

**Appendix D – BridgeGuard US-131 Delamination Report**

# Bridge Deck Delamination Report



Bridge: 5002 SB  
Talon Research, Inc.  
09/16/2013

Bridge deck delaminations can be detected within the thermal imagery captured during both daytime and nighttime hours as a result of the natural thermal transition within the structure due to normal diurnal environmental exposure. Delaminations within the concrete interrupt the flow of thermal energy to the inner deck core and, consequently, those areas will show higher/lower surface temperatures than the surrounding deck area. The BridgeGuard program exploits this situation by applying an IR camera as a thermal fault detection device. Care was taken to optimize the natural diurnal contrast between potential delaminations and the otherwise homogeneous bridge deck to include imaging at the proper time of the day and in appropriate environmental/weather conditions.

This report is presented to document the findings of a thermal infrared image analysis carried out on the bridge identified within this report along with the data specific to that bridge. The system is a vehicle mounted thermal infrared sensor suite that applies computer software tools designed to acquire appropriate information from the collected data, and maintain that data to ensure its availability for further analysis or distribution. The user is positioned in the vehicle and maintains control of the scanning process in real-time. The sensor is mounted on a monopod in the front of the vehicle which is positioned above the road to maximize the view of an entire bridge lane. A GPS device is used to monitor, in real time and ongoing, the speed at which the vehicle is traveling.

Page three (3) of this report is an overview of the bridge under investigation. Page four (4) is a summary page of the results to include a graphical representation of the bridge with the relative positions of each delamination found in the bridge. Page five (5) is a list of delaminations in descending order by the sq. ft. of each delamination. The remaining report shows the images that hold one or more delaminations with the delamination details documented.

Thank you for entrusting Talon Research with your bridge inspection needs. As with any technical reference there are items the reader must be aware of when beginning to read this document. First, use the Index as a reference tool to find specific areas of interest within the document. Secondly, highlighted hyperlinks throughout the document will bring you to areas of particular interest such as the largest delamination by size or area delaminated shown as a percentage of total area delaminated. At the bottom of each page there is a link to return the reader to the main subject heading, the Bridge Layout page. We thank you for your business. This report is illustrative of a typical bridge structure and its sole purpose is to allow the viewer to see the reporting format. It is not a representation of any individual bridge.

### **Disclaimer**

The information contained in this report is intended to supplement the client's bridge inspection protocol. The results obtained from the infrared inspection undertaken are meant to augment the bridge inspector's various inspection methods. Talon Research, Inc. does not make any claims or opinions to the safety or integrity of the structure inspected but leaves those decisions to the client, using all his/her resources and expertise to determine the appropriate action(s). Rules and regulations governing the structure's soundness and the client's actions based upon the regulations are the client's obligation and responsibility. Talon Research, Inc., while reporting the collected data within, makes no opinions or judgments to the structure's safety or soundness and is not held liable for any damages incurred whether actual or implied. The data in this report is not intended to be used solely in making those judgments but instead used as a tool along with the client's other available resources to determine the appropriate action(s) needed, if any.

Bridge:	5002 SB
Report Date:	09/16/2013
Data Collection Technician:	_____
	Chad Therrian
Data Analysis Technician:	_____
	Ben
Quality Control Technician:	_____
	Dave Torola

# Bridge Information



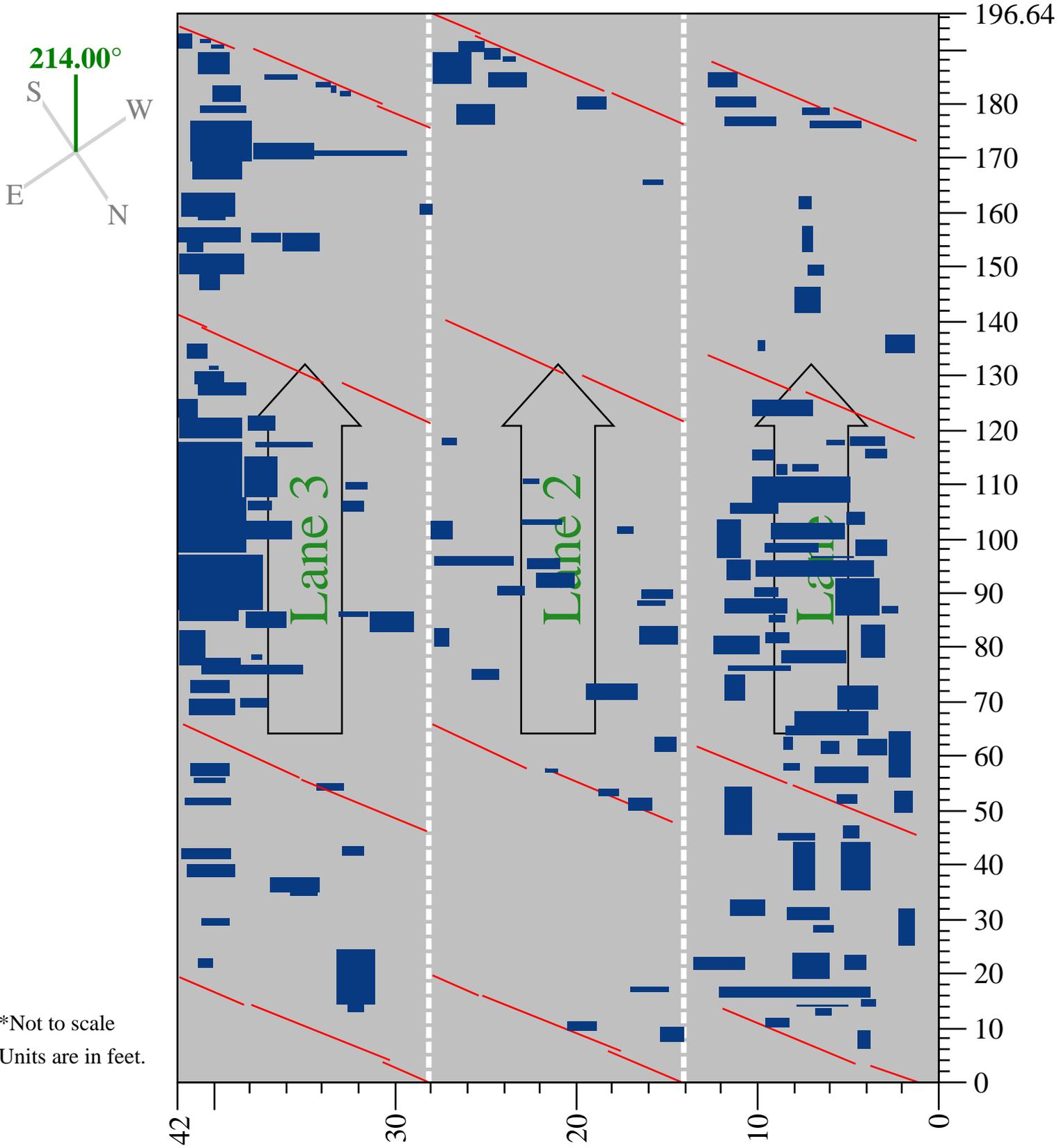
Client:	MTU Study
Bridge Name:	5002 SB
Number of Lanes:	3
Length of Bridge [ft]:	196.64
Width of Bridge [ft]:	42.00
Bridge Code:	
Year Built:	
State Name:	Michigan
State Code:	265
County Name:	Kent County
County Code:	test
Control Section:	
Location:	
Facility Carried by Structure:	
Features Intersected:	

# Pattern Overview



Total Bridge Area (sq ft): 8258.85  
 Defect Area (sq ft): 989.63

# of Defects: 161  
 % Defective: 11.98



\*Not to scale  
 Units are in feet.

