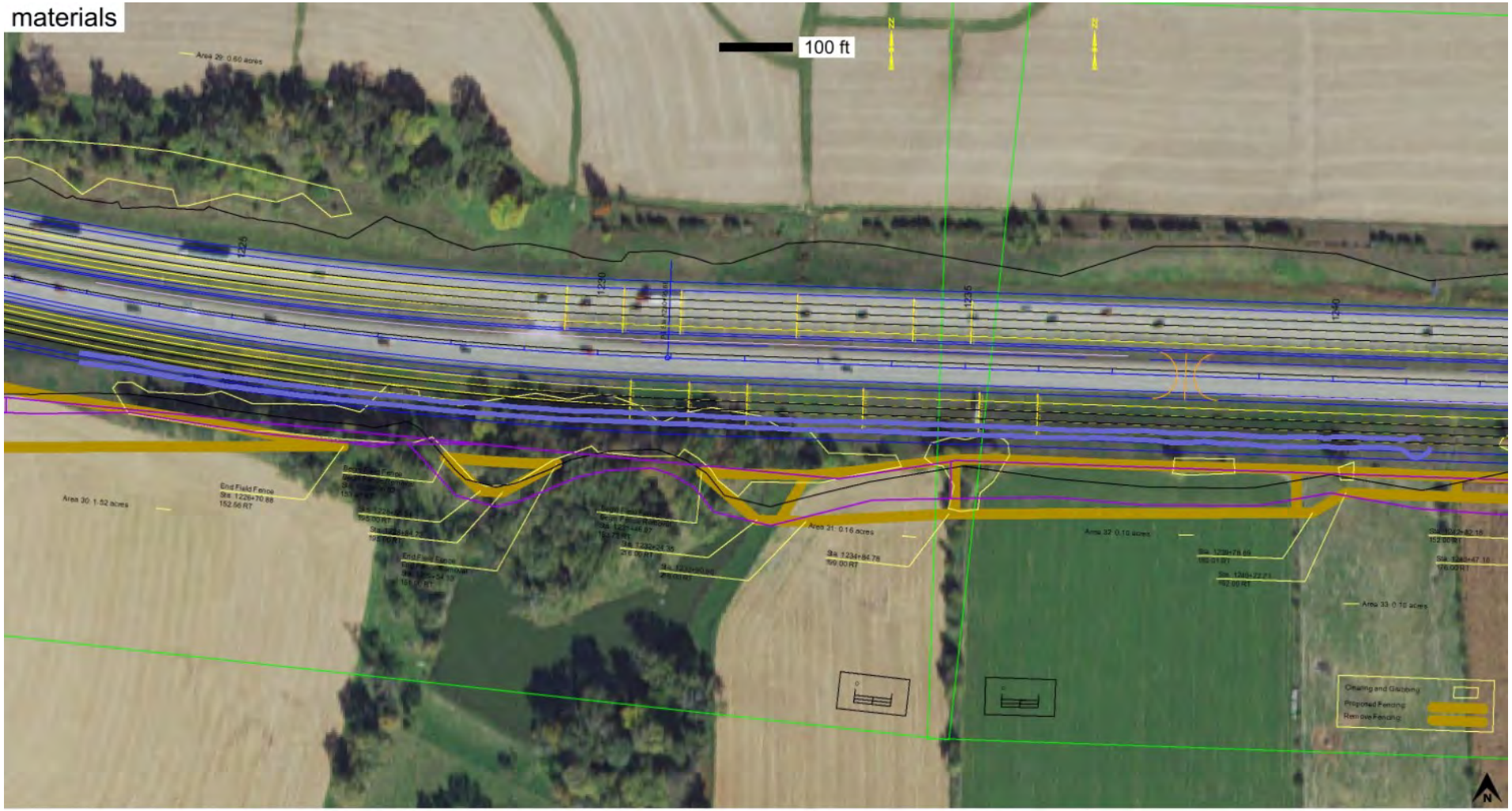



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Select Cohesive_IADOT | 24006 | 100.0 | 25779 | 0.592 | 100.0 | 3600.0 | 150.0 | 20.5 |




Subgrade_Treatment Select Cohesive_IADOT



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

9/8/2022 2:58:59 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-182712.JPG





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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_182712 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

9/8/2022 3:31:18 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-182712-POINT-2-3D-map-material-w-legend.jpg



Subgrade_Treatment Select Cohesive_IADOT (2102.02D)

material



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ingios GEOTECHNICS

9/8/2022 3:32:27 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-182712-DCP-I80-Johnson-20220811-PT2.jpg

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date of Test | 9/9/2022 | Test ID | PT_2 | Operator | CV | ASTM | D6951 |
| Easting (FT) | 20564361.5 | | Northing (FT) | 7939642.5 | | Elevation (ft) | 774.2 |
| Location | West of Wapsie Ave. | | Station | 1230+75 Outside Shoulder | | | |
| Comments | Top of the select subgrade treatment layer. Both top and bottom layers consist of CL material. Testing performed after production compaction passes by contractor and one pass using the RT machine in vibratory mode. | | | | | | |

| Parameter | DPI (mm/blow) | CBR (%) | $E_{CBR}$, Elastic Modulus (ksi) (non stress-dependent) | $S_{v,CBR}$, Bearing Capacity (psf) |
|---|---|---|---|---|
| Avg. Top Layer | 11.8 | 18.4 | 16.5 | 3,783 |
| Avg. Bottom Layer | 22.8 | 6.7 | 8.6 | 1,926 |
| Ratio of Avg. Top/Bottom Layer | 0.5 | 2.8 | 1.9 | 2.0 |
| Std.Dev. Top Layer | 10.3 | 10.8 | 11.7 | 2,645 |
| Std. Dev. Bottom Layer | 11.1 | 7.0 | 8.9 | 1,989 |

NOTE: *Top layer thickness assumed (nominal)*

NOTES:

Subgrade is classified as CL

[1] $CBR = 292/DPI^{1.12}$

[2] $CBR = 1/(0.017610(DPI))^2$

for CL soils with CBR < 10

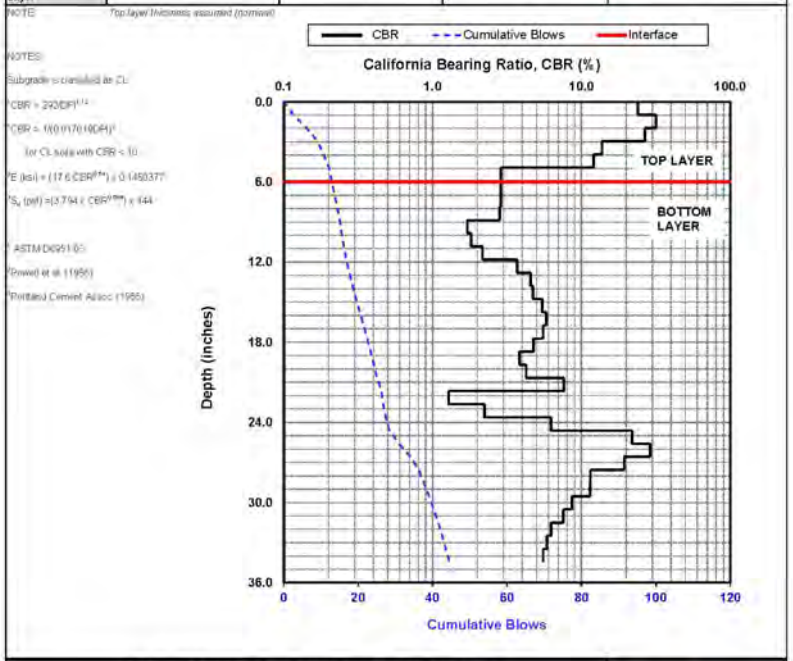
[3] $E\ (ksi) = (17.6\ CBR^{0.64}) \times 0.1450377$

[4] $S_v\ (psf) = (3.794 \times CBR^{0.709}) \times 144$

[1] ASTM D6951-03

[2] Powell et al. (1984)

[3] Portland Cement Assoc (1984)




**Dynamic Cone Penetrometer (DCP) Test Results**

| | |
|---|---|
| Project Name: | Johnson County I-80, IM-NHS-080-7(174)248--03-52 |
| Project ID: | SIA-00011 |
| Location: | I-80, Johnson County, Iowa |

ingios



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 7:05:57 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.374 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 47038 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 24 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 0.0 | 18.6 | 0.1 | 150.0 | 35.0 | 54.6 | 165.0 | 18.0 | 32.9 | -115.0 | -95.4 | 15.0 |
| Moisture Content | No | | | | | | | | | | | | |

## Mapped Area

| square feet | acres |
|---|---|
| 47038 | 1.080 |

## Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.0 | 2 |

## Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 742.15 | 767.03 | 780.83 |

## Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.5 | 5.1 | 6.7 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Select Cohesive_IADOT | 24006 | 100.0 | 47038 | 1.080 | 100.0 | 3600.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 1 | 47038 | 100.0 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

## Station

| Start | End |
|---|---|
| 1240+00 | 1274+00 |



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 7:05:57 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.374 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 47038 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 24 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 18.6 | CQI > = 95 |
| 0.0 | 80% of k-Value MVs >= 150 |
| 32.9 | COV <= 30 |
| 100.0 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

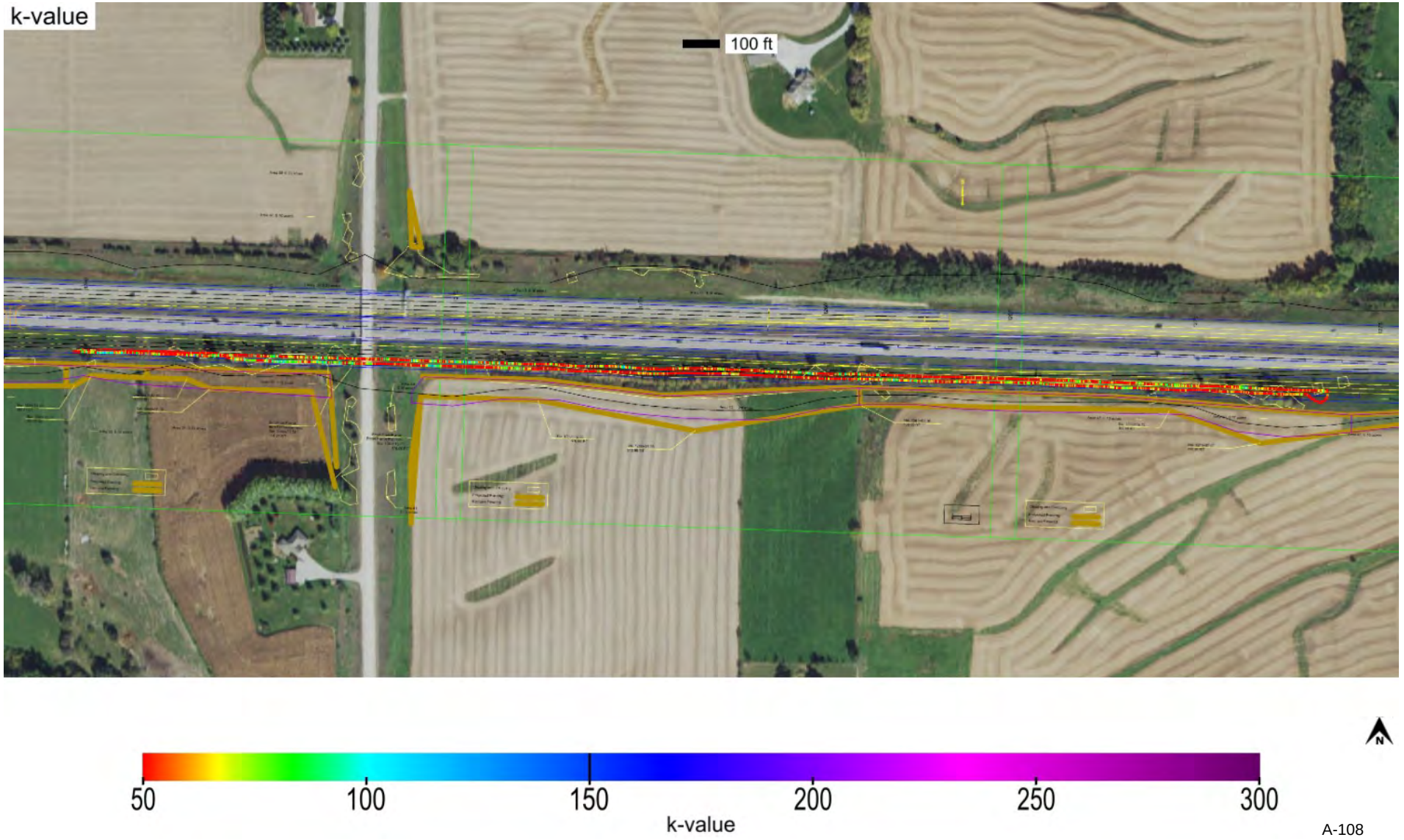


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.0 | 18.6 | 0.1 | 150.0 | 35.0 | 54.6 | 165.0 | 18.0 | 32.9 | -115.0 | -95.4 | 15.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.0 | 18.6 | 0.1 | 150.0 | 35.0 | 54.6 | 165.0 | 18.0 | 32.9 | -115.0 | -95.4 | 15.0 |



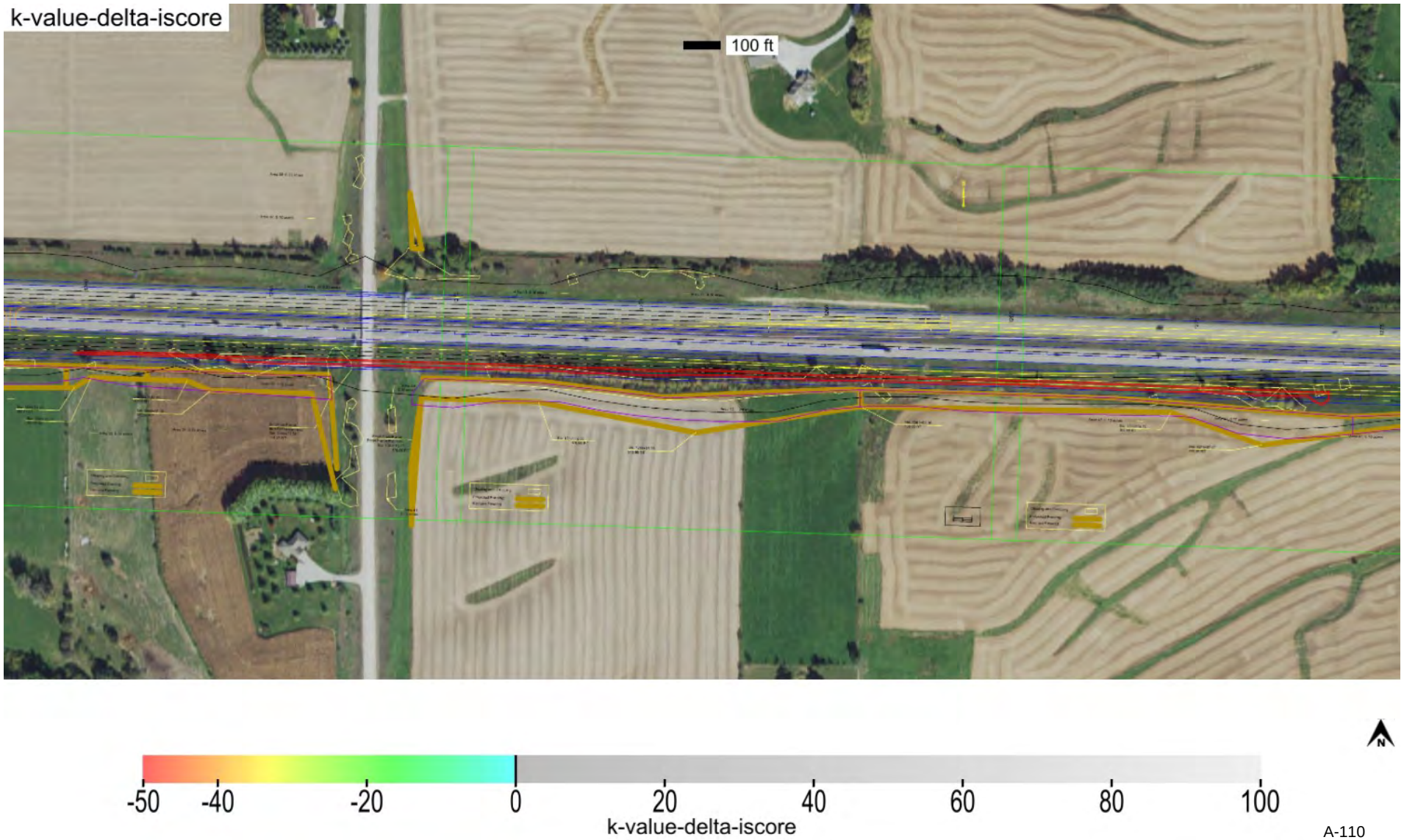



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.0 | 150.0 | -115.0 | -95.4 | 15.0 | -115.0 | -95.4 | -43.2 |



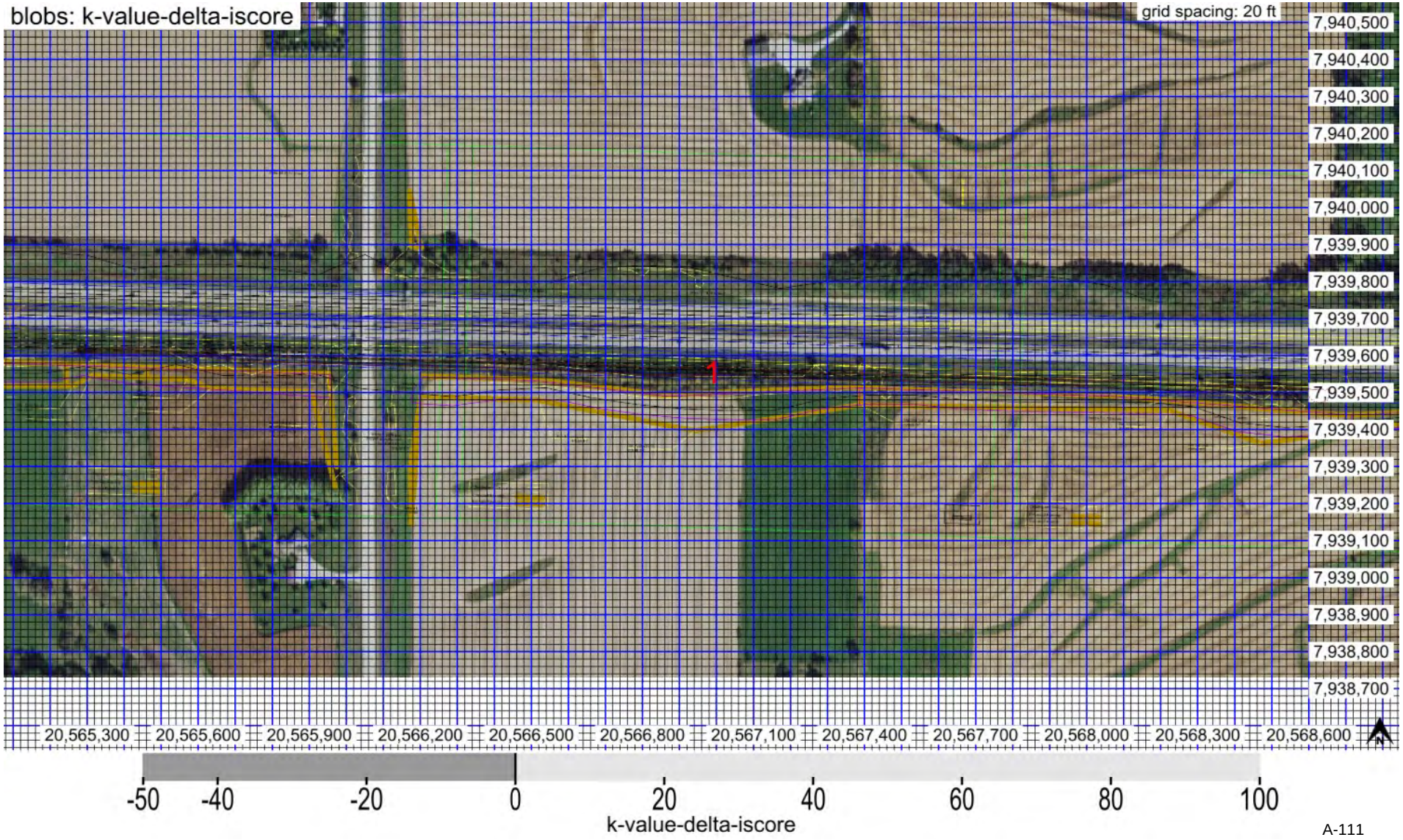



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 1 | 47038 | 100.0 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 47038 | 100.0 | 27 | -115.0 | -95.4 | -43.2 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20568628 | **7939470** |
| 2 | 20568652 | 7939482 |
| 3 | **20568656** | 7939498 |
| 4 | 20568652 | 7939510 |
| 5 | 20568646 | 7939506 |
| 6 | 20567902 | 7939538 |
| 7 | 20567258 | 7939554 |
| 8 | 20567012 | 7939568 |
| 9 | 20566844 | 7939566 |
| 10 | 20566556 | 7939580 |
| 11 | 20565662 | 7939604 |
| 12 | 20565622 | 7939612 |
| 13 | 20565364 | **7939618** |
| 14 | **20565262** | 7939614 |
| 15 | 20565262 | 7939608 |
| 16 | 20565268 | 7939606 |
| 17 | 20565664 | 7939596 |
| 18 | 20565698 | 7939586 |
| 19 | 20565802 | 7939580 |
| 20 | 20566556 | 7939562 |
| 21 | 20566812 | 7939548 |
| 22 | 20567038 | 7939548 |
| 23 | 20567288 | 7939534 |
| 24 | 20567866 | 7939524 |
| 25 | 20568088 | 7939508 |
| 26 | 20568594 | 7939492 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 27 | 20568628 | 7939472 |

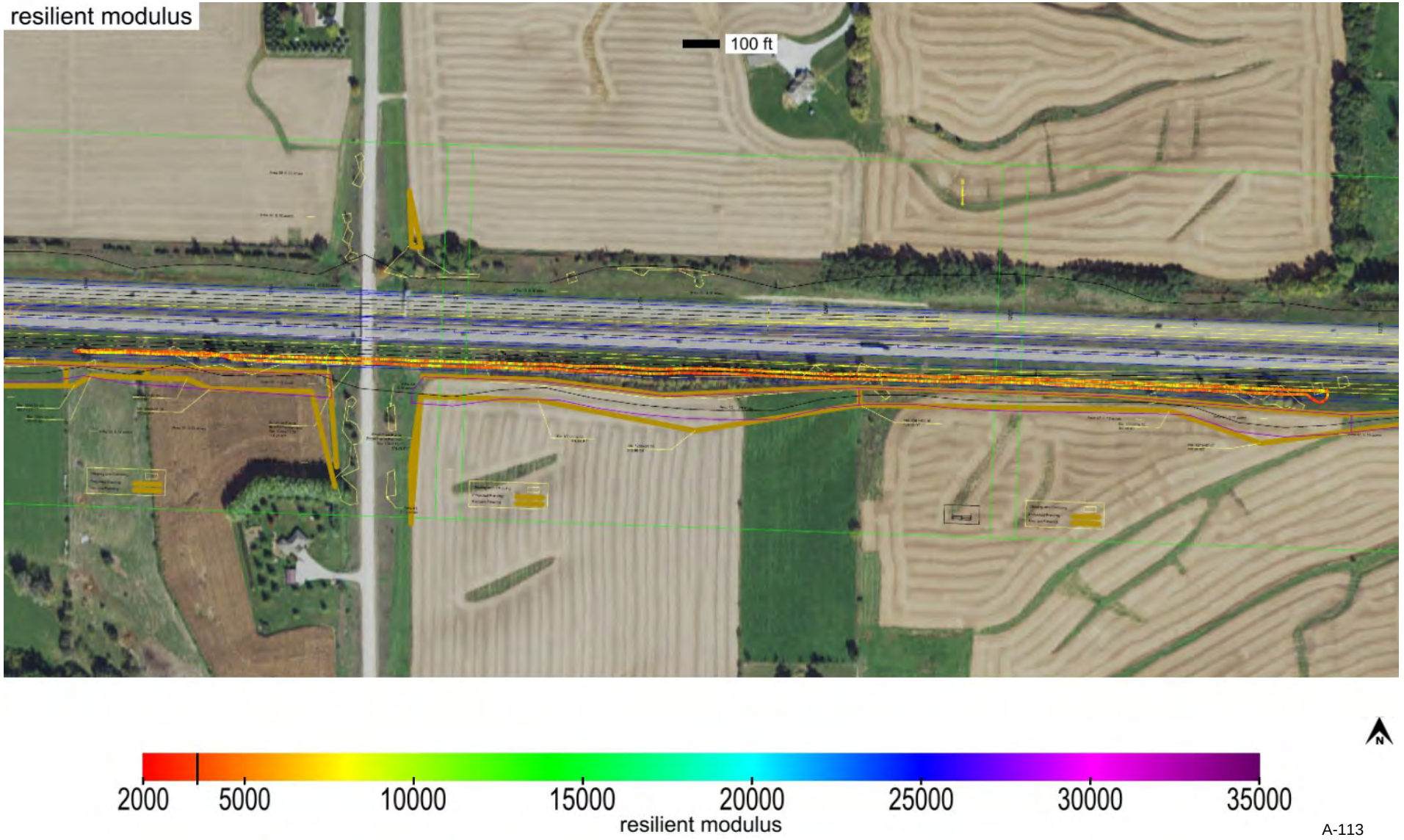


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 95.0 | 117.0 | 0.8 | 3600.0 | 2721.9 | 5462.1 | 11000.0 | 1420.4 | 26.0 | -878.1 | 1862.1 | 7400.0 |



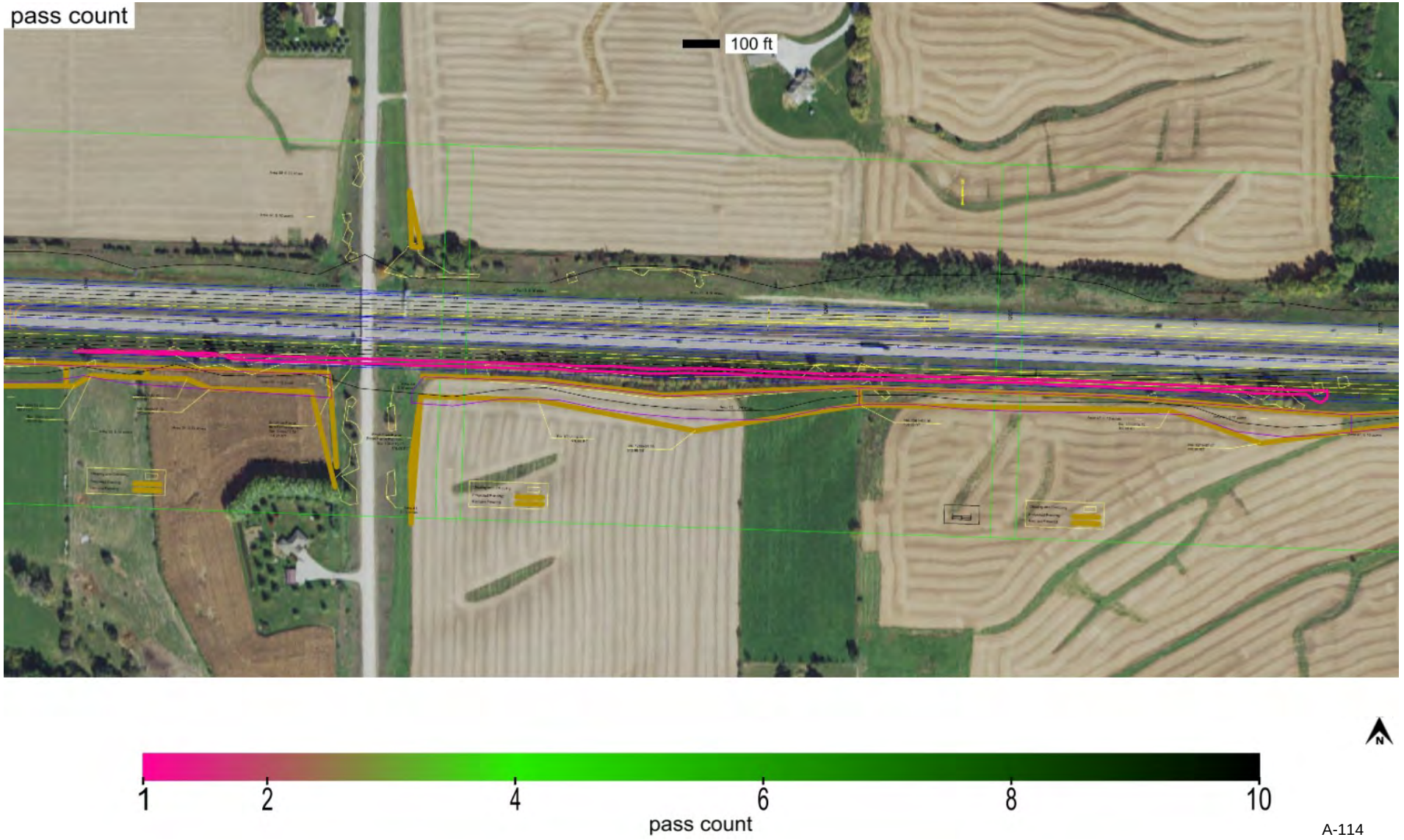



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.0 | 2 |



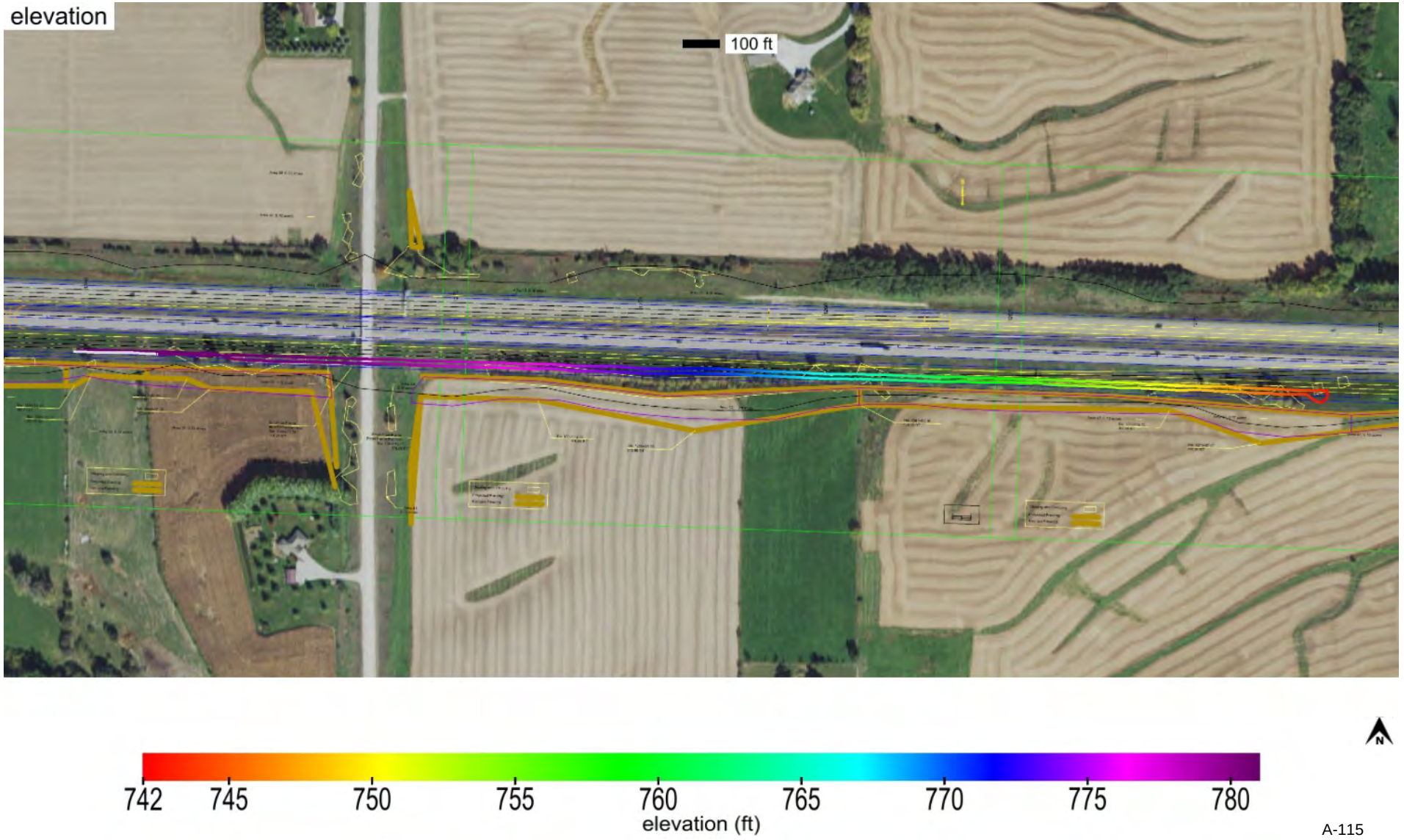



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| minimum | average | maximum |
|---|---|---|
| 742.15 | 767.03 | 780.83 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

lift thickness

100 ft








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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Select Cohesive_IADOT | 24006 | 100.0 | 47038 | 1.080 | 100.0 | 3600.0 | 150.0 | 20.5 |




Subgrade_Treatment Select Cohesive_IADOT



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

9/8/2022 2:59:28 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-190557.JPG



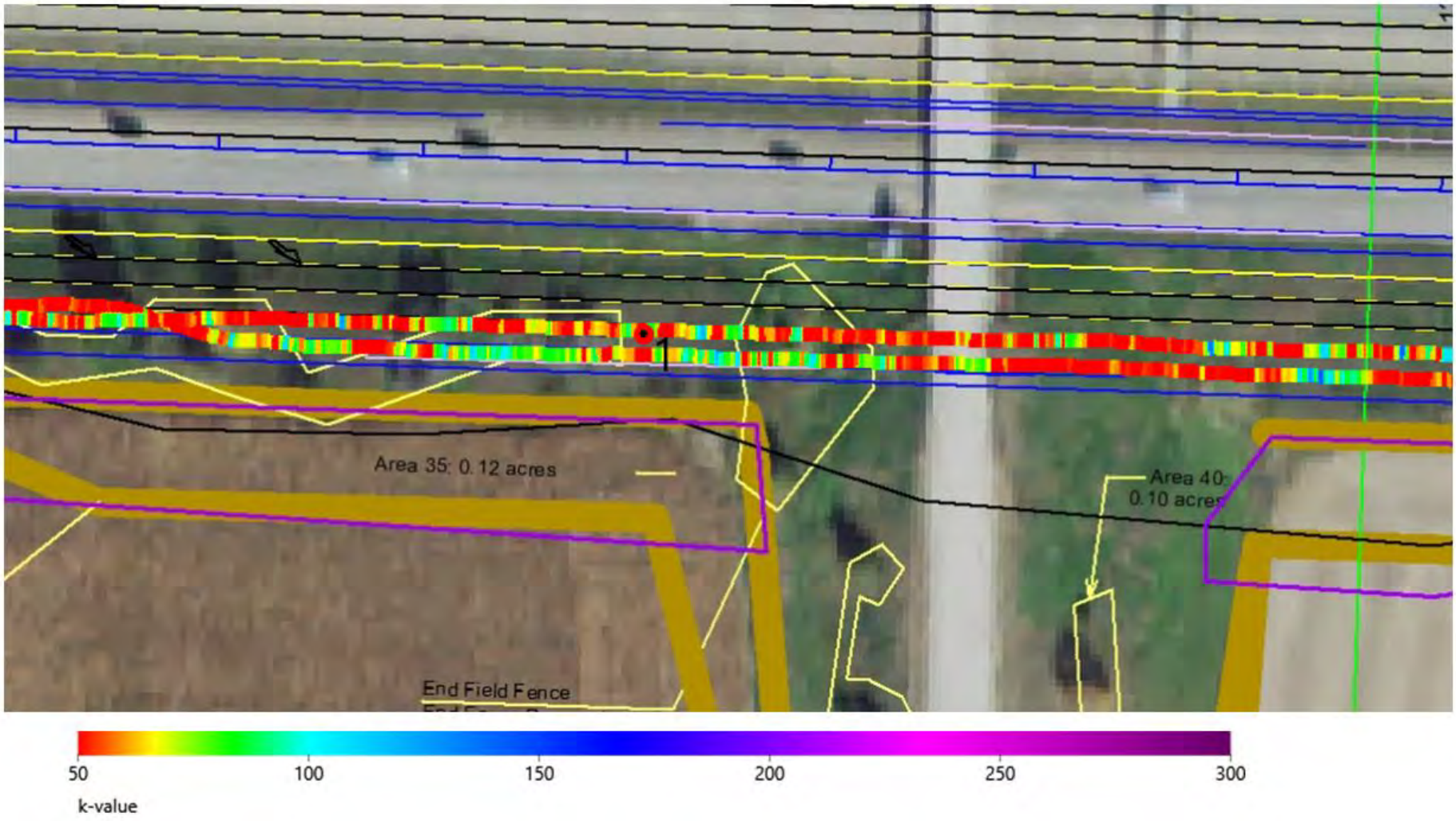


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_190557 Map Type: Verification Map Map Layer: Subgrade Treatment 24 Inches

9/8/2022 3:32:54 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-190557-POINT-1-3D-map-kvalue-w-legend.jpg






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ingios GEOTECHNICS

9/8/2022 3:33:59 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-190557-DCP-I80-Johnson-20220811-PT1.jpg

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date of Test | 8/9/2022 | Test ID | PT_1 | Operator | CV | ASTM | D6951 |
| Easting (FT) | 20565894.9 | | Northing (FT) | 7941708.1 | | Elevation (ft) | 780.5 |
| Location | West of Wapsie Ave. | | Station | 1246+00 | | | |
| Comments | Top of the select subgrade treatment layer. Both top and bottom layers consist of CL material. Testing performed after production compaction passes by contractor and one pass using the RT machine in vibratory mode. | | | | | | |

| Parameter | DPI (mm/blow) | CBR (%) | $E_{CBR}$, Elastic Modulus (ksi) (non stress-dependent) | $S_{v,CBR}$, Bearing Capacity (psf) |
|---|---|---|---|---|
| Avg. Top Layer | 12.0 | 18.0 | 16.3 | 3,730 |
| Avg. Bottom Layer | 38.8 | 2.3 | 4.3 | 947 |
| Ratio of Avg. Top/Bottom Layer | 0.3 | 7.9 | 3.7 | 3.9 |
| Std.Dev. Top Layer | 2.3 | 4.7 | 6.8 | 1,521 |
| Std. Dev. Bottom Layer | 14.7 | 3.2 | 5.4 | 1,188 |

NOTE: *Top layer thickness assumed (compact)*

NOTES:

Subgrade is classified as CL

[1] $CBR = 292/DPI^{1.12}$

[2] $CBR = 1/(0.017610(DPI))^2$

for CL soils with CBR < 10

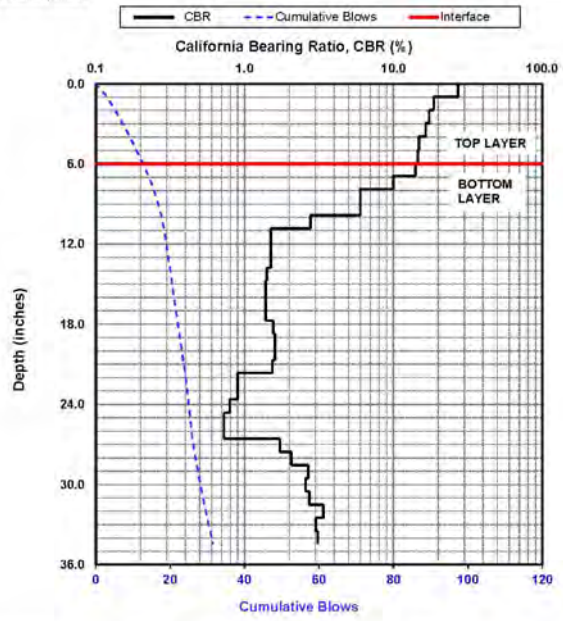
[3] $E\ (ksi) = (17.6\ CBR^{0.64}) \times 0.1450377$

