Disinfectant Residual Monitoring & Maintaining Residuals

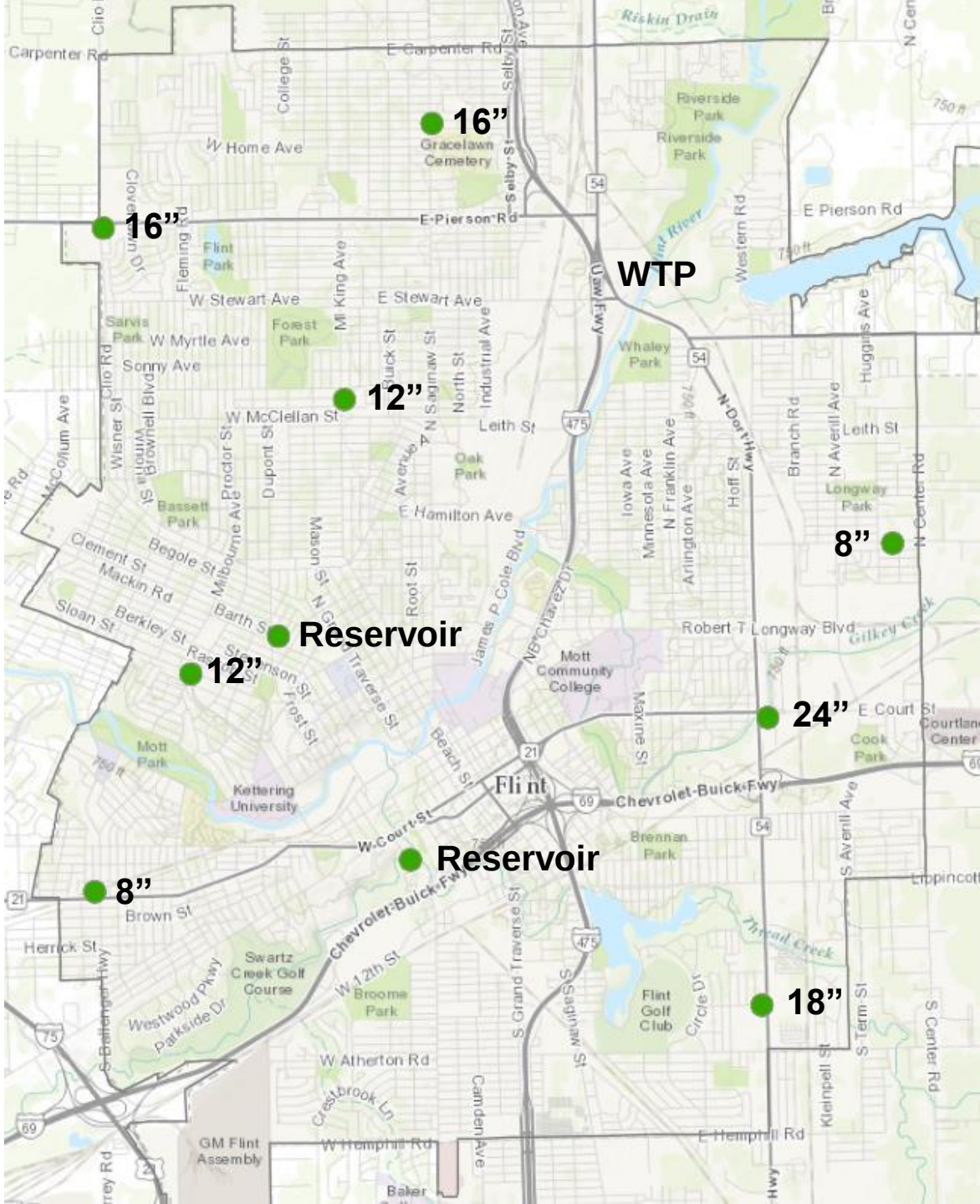
Data Summit
Region 5, U.S. EPA

January 10, 2017

Historic Monitoring

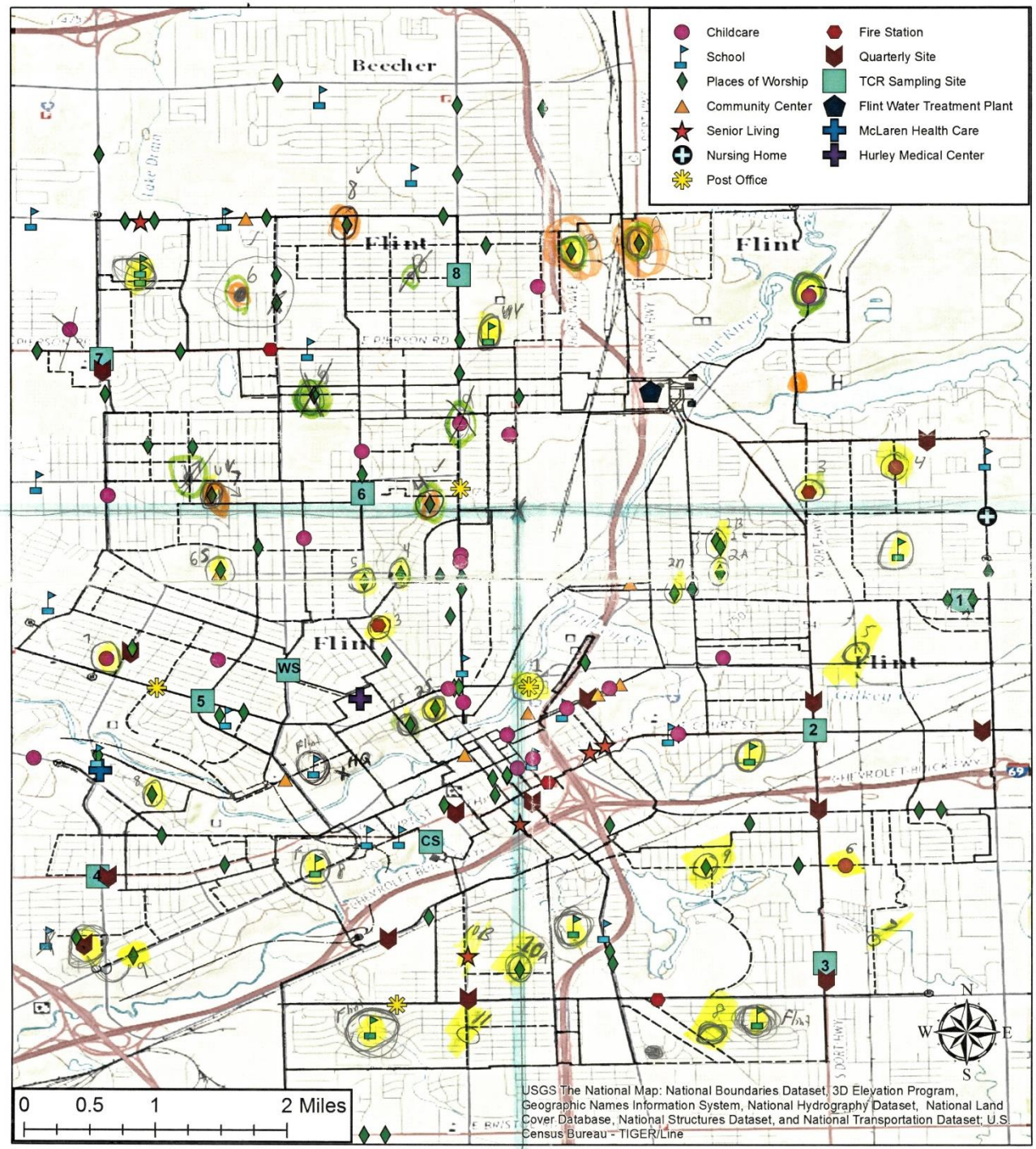
- ~100,000 population
- 100 monthly TCR samples required
- 10 locations, 3× week

- 01/16 – asked to assess chlorination in the DS to ensure the disinfection residual barrier and public health protection