# Overview (Scaled)

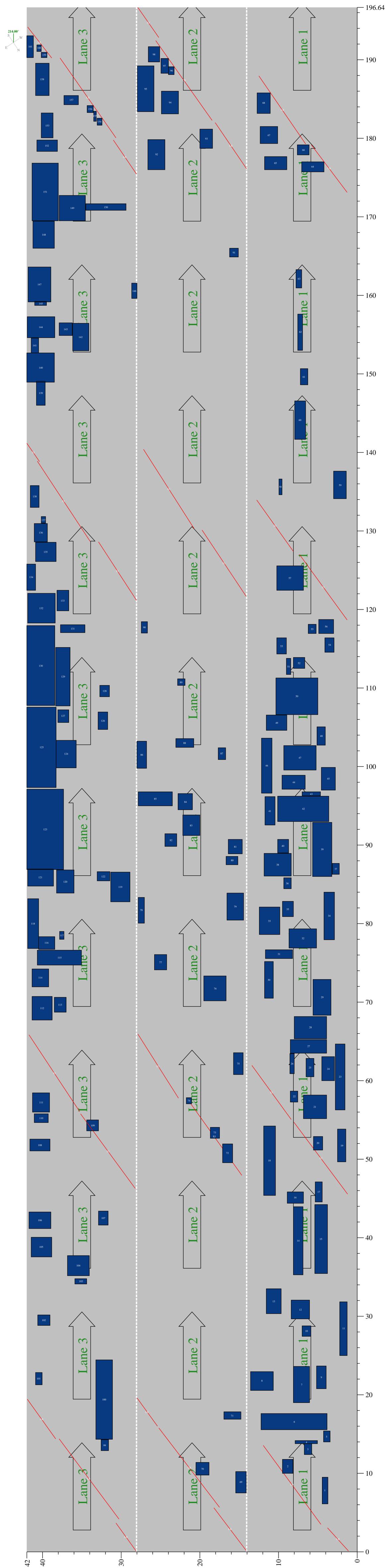


Total Bridge Area (sq ft):  
Defect Area (sq ft):

8258.85  
989.63

# of Defects:  
% Defective:

161  
11.98



# Defect Summary



The following table displays the largest defects in descending order.

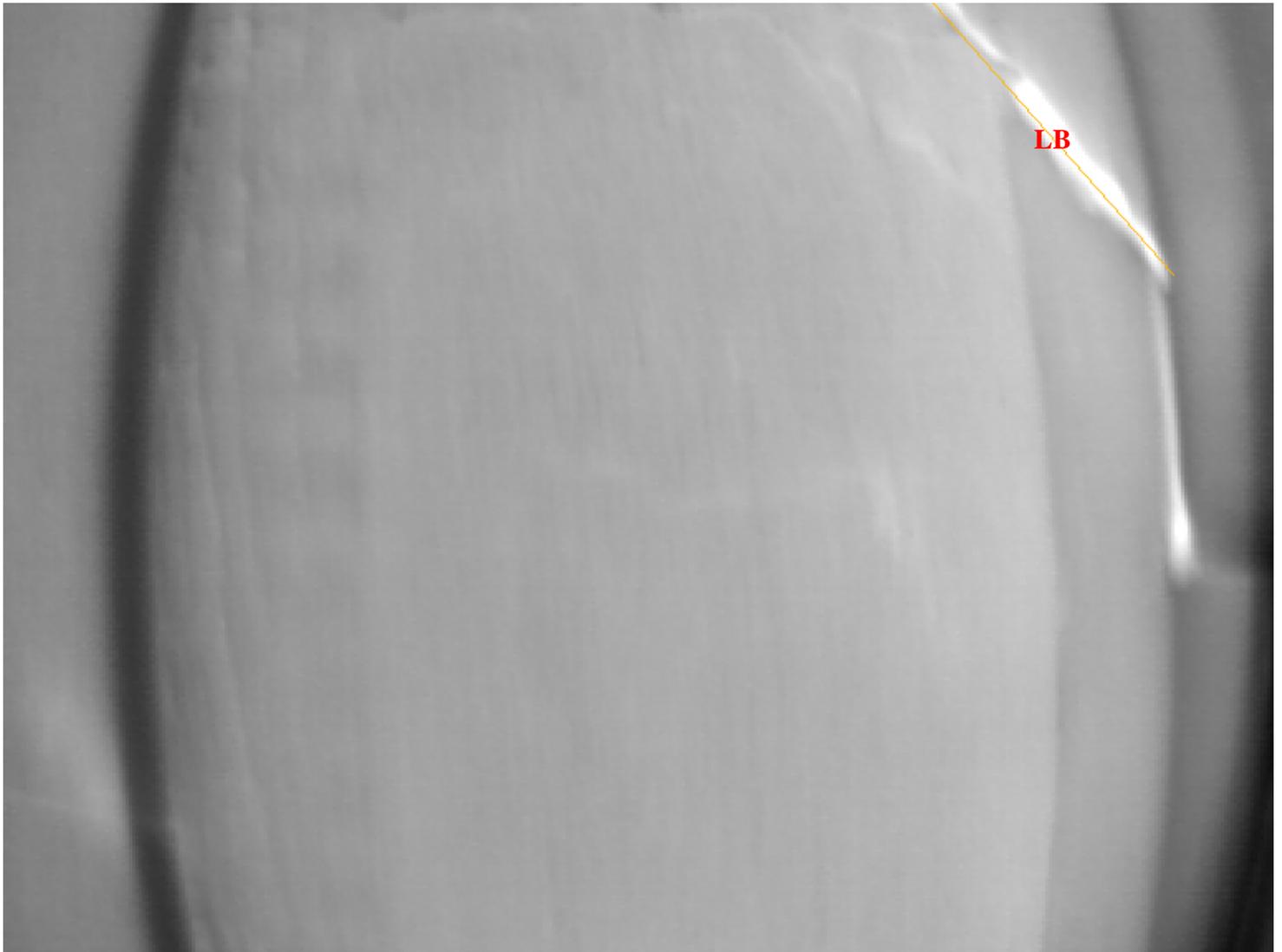
Area (sq ft)	% of Bridge	Dist fr Start (ft)	Dist fr Right (ft)	Image Name	Defect #	Page
49.83	0.60	92.02	39.66	3_4159000_60660_2174.tif	123	<a href="#">52</a>
40.06	0.49	102.43	40.13	3_4366000_60660_2174.tif	125	<a href="#">53</a>
37.90	0.46	112.82	40.22	3_4572000_60660_2174.tif	130	<a href="#">54</a>
26.31	0.32	108.96	7.67	1_4620000_57440_2171.tif	50	<a href="#">19</a>
25.65	0.31	173.15	39.67	3_5789000_60660_2157.tif	151	<a href="#">60</a>
22.39	0.27	19.40	32.17	3_2720000_60316_2181.tif	100	<a href="#">45</a>
21.83	0.26	94.58	6.85	1_4187000_57075_2174.tif	42	<a href="#">17</a>
18.11	0.22	16.57	7.99	1_2670000_57095_2176.tif	6	<a href="#">10</a>
17.80	0.22	89.47	4.44	1_4187000_57075_2174.tif	39	<a href="#">17</a>
14.73	0.18	39.85	4.61	1_3100000_57095_2176.tif	15	<a href="#">12</a>
14.53	0.18	111.46	37.41	3_4572000_60660_2174.tif	129	<a href="#">54</a>
13.91	0.17	120.19	40.14	3_4780000_60964_2162.tif	132	<a href="#">55</a>
13.81	0.17	49.83	11.16	1_3315000_57075_2174.tif	18	<a href="#">13</a>
13.71	0.17	150.79	40.20	3_5383000_60964_2162.tif	140	<a href="#">58</a>
13.61	0.16	161.38	40.41	3_5584000_60964_2162.tif	147	<a href="#">59</a>
13.31	0.16	101.10	7.27	1_4403000_57440_2171.tif	47	<a href="#">18</a>
13.07	0.16	186.30	26.90	2_5849000_64225_2160.tif	95	<a href="#">41</a>
12.12	0.15	66.79	5.94	1_3756000_57075_2174.tif	28	<a href="#">15</a>
11.31	0.14	171.11	36.24	3_5789000_60660_2157.tif	149	<a href="#">60</a>
10.94	0.13	75.69	37.84	3_3754000_60660_2174.tif	115	<a href="#">50</a>
10.94	0.13	39.59	7.49	1_3100000_57095_2176.tif	14	<a href="#">12</a>
10.93	0.13	124.00	8.58	1_4833000_57440_2171.tif	57	<a href="#">20</a>
10.89	0.13	70.59	4.46	1_3756000_57075_2174.tif	29	<a href="#">15</a>
10.69	0.13	60.47	2.14	1_3538000_57075_2174.tif	23	<a href="#">14</a>