[4] $S_v\ (psf) = (3.794 \times CBR^{0.709}) \times 144$

[1] ASTM D6951-03

[2] Powell et al. (1984)

[3] Portland Cement Assoc (1984)




**Dynamic Cone Penetrometer (DCP) Test Results**

| | |
|---|---|
| Project Name: | Johnson County I-80, IM-NHS-080-7(174)248--03-52 |
| Project ID: | SIA-00011 |
| Location: | I-80, Johnson County, Iowa |

ingios



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 7:29:38 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.224 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 20841 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 2.9 | 20.5 | 0.3 | 150.0 | 62.0 | 76.2 | 157.0 | 26.5 | 34.7 | -88.0 | -73.8 | 7.0 |
| Moisture Content | No | | | | | | | | | | | | |

## Mapped Area

| square feet | acres |
|---|---|
| 20841 | 0.478 |

## Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.3 | 3 |

## Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 778.98 | 780.75 | 781.55 |

## Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.6 | 5.1 | 6.1 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 20841 | 0.478 | 100.0 | 6778.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 2 | 20703 | 99.3 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

## Station

| Start | End |
|---|---|
| 1240+00 | 1249+00 |



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 7:29:38 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.224 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 20841 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 20.5 | CQI > = 95 |
| 2.9 | 80% of k-Value MVs >= 150 |
| 34.7 | COV <= 30 |
| 99.3 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

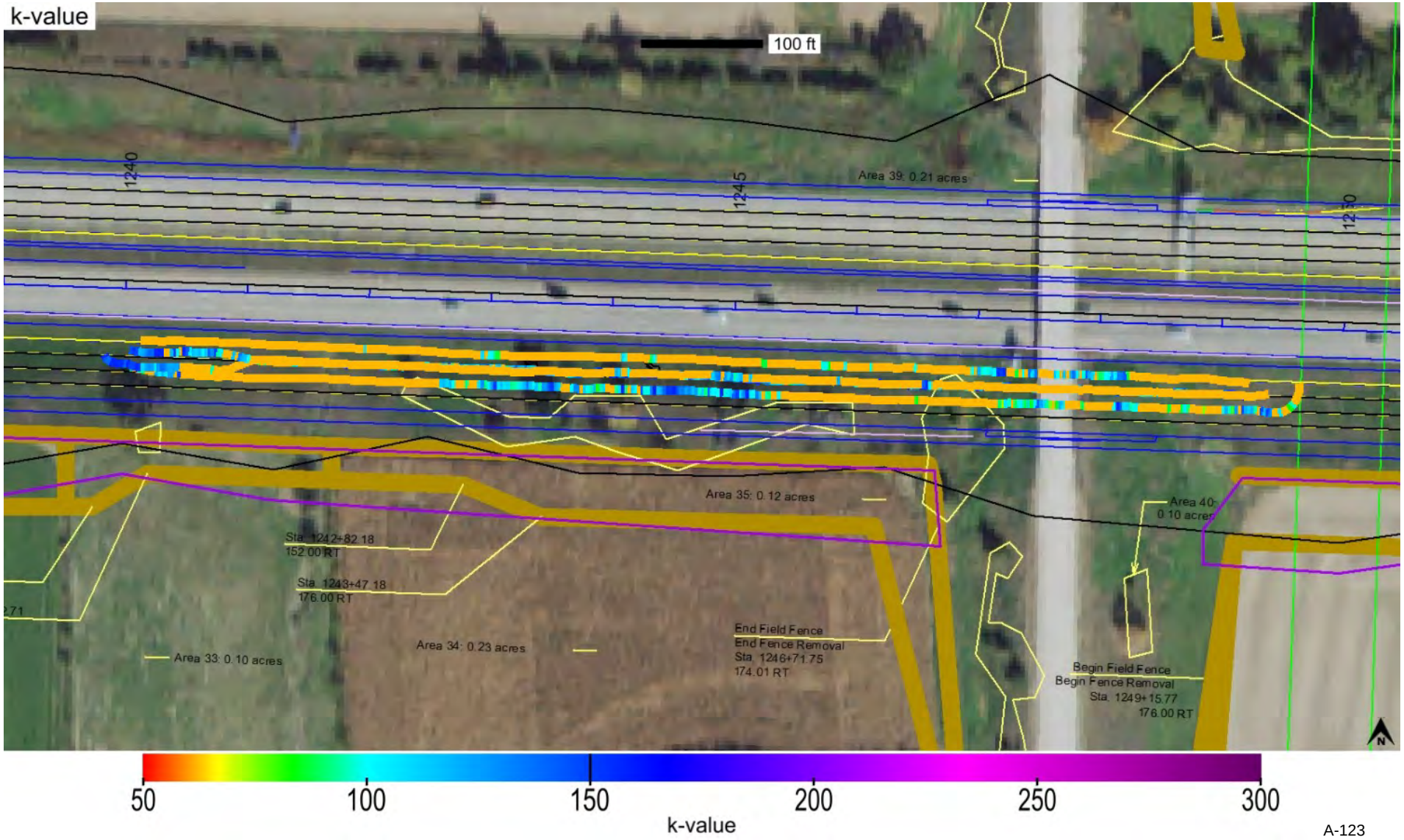


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 2.9 | 20.5 | 0.3 | 150.0 | 62.0 | 76.2 | 157.0 | 26.5 | 34.7 | -88.0 | -73.8 | 7.0 |



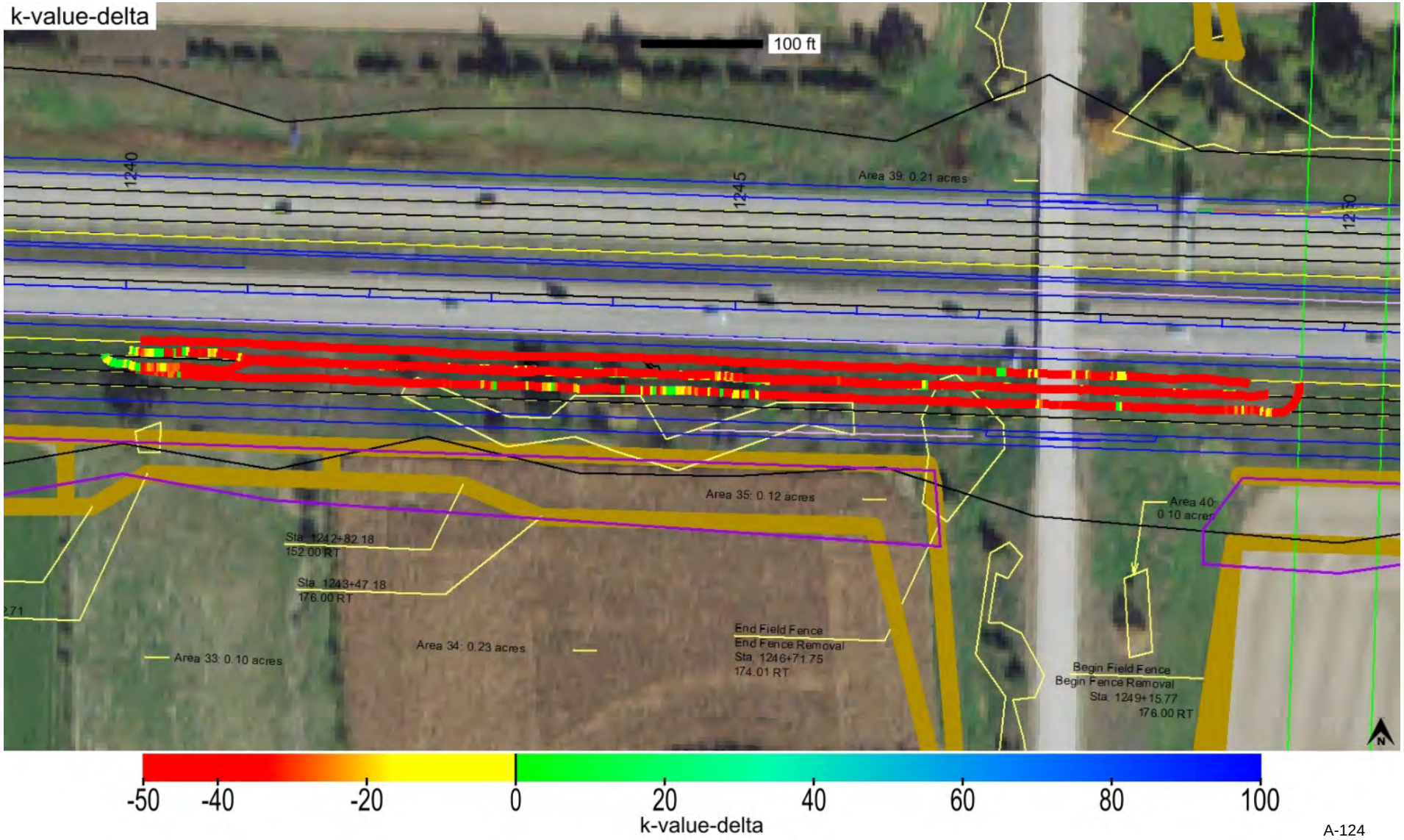



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 2.9 | 20.5 | 0.3 | 150.0 | 62.0 | 76.2 | 157.0 | 26.5 | 34.7 | -88.0 | -73.8 | 7.0 |



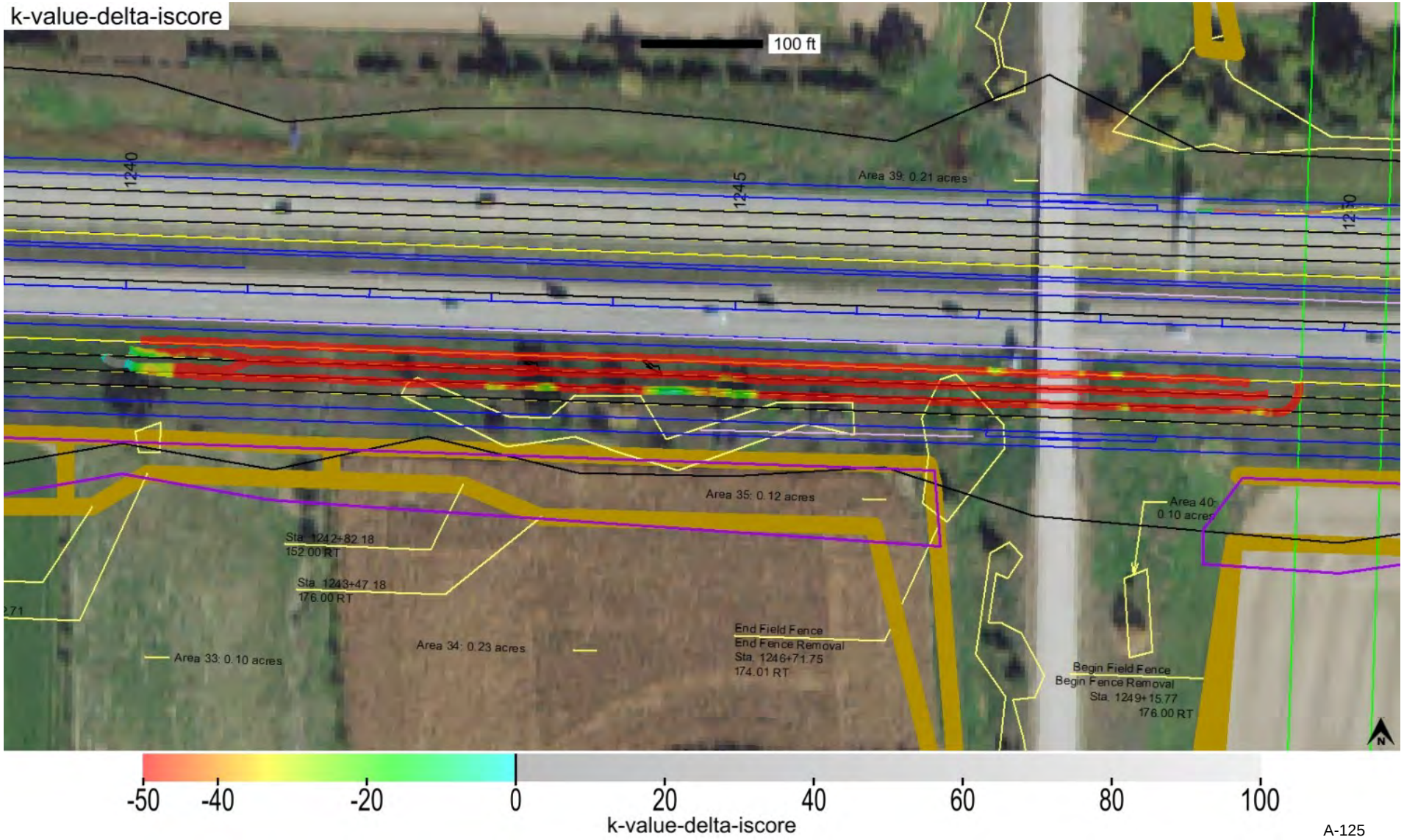



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 2.9 | 150.0 | -88.0 | -73.8 | 7.0 | -88.0 | -73.6 | 2.6 |



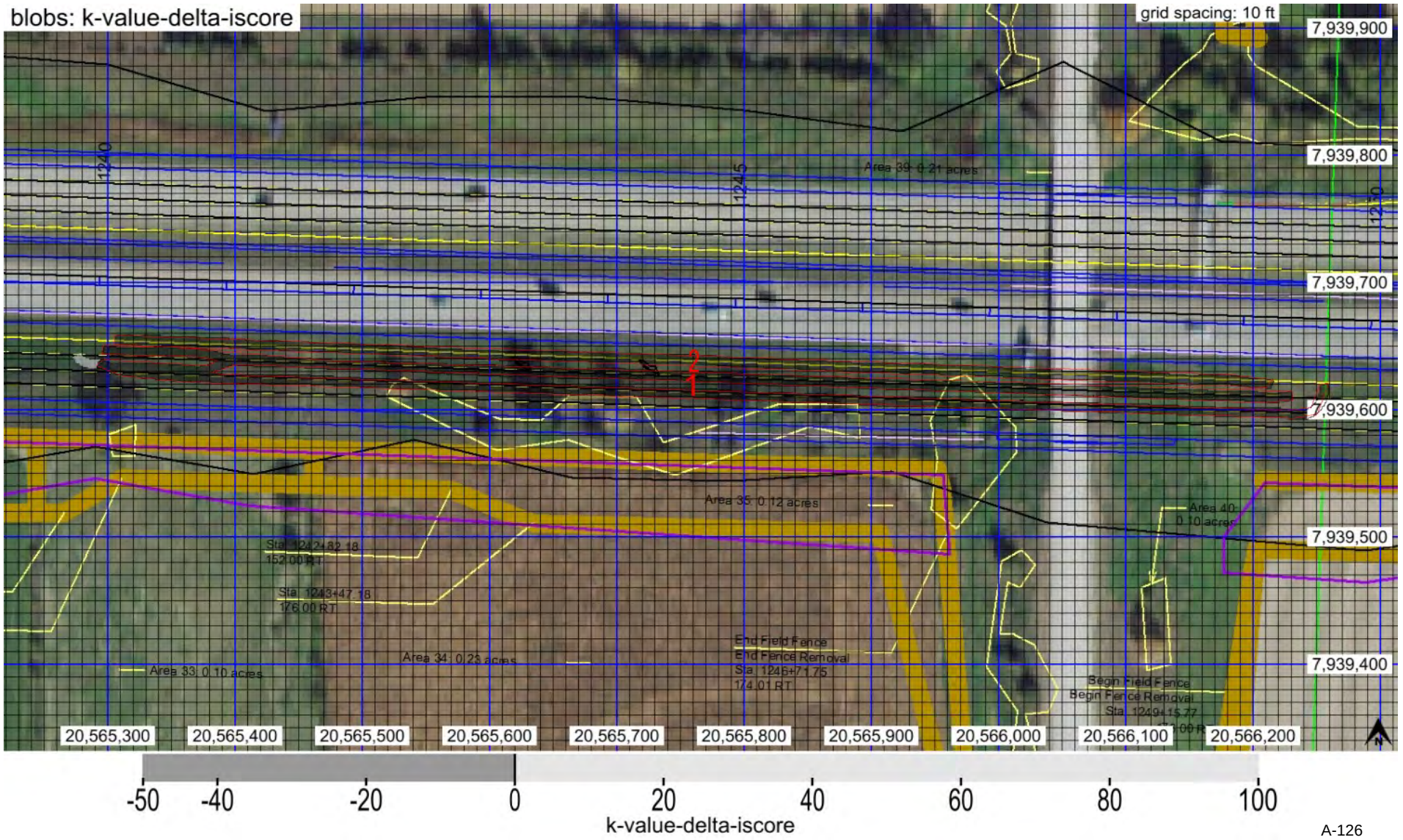



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 2 | 20703 | 99.3 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 14329 | 69.2 | 24 | -88.0 | -71.7 | 0.0 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20566228 | **7939592** |
| 2 | 20566250 | 7939596 |
| 3 | **20566260** | 7939620 |
| 4 | 20566252 | 7939620 |
| 5 | 20566246 | 7939602 |
| 6 | 20566228 | 7939600 |
| 7 | 20565390 | 7939628 |
| 8 | 20565382 | 7939630 |
| 9 | 20565402 | 7939636 |
| 10 | 20566210 | 7939606 |
| 11 | 20566232 | 7939608 |
| 12 | 20566230 | 7939614 |
| 13 | 20565476 | 7939638 |
| 14 | 20565348 | 7939650 |
| 15 | 20565296 | **7939650** |
| 16 | 20565296 | 7939644 |
| 17 | 20565372 | 7939642 |
| 18 | 20565386 | 7939638 |
| 19 | 20565378 | 7939634 |
| 20 | 20565296 | 7939640 |
| 21 | **20565292** | 7939634 |
| 22 | 20565312 | 7939626 |
| 23 | 20565366 | 7939622 |
| 24 | 20566228 | 7939594 |
| | | |
| | | |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 2 | 6374 | 30.8 | 7 | -88.0 | -79.5 | -26.5 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20566210 | **7939616** |
| 2 | **20566216** | 7939624 |
| 3 | 20566182 | 7939628 |
| 4 | **20565306** | **7939658** |
| 5 | 20565306 | 7939652 |
| 6 | 20565320 | 7939650 |
| 7 | 20566210 | 7939618 |

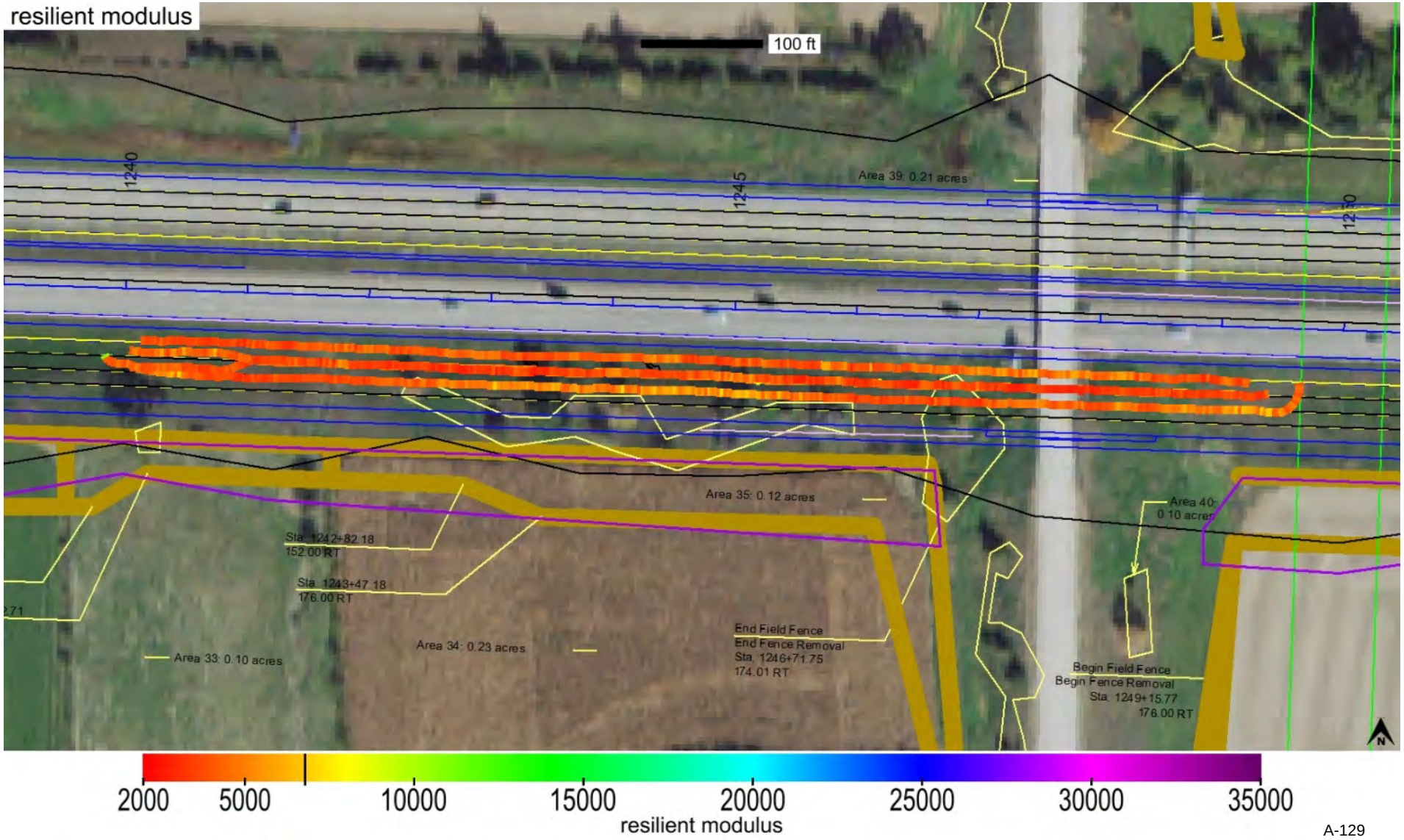


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 0.6 | 25.7 | 0.9 | 6778.0 | 2662.0 | 4183.5 | 11000.0 | 828.0 | 19.8 | -4116.0 | -2594.5 | 4222.0 |



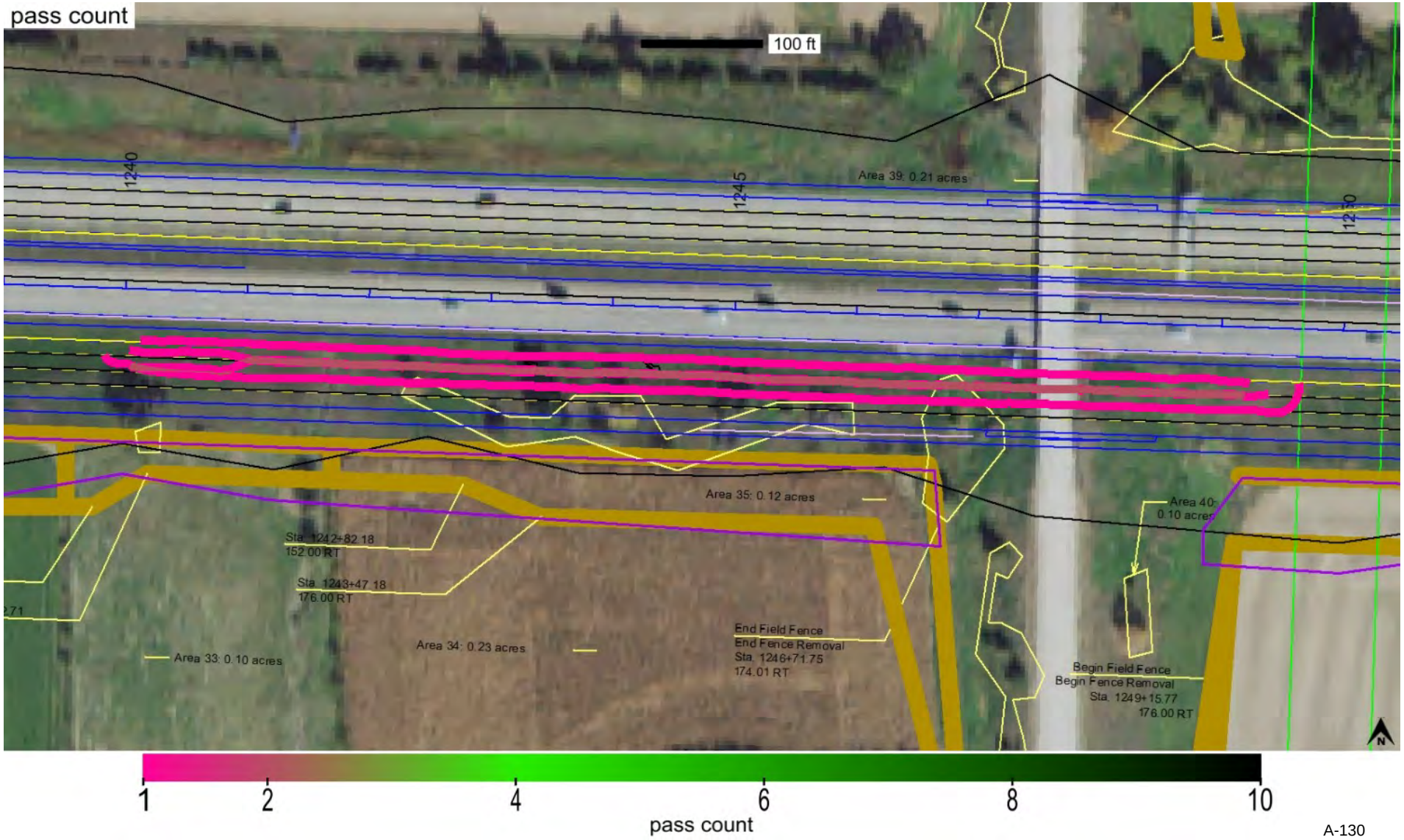



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.3 | 3 |



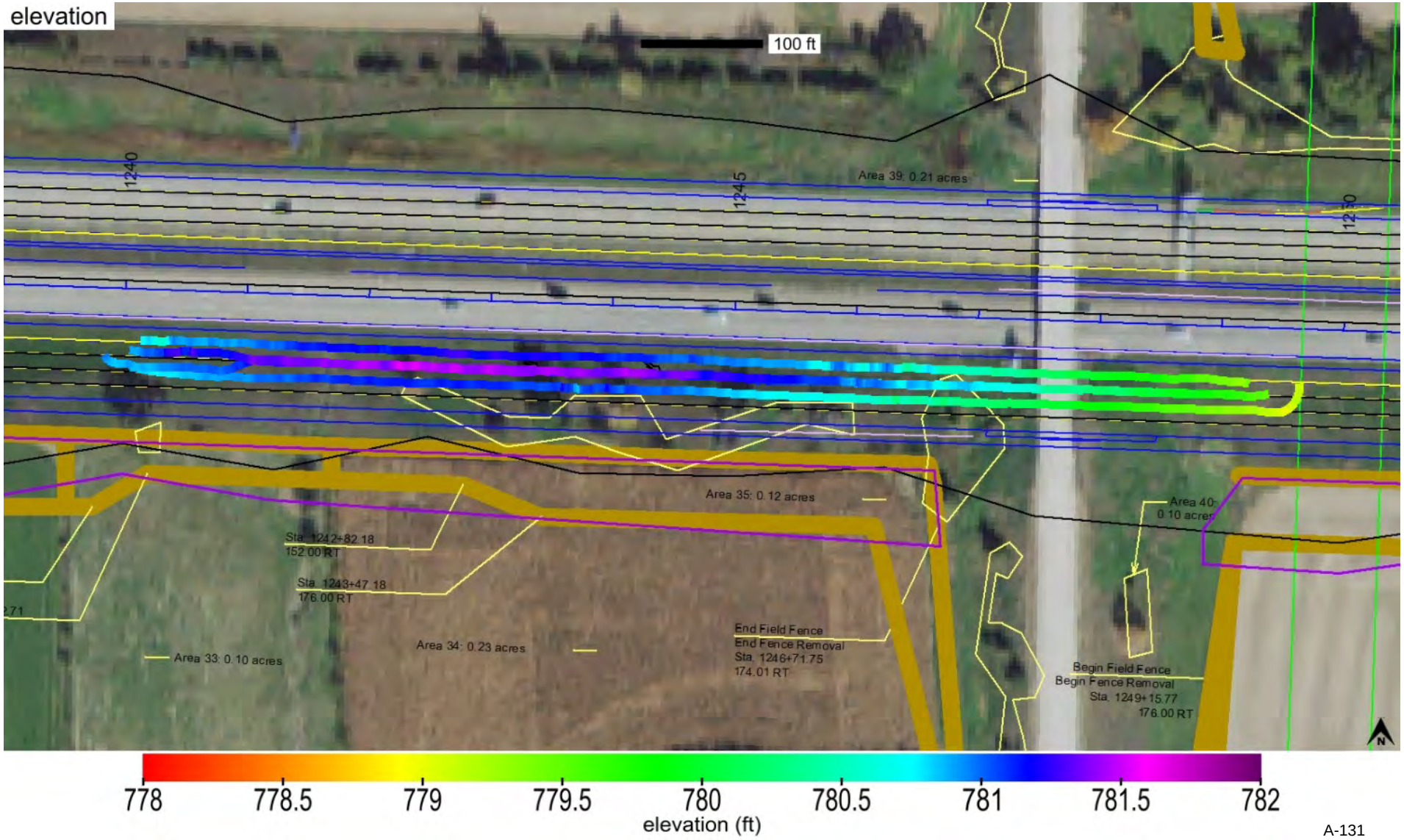



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 778.99 | 780.75 | 781.55 |



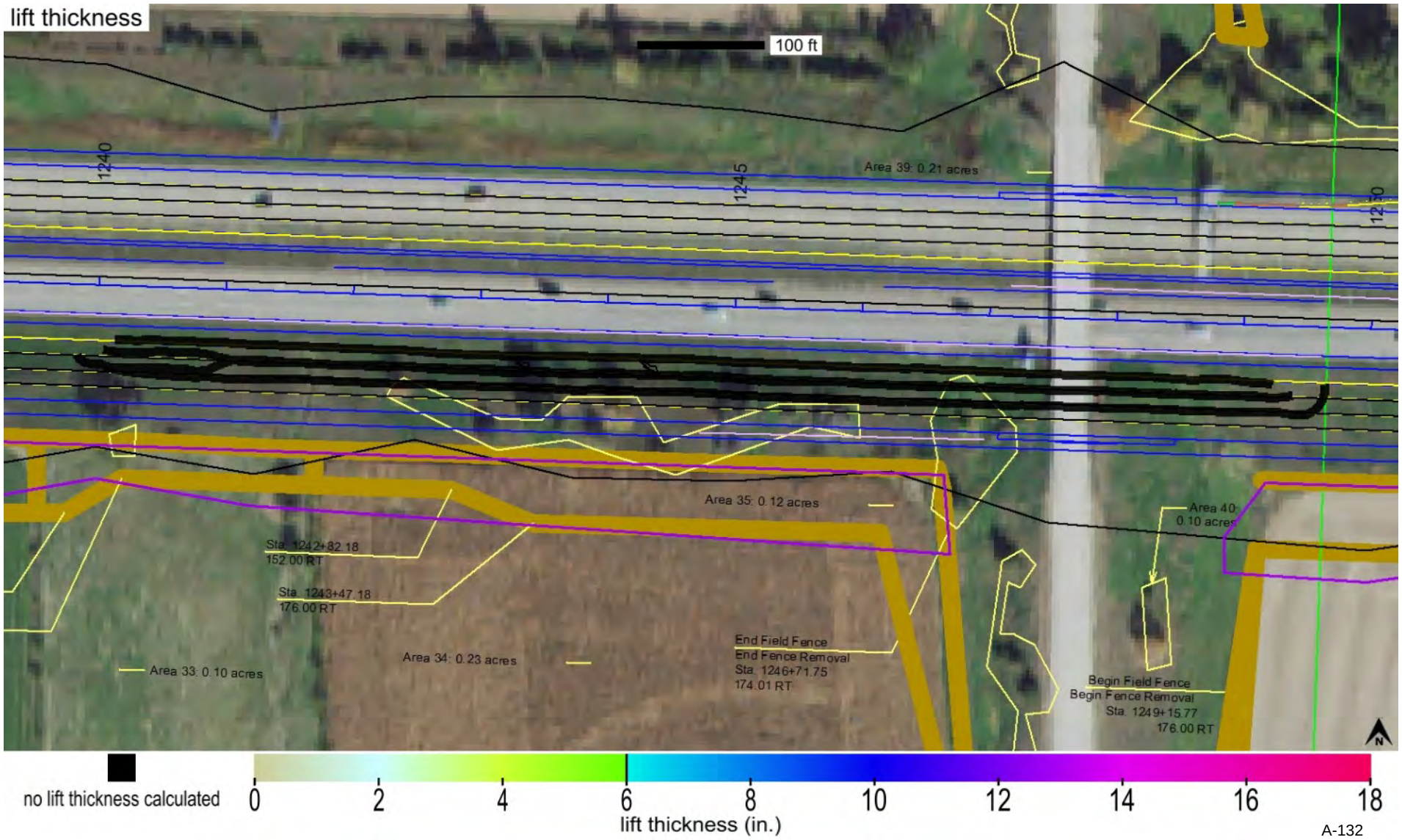



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |



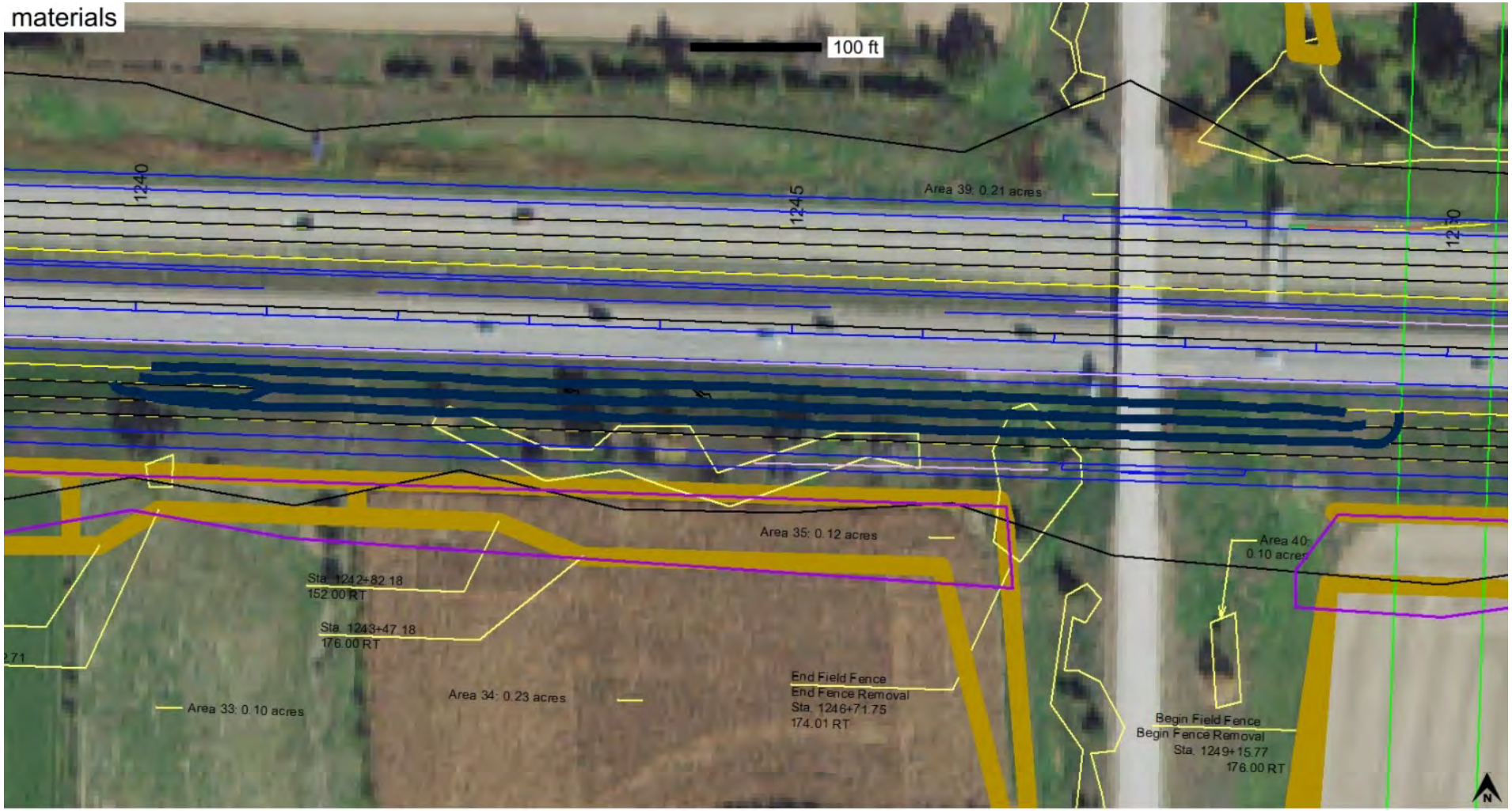



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 20841 | 0.478 | 100.0 | 6778.0 | 150.0 | 20.5 |




Granular Subbase Recycled PCC_IADOT



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_192938 Map Type: Verification Map Map Layer: Subbase 6 Inches

9/8/2022 2:59:56 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-192938.JPG





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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 7:46:41 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.064 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 7098 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 10.3 | 26.0 | 0.4 | 150.0 | 62.0 | 87.4 | 157.0 | 33.7 | 38.5 | -88.0 | -62.6 | 7.0 |
| Moisture Content | No | | | | | | | | | | | | |

## Mapped Area

| square feet | acres |
|---|---|
| 7098 | 0.163 |

## Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.0 | 1 |

## Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 775.23 | 777.77 | 779.92 |

## Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.8 | 5.1 | 5.7 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 7098 | 0.163 | 100.0 | 6778.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 2 | 5229 | 73.7 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

## Station

| Start | End |
|---|---|
| 1249+00 | 1254+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 7:46:41 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.064 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 7098 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 26.0 | CQI > = 95 |
| 10.3 | 80% of k-Value MVs >= 150 |
| 38.5 | COV <= 30 |
| 73.7 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