# Delaminations

Bridge: 5002 SB

Lane: 1

Image Name: 1\_2229000\_56731\_2185.tif



Defect #	LB
Feet from Start	1.59
Feet from Right	2.43
Defect Size	NA
Length x Width (ft)	NA
Type	Lane Bound

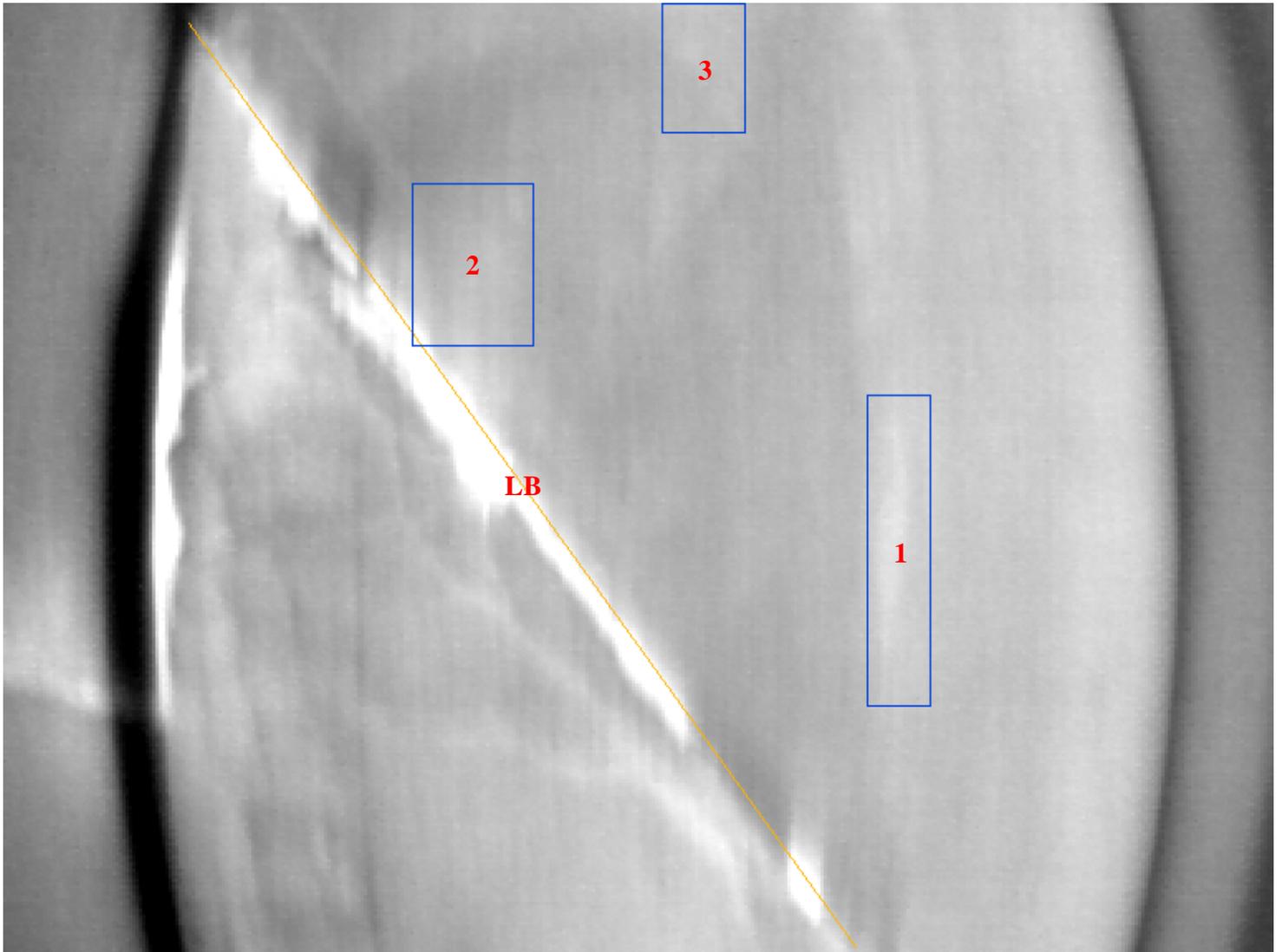
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# Delaminations

Bridge: 5002 SB

Lane: 1

Image Name: 1\_2454000\_57095\_2176.tif



Defect #	1	LB	2	3
Feet from Start	7.81	8.53	10.91	13.06
Feet from Right	4.13	8.29	8.82	6.28
Defect Size	2.52 sq ft	NA	2.50 sq ft	1.38 sq ft
Length x Width (ft)	3.38 x 0.71	NA	1.77 x 1.35	1.41 x 0.93
Type	Delam	Lane Bound	Delam	Delam

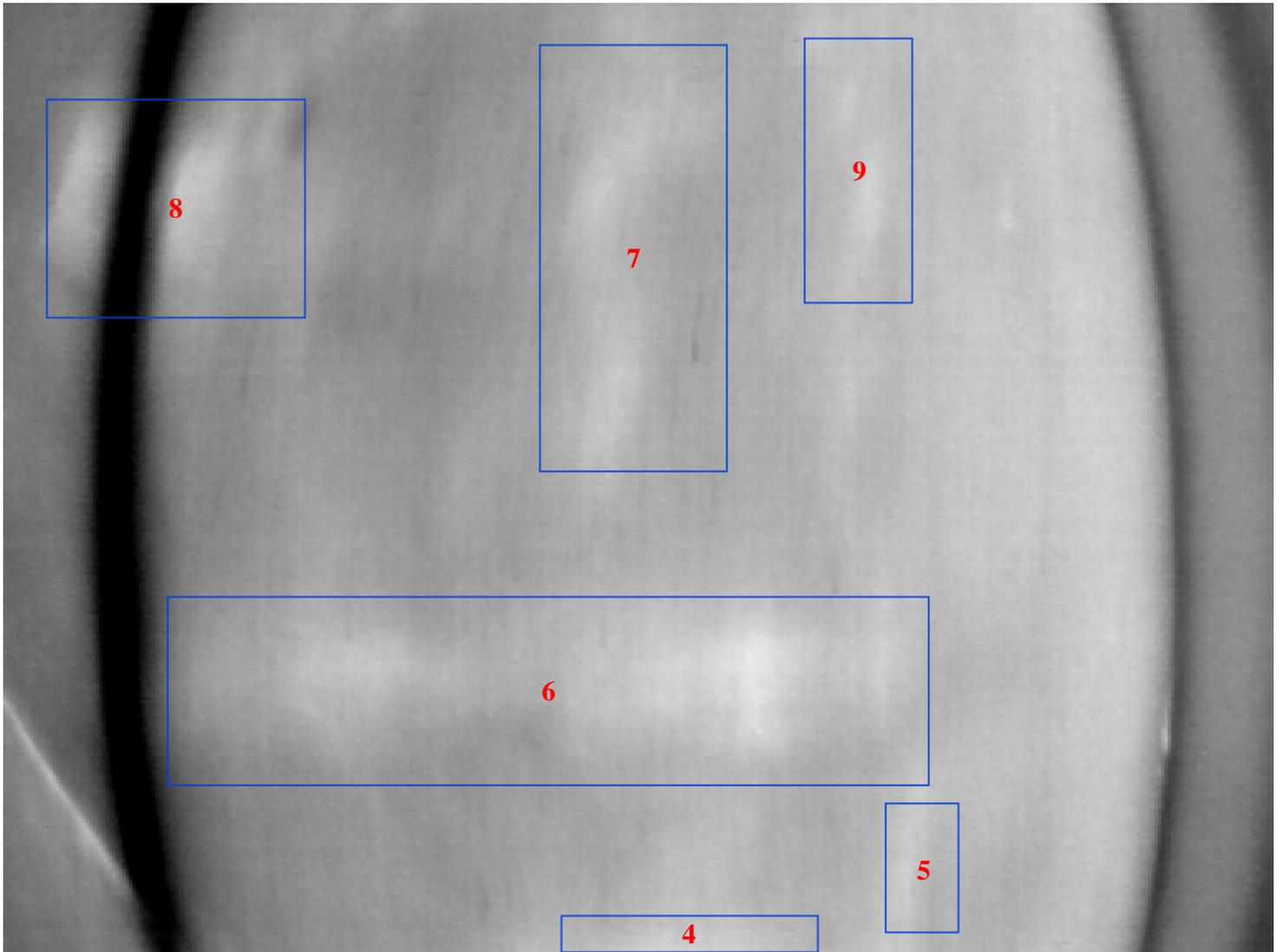
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# Delaminations

Bridge: 5002 SB

Lane: 1

Image Name: 1\_2670000\_57095\_2176.tif



Defect #	4	5	6	7	8	9
Feet from Start	13.95	14.65	16.57	21.26	21.80	22.21
Feet from Right	6.43	3.87	7.99	7.05	12.10	4.58
Defect Size	1.23 sq ft	1.21 sq ft	18.11 sq ft	10.09 sq ft	7.13 sq ft	3.63 sq ft
Length x Width (ft)	0.41 x 2.84	1.41 x 0.82	2.06 x 8.40	4.64 x 2.08	2.38 x 2.86	2.88 x 1.20
Type	Delam	Delam	Delam	Delam	Delam	Delam

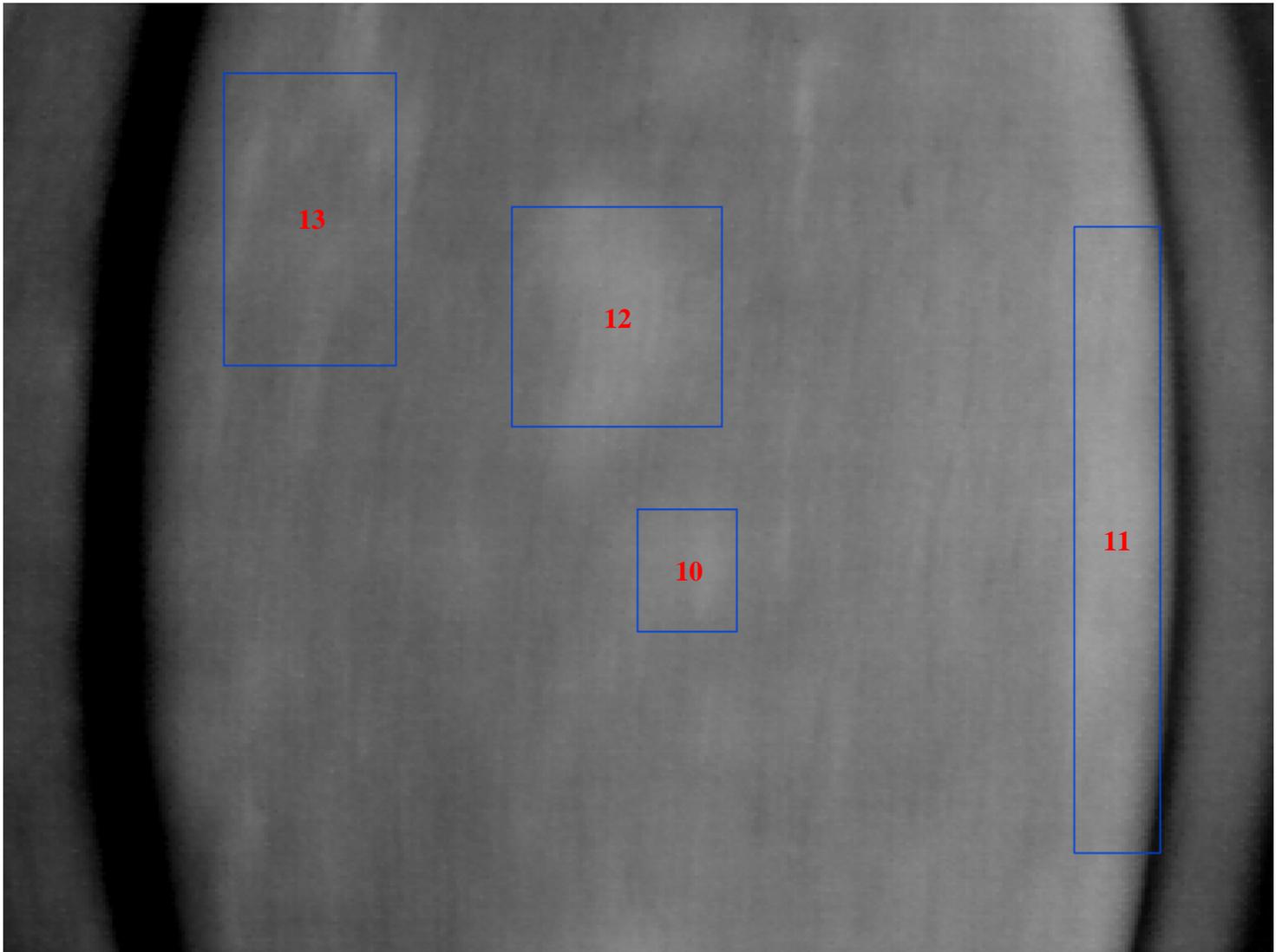
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# Delaminations

Bridge: 5002 SB

Lane: 1

Image Name: 1\_2885000\_57095\_2176.tif



Defect #	10	11	12	13
Feet from Start	28.10	28.44	30.85	31.91
Feet from Right	6.46	1.72	7.24	10.62
Defect Size	1.56 sq ft	6.88 sq ft	5.86 sq ft	6.38 sq ft
Length x Width (ft)	1.34 x 1.11	6.81 x 0.97	2.40 x 2.33	3.19 x 1.91
Type	Delam	Delam	Delam	Delam