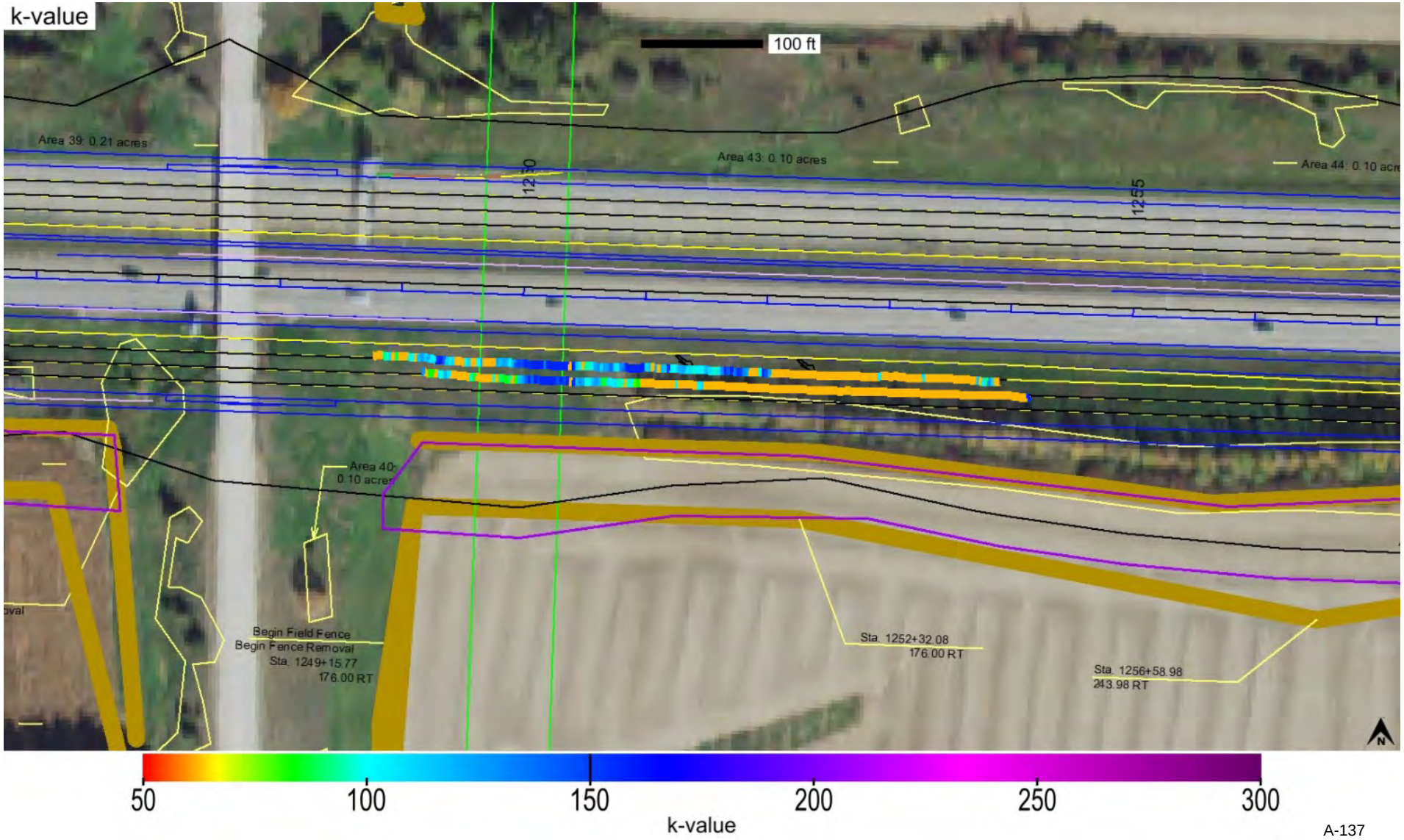


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 10.3 | 26.0 | 0.4 | 150.0 | 62.0 | 87.4 | 157.0 | 33.7 | 38.5 | -88.0 | -62.6 | 7.0 |



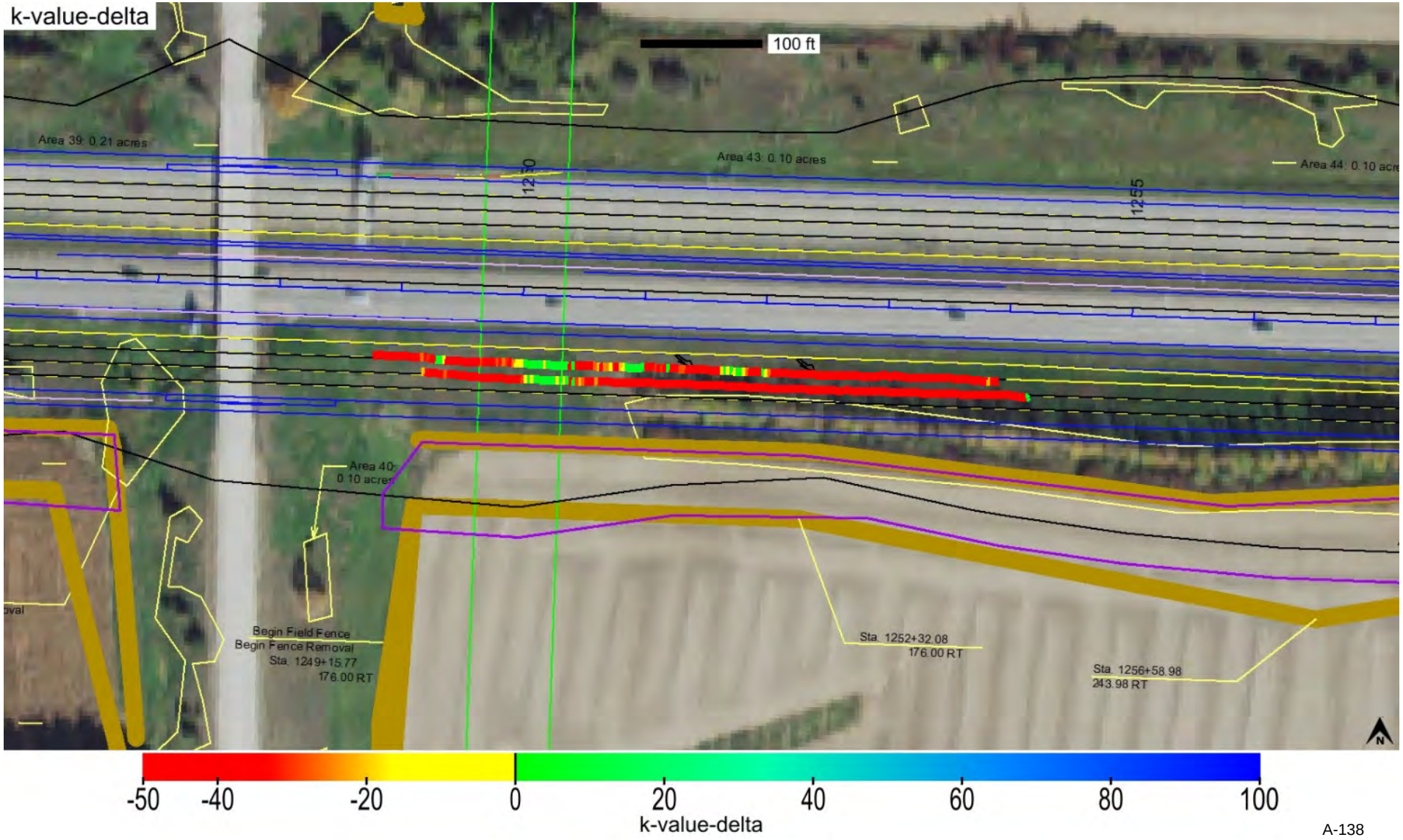



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 10.3 | 26.0 | 0.4 | 150.0 | 62.0 | 87.4 | 157.0 | 33.7 | 38.5 | -88.0 | -62.6 | 7.0 |



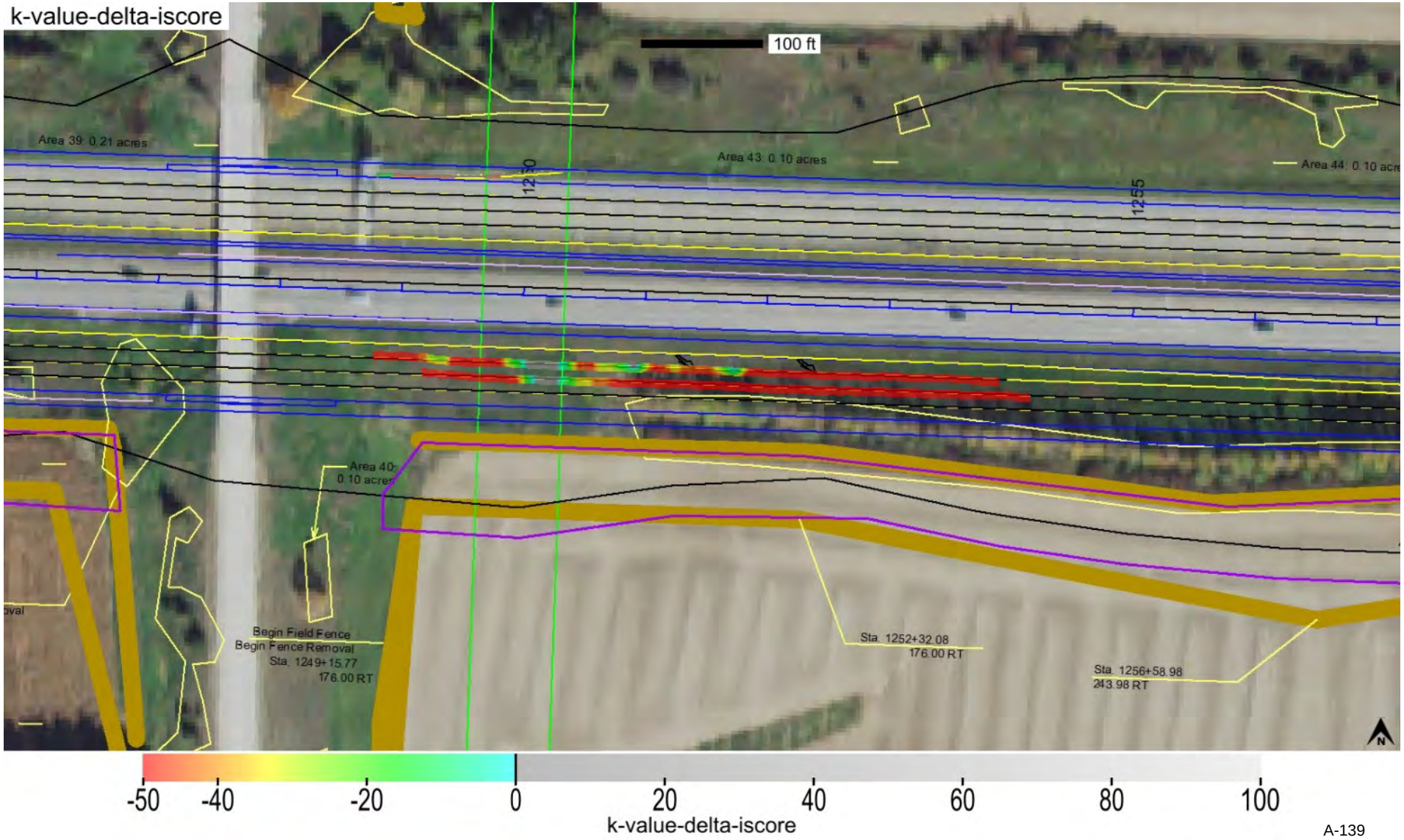



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 10.3 | 150.0 | -88.0 | -62.6 | 7.0 | -88.0 | -62.6 | 6.0 |



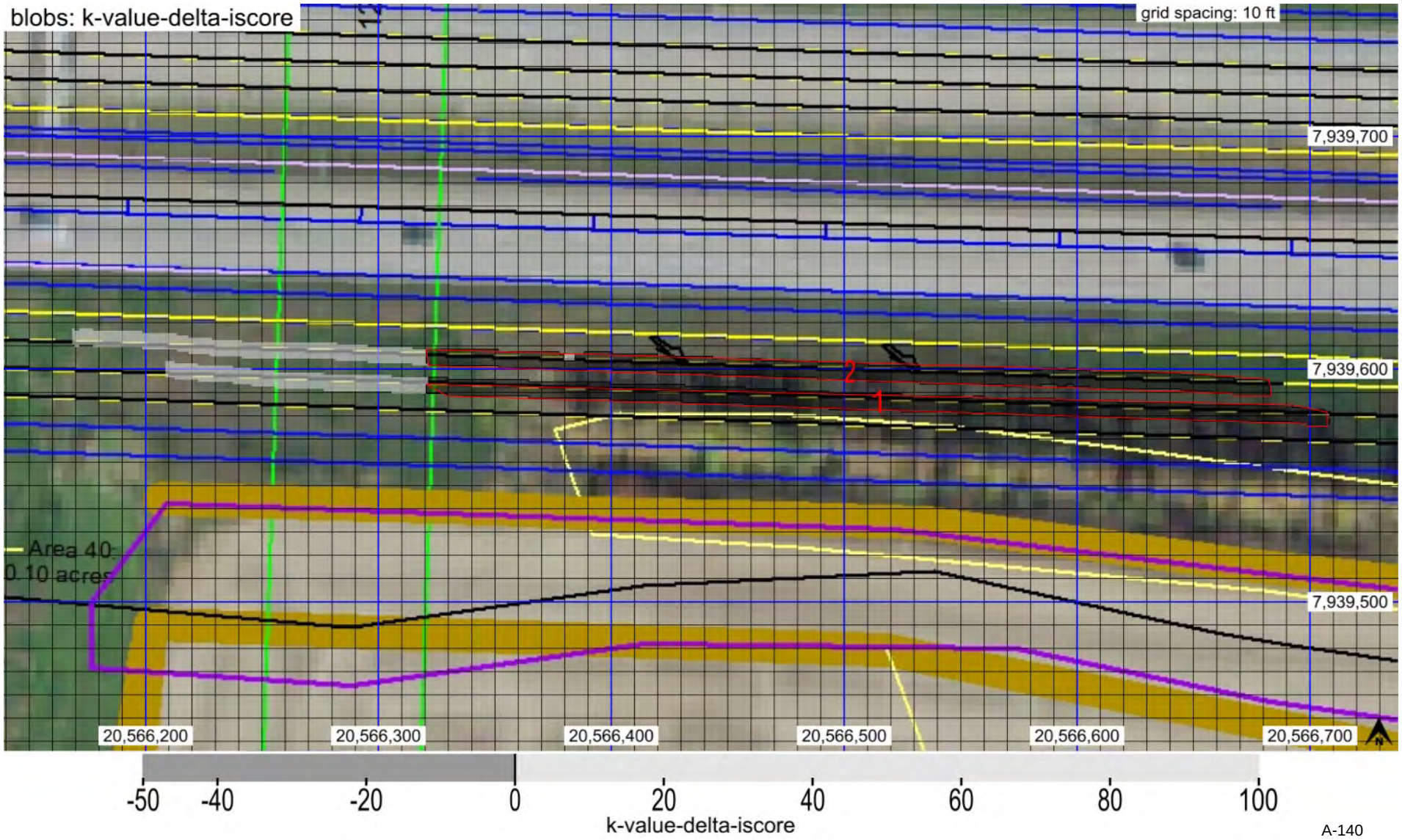



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 2 | 5229 | 73.7 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 2707 | 51.8 | 7 | -88.0 | -76.8 | -0.6 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20566698 | **7939576** |
| 2 | **20566708** | 7939576 |
| 3 | 20566708 | 7939582 |
| 4 | 20566692 | 7939584 |
| 5 | **20566320** | **7939594** |
| 6 | 20566330 | 7939588 |
| 7 | 20566698 | 7939576 |
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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 2 | 2522 | 48.2 | 7 | -88.0 | -60.1 | -0.2 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20566666 | **7939588** |
| 2 | **20566684** | 7939588 |
| 3 | 20566682 | 7939596 |
| 4 | 20566644 | 7939598 |
| 5 | **20566320** | **7939608** |
| 6 | 20566322 | 7939602 |
| 7 | 20566666 | 7939590 |
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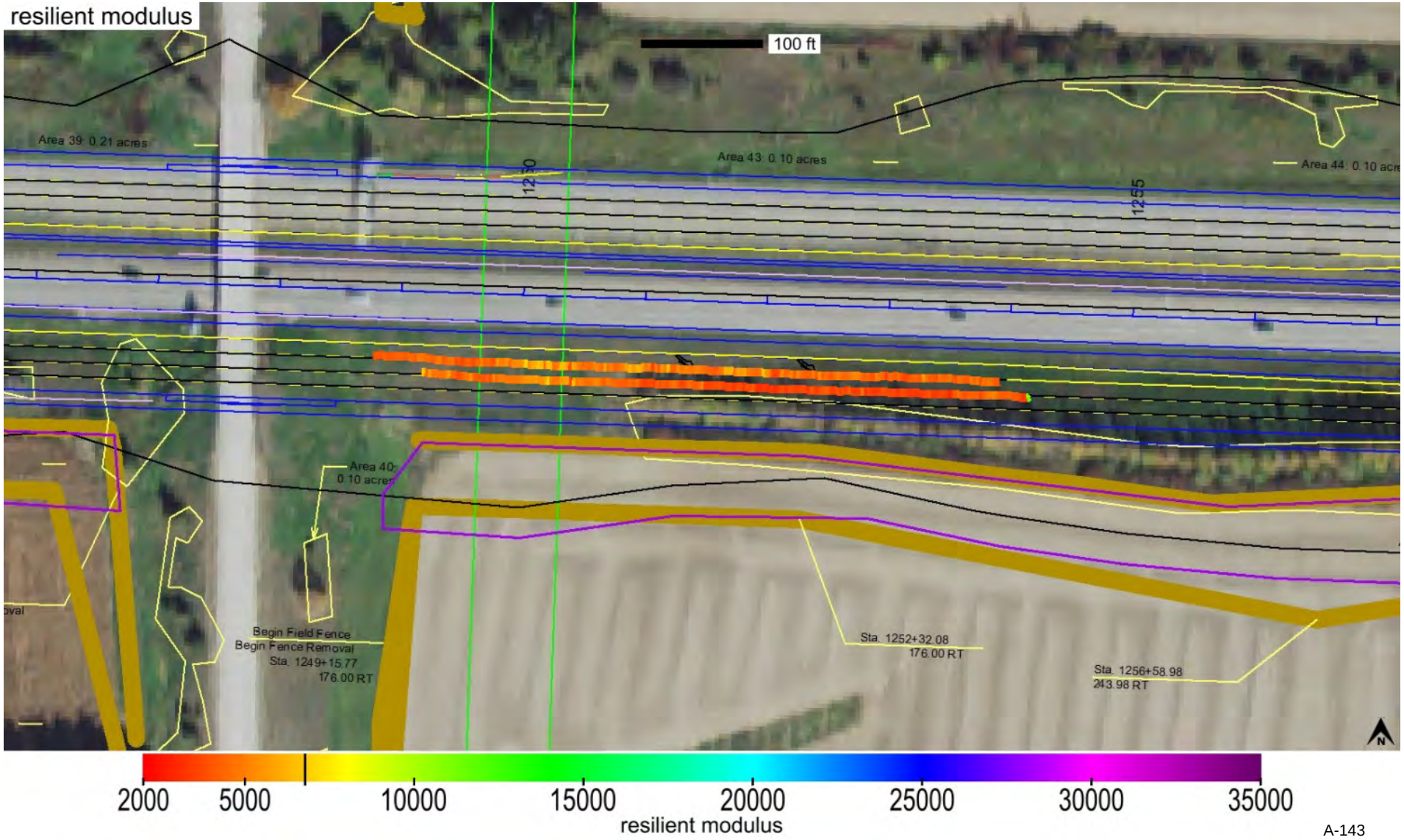


This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 1.0 | 26.7 | 1.0 | 6778.0 | 2912.8 | 4489.4 | 11000.0 | 835.1 | 18.6 | -3865.2 | -2288.6 | 4222.0 |






This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.0 | 1 |



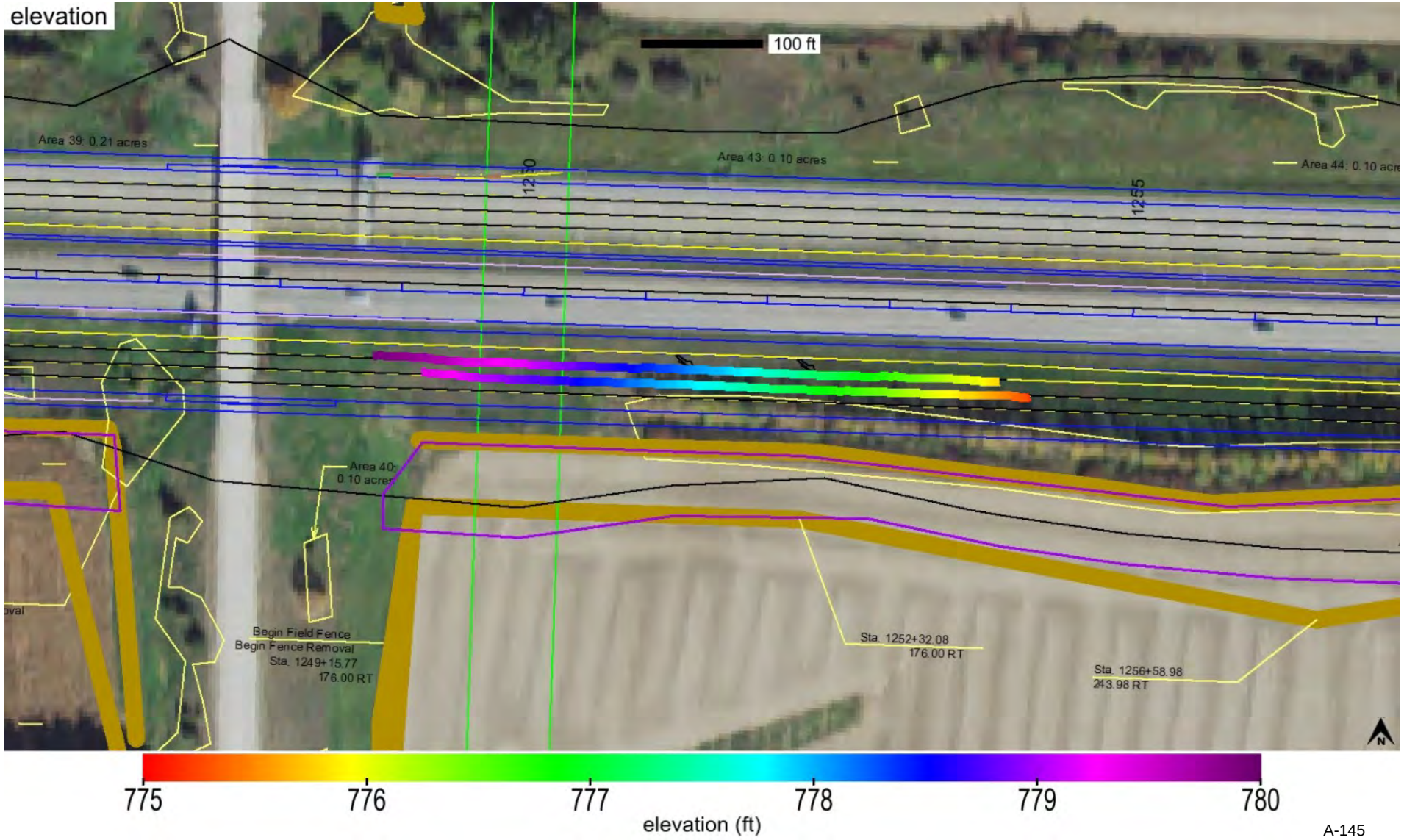



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 775.23 | 777.77 | 779.92 |



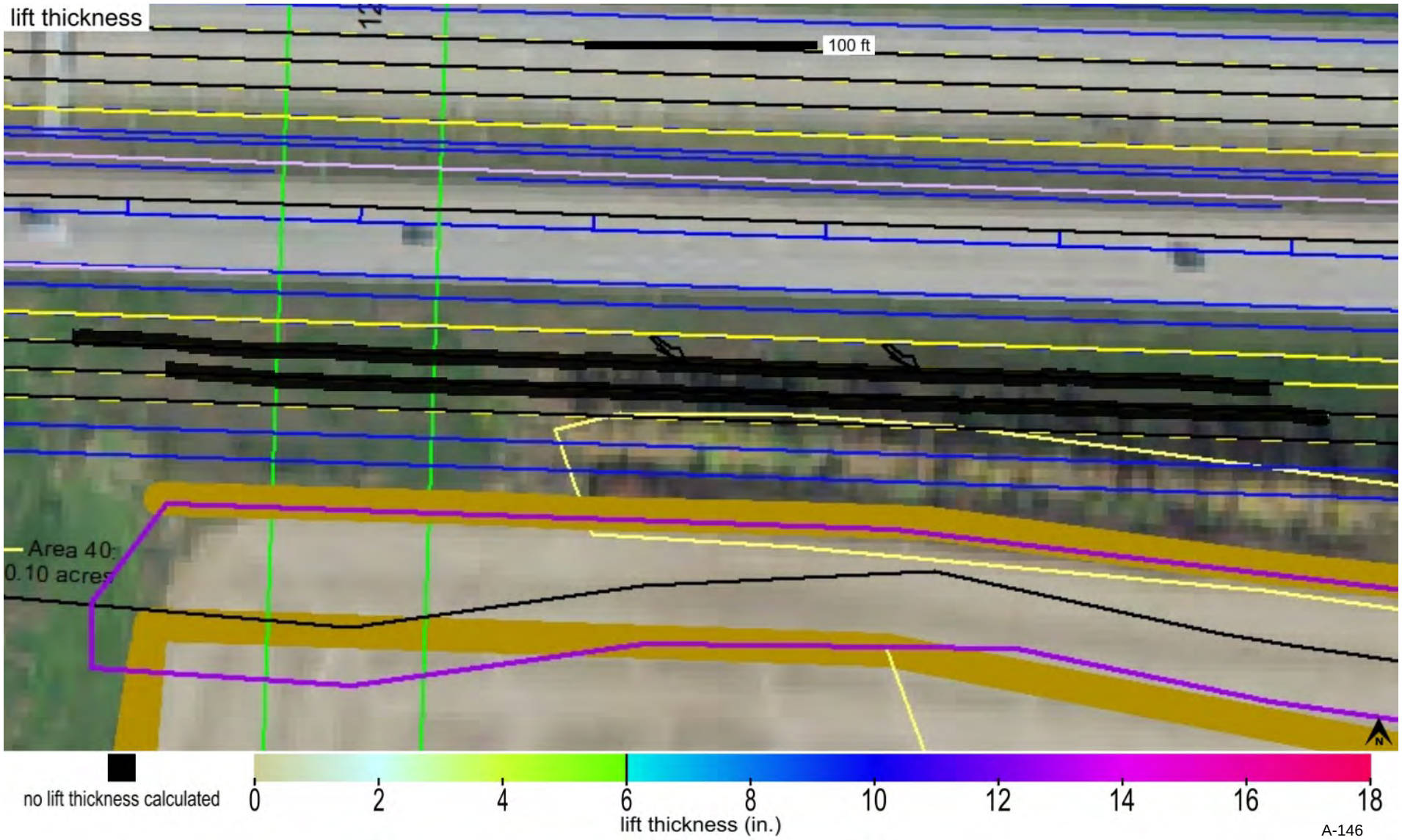



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 7098 | 0.163 | 100.0 | 6778.0 | 150.0 | 20.5 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_194641 Map Type: Verification Map Map Layer: Subbase 6 Inches

9/8/2022 3:00:21 PM ing-52-i080-174-cs56b-ingios01-2022-08-09-194641.JPG





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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 7:54:29 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.459 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 43288 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 0.4 | 23.5 | 0.3 | 150.0 | 62.0 | 66.6 | 157.0 | 15.9 | 23.8 | -88.0 | -83.4 | 7.0 |
| Moisture Content | No | | | | | | | | | | | | |

## Mapped Area

| square feet | acres |
|---|---|
| 43288 | 0.994 |

## Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.3 | 3 |

## Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 742.58 | 760.18 | 776.13 |

## Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.7 | 5.1 | 6.7 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 43288 | 0.994 | 100.0 | 6778.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 1 | 43288 | 100.0 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

## Station

| Start | End |
|---|---|
| 1254+00 | 1274+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/9/2022 7:54:29 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.459 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 43288 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rapids |
| | | Map Layer: | Subbase 6 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 23.5 | CQI > = 95 |
| 0.4 | 80% of k-Value MVs >= 150 |
| 23.8 | COV <= 30 |
| 100.0 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.4 | 23.5 | 0.3 | 150.0 | 62.0 | 66.6 | 157.0 | 15.9 | 23.8 | -88.0 | -83.4 | 7.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.4 | 23.5 | 0.3 | 150.0 | 62.0 | 66.6 | 157.0 | 15.9 | 23.8 | -88.0 | -83.4 | 7.0 |



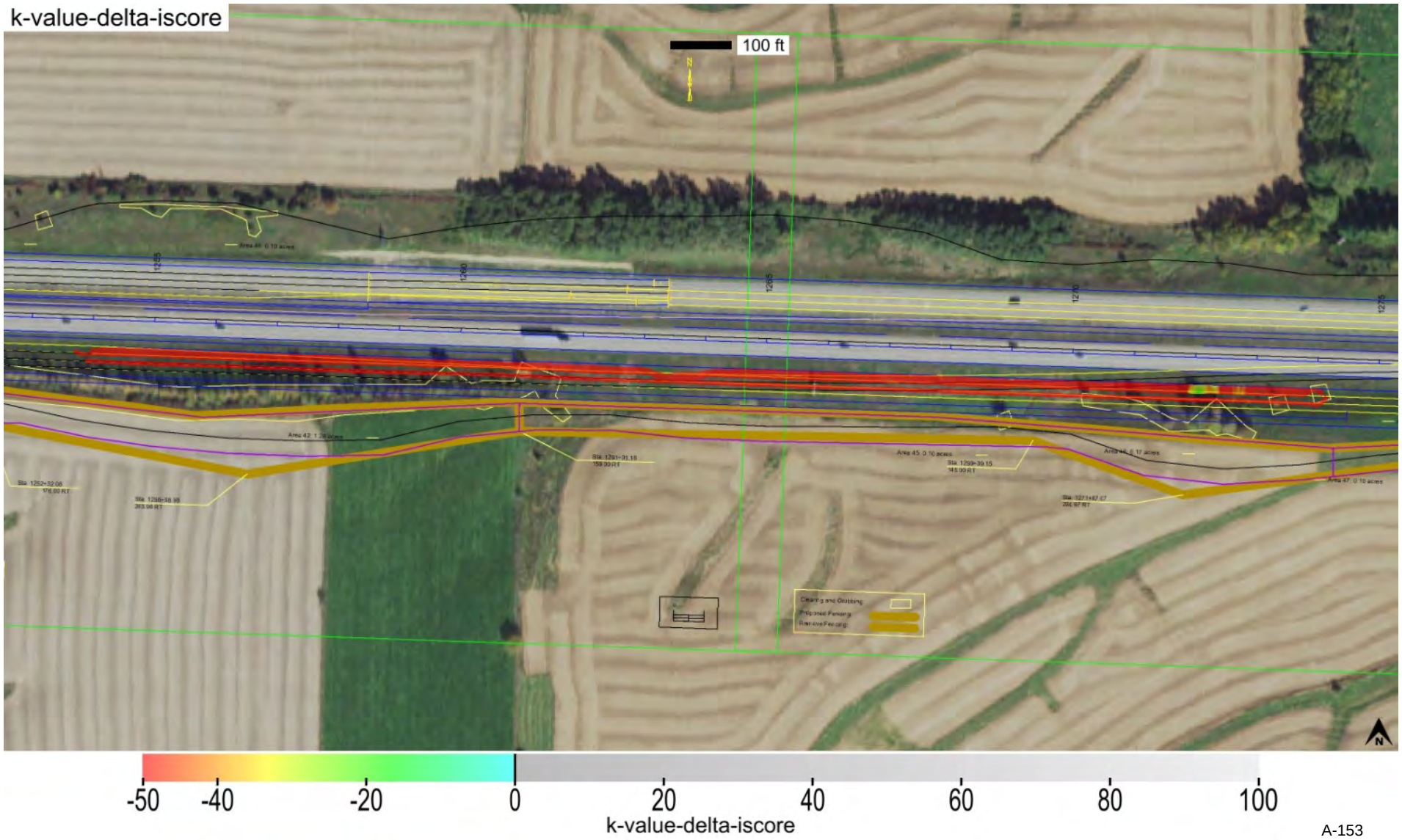



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.4 | 150.0 | -88.0 | -83.4 | 7.0 | -88.0 | -83.3 | -17.6 |



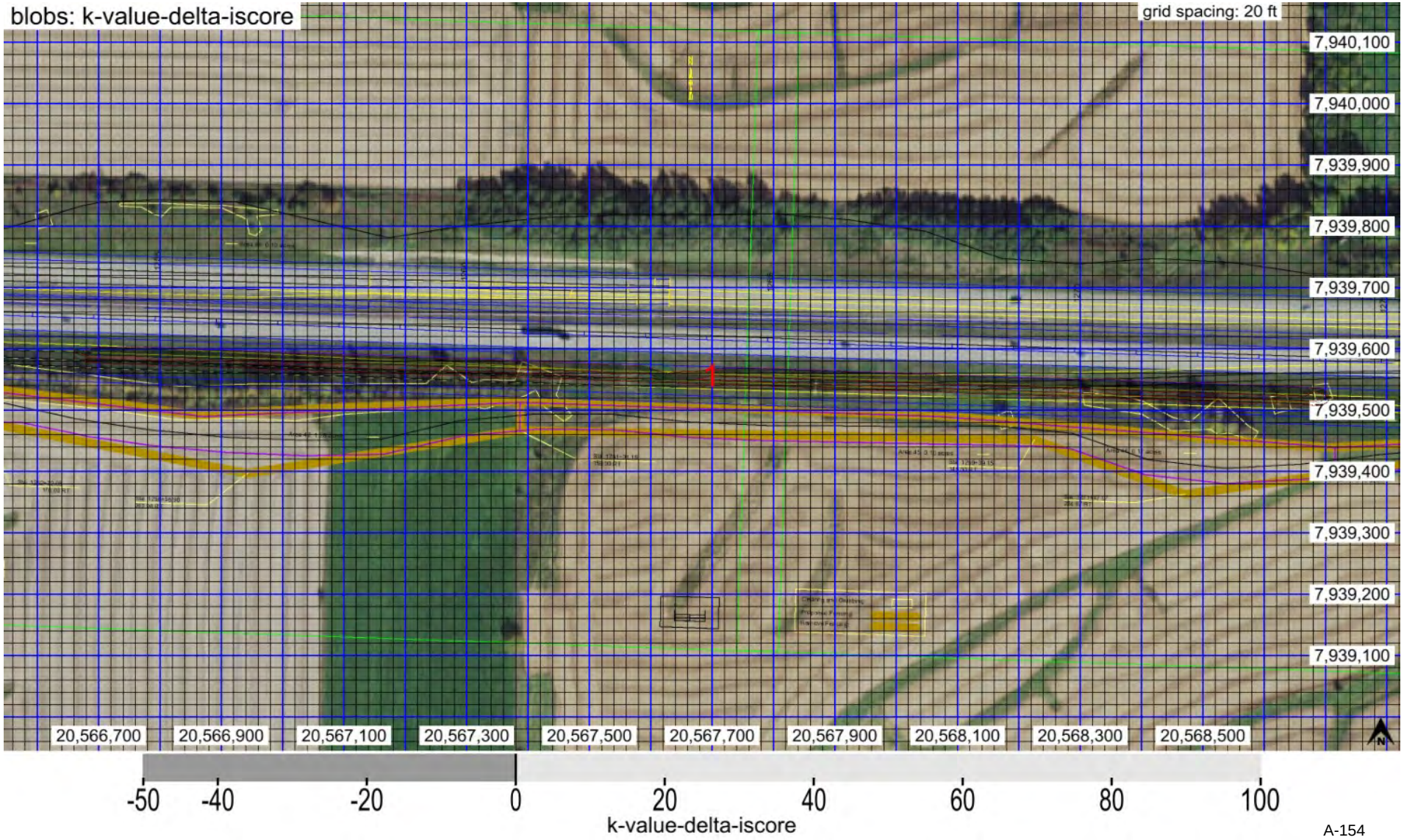



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429 Map Type: Verification Map Map Layer: Subbase 6 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 1 | 43288 | 100.0 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429 Map Type: Verification Map Map Layer: Subbase 6 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 43288 | 100.0 | 30 | -88.0 | -83.3 | -17.6 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20568684 | **7939506** |
| 2 | 20568702 | 7939512 |
| 3 | **20568708** | 7939522 |
| 4 | 20568704 | 7939524 |
| 5 | 20568684 | 7939514 |
| 6 | 20567676 | 7939550 |
| 7 | 20567700 | 7939556 |
| 8 | 20568662 | 7939522 |
| 9 | 20568680 | 7939530 |
| 10 | 20568698 | 7939524 |
| 11 | 20568702 | 7939530 |
| 12 | 20568696 | 7939534 |
| 13 | 20568642 | 7939540 |
| 14 | 20567752 | 7939570 |
| 15 | 20567628 | 7939560 |
| 16 | 20567586 | 7939572 |
| 17 | 20567440 | 7939578 |
| 18 | 20566746 | **7939604** |
| 19 | 20566690 | 7939602 |
| 20 | 20566678 | 7939596 |
| 21 | 20566666 | 7939602 |
| 22 | **20566658** | 7939598 |
| 23 | 20566676 | 7939588 |
| 24 | 20567602 | 7939558 |
| 25 | 20567606 | 7939552 |
| 26 | 20566688 | 7939586 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 27 | 20566678 | 7939584 |
| 28 | 20566678 | 7939578 |
| 29 | 20566744 | 7939574 |
| 30 | 20568684 | 7939508 |

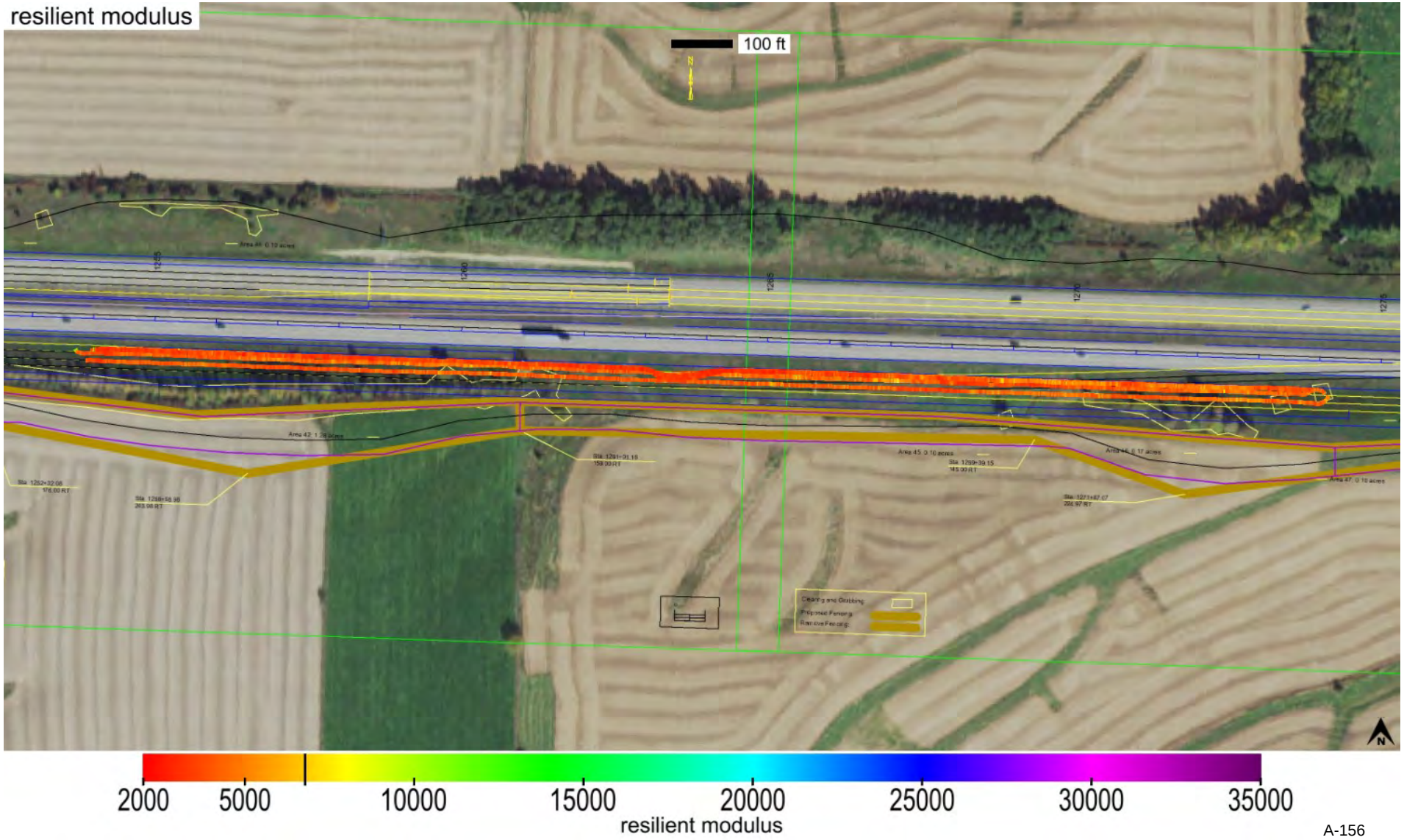


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429 Map Type: Verification Map Map Layer: Subbase 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 0.4 | 26.1 | 0.9 | 6778.0 | 2000.0 | 4141.7 | 11000.0 | 766.4 | 18.5 | -4778.0 | -2636.4 | 4222.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.3 | 3 |