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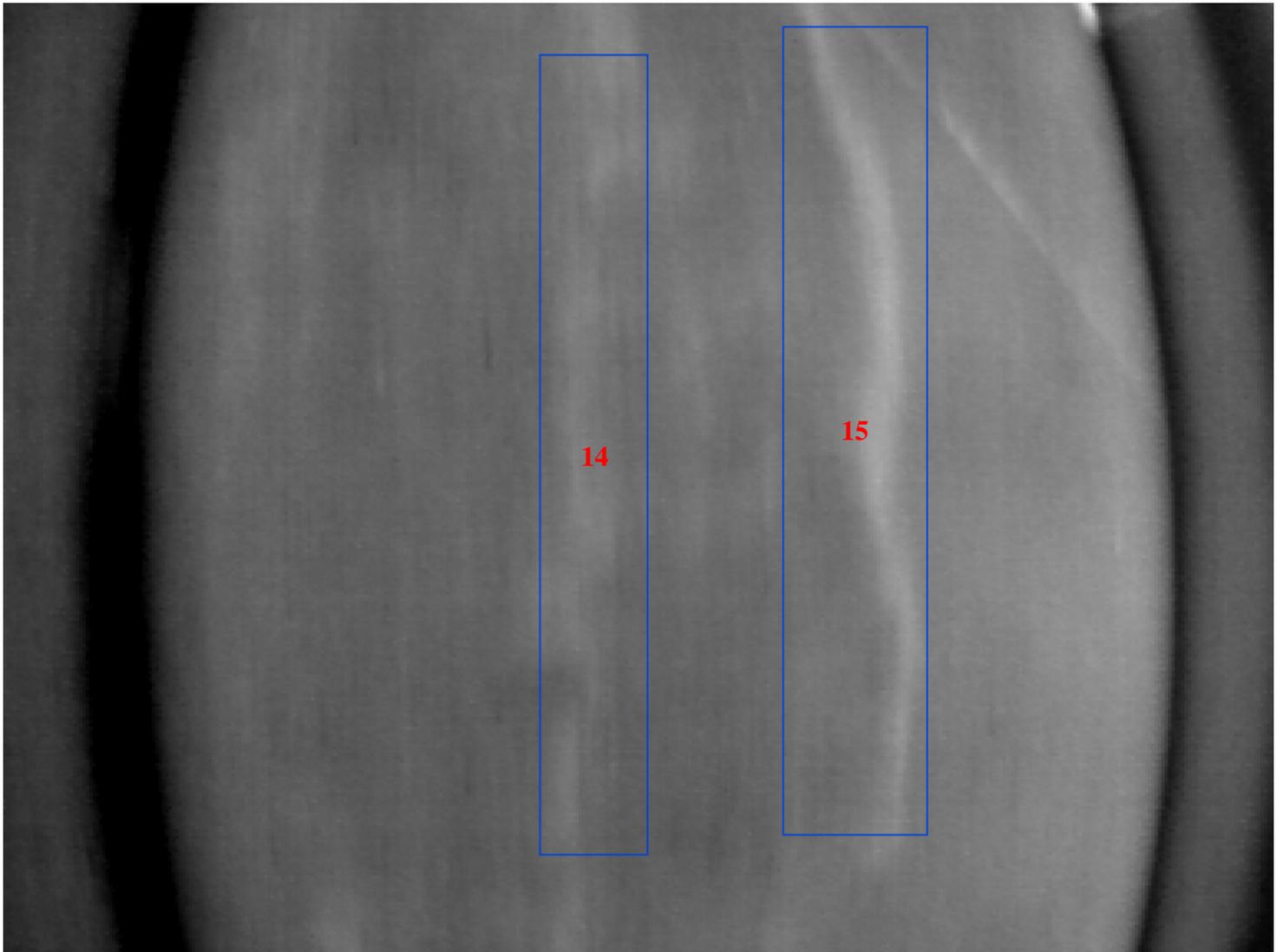
# Delaminations



Bridge: 5002 SB

Lane: 1

Image Name: 1\_3100000\_57095\_2176.tif



Defect #	14	15
Feet from Start	39.59	39.85
Feet from Right	7.49	4.61
Defect Size	10.94 sq ft	14.73 sq ft
Length x Width (ft)	8.69 x 1.20	8.78 x 1.60
Type	Delam	Delam

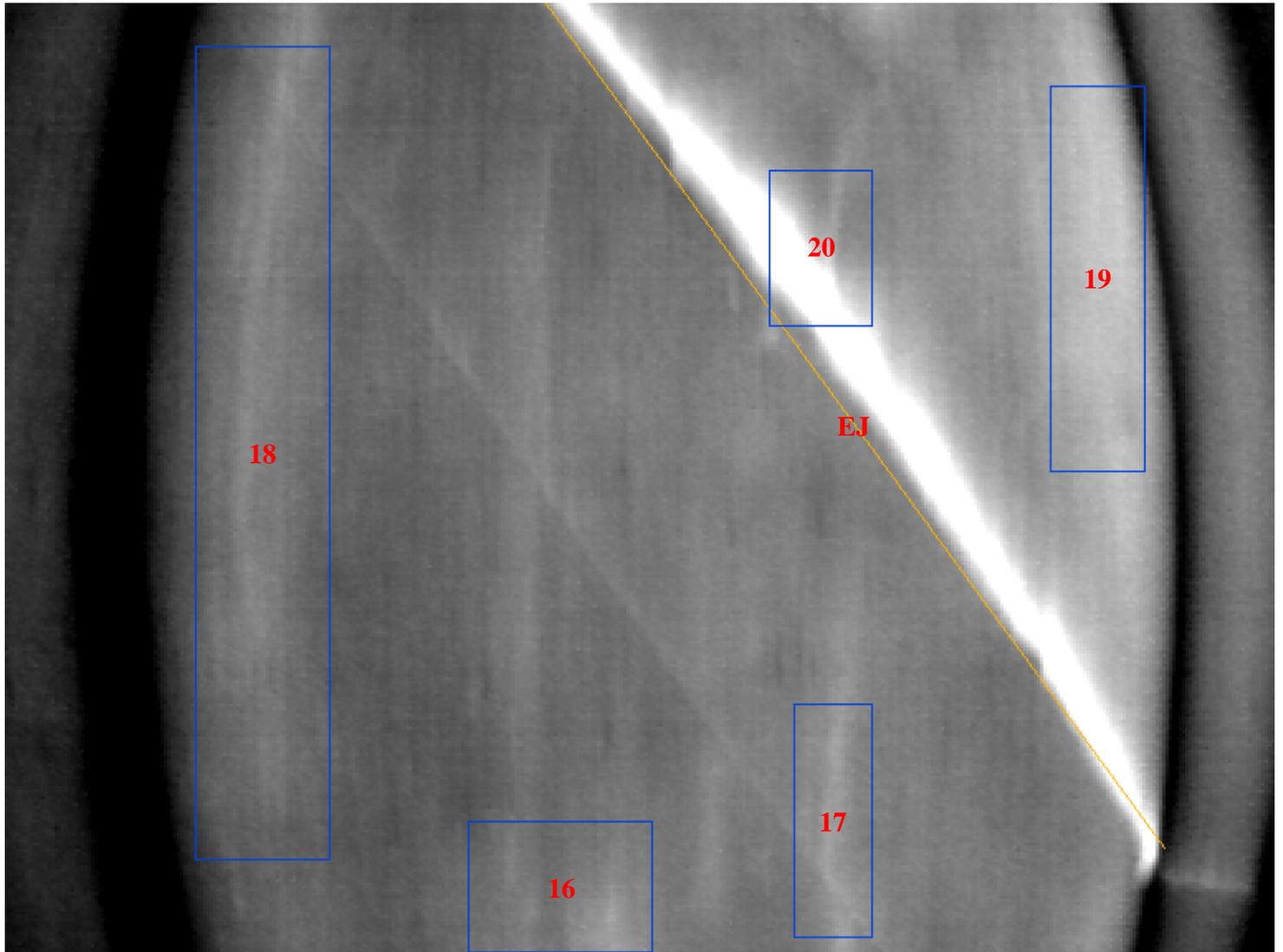
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# Delaminations

Bridge: 5002 SB

Lane: 1

Image Name: 1\_3315000\_57075\_2174.tif



Defect #	16	17	18	EJ	19	20
Feet from Start	45.13	45.85	49.83	50.14	51.72	52.07
Feet from Right	7.88	4.87	11.16	4.63	1.95	5.00
Defect Size	3.06 sq ft	2.33 sq ft	13.81 sq ft	NA	4.64 sq ft	2.04 sq ft
Length x Width (ft)	1.43 x 2.04	2.54 x 0.88	8.83 x 1.49	NA	4.19 x 1.06	1.70 x 1.15
Type	Delam	Delam	Delam	Joint	Delam	Delam

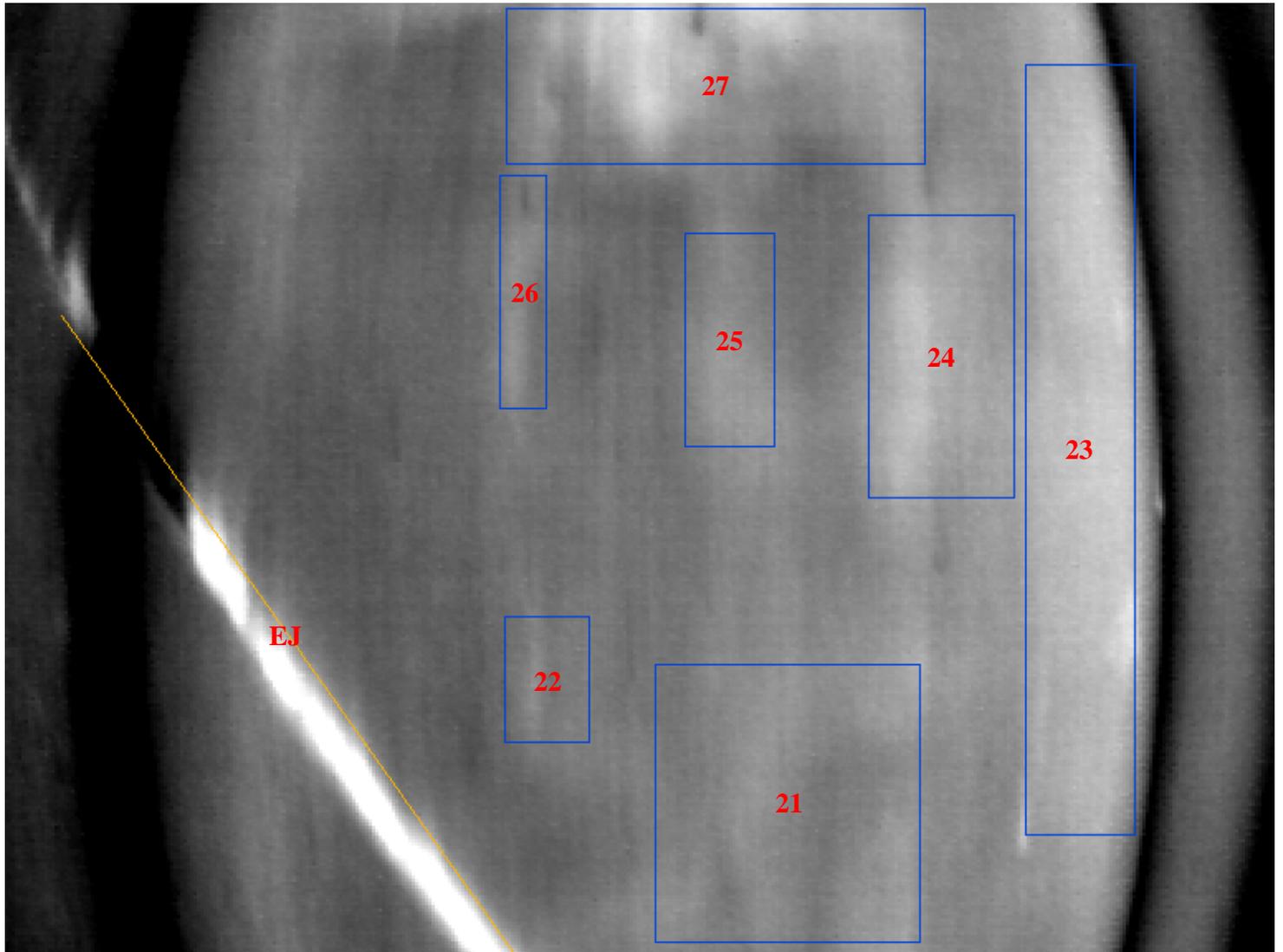
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# Delaminations

Bridge: 5002 SB

Lane: 1

Image Name: 1\_3538000\_57075\_2174.tif



Defect #	21	22	EJ	23	24	25	26	27
Feet from Start	56.66	58.00	58.49	60.47	61.49	61.66	62.18	64.41
Feet from Right	5.37	8.02	10.89	2.14	3.67	6.01	8.29	6.16
Defect Size	9.30 sq ft	1.37 sq ft	NA	10.69 sq ft	5.23 sq ft	2.44 sq ft	1.41 sq ft	8.24 sq ft
Length x Width (ft)	3.03 x 2.93	1.38 x 0.95	NA	8.36 x 1.22	3.08 x 1.62	2.33 x 1.00	2.54 x 0.53	1.70 x 4.63
Type	Delam	Delam	Joint	Delam	Delam	Delam	Delam	Delam

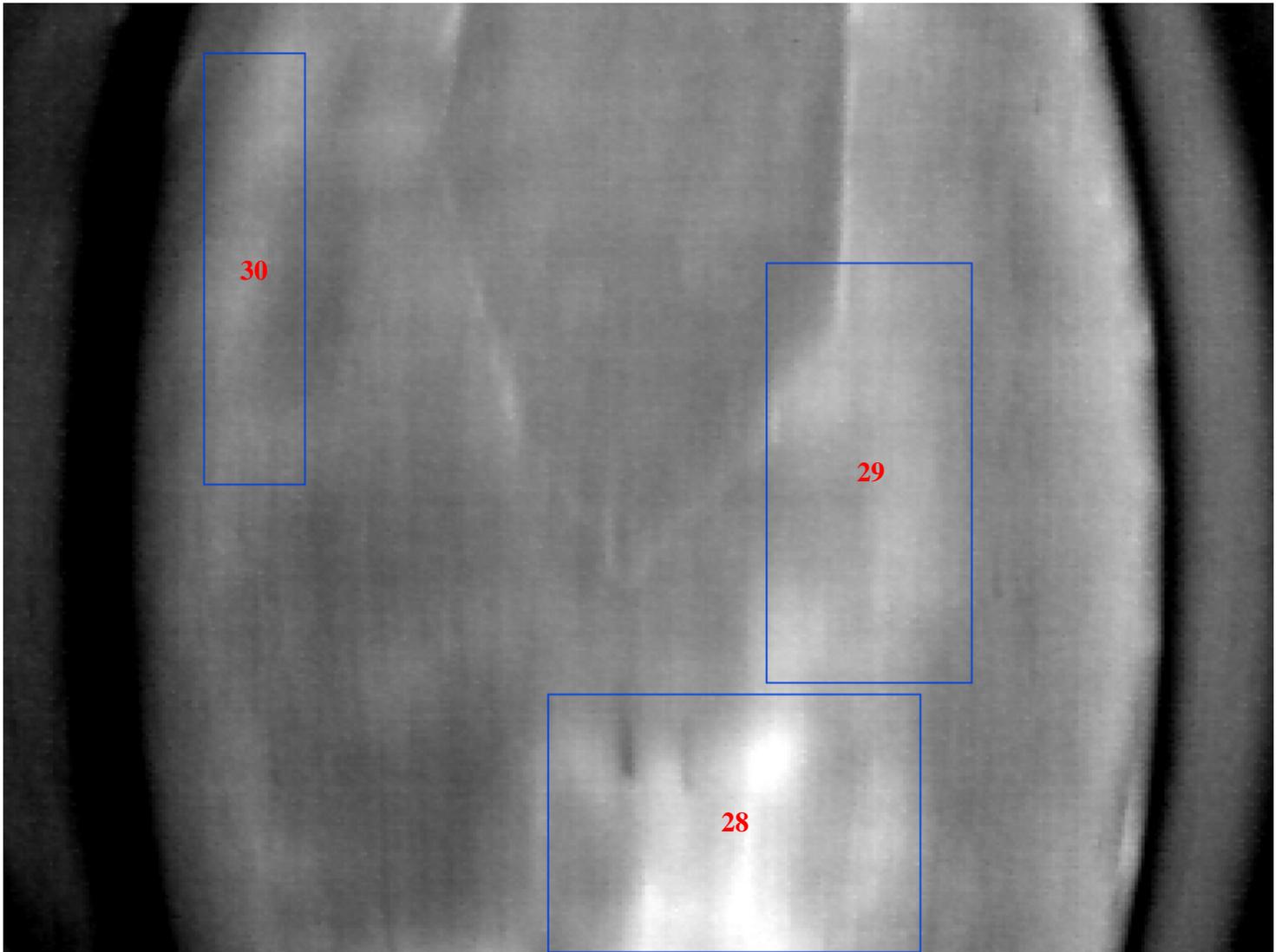
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# Delaminations