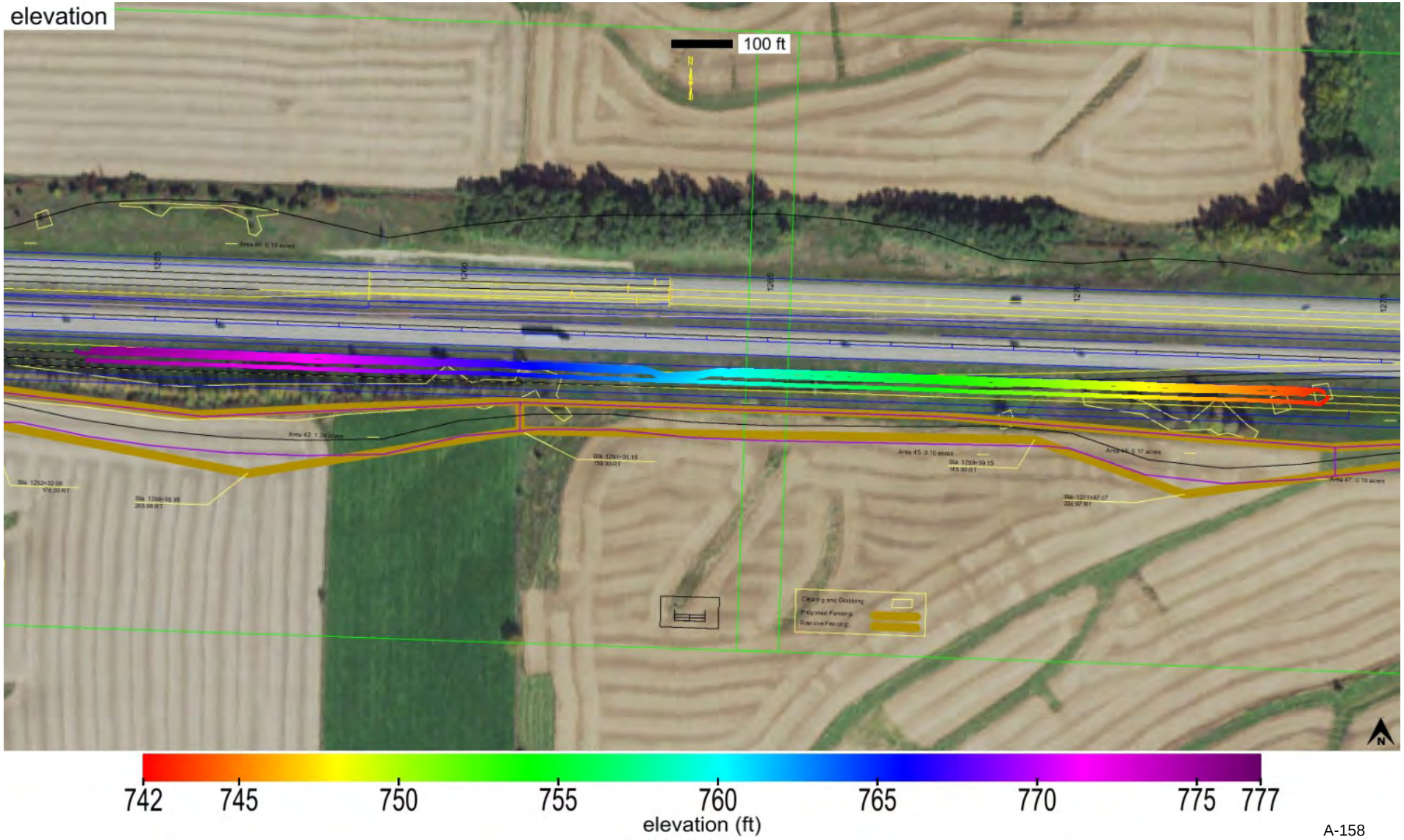



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429 Map Type: Verification Map Map Layer: Subbase 6 Inches

| minimum | average | maximum |
|---|---|---|
| 742.58 | 760.18 | 776.13 |





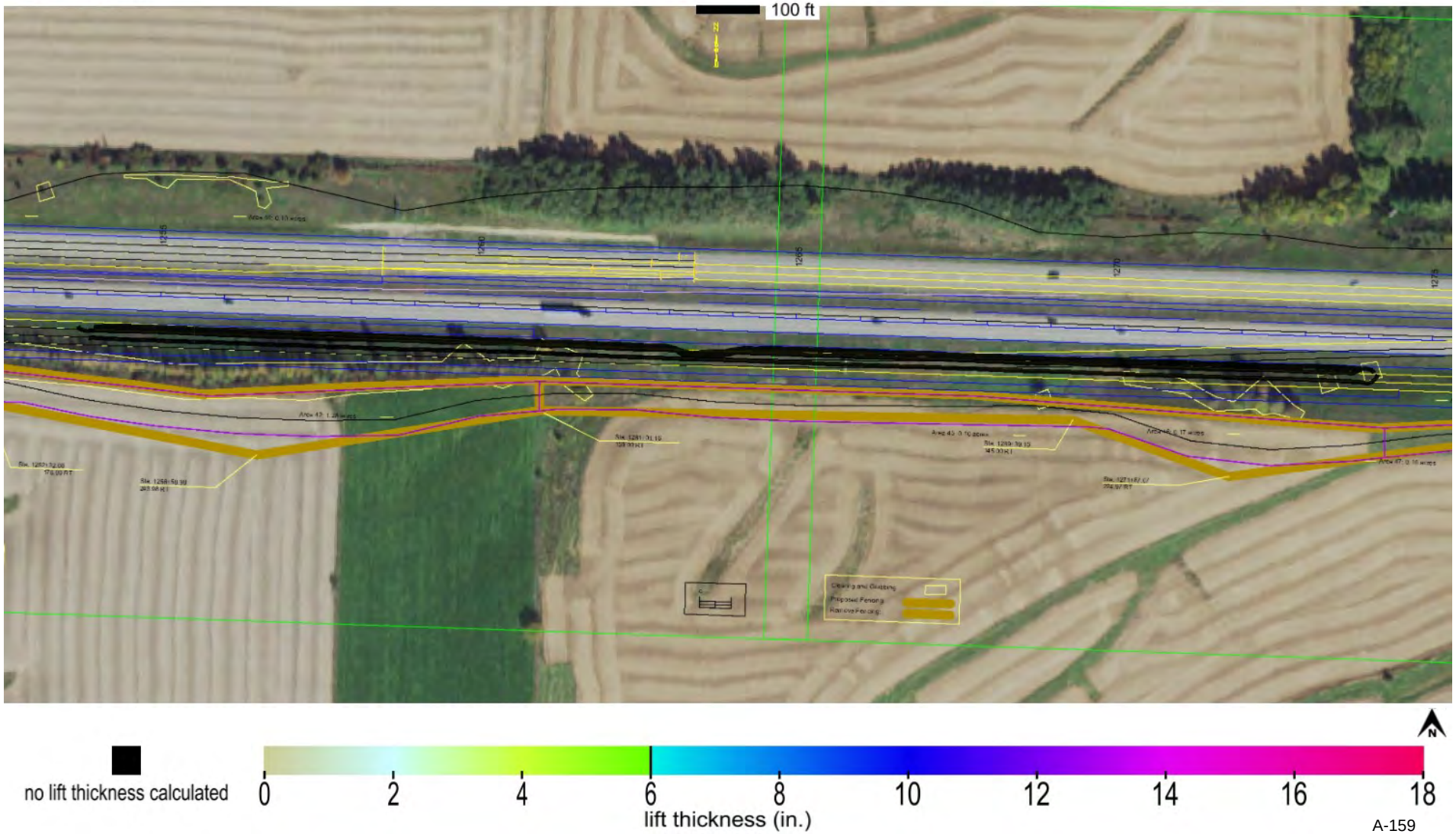

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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429 Map Type: Verification Map Map Layer: Subbase 6 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

lift thickness






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429 Map Type: Verification Map Map Layer: Subbase 6 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Granular Subbase Recycled PCC_IADOT | 41021 | 100.0 | 43288 | 0.994 | 100.0 | 6778.0 | 150.0 | 20.5 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_09_195429 Map Type: Verification Map Map Layer: Subbase 6 Inches

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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 12:56:33 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.218 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 19531 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rap |
| | | Map Layer: | Subgrade Treatment 6 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 0.5 | 9.0 | 0.2 | 150.0 | 20.0 | 66.5 | 184.7 | 35.2 | 53.0 | -130.0 | -83.5 | 34.7 |
| Moisture Content | No | | | | | | | | | | | | |

## Mapped Area

| square feet | acres |
|---|---|
| 19531 | 0.448 |

## Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.3 | 2 |

## Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 754.16 | 755.30 | 756.31 |

## Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.4 | 5.1 | 6.9 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 19531 | 0.448 | 100.0 | 3600.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 1 | 19531 | 100.0 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |

## Station

| Start | End |
|---|---|
| 1109+00 | 1120+50 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 12:56:33 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.218 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 19531 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Rap |
| | | Map Layer: | Subgrade Treatment 6 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 9.0 | CQI > = 95 |
| 0.5 | 80% of k-Value MVs >= 150 |
| 53.0 | COV <= 30 |
| 100.0 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

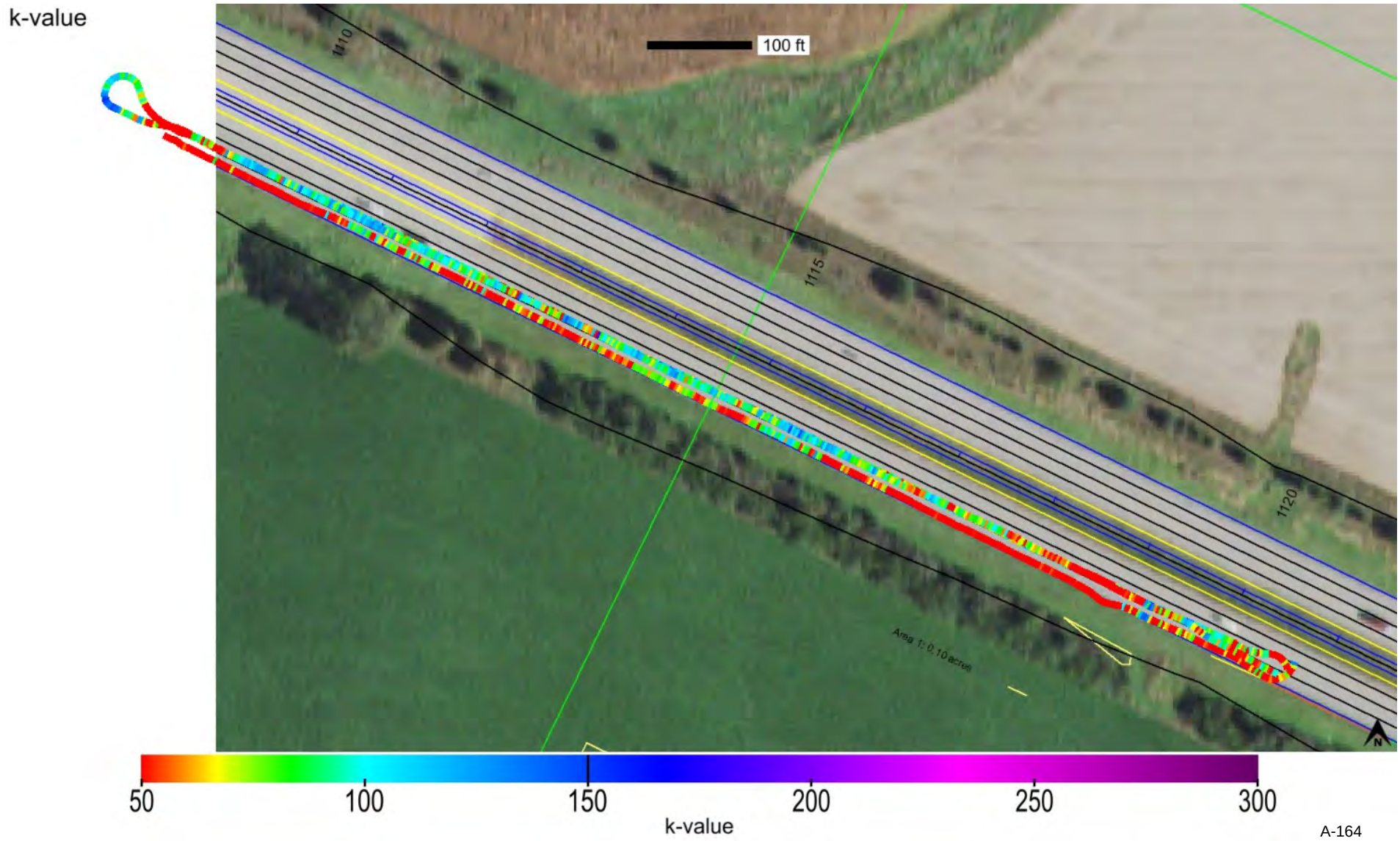


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633 Map Type: Verification Map Map Layer: Subgrade Treatment 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.5 | 9.0 | 0.2 | 150.0 | 20.0 | 66.5 | 184.7 | 35.2 | 53.0 | -130.0 | -83.5 | 34.7 |



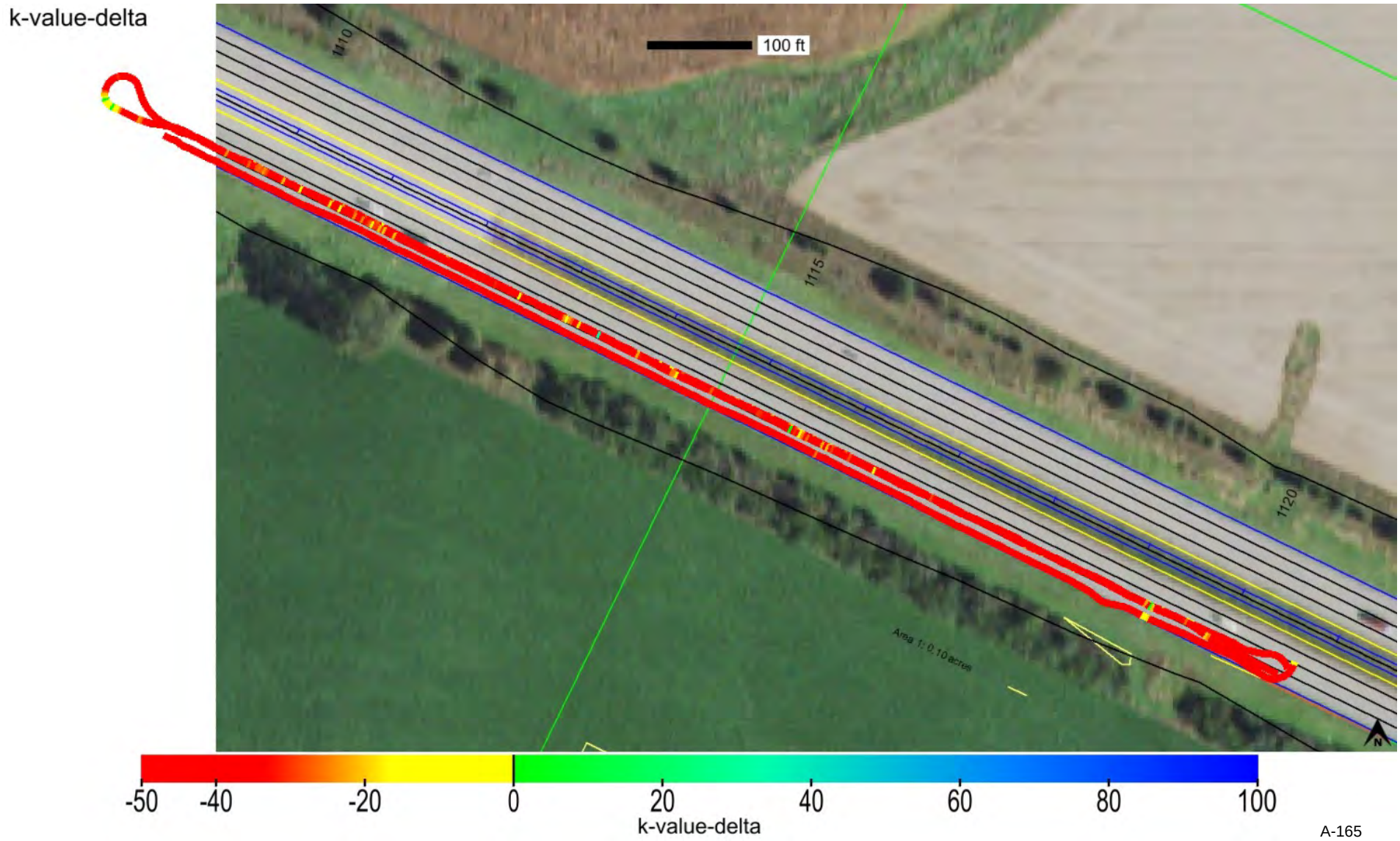



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633 Map Type: Verification Map Map Layer: Subgrade Treatment 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.5 | 9.0 | 0.2 | 150.0 | 20.0 | 66.5 | 184.7 | 35.2 | 53.0 | -130.0 | -83.5 | 34.7 |



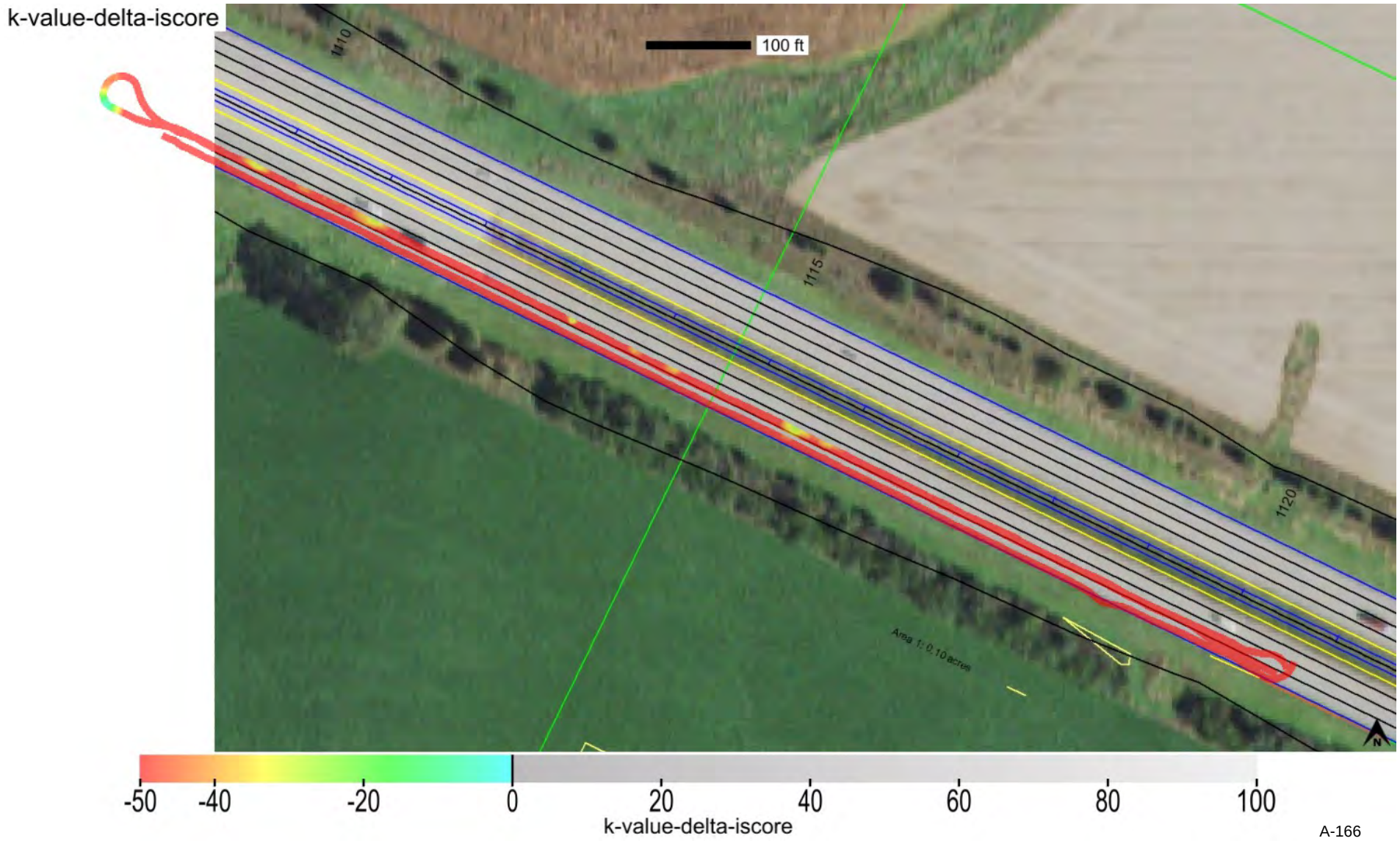



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633 Map Type: Verification Map Map Layer: Subgrade Treatment 6 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 0.5 | 150.0 | -130.0 | -83.5 | 34.7 | -130.0 | -83.3 | -5.5 |



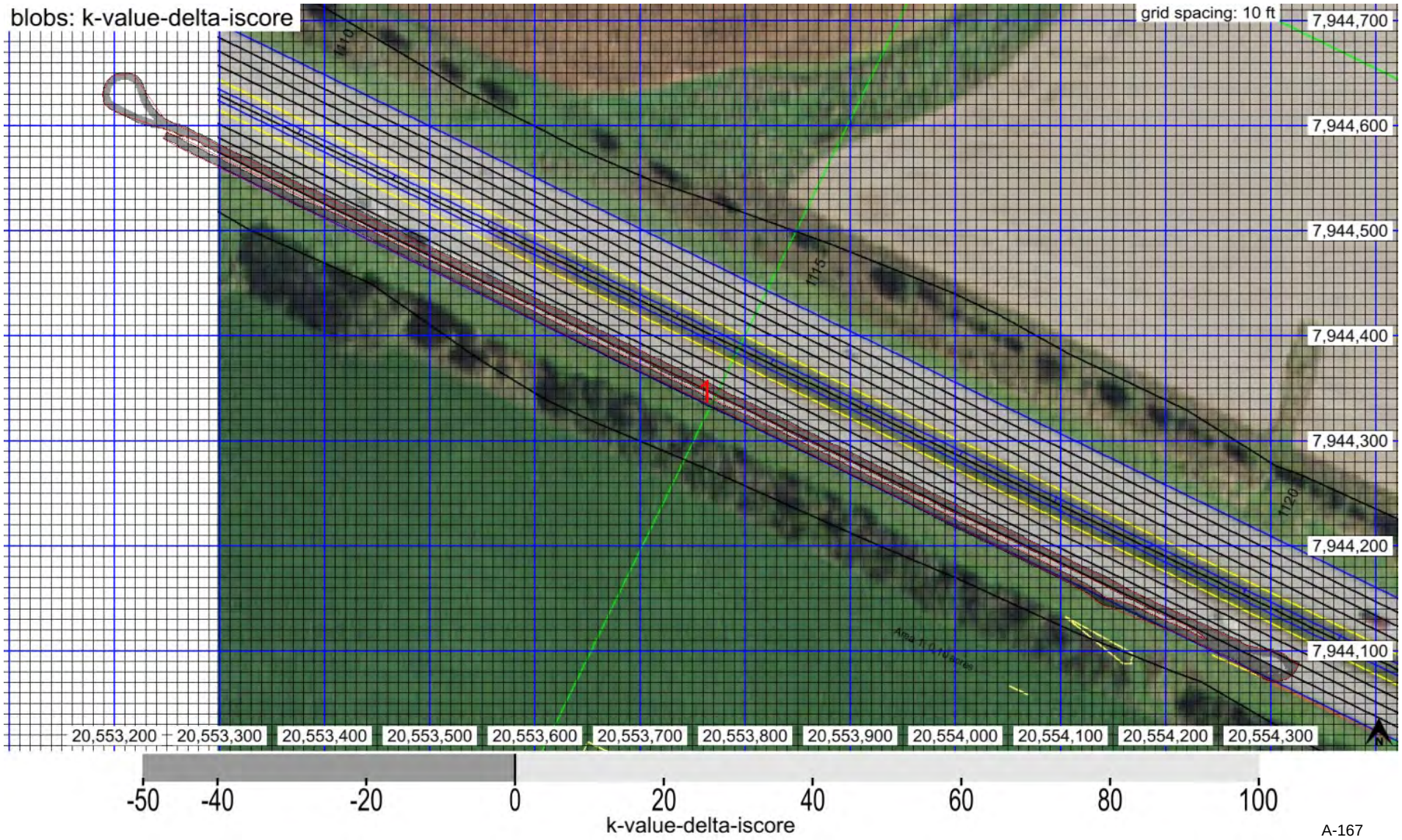



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633 Map Type: Verification Map Map Layer: Subgrade Treatment 6 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 1 | 19531 | 100.0 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633 Map Type: Verification Map Map Layer: Subgrade Treatment 6 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 19531 | 100.0 | 27 | -130.0 | -83.3 | -5.5 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20554300 | **7944070** |
| 2 | 20554316 | 7944074 |
| 3 | **20554326** | 7944086 |
| 4 | 20554312 | 7944098 |
| 5 | 20554278 | 7944104 |
| 6 | 20554192 | 7944144 |
| 7 | 20553248 | 7944606 |
| 8 | 20553218 | **7944650** |
| 9 | 20553198 | 7944648 |
| 10 | **20553188** | 7944632 |
| 11 | 20553190 | 7944620 |
| 12 | 20553202 | 7944612 |
| 13 | 20553280 | 7944586 |
| 14 | 20554230 | 7944118 |
| 15 | 20554238 | 7944110 |
| 16 | 20554168 | 7944144 |
| 17 | 20554142 | 7944150 |
| 18 | 20554088 | 7944184 |
| 19 | 20553262 | 7944590 |
| 20 | 20553250 | 7944594 |
| 21 | 20553246 | 7944588 |
| 22 | 20553264 | 7944578 |
| 23 | 20553828 | 7944304 |
| 24 | 20554108 | 7944166 |
| 25 | 20554138 | 7944144 |
| 26 | 20554220 | 7944114 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 27 | 20554300 | 7944072 |

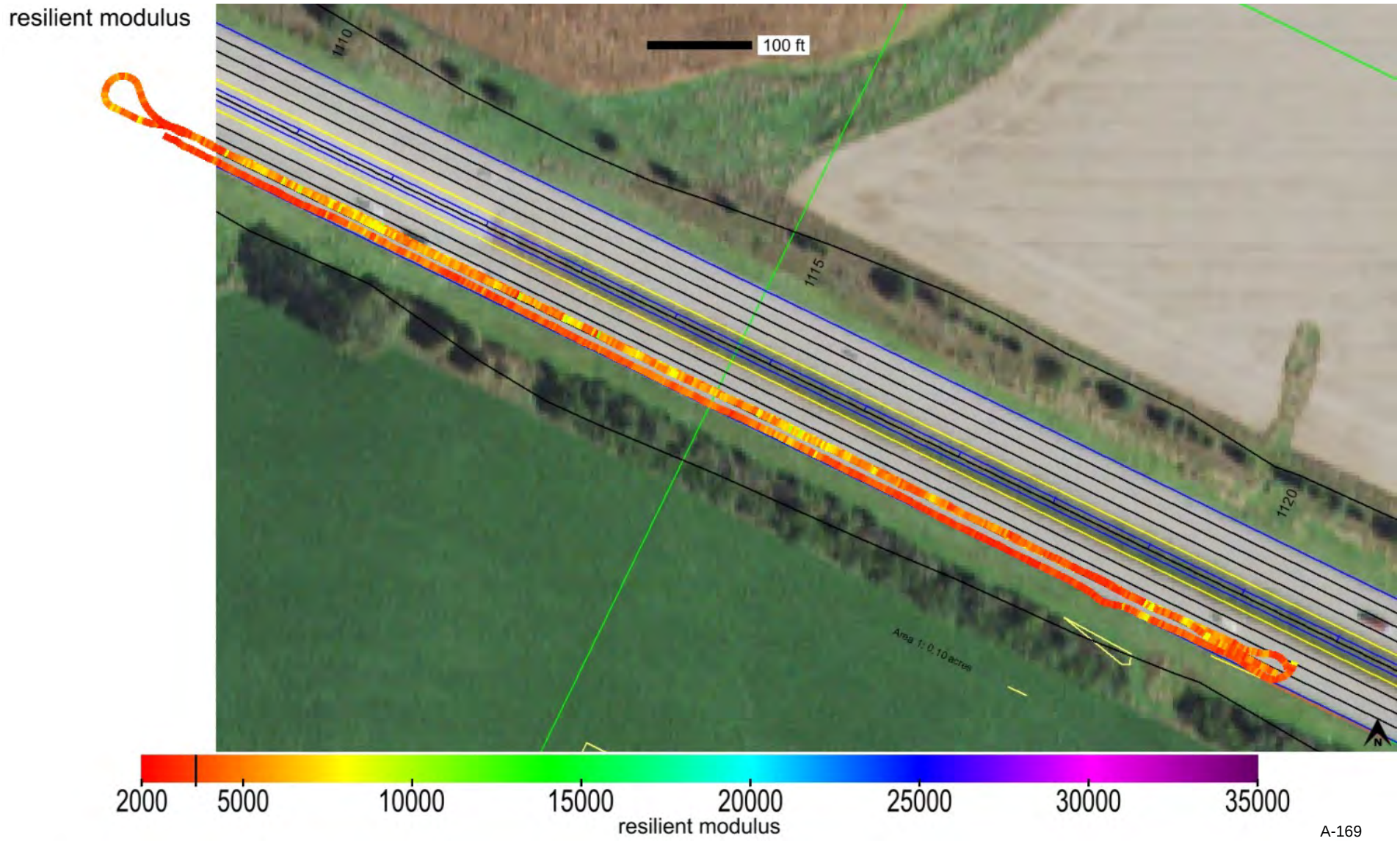


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633 Map Type: Verification Map Map Layer: Subgrade Treatment 6 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 76.2 | 96.2 | 0.6 | 3600.0 | 2000.0 | 4749.7 | 11000.0 | 1426.1 | 30.0 | -1600.0 | 1149.7 | 7400.0 |



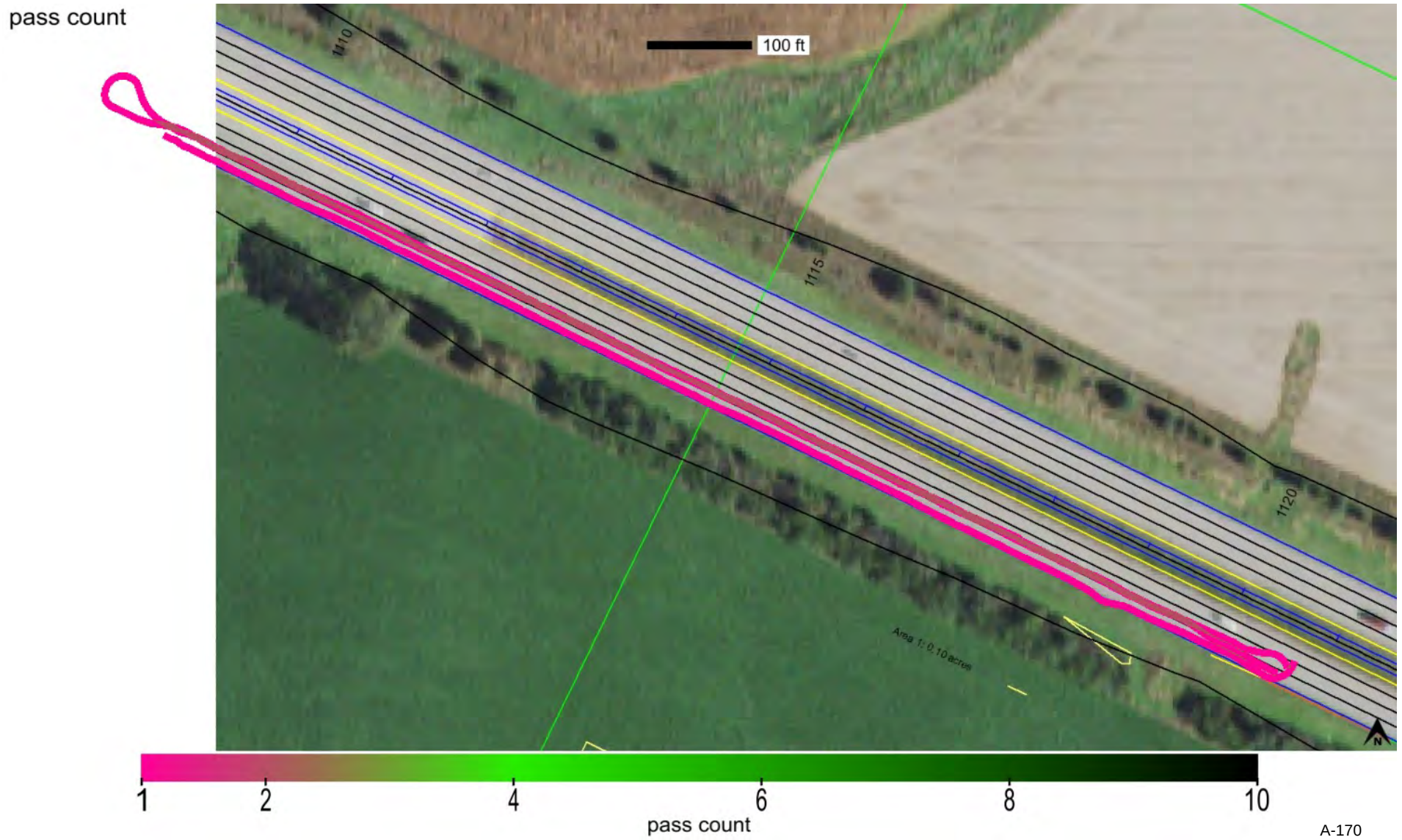



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633 Map Type: Verification Map Map Layer: Subgrade Treatment 6 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.3 | 2 |



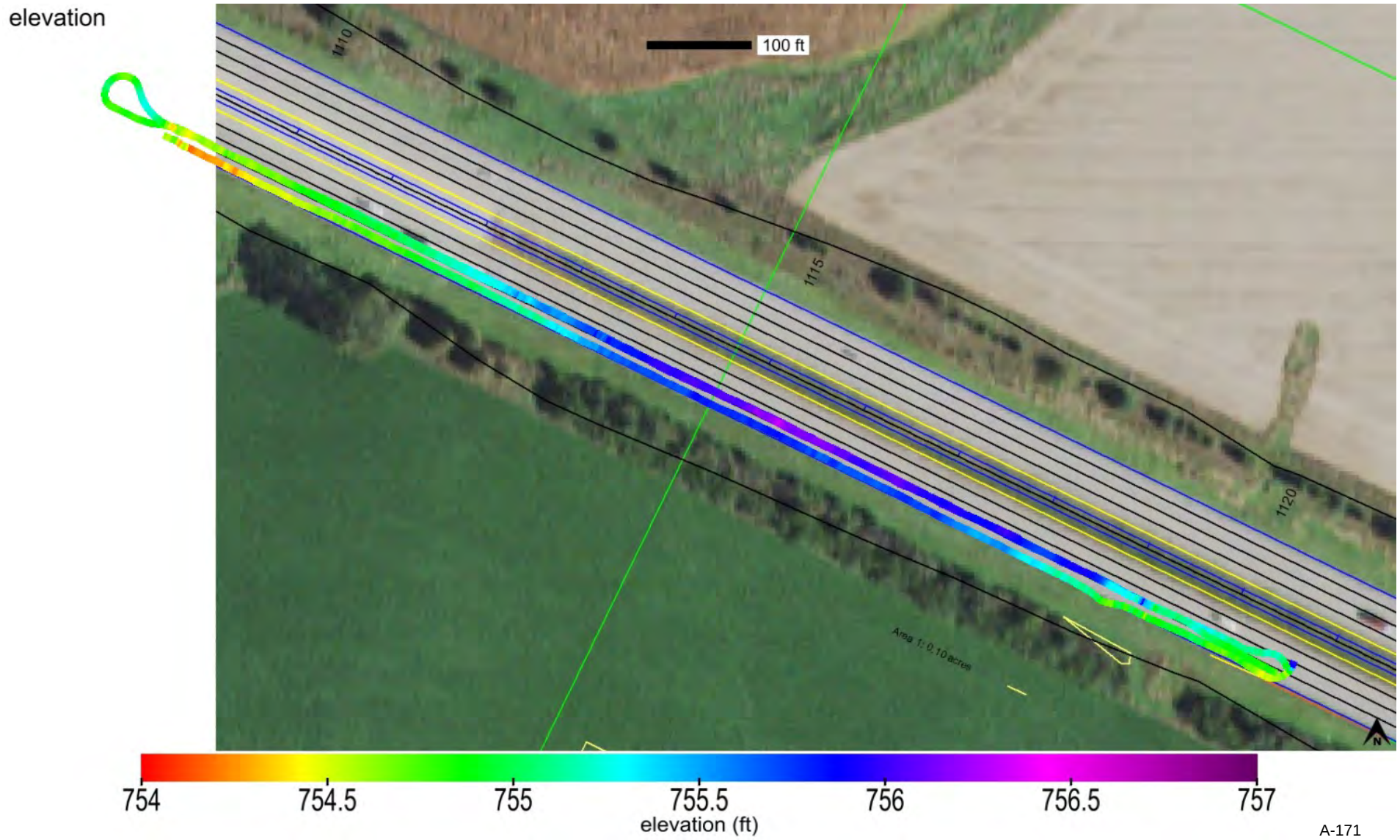



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633 Map Type: Verification Map Map Layer: Subgrade Treatment 6 Inches

| minimum | average | maximum |
|---|---|---|
| 754.16 | 755.30 | 756.31 |



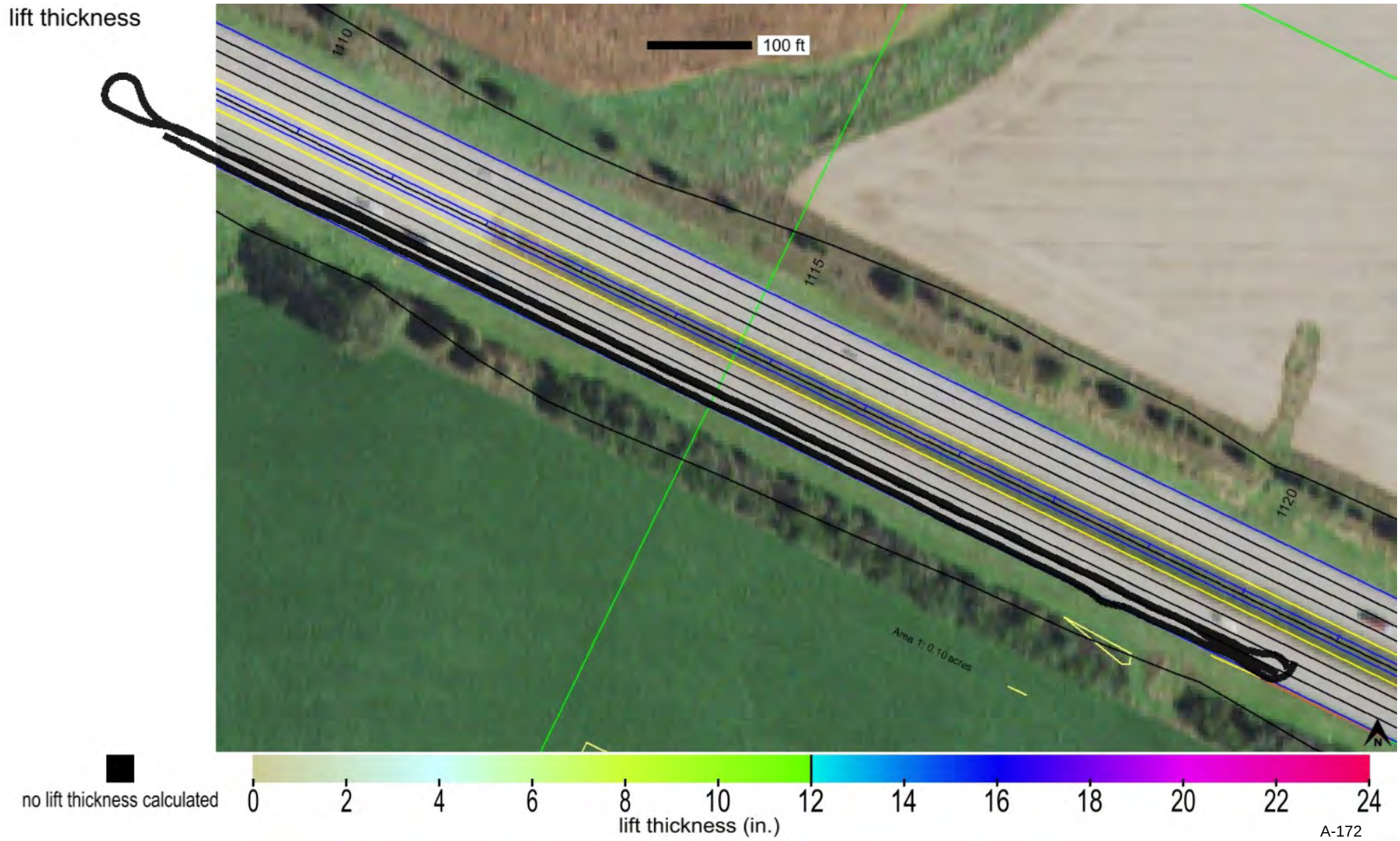



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633 Map Type: Verification Map Map Layer: Subgrade Treatment 6 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |



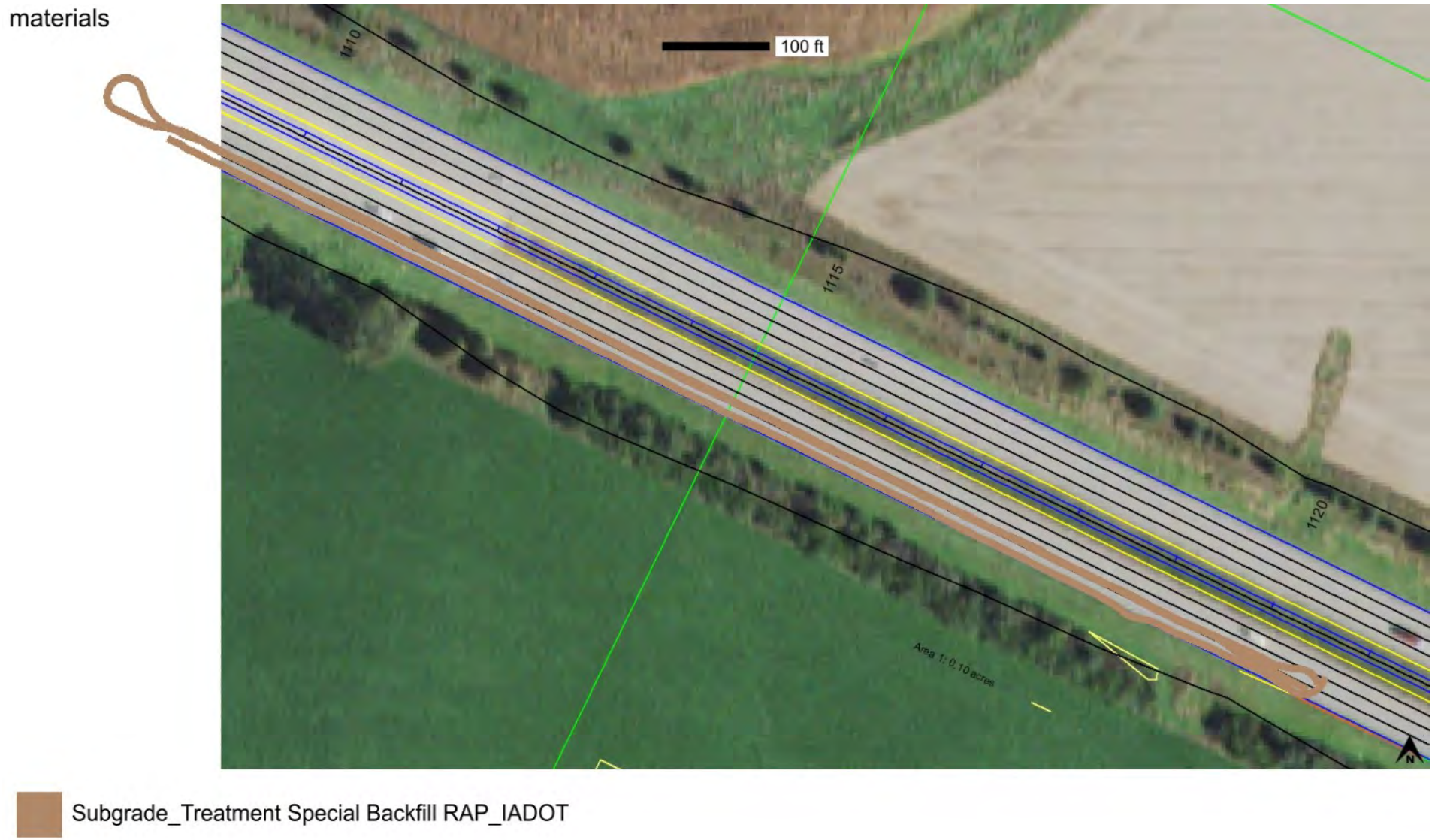



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633 Map Type: Verification Map Map Layer: Subgrade Treatment 6 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 19531 | 0.448 | 100.0 | 3600.0 | 150.0 | 20.5 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_125633 Map Type: Verification Map Map Layer: Subgrade Treatment 6 Inches

9/8/2022 3:02:24 PM ing-52-i080-174-cs56b-ingios01-2022-08-10-125633.JPG





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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 1:18:43 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.255 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 22612 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 32.3 | 57.2 | 1.0 | 150.0 | 20.0 | 135.5 | 189.0 | 27.4 | 20.3 | -130.0 | -14.5 | 39.0 |
| Moisture Content | No | | | | | | | | | | | | |

## Mapped Area

| square feet | acres |
|---|---|
| 22612 | 0.519 |

## Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.4 | 2 |

## Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 753.55 | 755.99 | 762.67 |

## Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.6 | 5.2 | 6.7 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 22612 | 0.519 | 100.0 | 3600.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 6 | 12060 | 53.3 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |

## Station

| Start | End |
|---|---|
| 1121+00 | 1135+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 1:18:43 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.255 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 22612 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 57.2 | CQI > = 95 |
| 32.3 | 80% of k-Value MVs >= 150 |
| 20.3 | COV <= 30 |
| 53.3 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

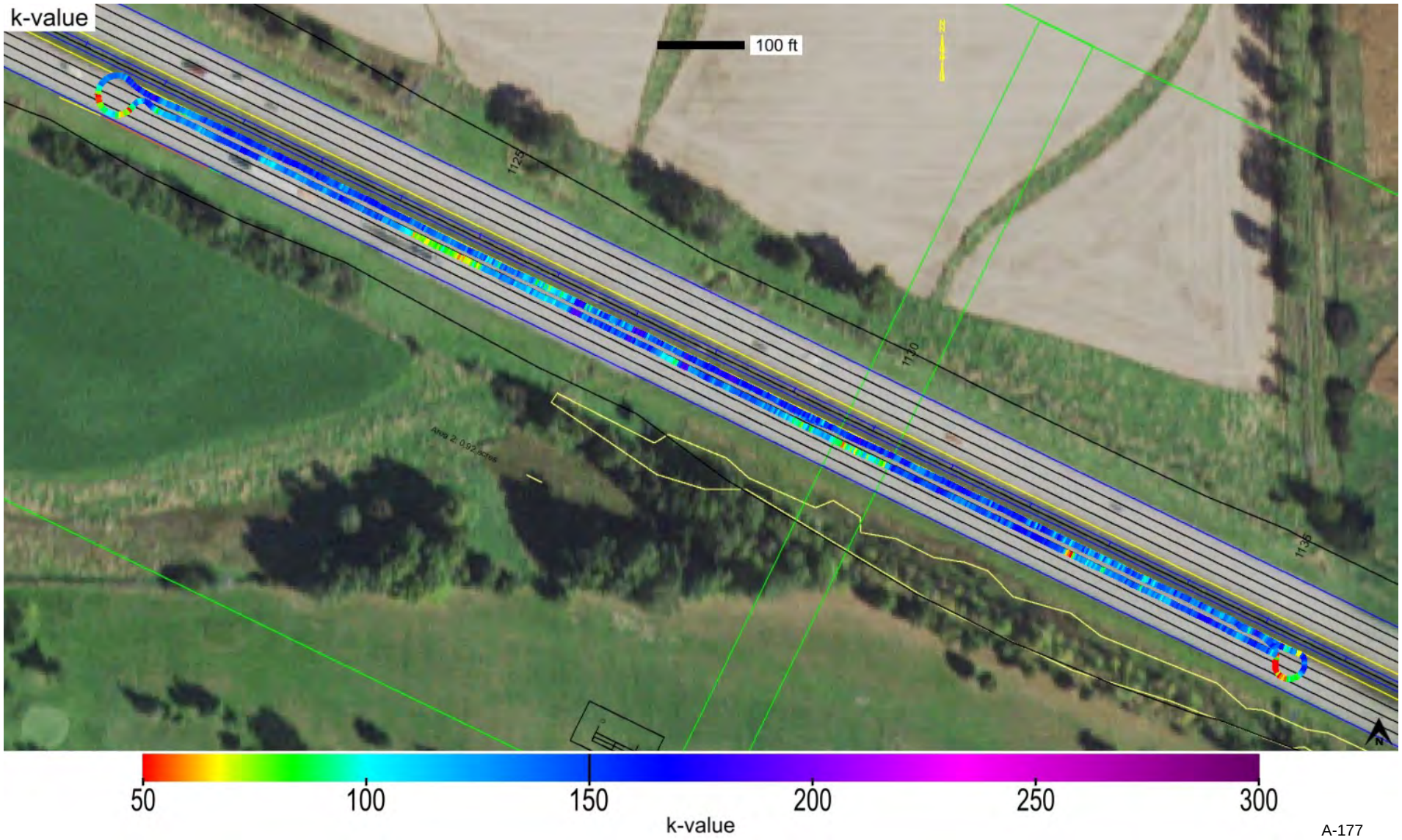


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 32.3 | 57.2 | 1.0 | 150.0 | 20.0 | 135.5 | 189.0 | 27.4 | 20.3 | -130.0 | -14.5 | 39.0 |



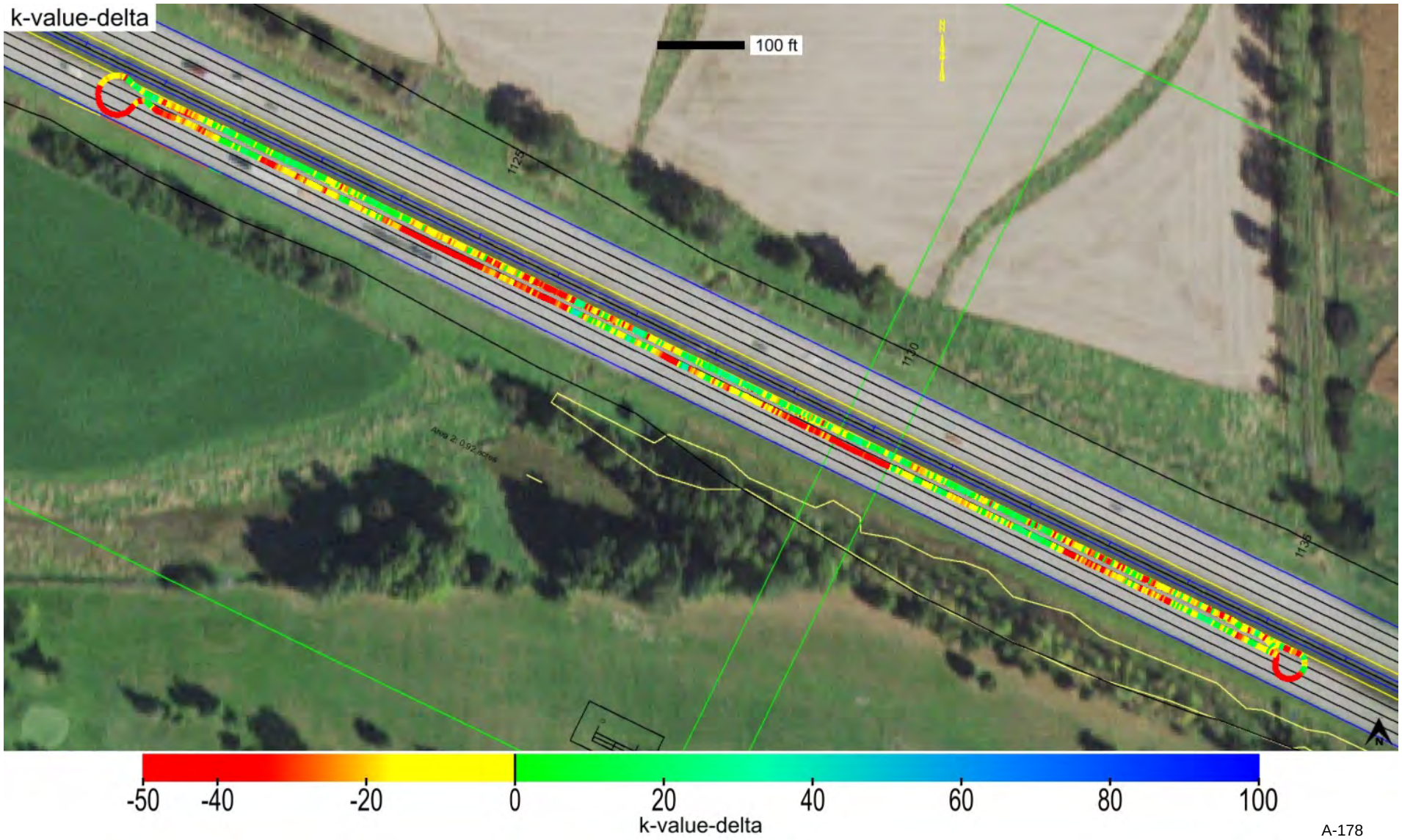



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 32.3 | 57.2 | 1.0 | 150.0 | 20.0 | 135.5 | 189.0 | 27.4 | 20.3 | -130.0 | -14.5 | 39.0 |



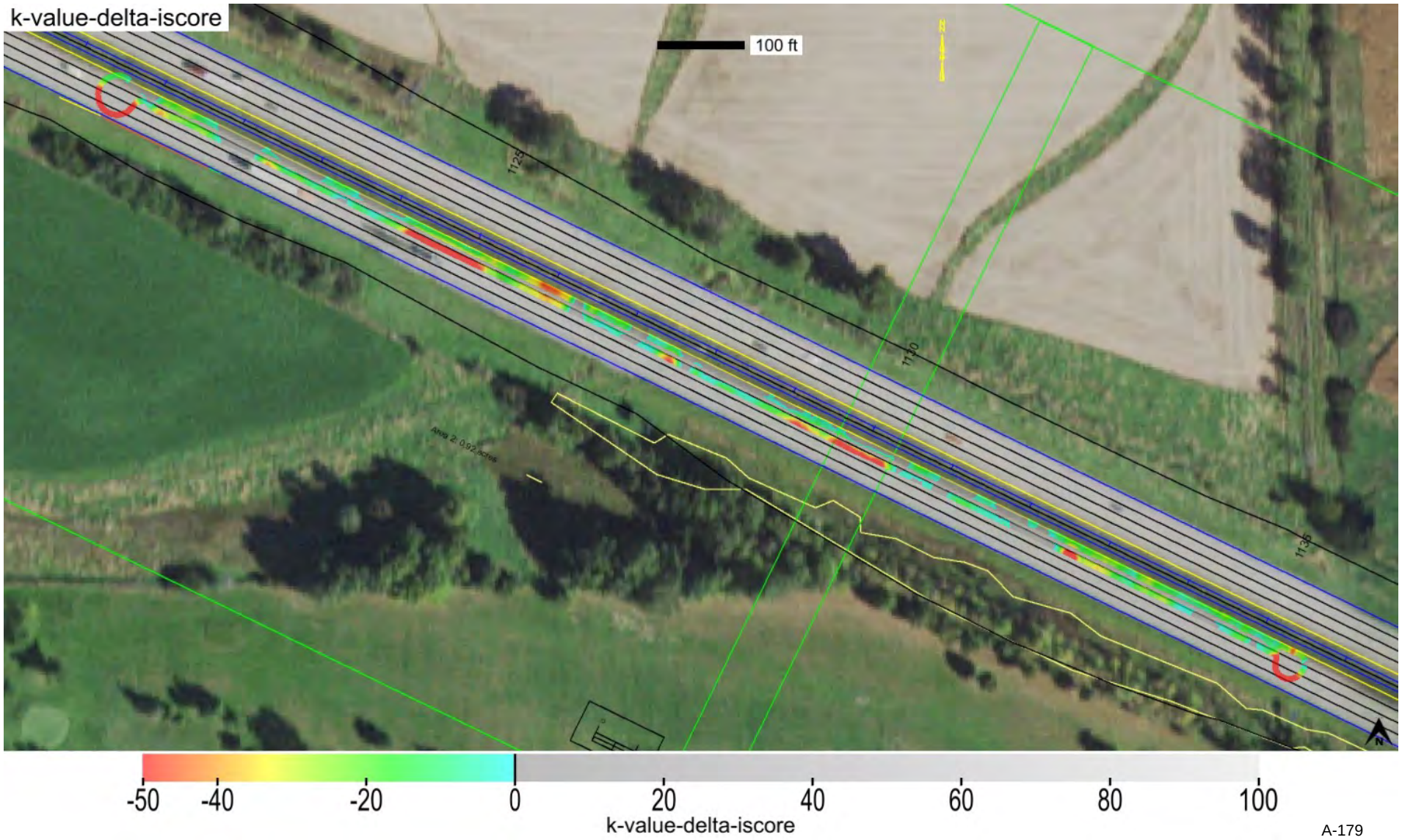



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 32.3 | 150.0 | -130.0 | -14.5 | 39.0 | -115.0 | -14.5 | 25.3 |



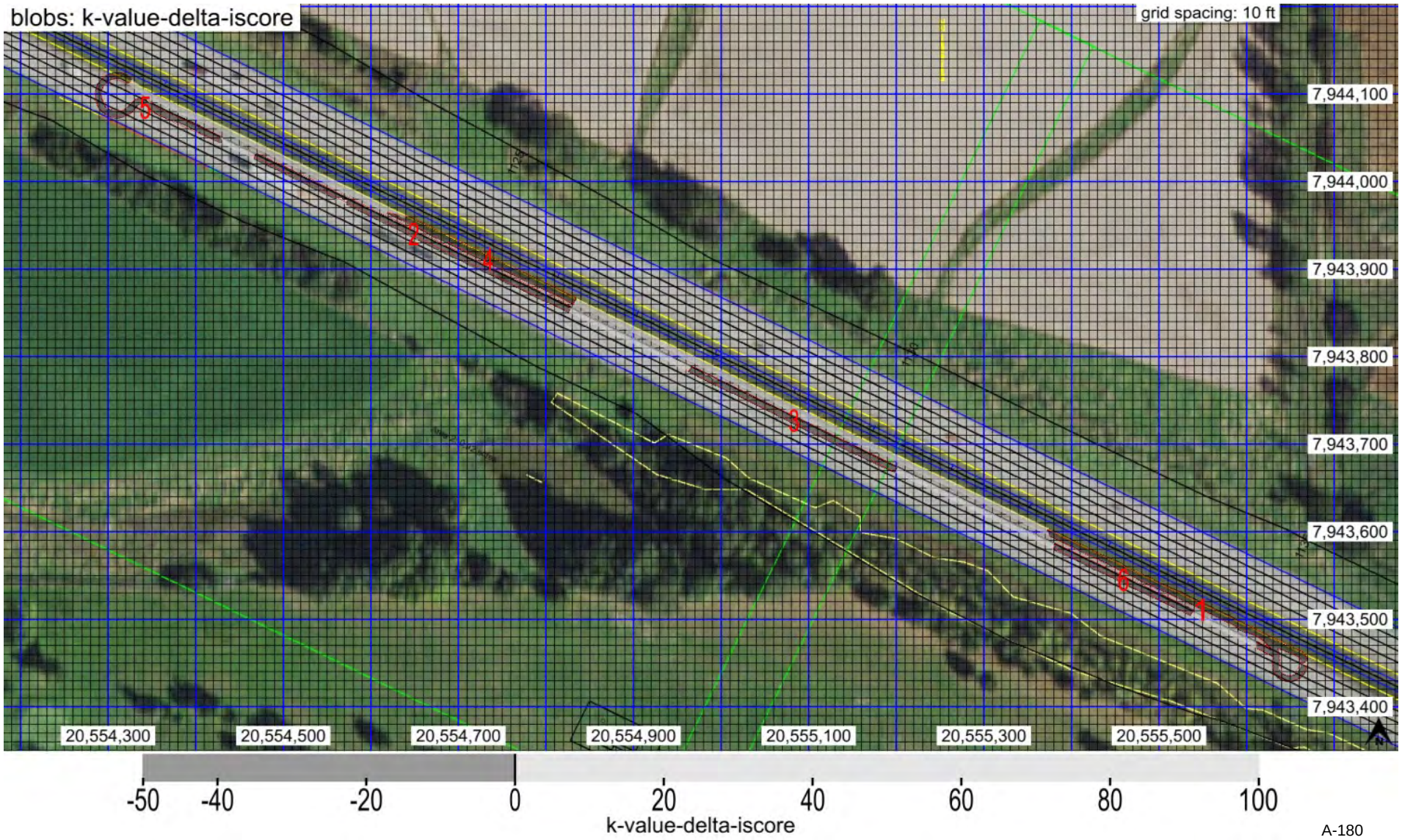



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 6 | 12060 | 53.3 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 3115 | 25.8 | 20 | -115.0 | -22.7 | -0.1 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20555644 | **7943428** |
| 2 | 20555660 | 7943432 |
| 3 | **20555670** | 7943446 |
| 4 | 20555662 | 7943448 |
| 5 | 20555652 | 7943436 |
| 6 | 20555640 | 7943438 |
| 7 | 20555636 | 7943466 |
| 8 | 20555660 | 7943458 |
| 9 | 20555662 | 7943450 |
| 10 | 20555670 | 7943452 |
| 11 | 20555664 | 7943462 |
| 12 | **20555372** | **7943602** |
| 13 | 20555376 | 7943594 |
| 14 | 20555616 | 7943478 |
| 15 | 20555628 | 7943466 |
| 16 | 20555612 | 7943474 |
| 17 | 20555612 | 7943466 |
| 18 | 20555630 | 7943458 |
| 19 | 20555630 | 7943442 |
| 20 | 20555644 | 7943430 |
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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 2 | 2735 | 22.7 | 7 | -83.2 | -30.1 | 0.0 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20554824 | **7943850** |
| 2 | **20554828** | 7943858 |
| 3 | 20554814 | 7943864 |
| 4 | 20554502 | 7944018 |
| 5 | 20554472 | **7944032** |
| 6 | **20554466** | 7944028 |
| 7 | 20554824 | 7943852 |
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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 3 | 1798 | 14.9 | 6 | -69.0 | -27.1 | 0.0 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20555198 | **7943668** |
| 2 | **20555200** | 7943674 |
| 3 | 20555194 | 7943678 |
| 4 | 20554968 | **7943788** |
| 5 | **20554962** | 7943784 |
| 6 | 20555198 | 7943668 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 4 | 1650 | 13.7 | 6 | -49.4 | -23.5 | -0.1 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20554830 | **7943860** |
| 2 | **20554834** | 7943868 |
| 3 | 20554816 | 7943876 |
| 4 | 20554646 | 7943960 |
| 5 | **20554618** | **7943964** |
| 6 | 20554830 | 7943860 |
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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 5 | 1531 | 12.7 | 21 | -92.7 | -35.0 | 0.0 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20554426 | **7944044** |
| 2 | **20554428** | 7944052 |
| 3 | 20554358 | 7944084 |
| 4 | 20554344 | 7944096 |
| 5 | 20554332 | 7944094 |
| 6 | 20554316 | 7944080 |
| 7 | 20554298 | 7944084 |
| 8 | 20554292 | 7944098 |
| 9 | 20554294 | 7944110 |
| 10 | 20554306 | 7944118 |
| 11 | 20554324 | 7944112 |
| 12 | 20554326 | 7944118 |
| 13 | 20554320 | **7944124** |
| 14 | 20554296 | 7944120 |
| 15 | **20554284** | 7944100 |
| 16 | 20554288 | 7944084 |
| 17 | 20554302 | 7944074 |
| 18 | 20554320 | 7944074 |
| 19 | 20554342 | 7944088 |
| 20 | 20554354 | 7944078 |
| 21 | 20554426 | 7944046 |
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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 6 | 1231 | 10.2 | 6 | -67.4 | -22.5 | -0.2 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20555534 | **7943504** |
| 2 | **20555540** | 7943510 |
| 3 | 20555530 | 7943516 |
| 4 | 20555382 | **7943586** |
| 5 | **20555380** | 7943582 |
| 6 | 20555534 | 7943506 |

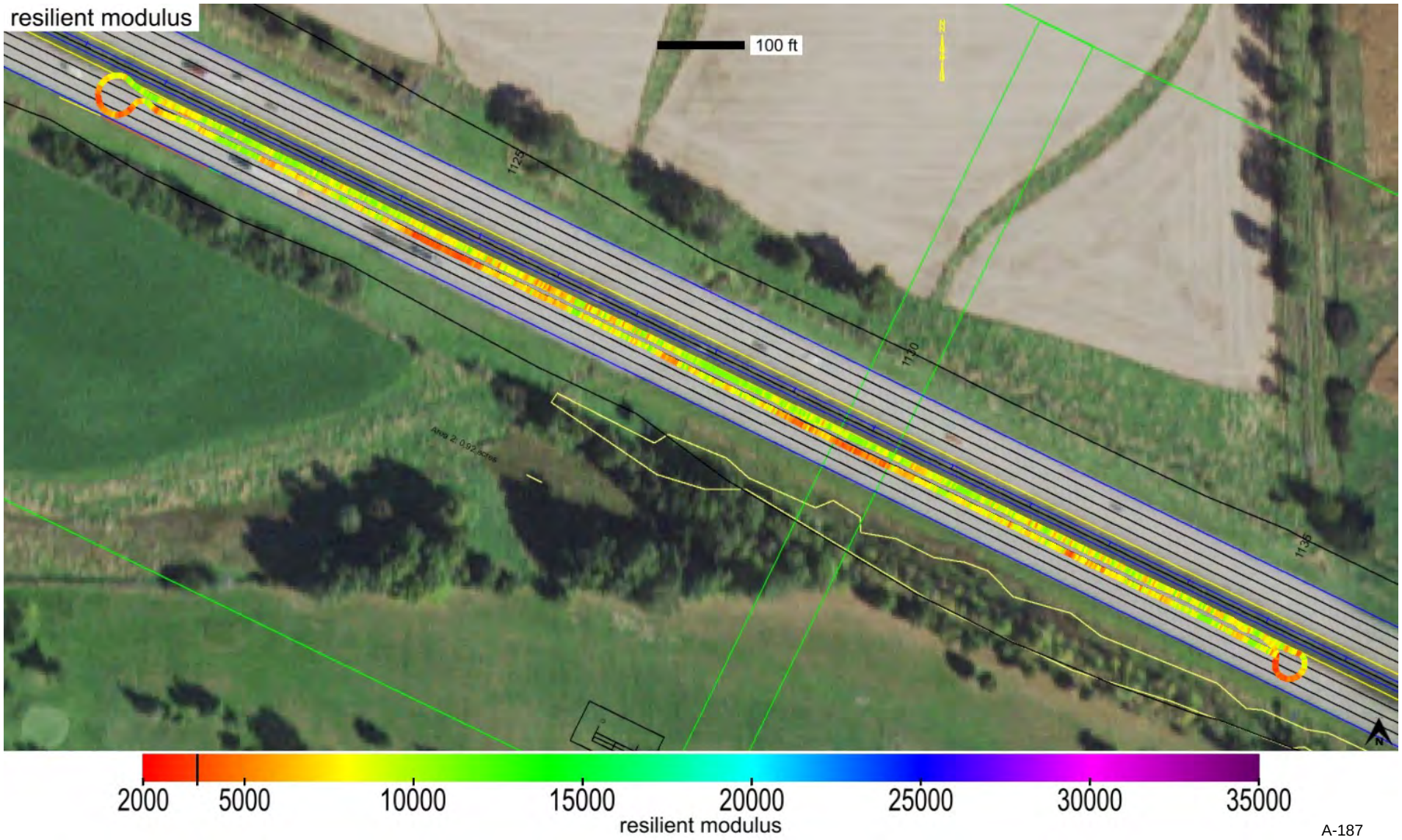


This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 99.4 | 122.5 | 1.1 | 3600.0 | 2872.4 | 8174.1 | 11000.0 | 1938.5 | 23.7 | -727.6 | 4574.1 | 7400.0 |



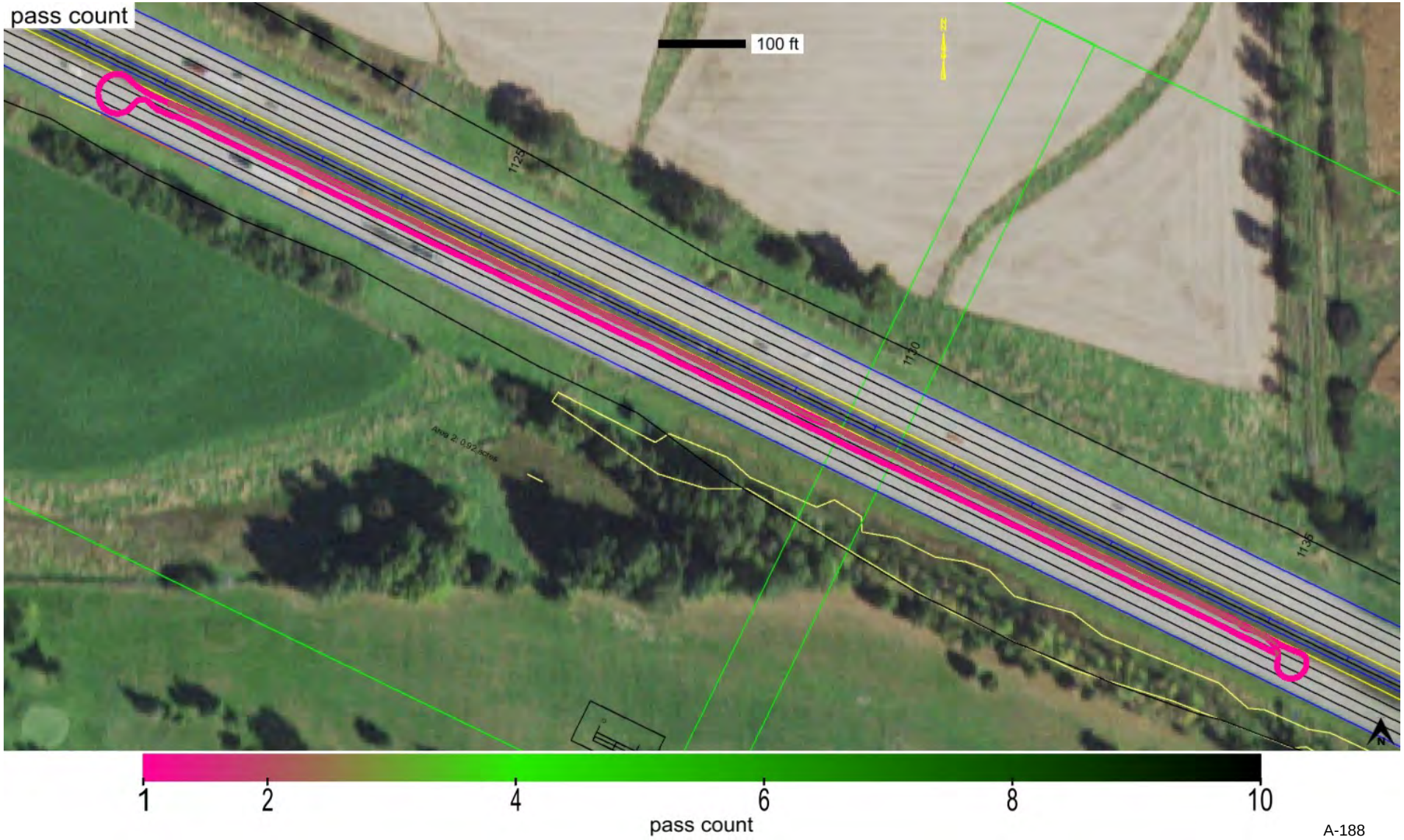



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.4 | 2 |



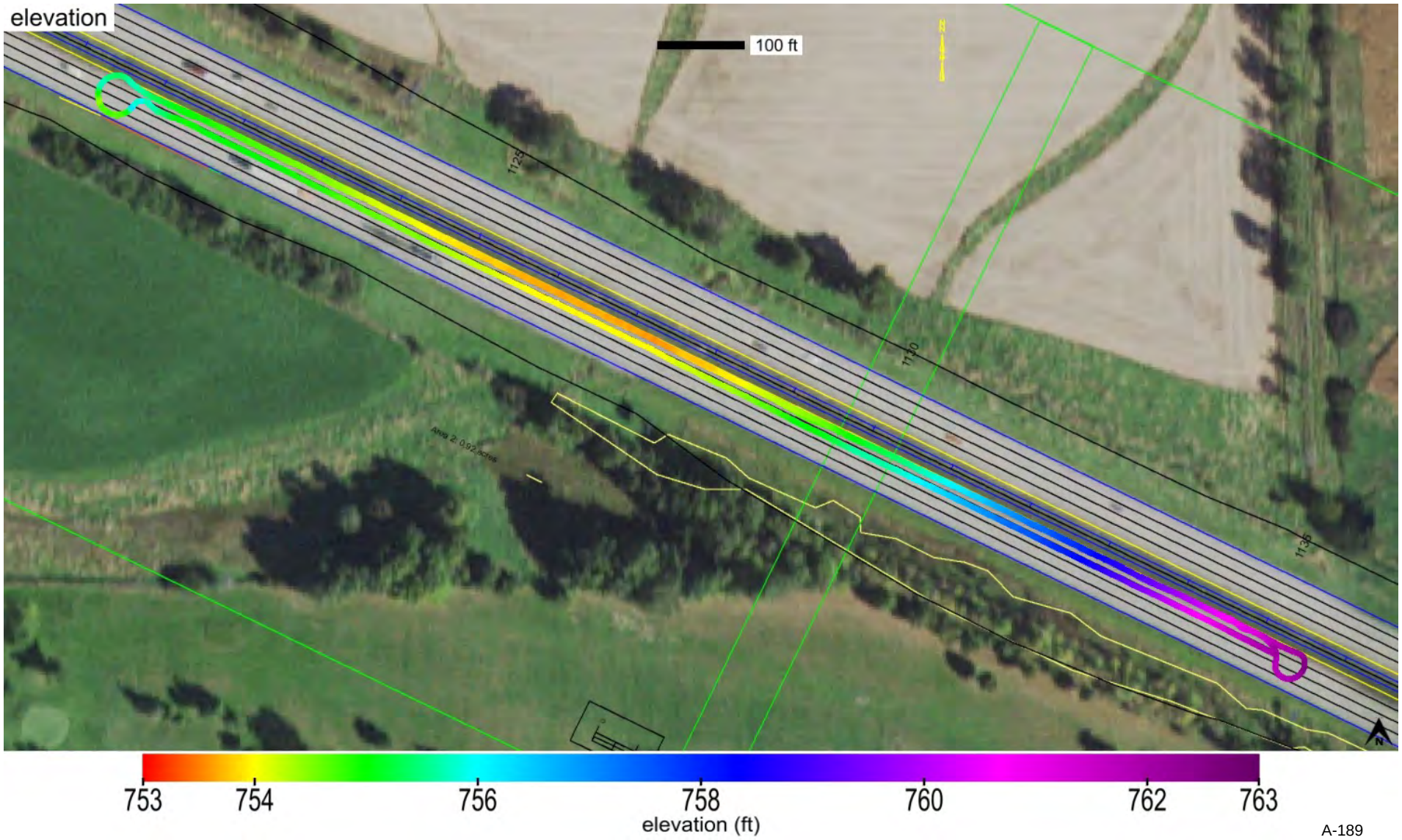



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 753.55 | 755.99 | 762.67 |



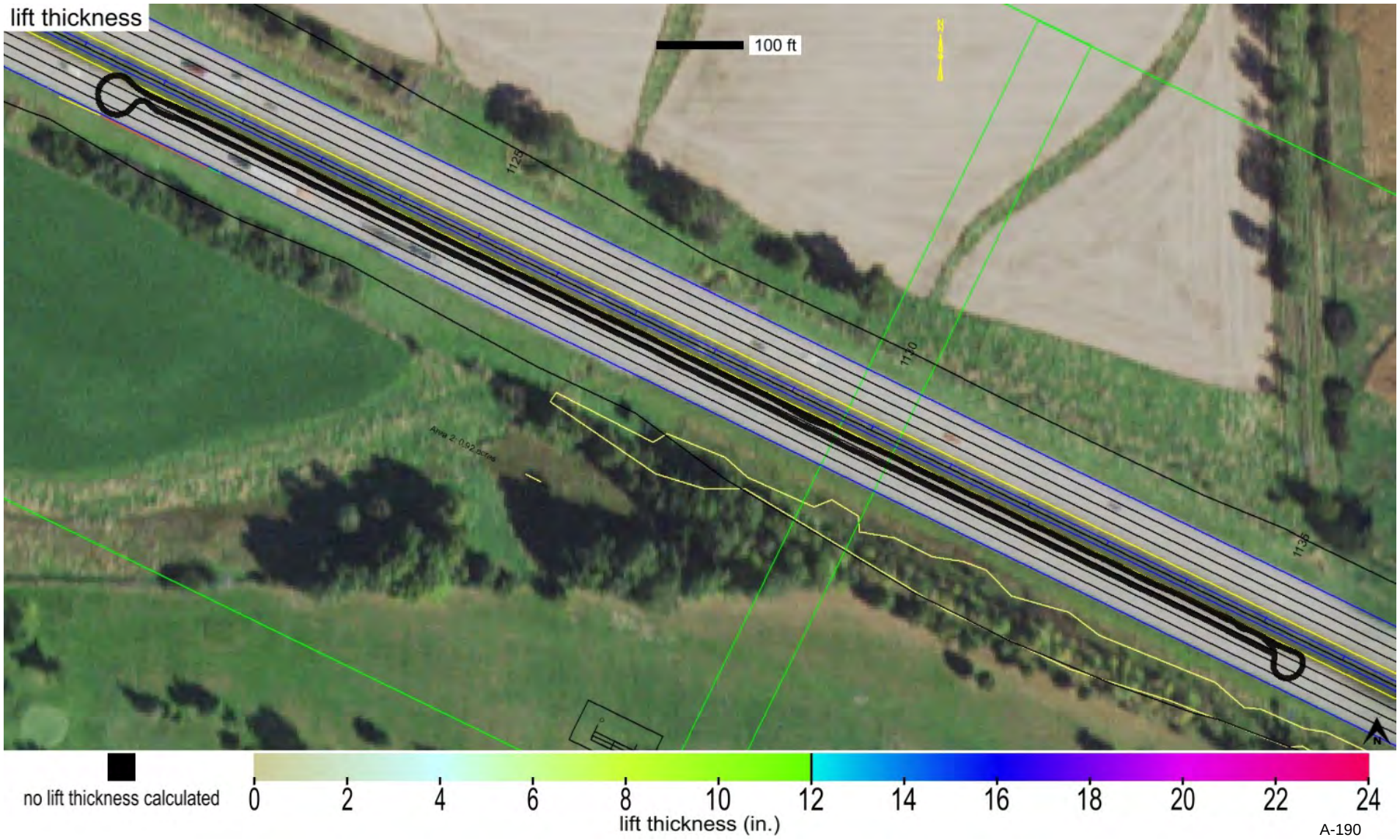



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 22612 | 0.519 | 100.0 | 3600.0 | 150.0 | 20.5 |