Bridge: 5002 SB

Lane: 1

Image Name: 1\_3756000\_57075\_2174.tif



Defect #	28	29	30
Feet from Start	66.79	70.59	72.82
Feet from Right	5.94	4.46	11.23
Defect Size	12.12 sq ft	10.89 sq ft	5.55 sq ft
Length x Width (ft)	2.81 x 4.12	4.57 x 2.28	4.69 x 1.13
Type	Delam	Delam	Delam

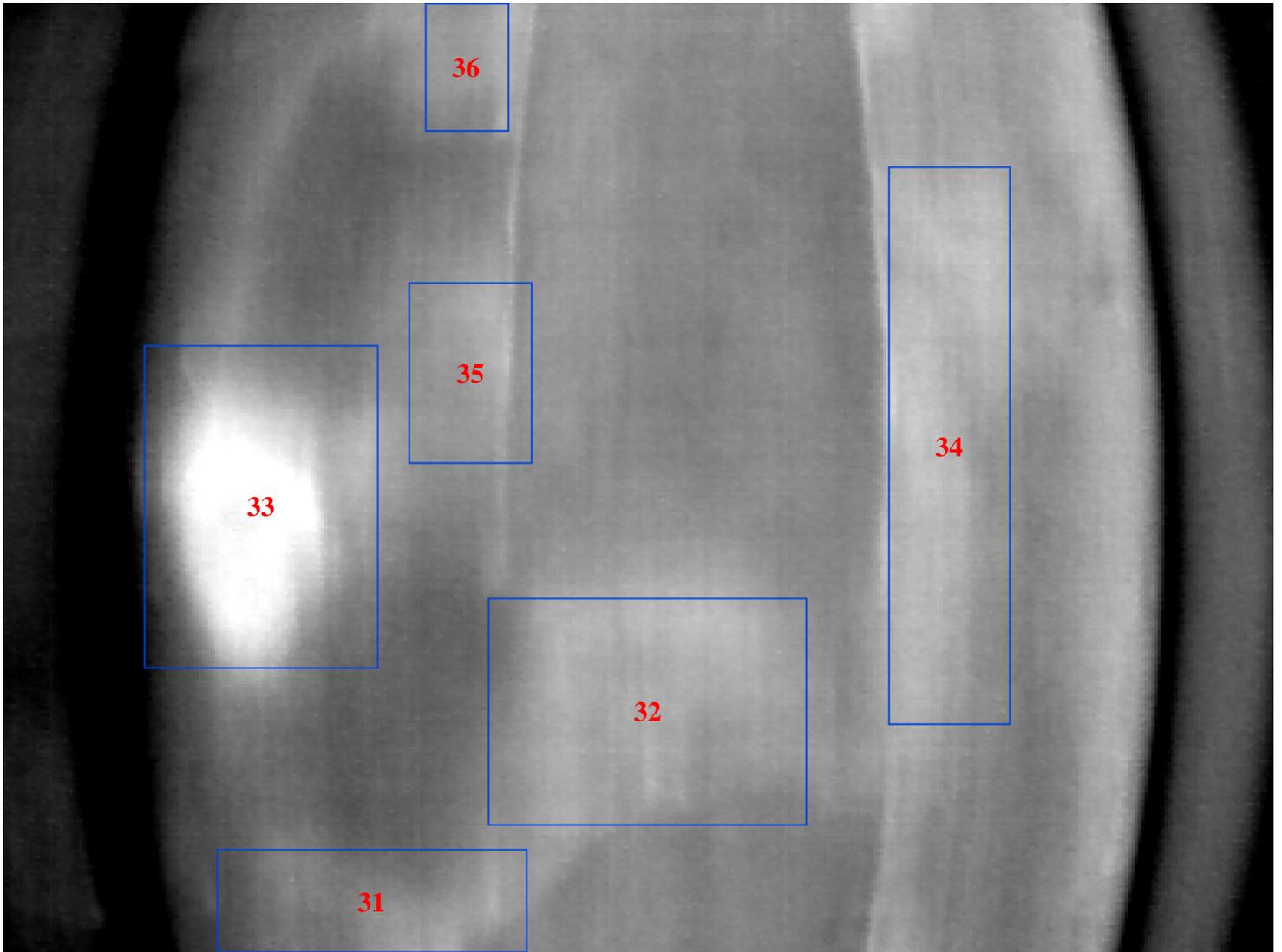
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# Delaminations

Bridge: 5002 SB

Lane: 1

Image Name: 1\_3969000\_57075\_2174.tif



Defect #	31	32	33	34	35	36
Feet from Start	76.08	78.13	80.36	81.02	81.81	85.12
Feet from Right	9.93	6.90	11.16	3.57	8.85	8.89
Defect Size	4.05 sq ft	9.10 sq ft	9.51 sq ft	8.54 sq ft	2.82 sq ft	1.36 sq ft
Length x Width (ft)	1.13 x 3.43	2.47 x 3.52	3.51 x 2.59	6.05 x 1.35	1.97 x 1.37	1.40 x 0.93
Type	Delam	Delam	Delam	Delam	Delam	Delam

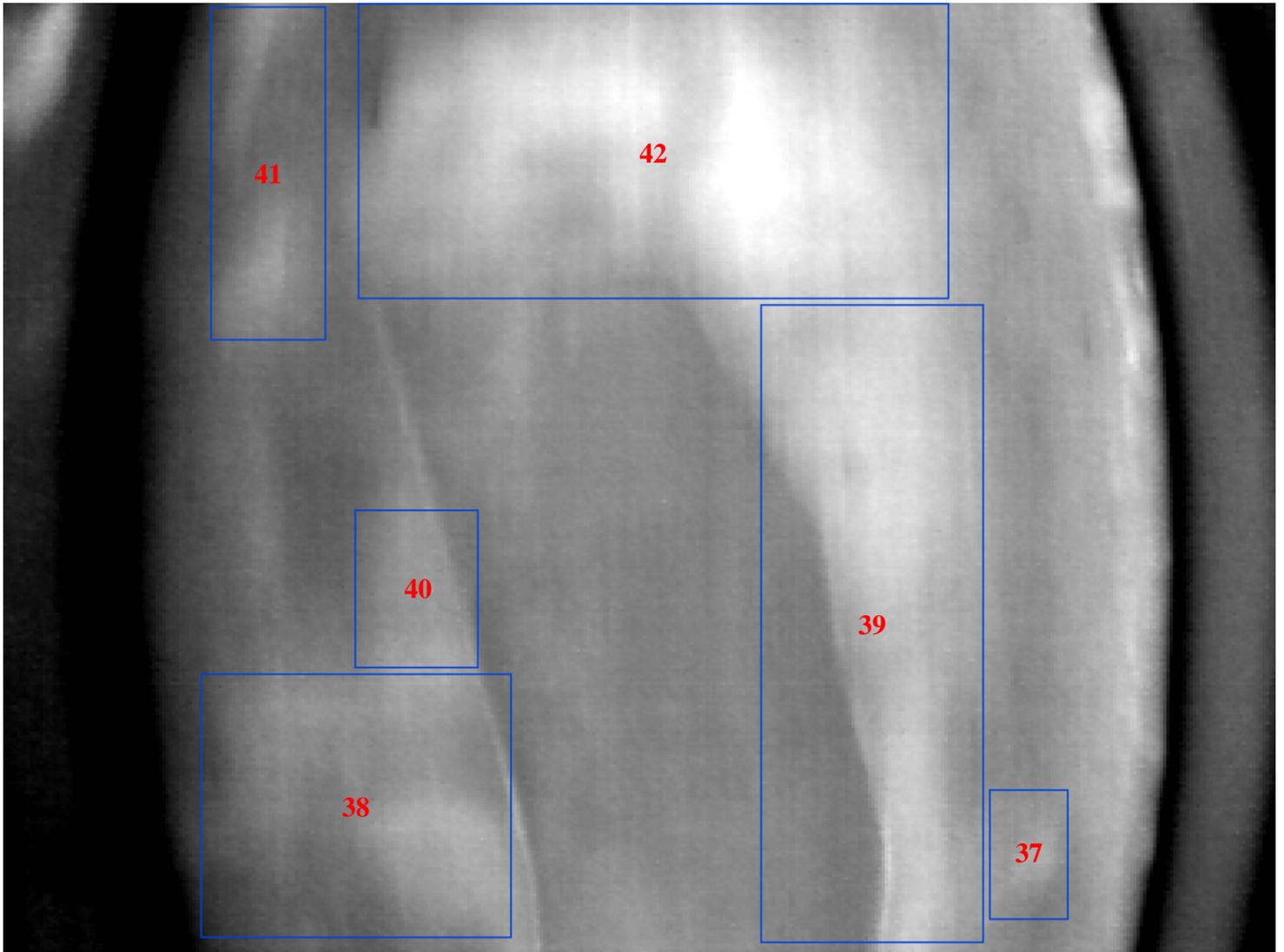
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# Delaminations