Subgrade_Treatment Special Backfill RAP_IADOT



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_131843 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

9/8/2022 3:02:46 PM ing-52-i080-174-cs56b-ingios01-2022-08-10-131843.JPG





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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 1:48:21 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.378 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 32340 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 1.7 | 11.5 | 0.2 | 150.0 | 20.0 | 69.5 | 189.0 | 35.1 | 50.4 | -130.0 | -80.5 | 39.0 |
| Moisture Content | No | | | | | | | | | | | | |

## Mapped Area

| square feet | acres |
|---|---|
| 32340 | 0.742 |

## Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.5 | 4 |

## Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 753.27 | 756.12 | 763.61 |

## Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.5 | 5.2 | 6.9 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 32340 | 0.742 | 100.0 | 3600.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 1 | 32321 | 99.9 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |

## Station

| Start | End |
|---|---|
| 1123+00 | 1135+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 1:48:21 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.378 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 32340 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 11.5 | CQI > = 95 |
| 1.7 | 80% of k-Value MVs >= 150 |
| 50.4 | COV <= 30 |
| 99.9 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

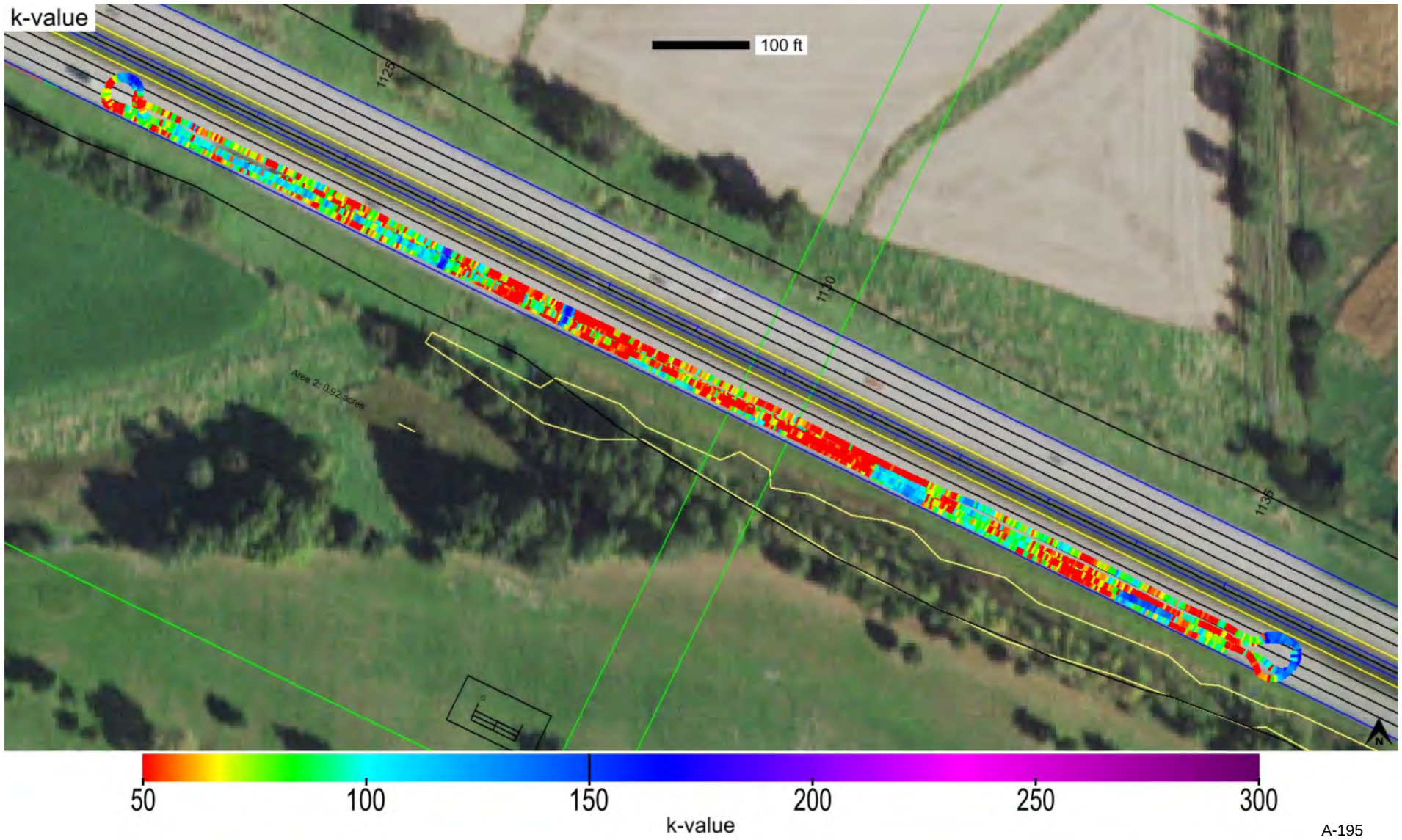


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 1.7 | 11.5 | 0.2 | 150.0 | 20.0 | 69.5 | 189.0 | 35.1 | 50.4 | -130.0 | -80.5 | 39.0 |



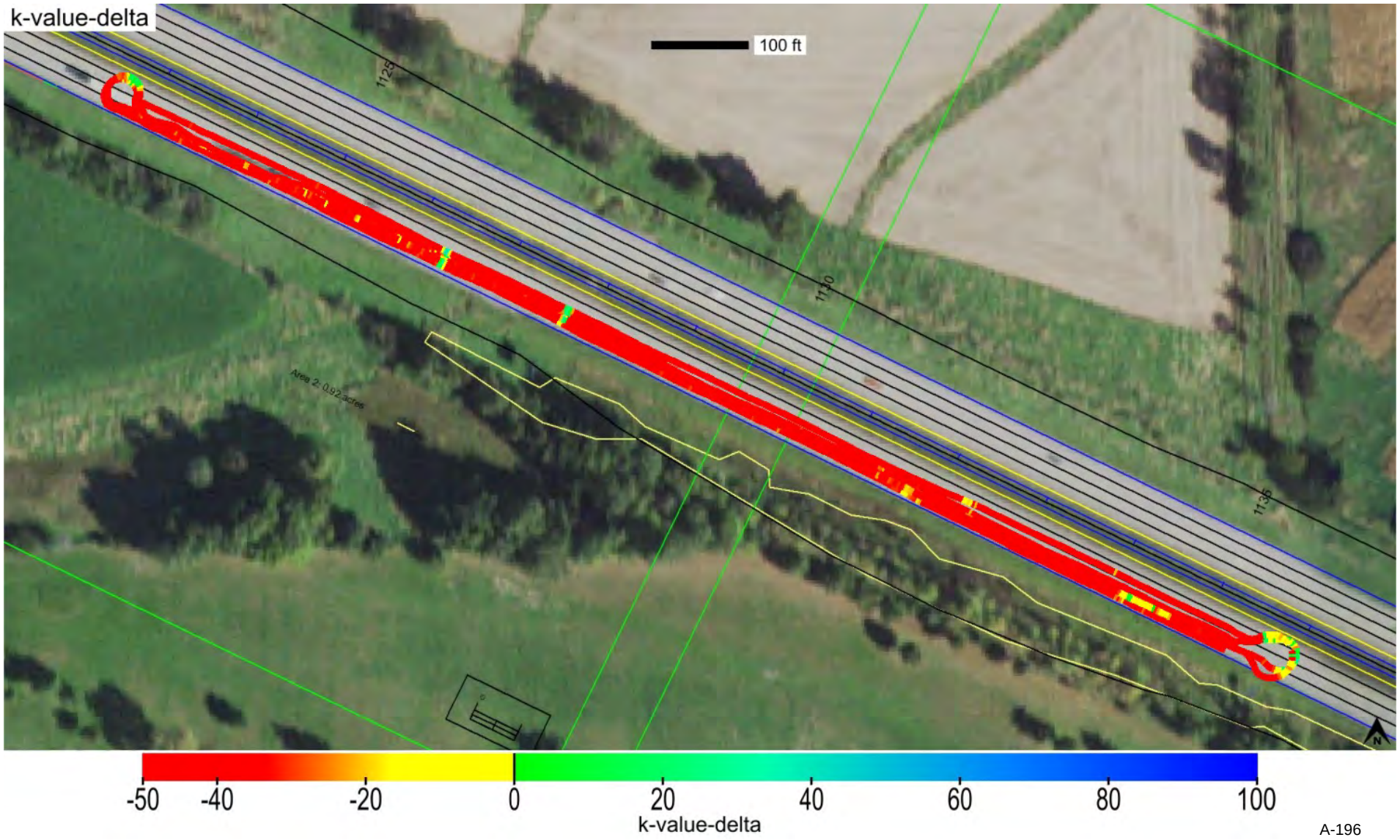



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 1.7 | 11.5 | 0.2 | 150.0 | 20.0 | 69.5 | 189.0 | 35.1 | 50.4 | -130.0 | -80.5 | 39.0 |



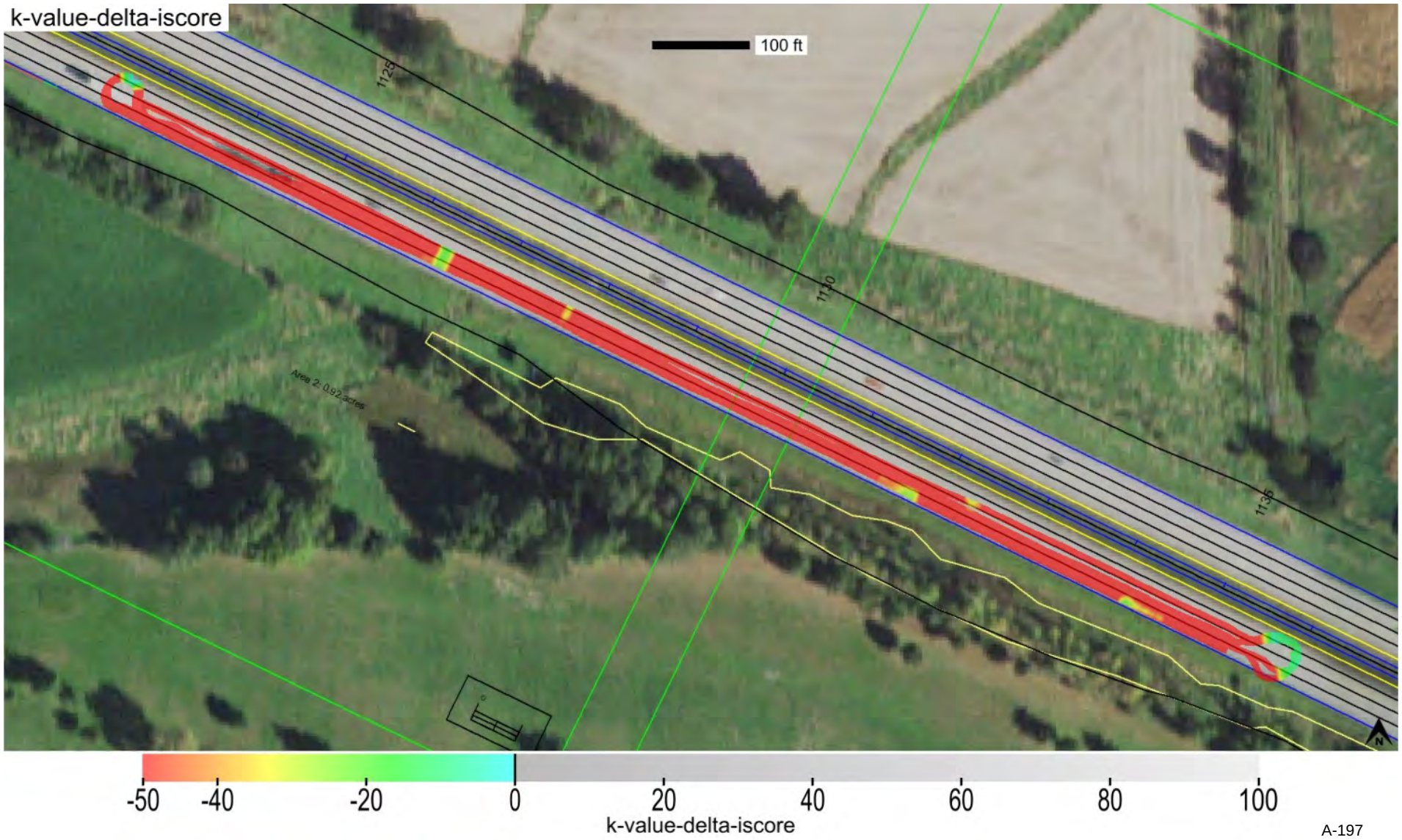



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 1.7 | 150.0 | -130.0 | -80.5 | 39.0 | -130.0 | -80.3 | 6.0 |



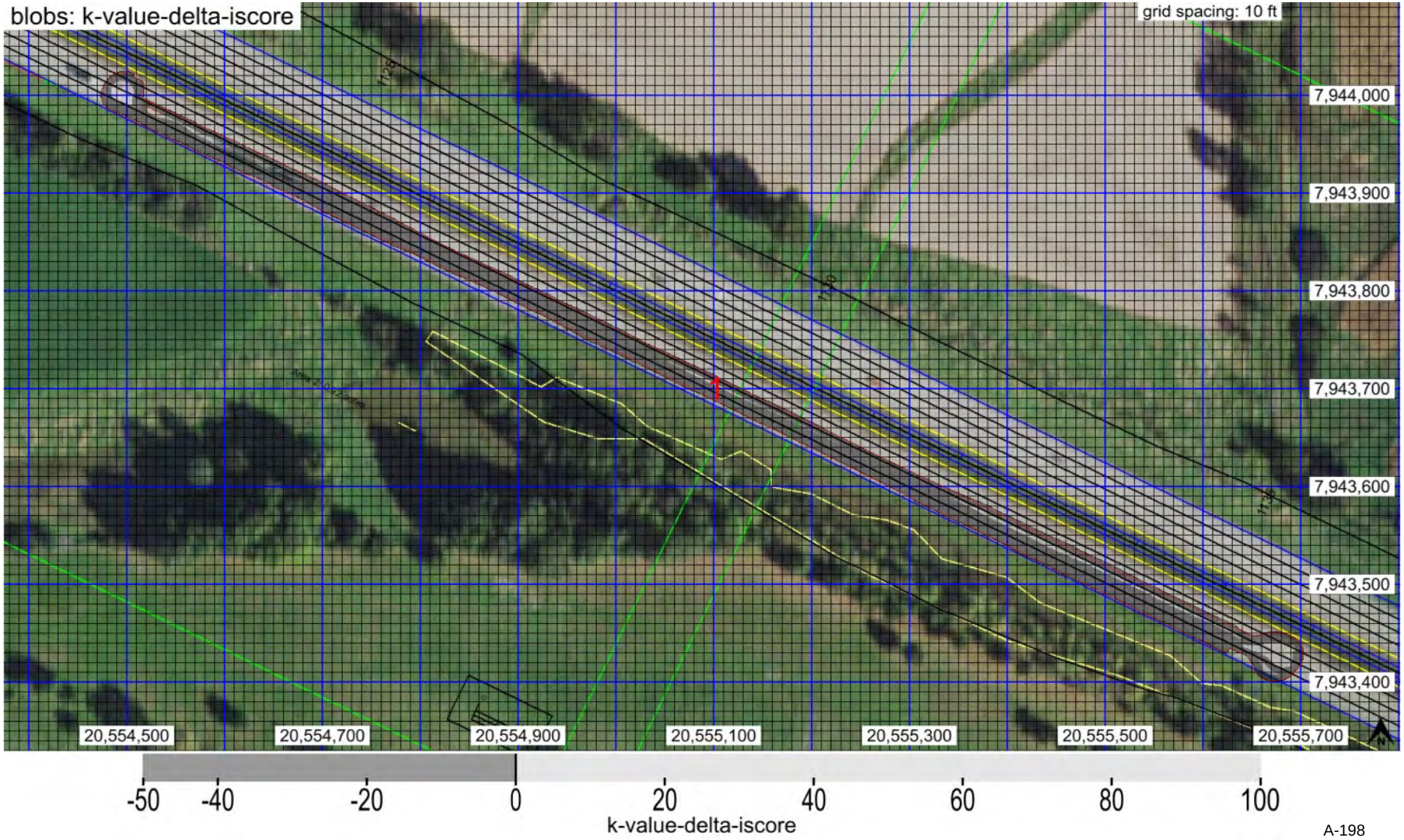



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 1 | 32321 | 99.9 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 32321 | 100.0 | 22 | -130.0 | -80.3 | -0.1 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20555668 | **7943400** |
| 2 | 20555686 | 7943404 |
| 3 | 20555700 | 7943418 |
| 4 | **20555702** | 7943436 |
| 5 | 20555696 | 7943444 |
| 6 | 20555680 | 7943452 |
| 7 | 20555650 | 7943448 |
| 8 | 20554840 | 7943838 |
| 9 | 20554698 | 7943912 |
| 10 | 20554516 | 7943996 |
| 11 | 20554518 | 7944012 |
| 12 | 20554506 | **7944024** |
| 13 | 20554486 | 7944022 |
| 14 | **20554474** | 7944004 |
| 15 | 20554478 | 7943988 |
| 16 | 20554522 | 7943966 |
| 17 | 20554874 | 7943800 |
| 18 | 20555620 | 7943430 |
| 19 | 20555628 | 7943434 |
| 20 | 20555644 | 7943428 |
| 21 | 20555656 | 7943406 |
| 22 | 20555668 | 7943402 |
| | | |
| | | |
| | | |
| | | |

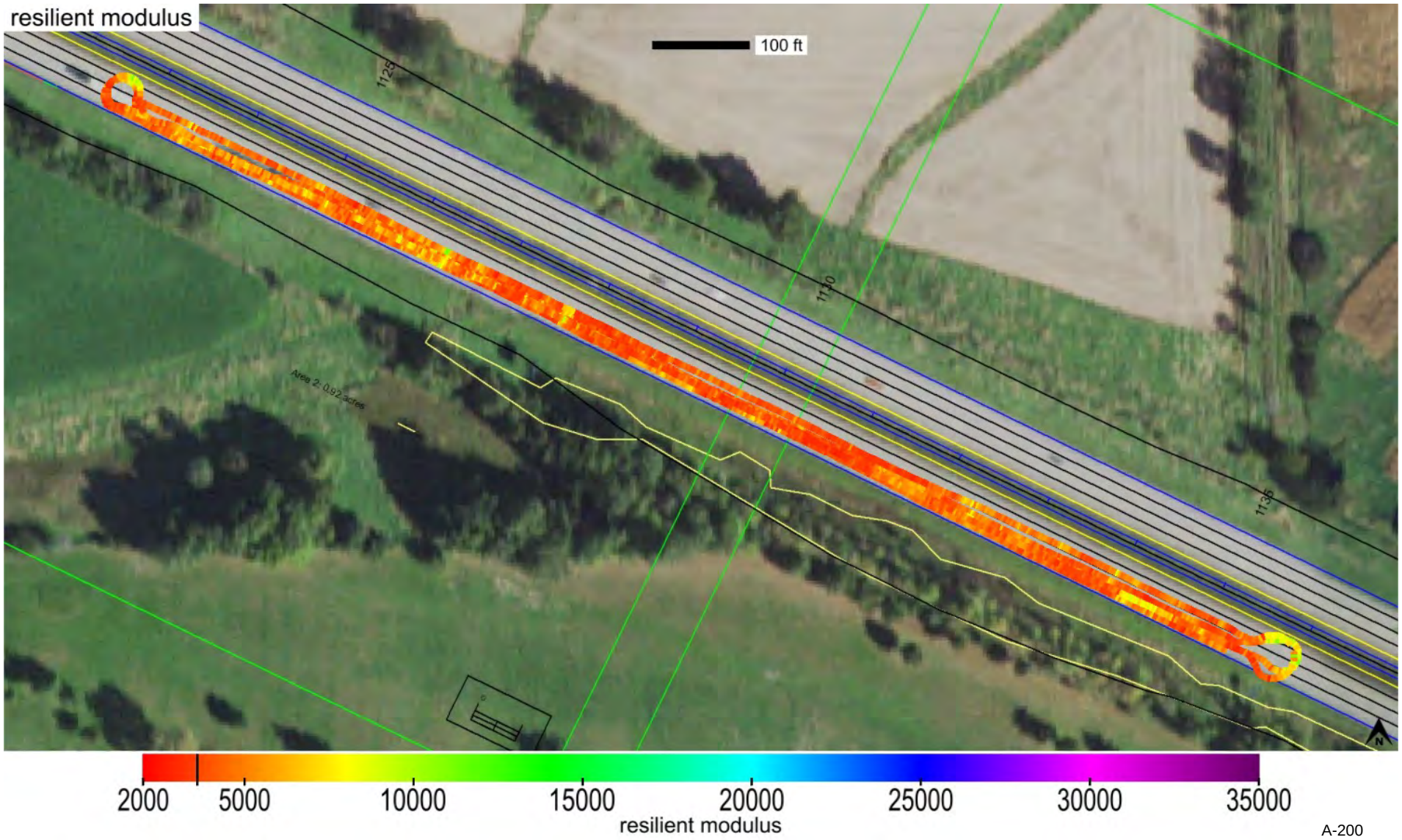


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 80.9 | 102.2 | 0.7 | 3600.0 | 2501.1 | 4704.2 | 11000.0 | 1292.2 | 27.5 | -1098.9 | 1104.2 | 7400.0 |



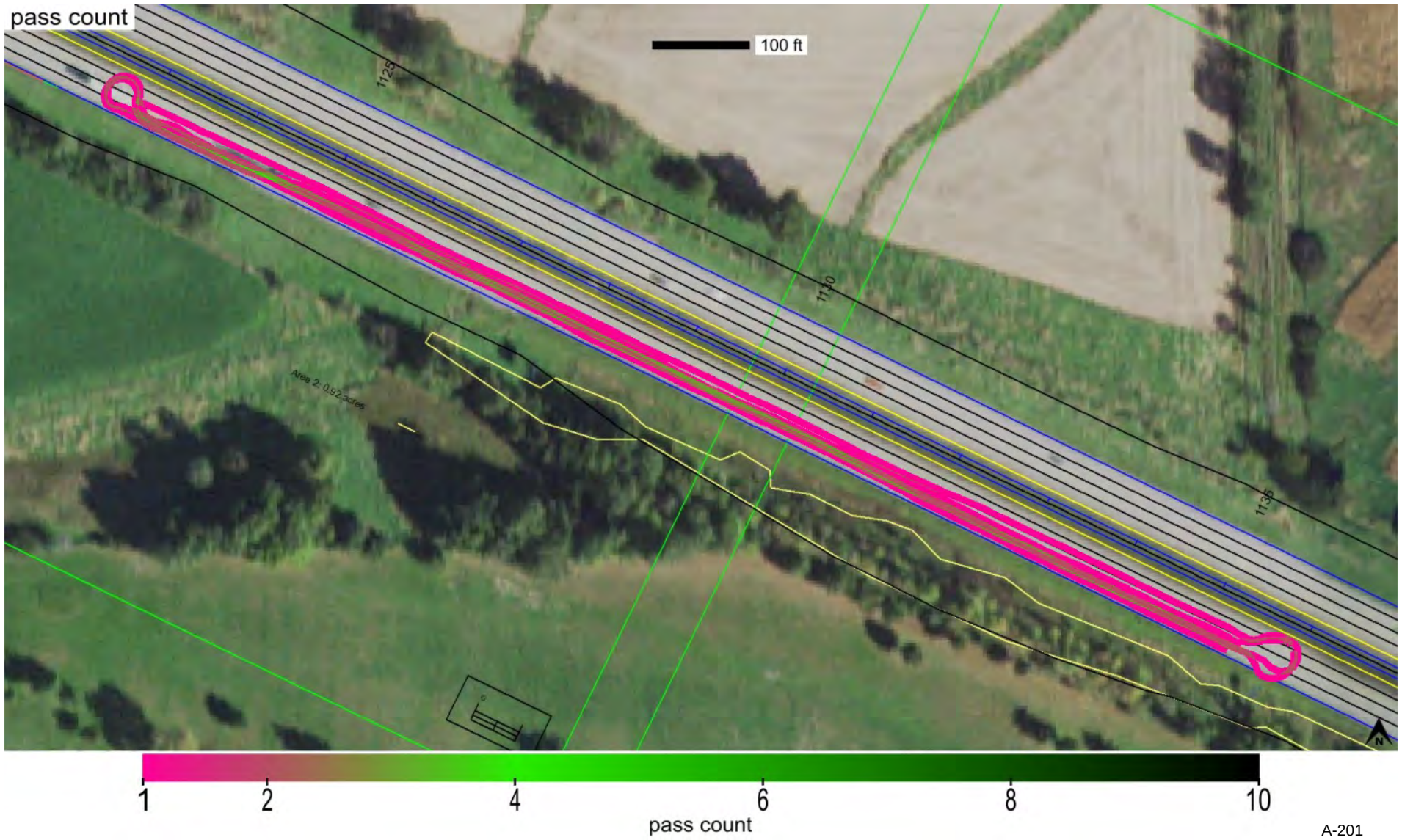



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.5 | 4 |



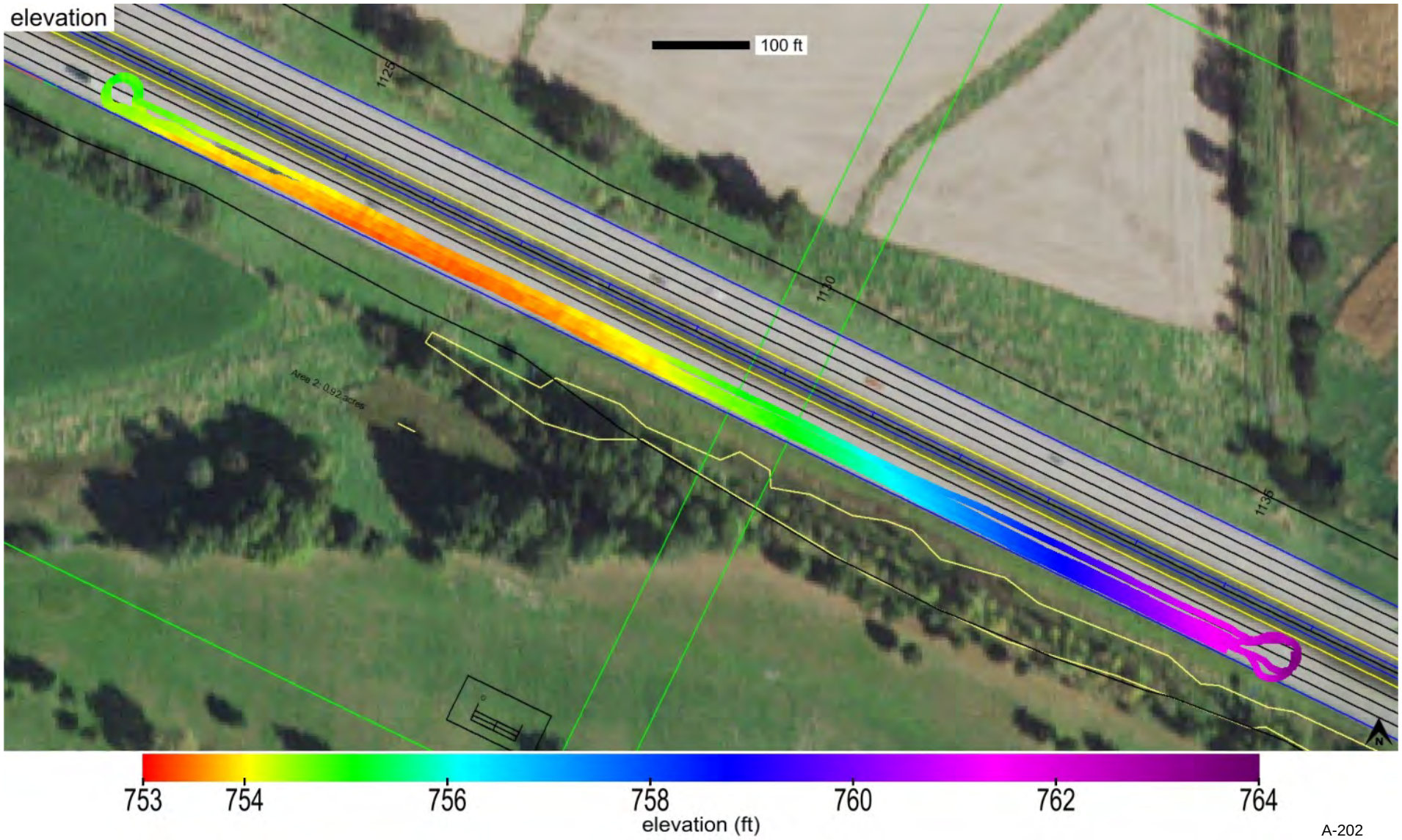



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 753.27 | 756.12 | 763.61 |



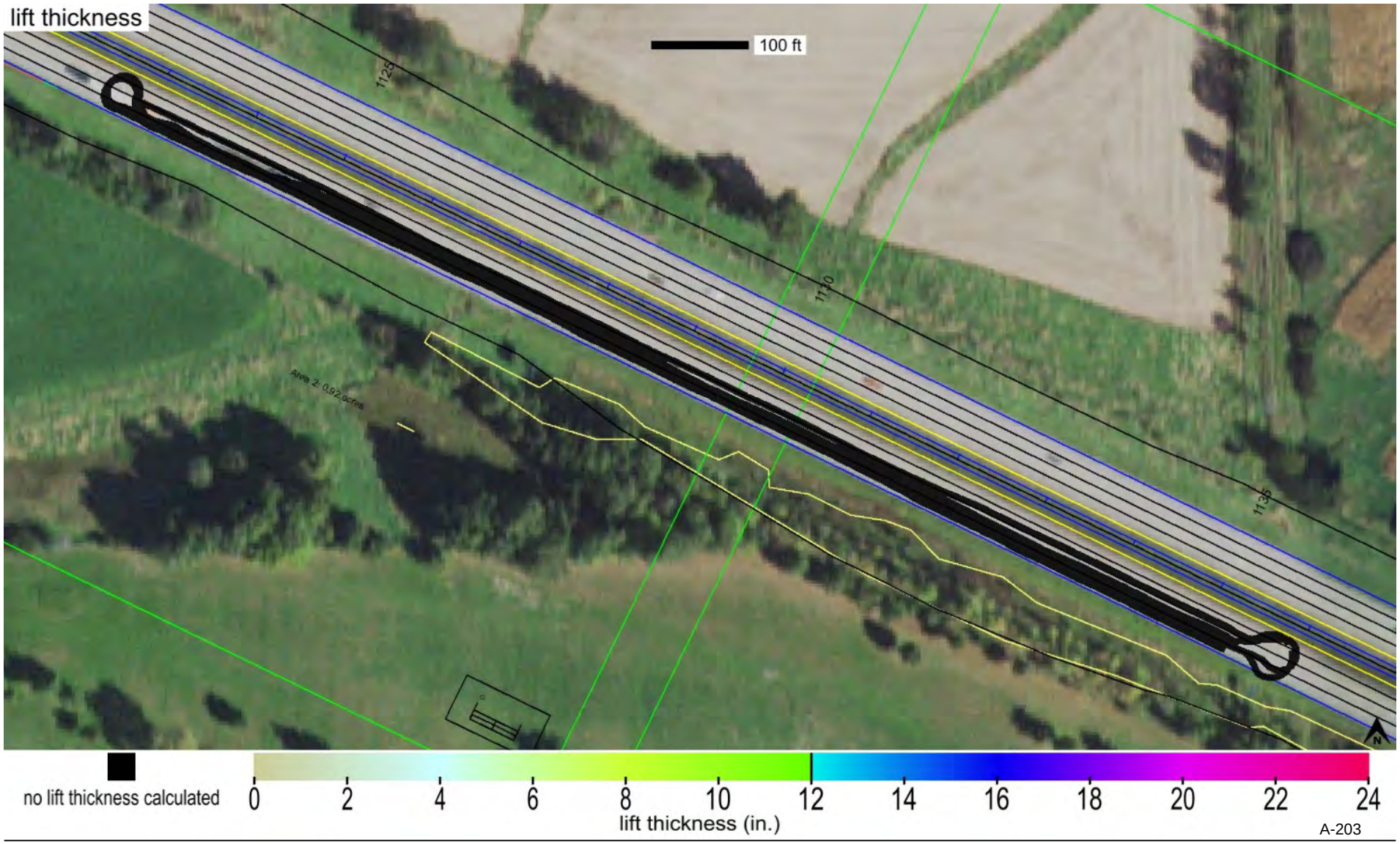



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 32340 | 0.742 | 100.0 | 3600.0 | 150.0 | 20.5 |




Subgrade_Treatment Special Backfill RAP_IADOT



This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_134821 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

9/8/2022 3:03:16 PM ing-52-i080-174-cs56b-ingios01-2022-08-10-134821.JPG





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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 2:21:34 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.192 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 17827 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 3.7 | 12.5 | 0.2 | 150.0 | 20.0 | 75.5 | 189.0 | 39.6 | 52.5 | -130.0 | -74.5 | 39.0 |
| Moisture Content | No | | | | | | | | | | | | |

## Mapped Area

| square feet | acres |
|---|---|
| 17827 | 0.409 |

## Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.3 | 3 |

## Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 754.11 | 755.27 | 756.55 |

## Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.4 | 5.3 | 6.9 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 17827 | 0.409 | 100.0 | 3600.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 1 | 17717 | 99.4 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |

## Station

| Start | End |
|---|---|
| 1109+00 | 1113+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 2:21:34 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.192 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 17827 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 12.5 | CQI > = 95 |
| 3.7 | 80% of k-Value MVs >= 150 |
| 52.5 | COV <= 30 |
| 99.4 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

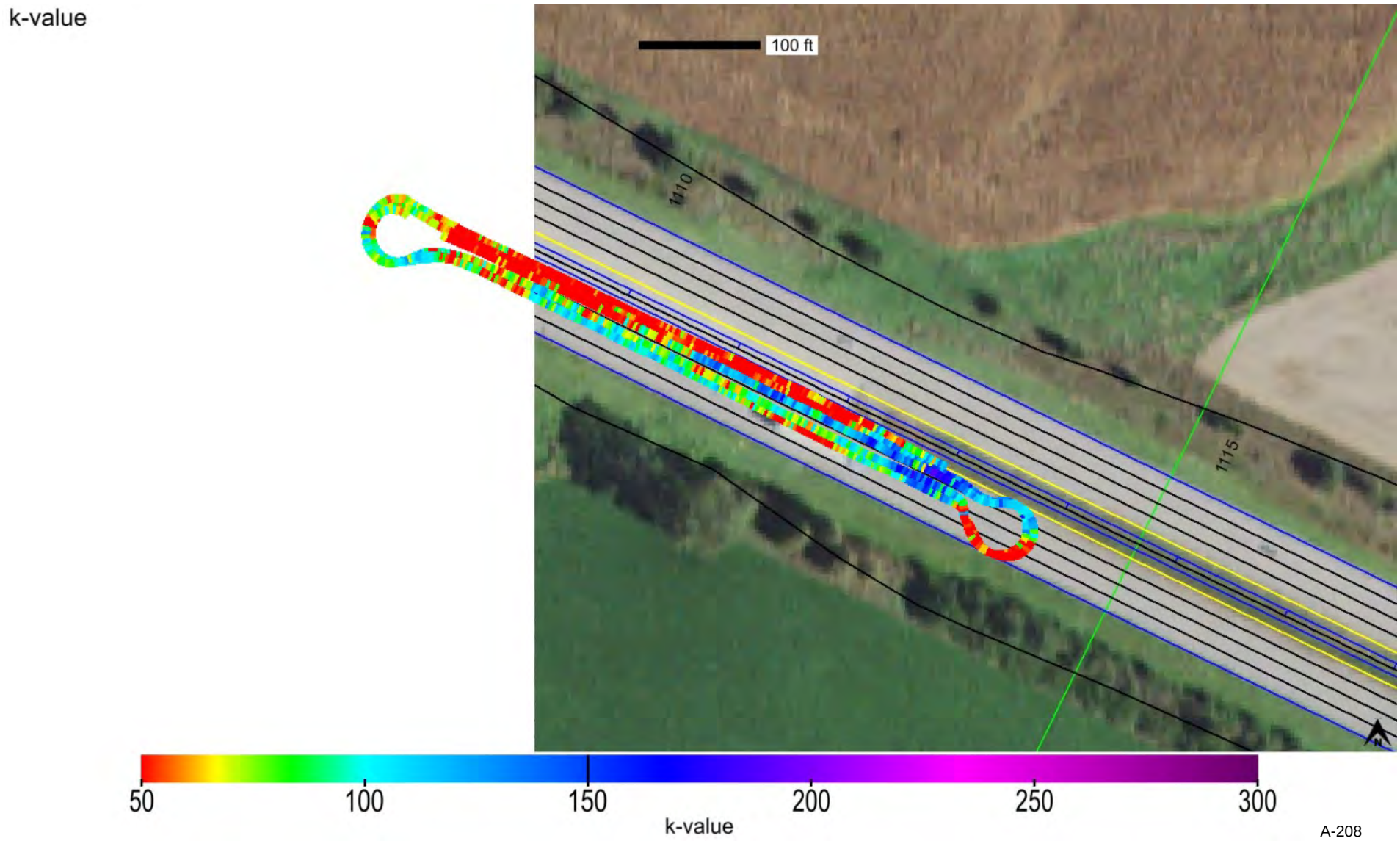


This report is only for use of the client named and it cannot be relied upon by any other person or entity.

ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 3.7 | 12.5 | 0.2 | 150.0 | 20.0 | 75.5 | 189.0 | 39.6 | 52.5 | -130.0 | -74.5 | 39.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 3.7 | 12.5 | 0.2 | 150.0 | 20.0 | 75.5 | 189.0 | 39.6 | 52.5 | -130.0 | -74.5 | 39.0 |

k-value-delta






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 3.7 | 150.0 | -130.0 | -74.5 | 39.0 | -127.5 | -74.5 | 8.2 |

k-value-delta-iscore



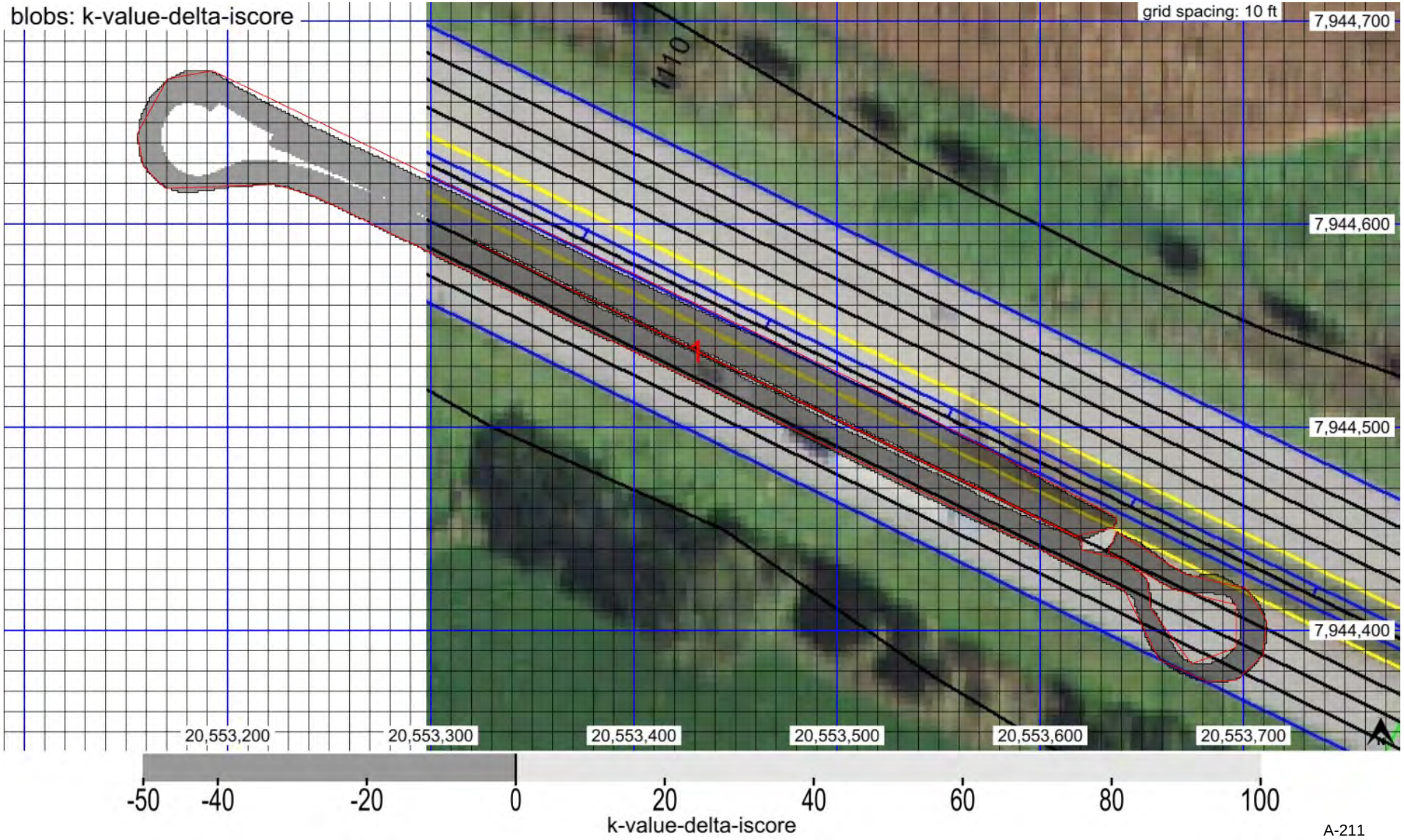



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 1 | 17717 | 99.4 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 17717 | 100.0 | 32 | -127.5 | -75.0 | 0.0 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20553680 | **7944374** |
| 2 | 20553696 | 7944376 |
| 3 | 20553710 | 7944388 |
| 4 | **20553712** | 7944404 |
| 5 | 20553702 | 7944420 |
| 6 | 20553672 | 7944428 |
| 7 | 20553638 | 7944448 |
| 8 | 20553634 | 7944438 |
| 9 | 20553664 | 7944420 |
| 10 | 20553696 | 7944412 |
| 11 | 20553696 | 7944392 |
| 12 | 20553674 | 7944384 |
| 13 | 20553654 | 7944410 |
| 14 | 20553652 | 7944426 |
| 15 | 20553642 | 7944434 |
| 16 | 20553620 | 7944440 |
| 17 | 20553620 | 7944444 |
| 18 | 20553322 | 7944590 |
| 19 | 20553618 | 7944446 |
| 20 | 20553636 | 7944450 |
| 21 | 20553638 | 7944456 |
| 22 | 20553530 | 7944512 |
| 23 | 20553192 | **7944676** |
| 24 | 20553170 | 7944672 |
| 25 | **20553156** | 7944644 |
| 26 | 20553158 | 7944628 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 27 | 20553170 | 7944618 |
| 28 | 20553224 | 7944620 |
| 29 | 20553244 | 7944614 |
| 30 | 20553642 | 7944420 |
| 31 | 20553658 | 7944386 |
| 32 | 20553680 | 7944376 |

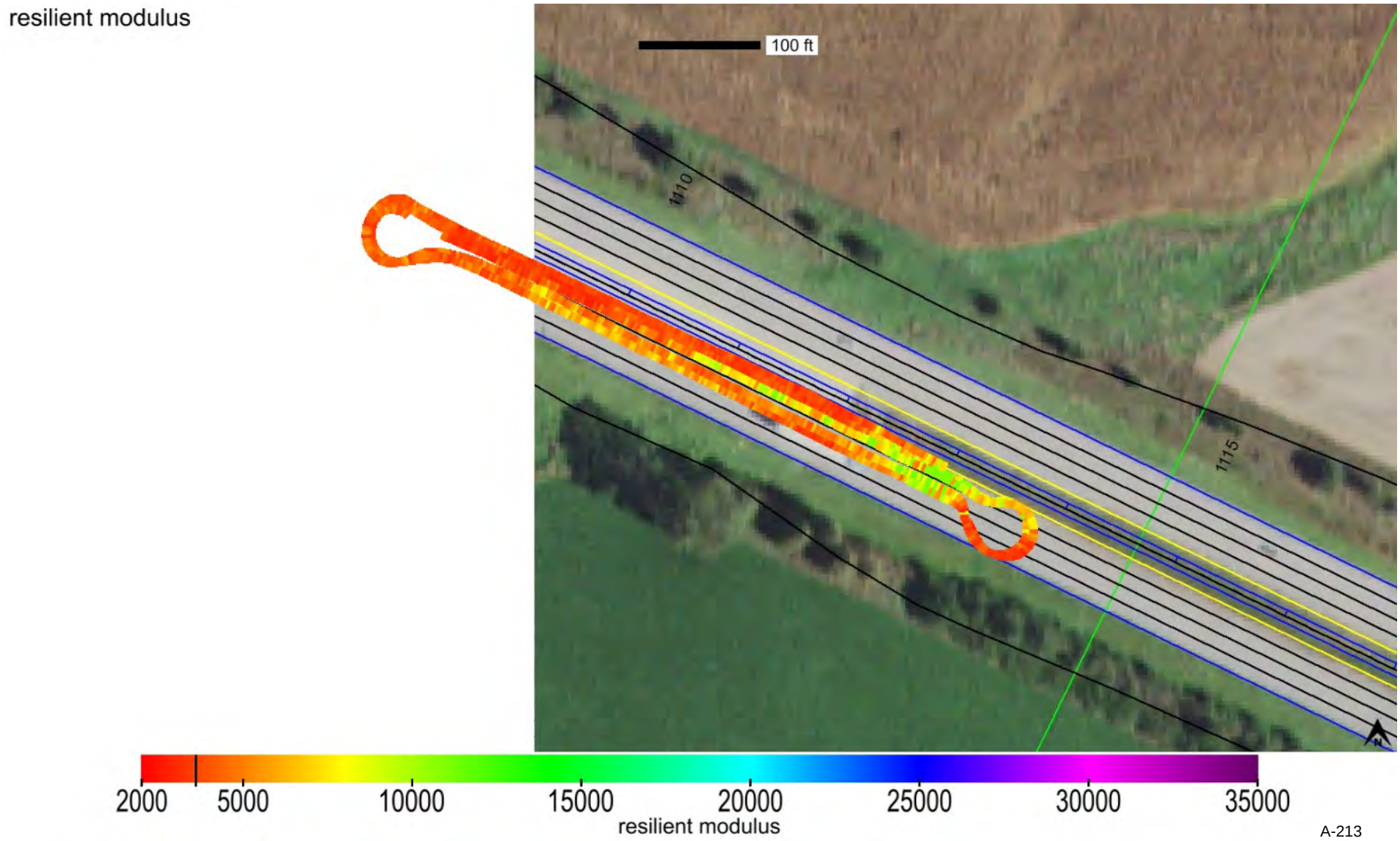


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 79.9 | 95.7 | 0.5 | 3600.0 | 2656.9 | 5179.9 | 11000.0 | 1989.6 | 38.4 | -943.1 | 1579.9 | 7400.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.3 | 3 |



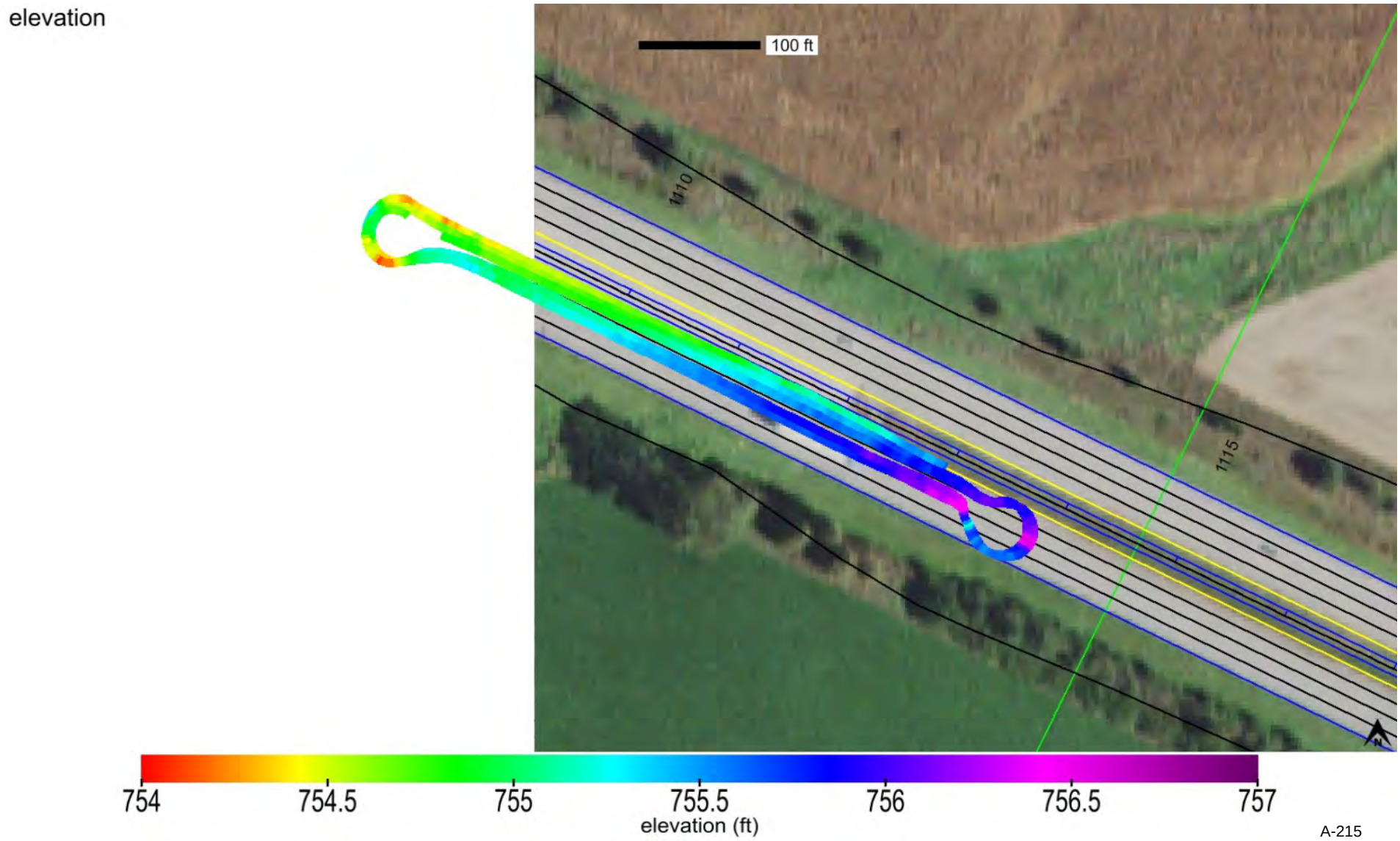



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 754.11 | 755.27 | 756.55 |



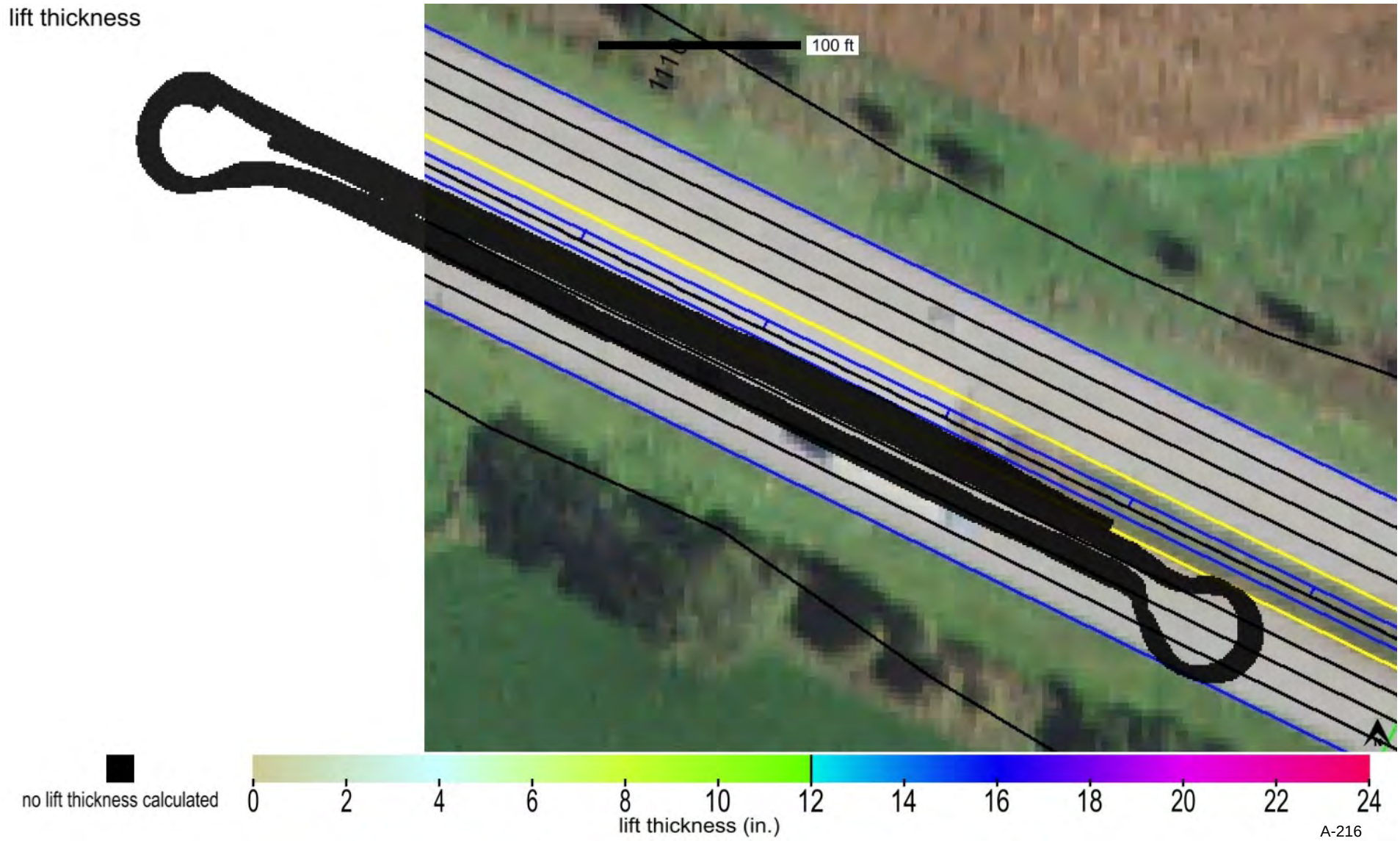



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 17827 | 0.409 | 100.0 | 3600.0 | 150.0 | 20.5 |

materials




Subgrade_Treatment Special Backfill RAP_IADOT



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_142134 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 4:29:50 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.519 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 53500 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 10.5 | 24.8 | 0.4 | 150.0 | 20.0 | 97.2 | 189.0 | 40.3 | 41.5 | -130.0 | -52.8 | 39.0 |
| Moisture Content | No | | | | | | | | | | | | |

### Mapped Area

| square feet | acres |
|---|---|
| 53500 | 1.228 |

### Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.2 | 4 |

### Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 759.60 | 768.55 | 777.20 |

### Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.4 | 5.2 | 6.7 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 53500 | 1.228 | 100.0 | 3600.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 1 | 52041 | 97.3 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |

## Station

| Start | End |
|---|---|
| 1135+00 | 1145+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 4:29:50 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.519 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 53500 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 24.8 | CQI > = 95 |
| 10.5 | 80% of k-Value MVs >= 150 |
| 41.5 | COV <= 30 |
| 97.3 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

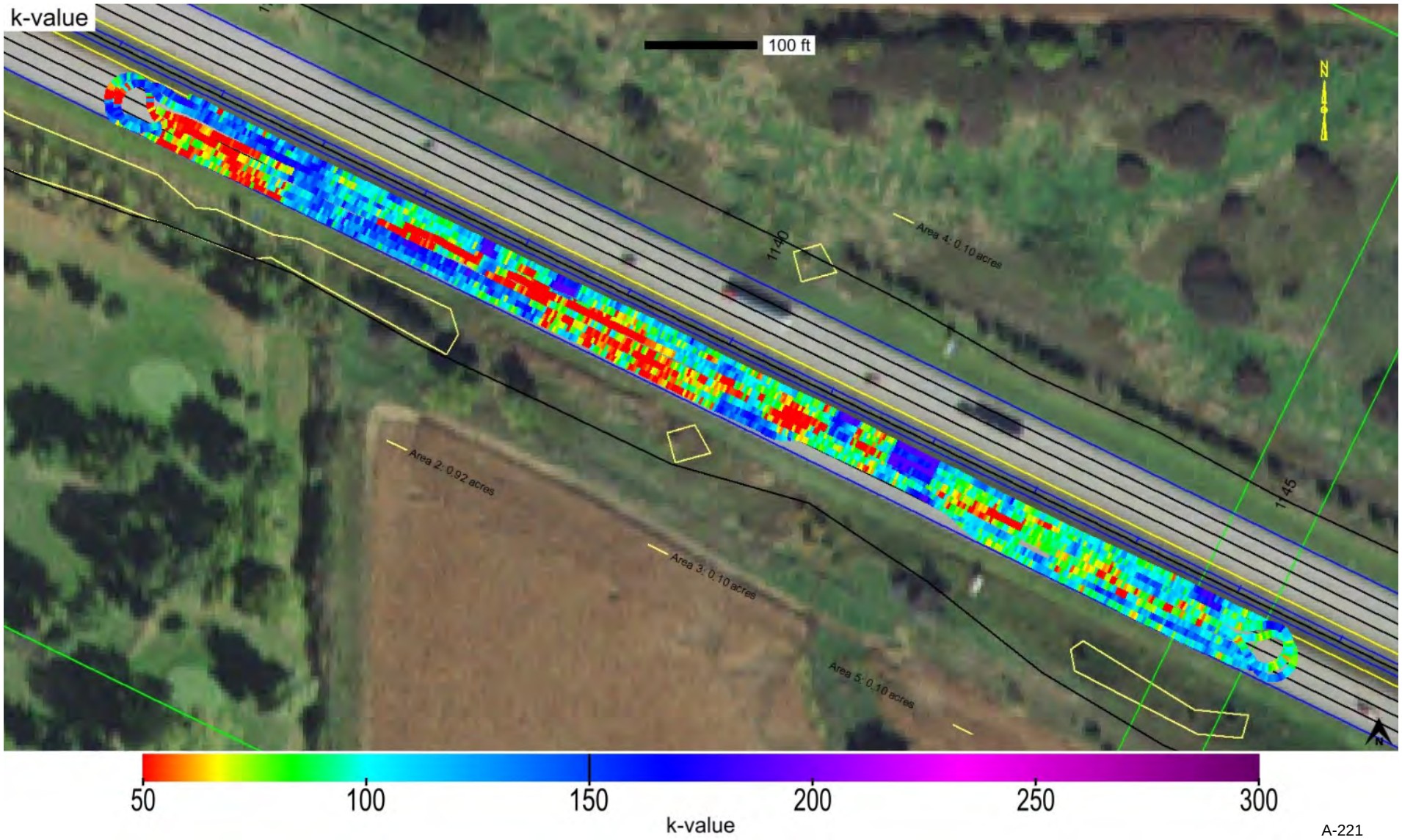


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 10.5 | 24.8 | 0.4 | 150.0 | 20.0 | 97.2 | 189.0 | 40.3 | 41.5 | -130.0 | -52.8 | 39.0 |



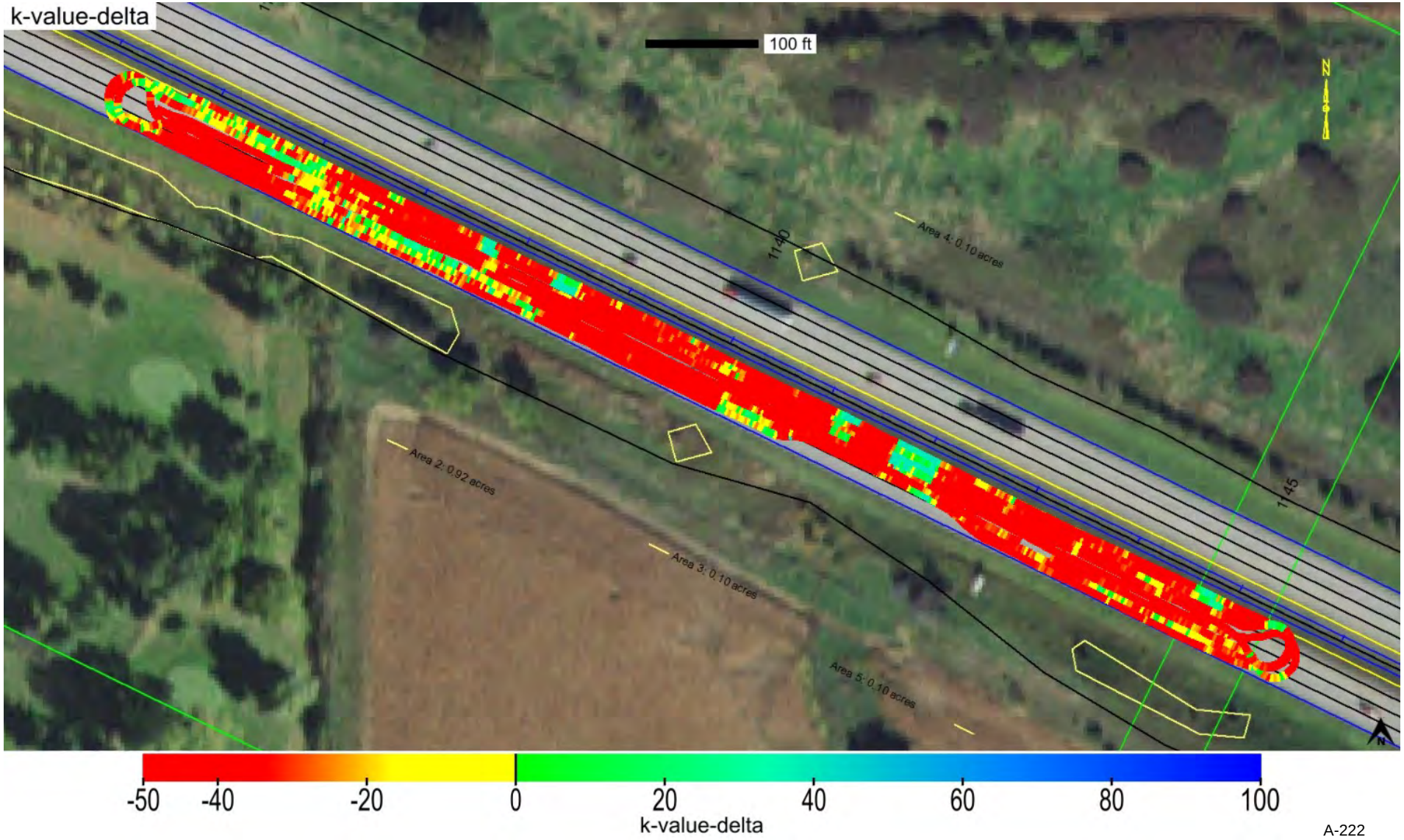



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 10.5 | 24.8 | 0.4 | 150.0 | 20.0 | 97.2 | 189.0 | 40.3 | 41.5 | -130.0 | -52.8 | 39.0 |



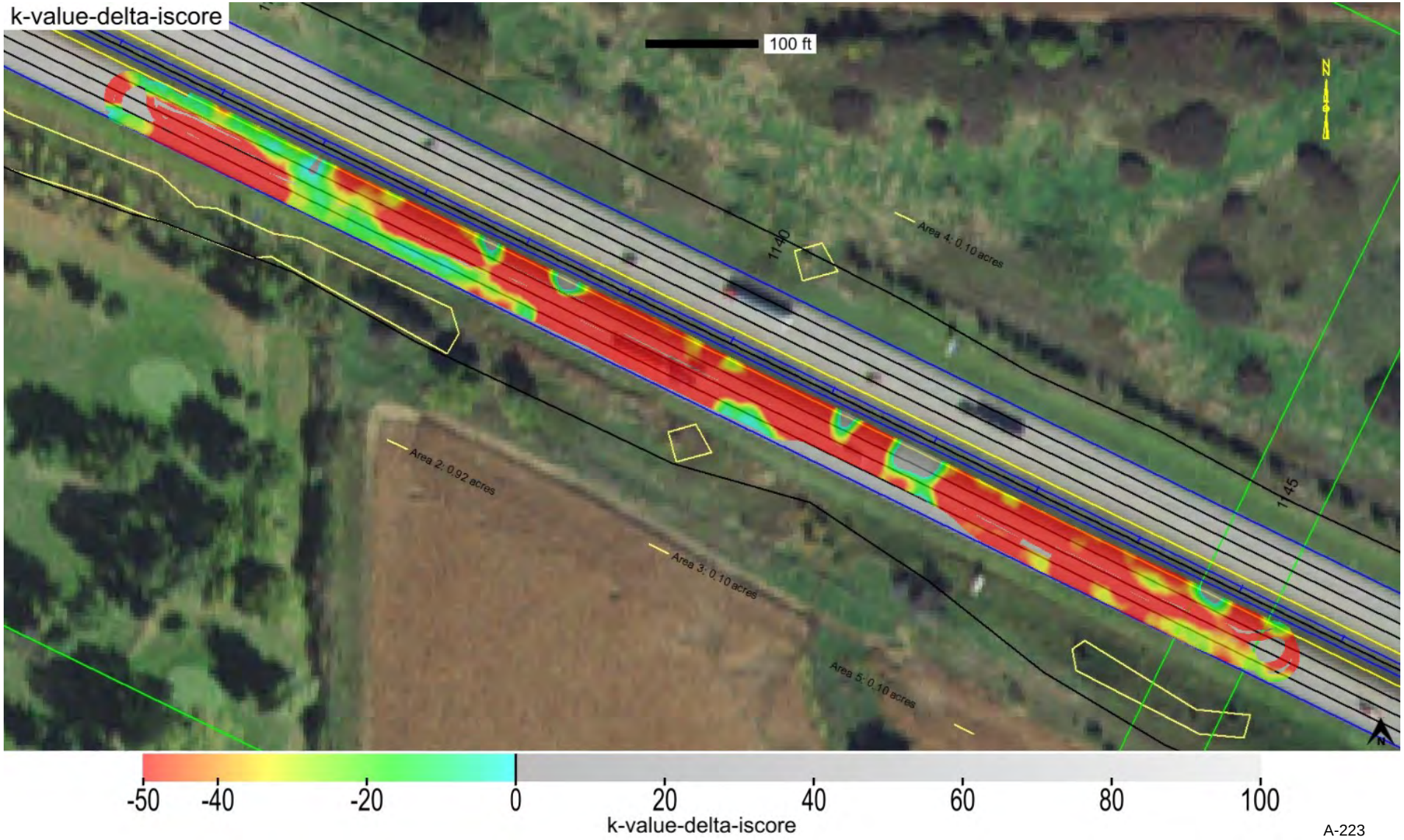



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 10.5 | 150.0 | -130.0 | -52.8 | 39.0 | -125.6 | -52.7 | 31.4 |



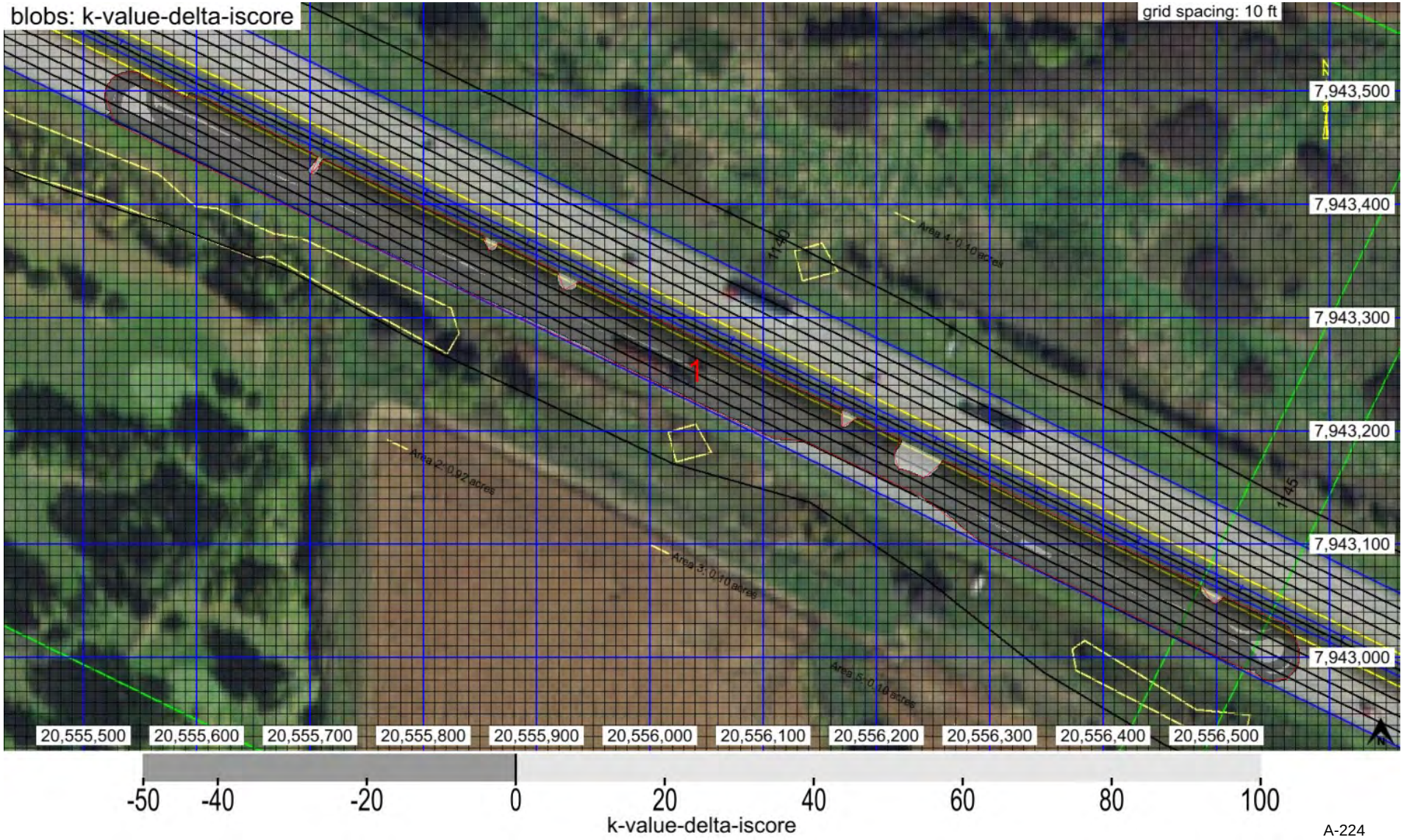



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 1 | 52041 | 97.3 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 52041 | 100.0 | 36 | -125.6 | -54.6 | 0.0 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20556546 | **7942978** |
| 2 | 20556564 | 7942982 |
| 3 | **20556574** | 7942996 |
| 4 | 20556572 | 7943010 |
| 5 | 20556560 | 7943030 |
| 6 | 20556506 | 7943054 |
| 7 | 20556498 | 7943048 |
| 8 | 20556486 | 7943064 |
| 9 | 20556260 | 7943174 |
| 10 | 20556242 | 7943158 |
| 11 | 20556220 | 7943166 |
| 12 | 20556216 | 7943180 |
| 13 | 20556222 | 7943192 |
| 14 | 20556184 | 7943212 |
| 15 | 20556170 | 7943204 |
| 16 | 20556170 | 7943218 |
| 17 | 20555938 | 7943332 |
| 18 | 20555924 | 7943324 |
| 19 | 20555918 | 7943340 |
| 20 | 20555868 | 7943366 |
| 21 | 20555858 | 7943360 |
| 22 | 20555854 | 7943372 |
| 23 | 20555714 | 7943440 |
| 24 | 20555700 | 7943426 |
| 25 | 20555708 | 7943442 |
| 26 | 20555606 | 7943494 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 27 | 20555590 | 7943494 |
| 28 | 20555544 | **7943518** |
| 29 | 20555526 | 7943512 |
| 30 | **20555518** | 7943498 |
| 31 | 20555528 | 7943472 |
| 32 | 20556102 | 7943196 |
| 33 | 20556136 | 7943190 |
| 34 | 20556240 | 7943142 |
| 35 | 20556292 | 7943102 |
| 36 | 20556546 | 7942980 |

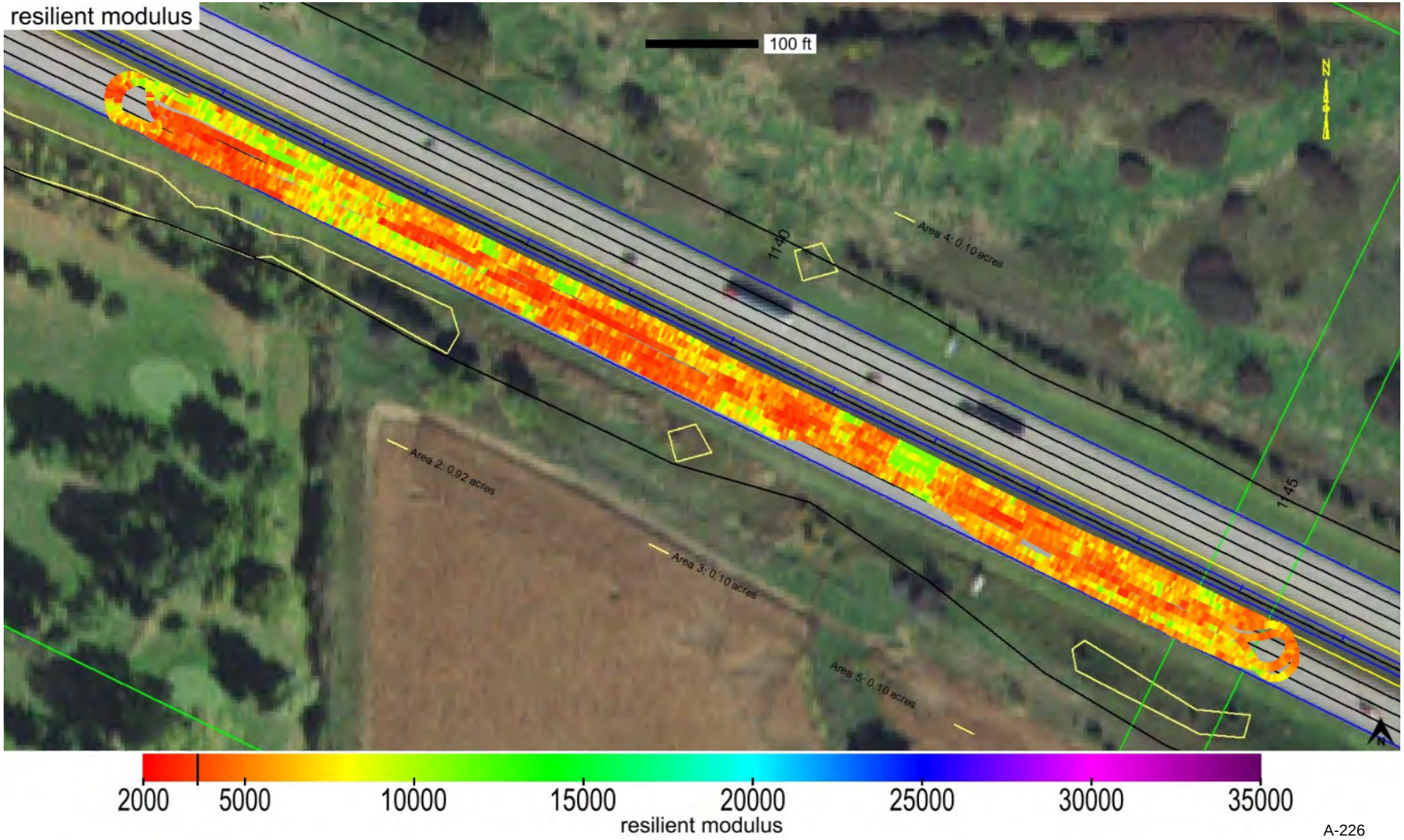


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 91.6 | 109.8 | 0.7 | 3600.0 | 2589.8 | 5927.3 | 11000.0 | 1992.4 | 33.6 | -1010.2 | 2327.3 | 7400.0 |



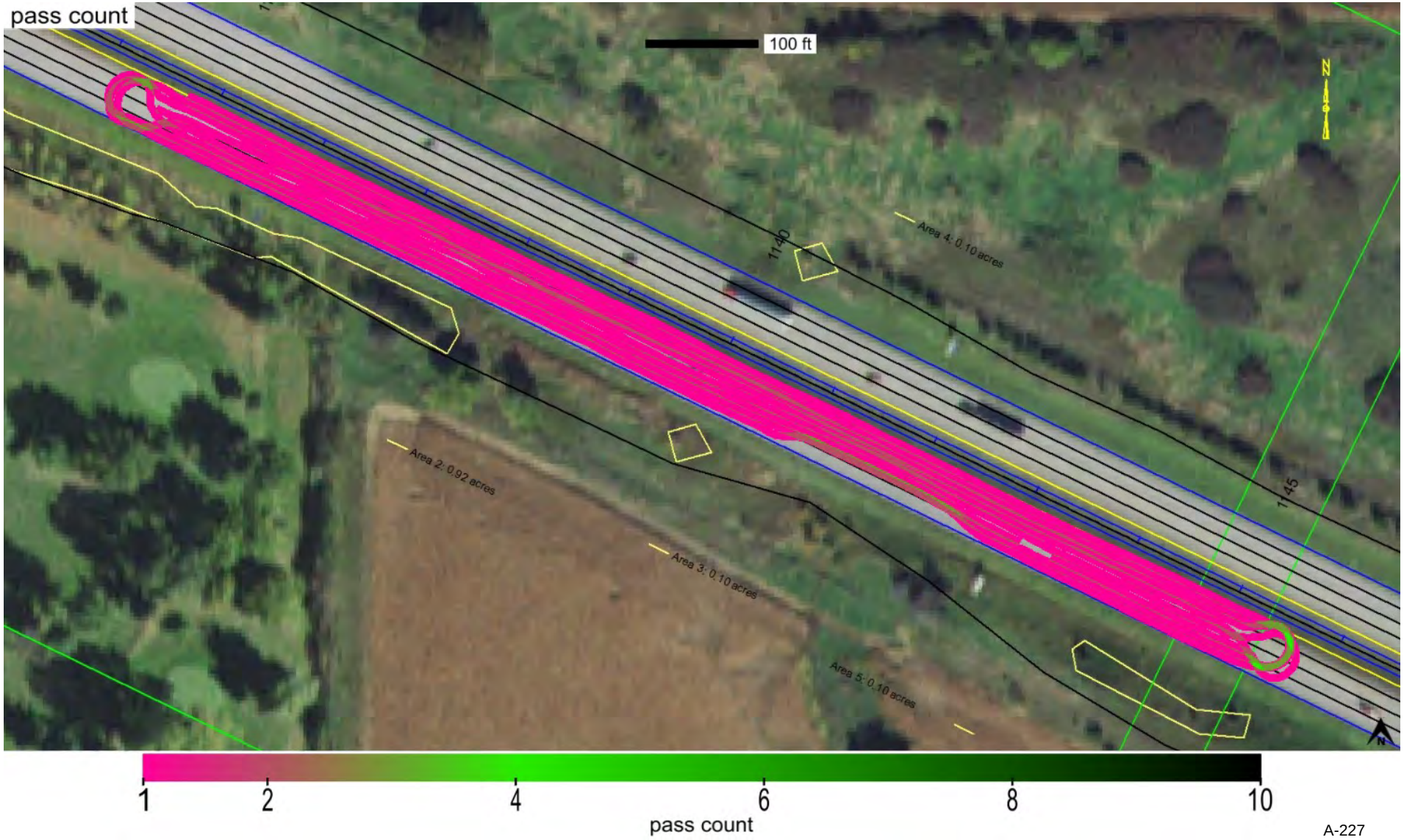



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.2 | 4 |



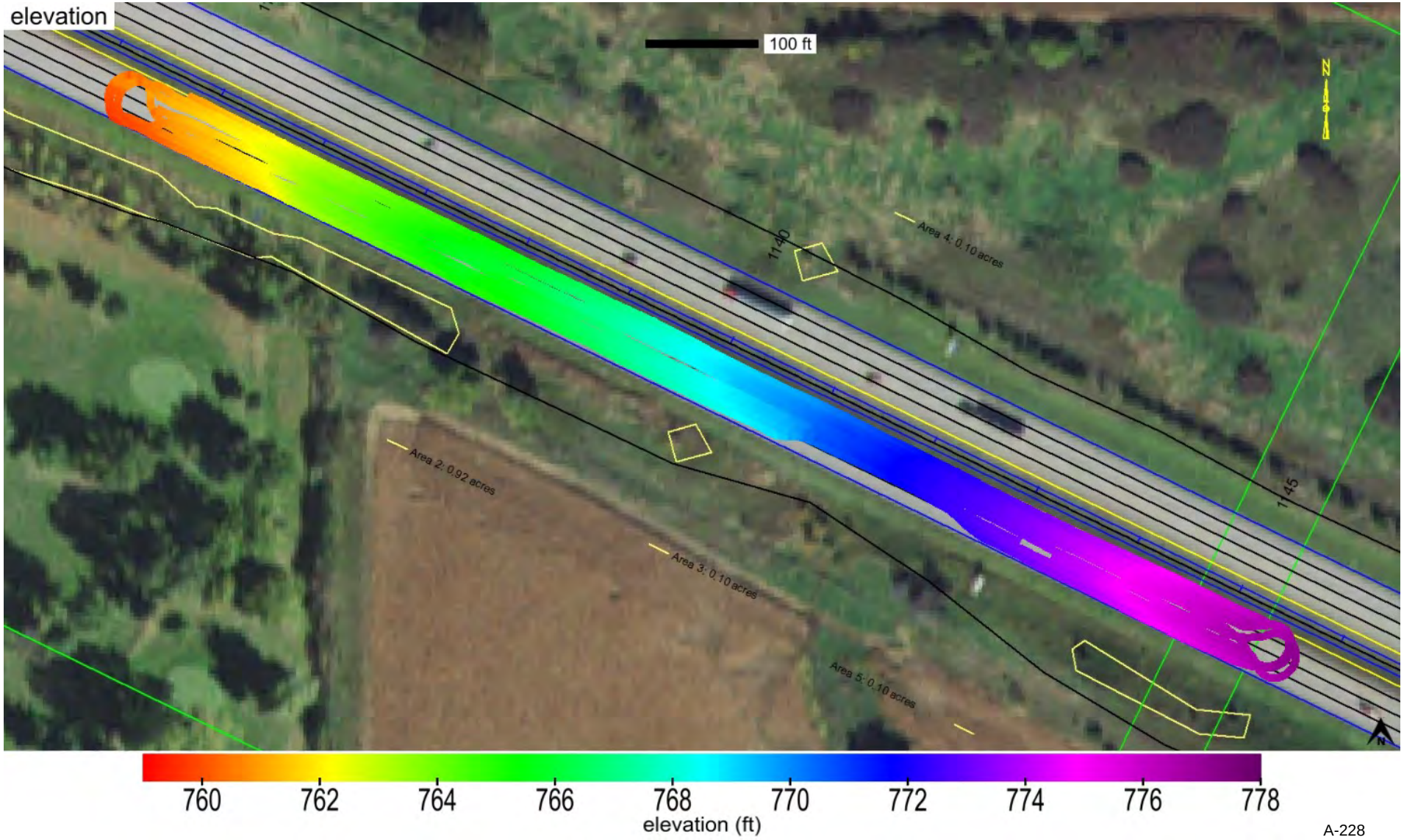



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 759.60 | 768.55 | 777.21 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 12.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 53500 | 1.228 | 100.0 | 3600.0 | 150.0 | 20.5 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_162950 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 5:21:02 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.35 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 34749 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## Map Summary

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XMV | No | | | | | | | | | | | | |
| Resilient Modulus | No | | | | | | | | | | | | |
| k-value | Yes | 22.5 | 41.3 | 0.6 | 150.0 | 20.0 | 117.9 | 189.0 | 38.2 | 32.4 | -130.0 | -32.1 | 39.0 |
| Moisture Content | No | | | | | | | | | | | | |

### Mapped Area

| square feet | acres |
|---|---|
| 34749 | 0.798 |

### Pass Count

| min. | avg. | max. |
|---|---|---|
| 1 | 1.3 | 4 |

### Elevation (ft)

| min. | avg. | max. |
|---|---|---|
| 773.68 | 779.03 | 784.41 |

### Velocity (fps)

| min. | avg. | max. |
|---|---|---|
| 4.4 | 5.2 | 6.8 |

## Materials

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 34749 | 0.798 | 100.0 | 3600.0 | 150.0 | 20.5 |

## Blobs

| parameter | min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|---|
| k-value | 1000.0 | 2 | 29293 | 84.3 | none | 0.0 | 4.0 |

## Lift Thickness

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |

## Station

| Start | End |
|---|---|
| 1144+00 | 1150+00 |



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102

| | | | | | |
|---|---|---|---|---|---|
| Project: | Johnson County I-80 | Date and Time: | 8/10/2022 5:21:02 PM | Machine ID: | Ingios01 |
| Description: | ~1.5mi E of IA 1 to 0.5 mi E of Wapsi Ave (EB/WB) | Mapping Duration (hrs): | 0.35 | Operator: | Ingios |
| Location: | Johnson County IA | No. of Measurements: | 34749 | Machine Operator ID: | 582 |
| Review Status: | Review Required | Map Type: | Verification Map | State Plane: | 10 IOWA Cedar Ra |
| | | Map Layer: | Subgrade Treatment 12 Inches | Segment: | |

## QUALITY ANALYSIS SUMMARY - k-Value

| Quality Value | Criteria |
|---|---|
| 41.3 | CQI > = 95 |
| 22.5 | 80% of k-Value MVs >= 150 |
| 32.4 | COV <= 30 |
| 84.3 | % i-Score Blob Area >= 1000 ft^2 |
| 0.0 | Lift Thickness Median Value (in.) |

Compaction Quality Index(CQI): Relative compaction quality index based on the percentage of the geospatial area that meets the minimum target values and accounts for the uniformity of compaction.The default minimum target CQI is 95% using a uniformity weight factor of 50%.

Percent Passing Target Values: Number of geospatial grid points from the output that meet or exceed the target value (TV) for the selected material. Level I target % Passing TV = 80%. Level II target % Passing TV = 90%.

Coefficient of Variation (COV): Calculated from the ratio of the standard deviation to the mean based on the measurement values (MVs) reported at each grid point of the mapping area. Description of COV ranges: <= 20% = Low Variability; 20 to 40% = Moderate Variability; > 40% = High Variability. The default target COV is <= 30%.

i-Score Blob (%): The percentage of the map area analyzed with contiguous blob areas with MVs < TV. Control Level 1 >= 100 sq. ft.; Control Level 2 >= 200 sq. ft.; Control Level 3 >= 500 sq. ft.; Control Level 4 >= 1,000 sq. ft.; Control Level 5 >= 2,000 sq. ft.

Lift thickness: Green: 75th percentile value <= TV; Yellow: median value <= TV and 75th percentile > TV; Red: median value (50th percentile) > TV.

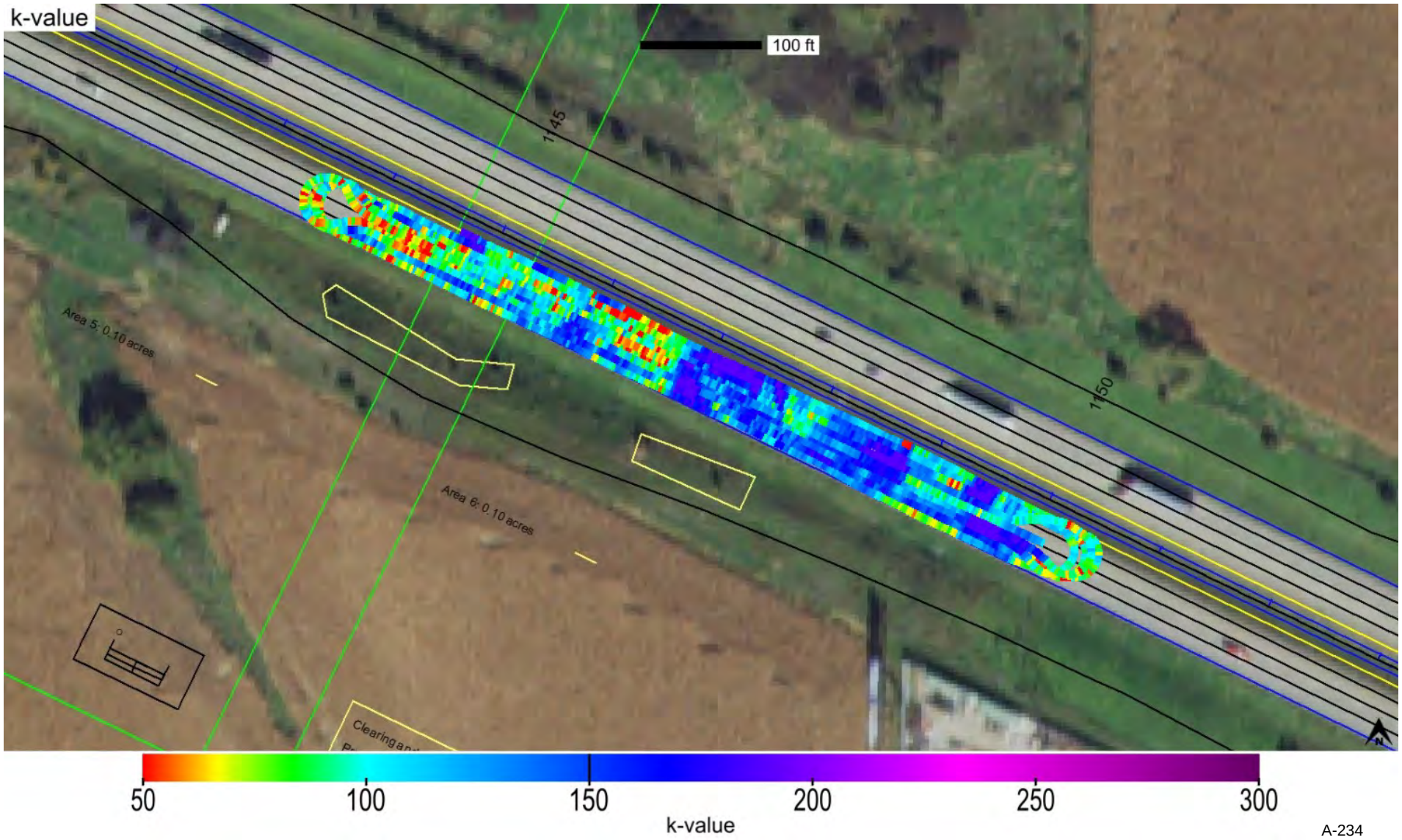


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 22.5 | 41.3 | 0.6 | 150.0 | 20.0 | 117.9 | 189.0 | 38.2 | 32.4 | -130.0 | -32.1 | 39.0 |



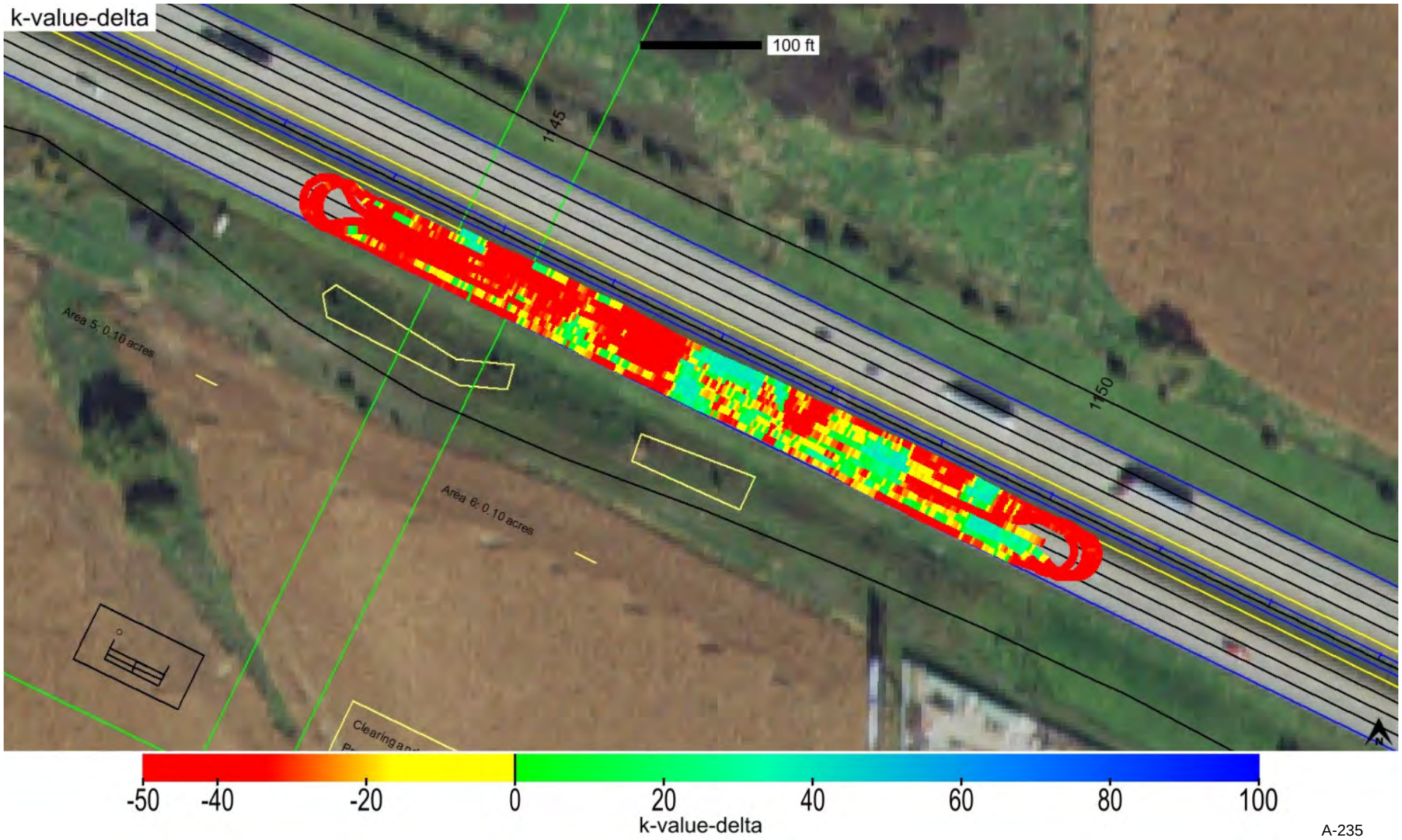



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 22.5 | 41.3 | 0.6 | 150.0 | 20.0 | 117.9 | 189.0 | 38.2 | 32.4 | -130.0 | -32.1 | 39.0 |



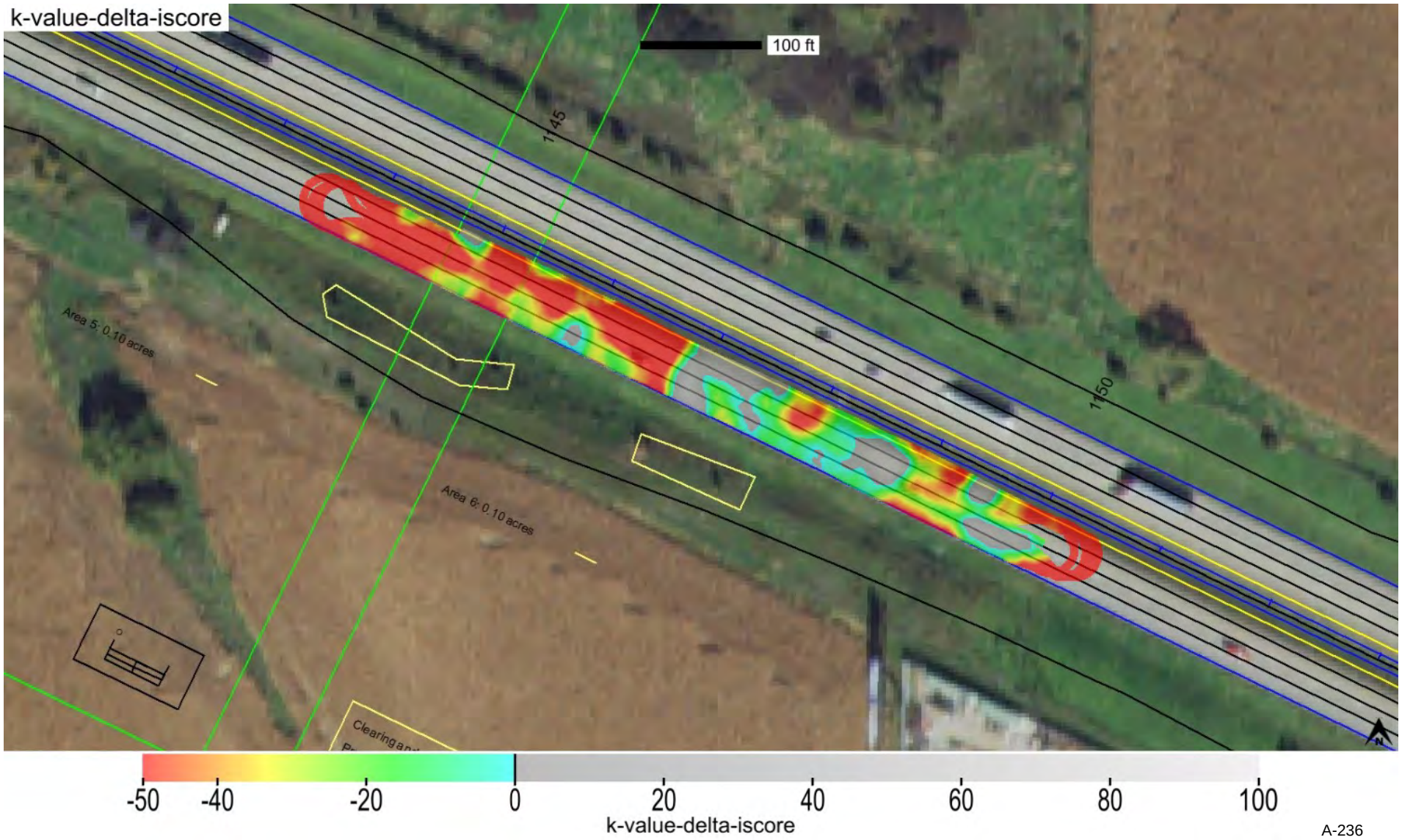



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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | Calc. TV | min.-delta | avg.-delta | max.-delta | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|---|---|---|
| k-value | Yes | 22.5 | 150.0 | -130.0 | -32.1 | 39.0 | -93.8 | -31.7 | 38.7 |



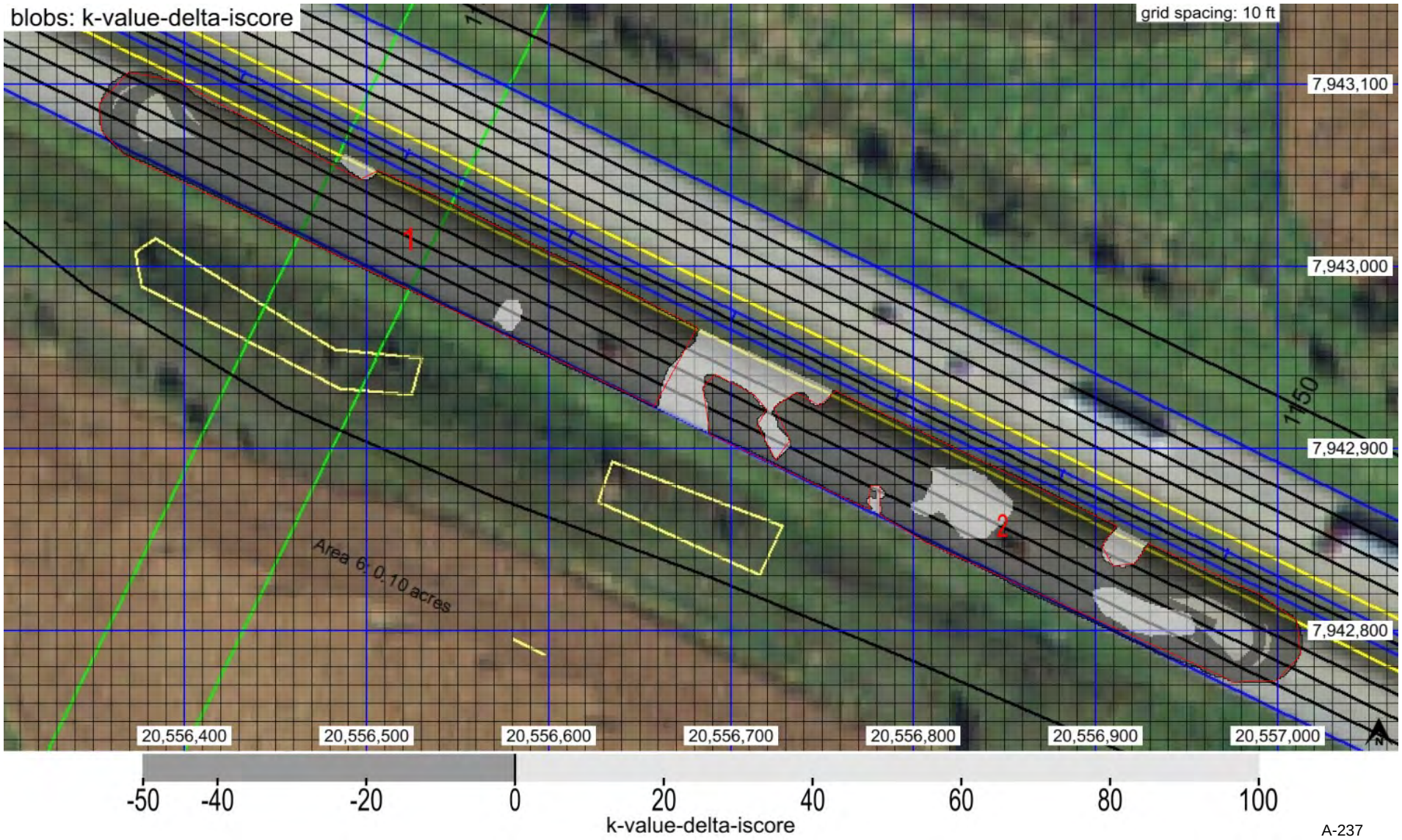



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Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| min. area(ft^2) | # of blobs | blob area(ft^2) | % of map | lower bound-tv | upper bound-tv | poly-tol. |
|---|---|---|---|---|---|---|
| 1000 | 2 | 29293 | 84.3 | none | 0.0 | 4.0 |






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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 1 | 16103 | 55.0 | 11 | -93.8 | -50.9 | 0.0 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20556658 | **7942922** |
| 2 | **20556682** | 7942966 |
| 3 | 20556534 | 7943040 |
| 4 | 20556506 | 7943052 |
| 5 | 20556496 | 7943048 |
| 6 | 20556396 | 7943102 |
| 7 | 20556370 | **7943106** |
| 8 | **20556354** | 7943090 |
| 9 | 20556354 | 7943074 |
| 10 | 20556366 | 7943062 |
| 11 | 20556658 | 7942924 |
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Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

blob: k-value-delta-iscore

| Blob # | Area (ft^2) | % of blobs area | # b.p. | min.-delta-iscore | avg.-delta-iscore | max.-delta-iscore |
|---|---|---|---|---|---|---|
| 2 | 13190 | 45.0 | 28 | -75.0 | -27.4 | 0.0 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 1 | 20556974 | **7942772** |
| 2 | 20557000 | 7942772 |
| 3 | **20557012** | 7942786 |
| 4 | 20557010 | 7942806 |
| 5 | 20556990 | 7942820 |
| 6 | 20556930 | 7942848 |
| 7 | 20556922 | 7942836 |
| 8 | 20556910 | 7942836 |
| 9 | 20556904 | 7942846 |
| 10 | 20556912 | 7942858 |
| 11 | 20556758 | 7942932 |
| 12 | 20556748 | 7942924 |
| 13 | 20556736 | 7942930 |
| 14 | 20556724 | 7942922 |
| 15 | 20556732 | 7942904 |
| 16 | 20556724 | 7942894 |
| 17 | 20556714 | 7942912 |
| 18 | 20556720 | 7942922 |
| 19 | 20556712 | 7942930 |
| 20 | 20556692 | **7942940** |
| 21 | **20556684** | 7942934 |
| 22 | 20556688 | 7942908 |
| 23 | 20556776 | 7942866 |
| 24 | 20556776 | 7942880 |
| 25 | 20556782 | 7942880 |
| 26 | 20556782 | 7942864 |

| Point | Easting (ft) | Northing (ft) |
|---|---|---|
| 27 | 20556806 | 7942848 |
| 28 | 20556974 | 7942772 |

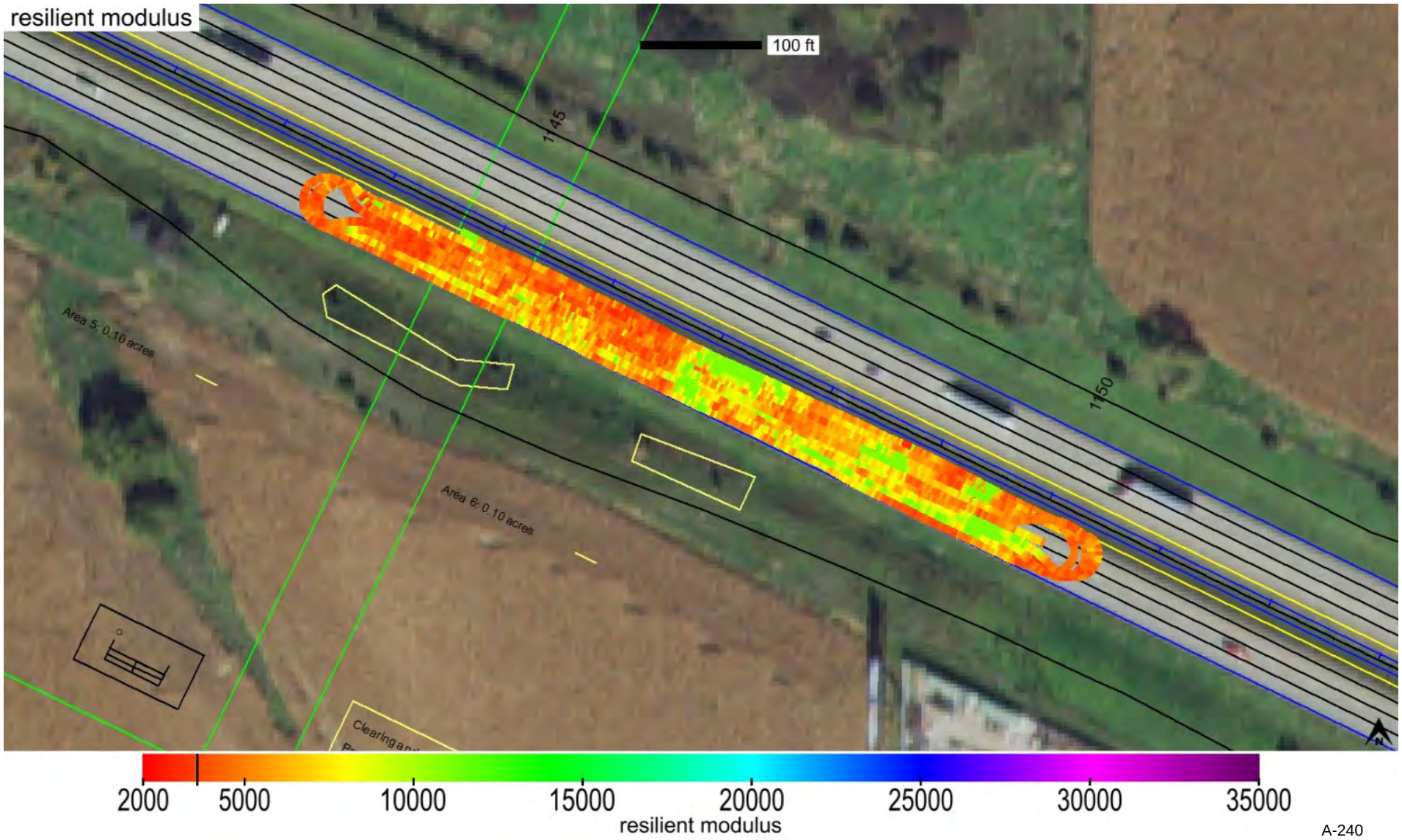


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ingios GEOTECHNICS

Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| Parameter | Measured | % Passing | CQI | CI | Calc. TV | min. | avg. | max. | std. dev. | cov(%) | min.-delta | avg.-delta | max.-delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| resilient modulus | Yes | 95.4 | 113.1 | 0.7 | 3600.0 | 2901.7 | 6245.6 | 11000.0 | 2149.9 | 34.4 | -698.3 | 2645.6 | 7400.0 |






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Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 1 | 1.3 | 4 |



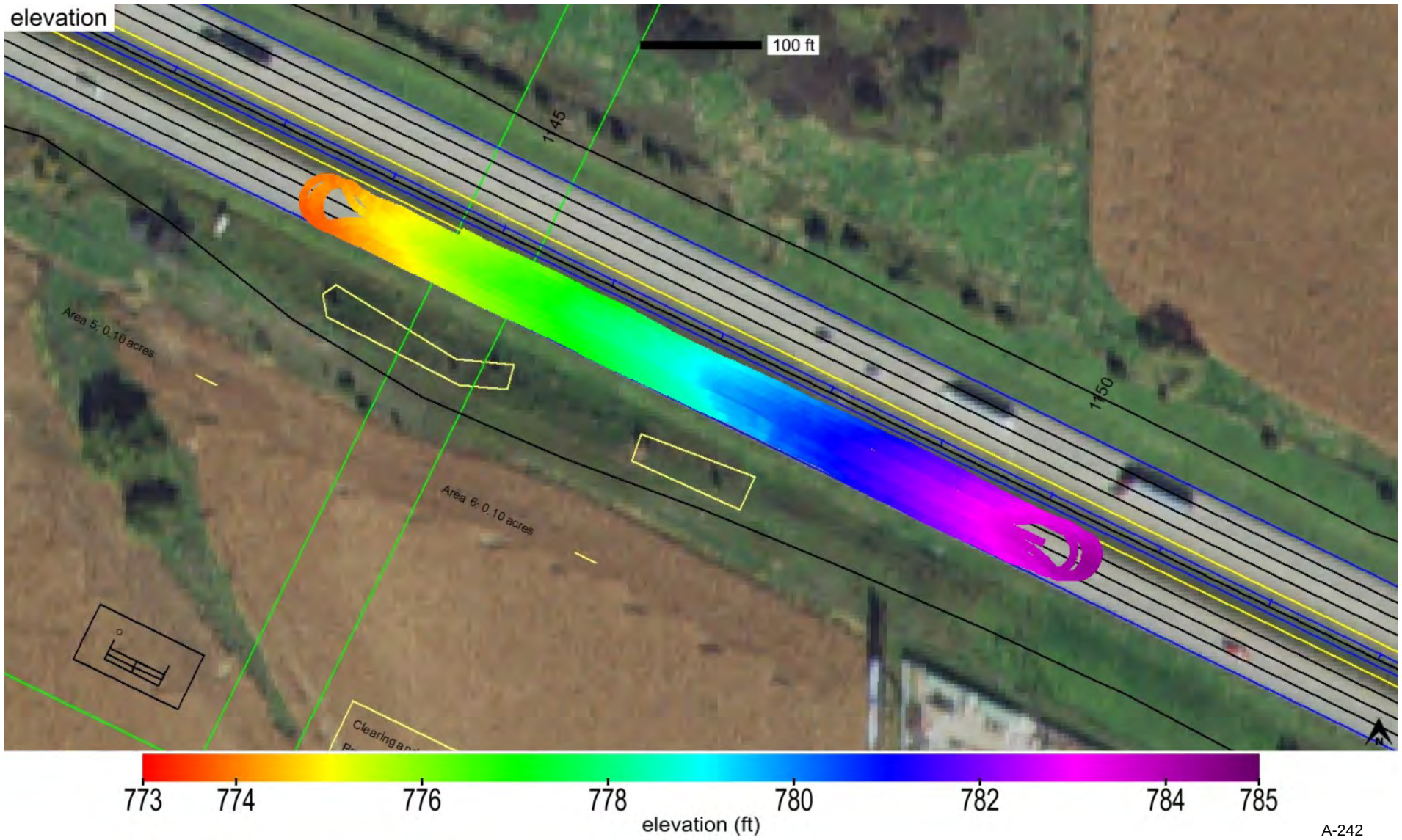



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Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| minimum | average | maximum |
|---|---|---|
| 773.68 | 779.03 | 784.41 |



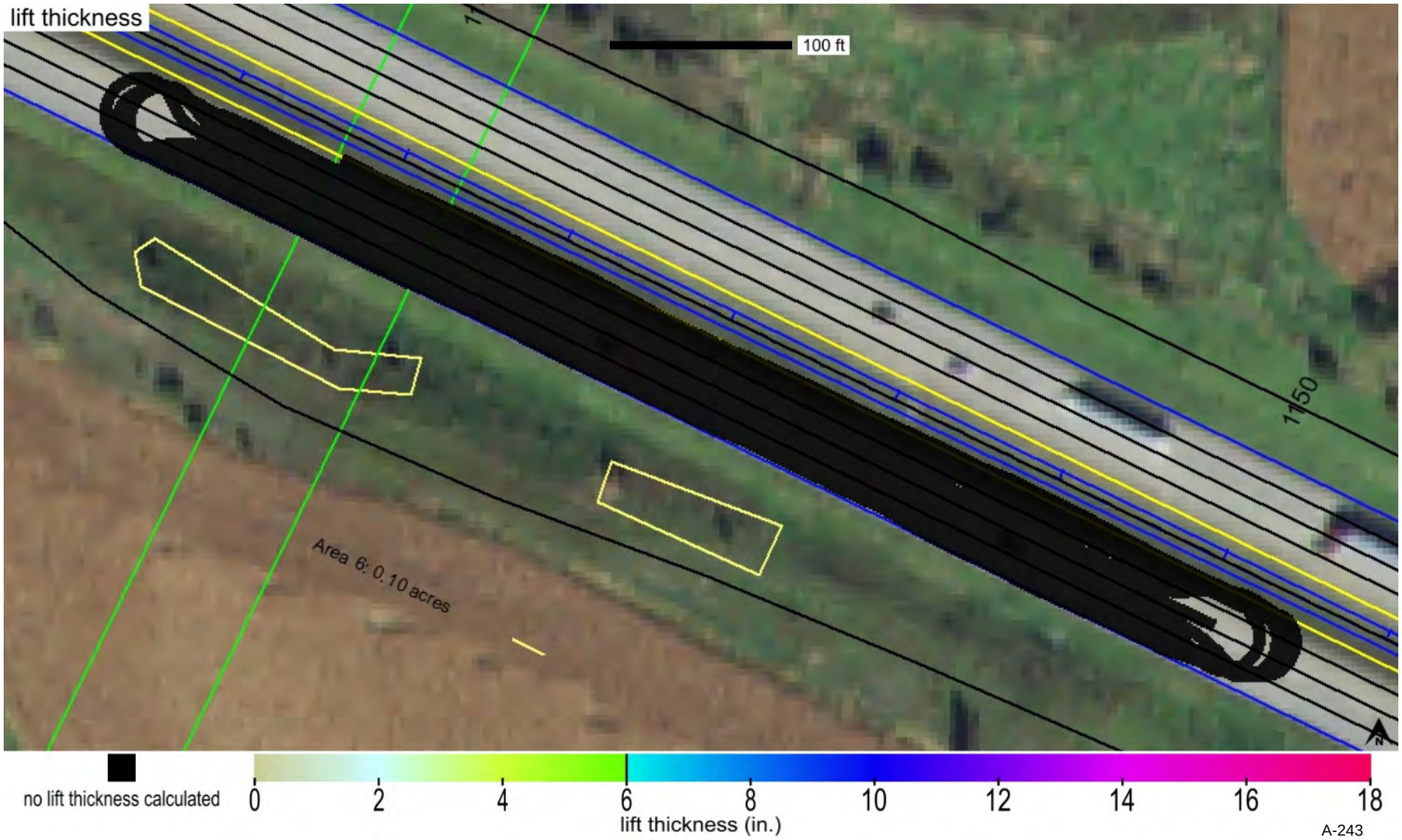



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Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| 25th percentile (in.) | Median (in.) | 75th percentile (in.) | Target Value (in.) |
|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 6.0 |






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Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

| name | id | % of total | area-square ft | area-acres | tl-xmv | tl-Mr | tl-k value | tl-w% |
|---|---|---|---|---|---|---|---|---|
| Subgrade_Treatment Special Backfill RAP_IADOT | 21015 | 100.0 | 34749 | 0.798 | 100.0 | 3600.0 | 150.0 | 20.5 |






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Map ID: ing_52-i080-174_cs56b-ingios01_2022_08_10_172102 Map Type: Verification Map Map Layer: Subgrade Treatment 12 Inches

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