Bridge: 5002 SB

Lane: 1

Image Name: 1\_4187000\_57075\_2174.tif



Defect #	37	38	39	40	41	42
Feet from Start	86.97	87.50	89.47	89.86	94.34	94.58
Feet from Right	2.72	10.12	4.44	9.45	11.08	6.85
Defect Size	1.30 sq ft	10.28 sq ft	17.80 sq ft	2.46 sq ft	4.83 sq ft	21.83 sq ft
Length x Width (ft)	1.41 x 0.88	2.87 x 3.43	6.91 x 2.46	1.72 x 1.37	3.62 x 1.28	3.21 x 6.51
Type	Delam	Delam	Delam	Delam	Delam	Delam

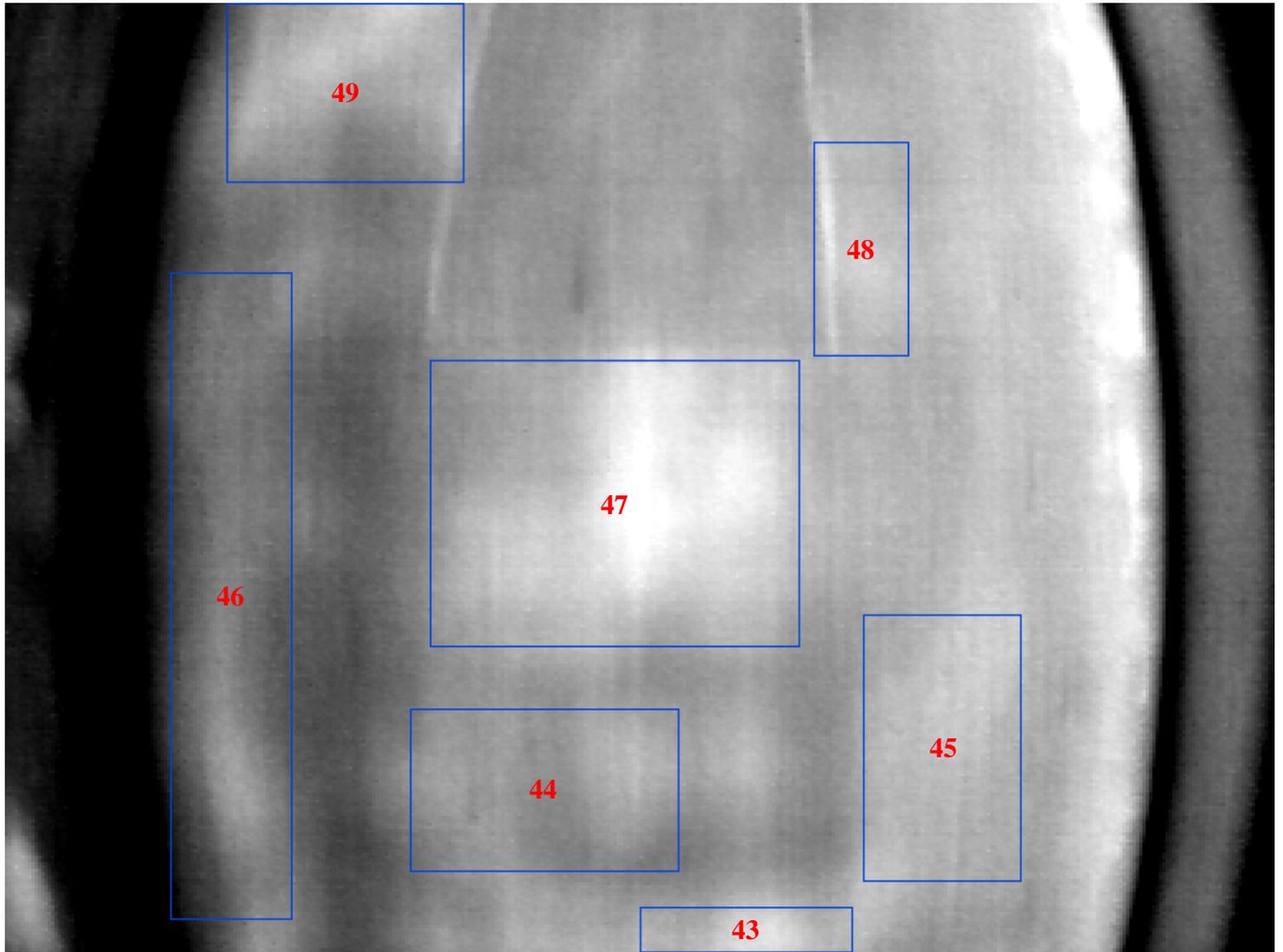
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# Delaminations

Bridge: 5002 SB

Lane: 1

Image Name: 1\_4403000\_57440\_2171.tif



Defect #	43	44	45	46	47	48	49
Feet from Start	96.48	98.01	98.47	100.11	101.10	103.88	105.55
Feet from Right	5.82	8.05	3.66	11.50	7.27	4.56	10.24
Defect Size	1.23 sq ft	5.51 sq ft	5.31 sq ft	9.91 sq ft	13.31 sq ft	2.58 sq ft	5.36 sq ft
Length x Width (ft)	0.50 x 2.35	1.77 x 2.97	2.90 x 1.75	7.02 x 1.35	3.12 x 4.08	2.33 x 1.06	1.95 x 2.63
Type	Delam						

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# Delaminations

Bridge: 5002 SB

Lane: 1

Image Name: 1\_4620000\_57440\_2171.tif



Defect #	50	51	52	53	54
Feet from Start	108.96	112.71	113.17	115.32	115.52
Feet from Right	7.67	8.71	7.36	9.63	3.49
Defect Size	26.31 sq ft	1.26 sq ft	2.08 sq ft	2.66 sq ft	2.24 sq ft
Length x Width (ft)	4.69 x 5.36	2.06 x 0.58	1.40 x 1.42	2.08 x 1.22	1.81 x 1.18
Type	Delam	Delam	Delam	Delam	Delam

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