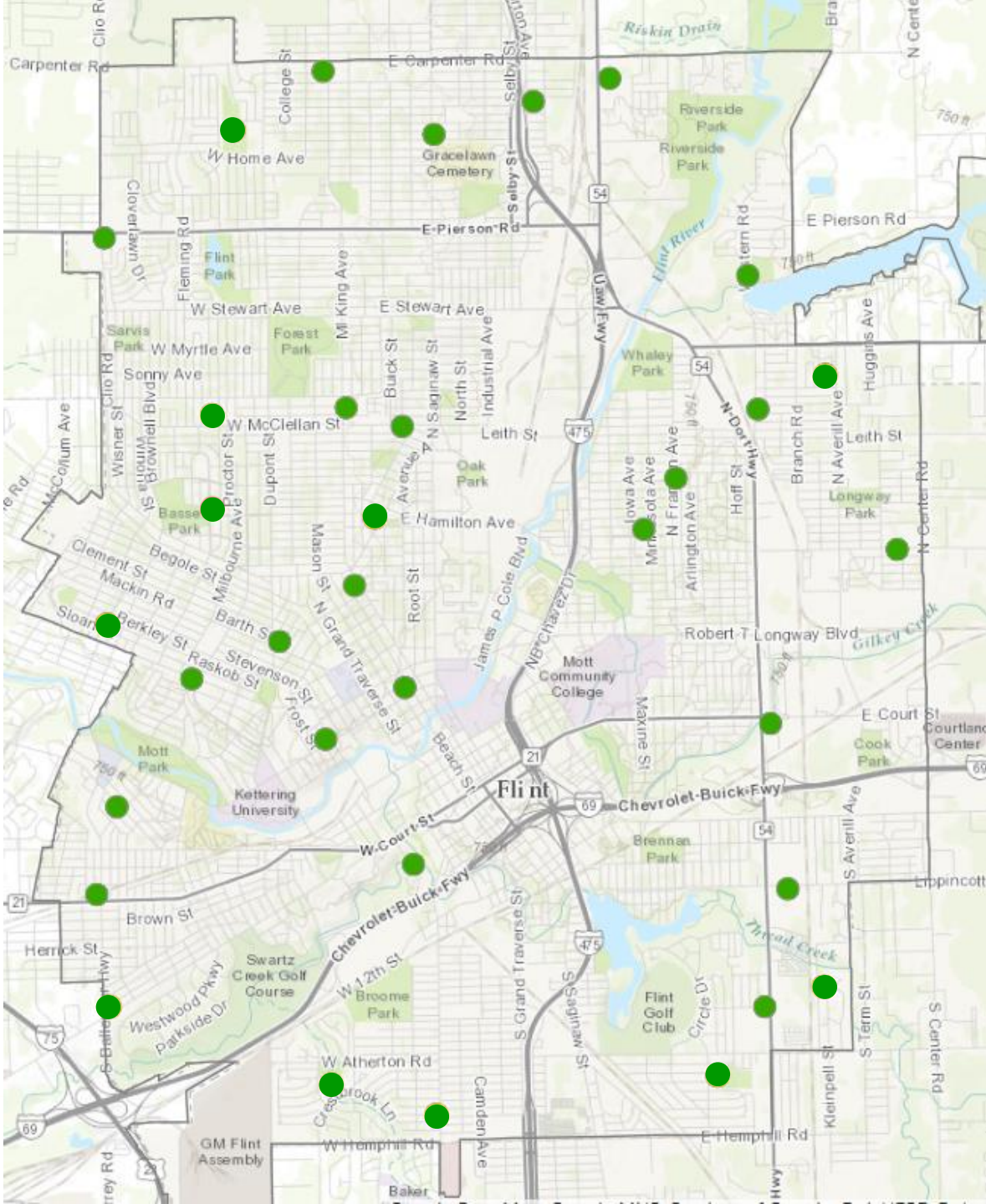
EPA Recurring Chlorine Monitoring

- Additional Cl_2 monitoring locations justified:
  - Areas embedded with residences
  - Smaller diameter DS network/ representing ageing water
- 1 week implementation
- Mapped all public locations (i.e. schools, churches, etc.)
- Developed sectors
- Investigated areas closest to primary residential water usage
- Measured service lines and flow rates / calculated flush times



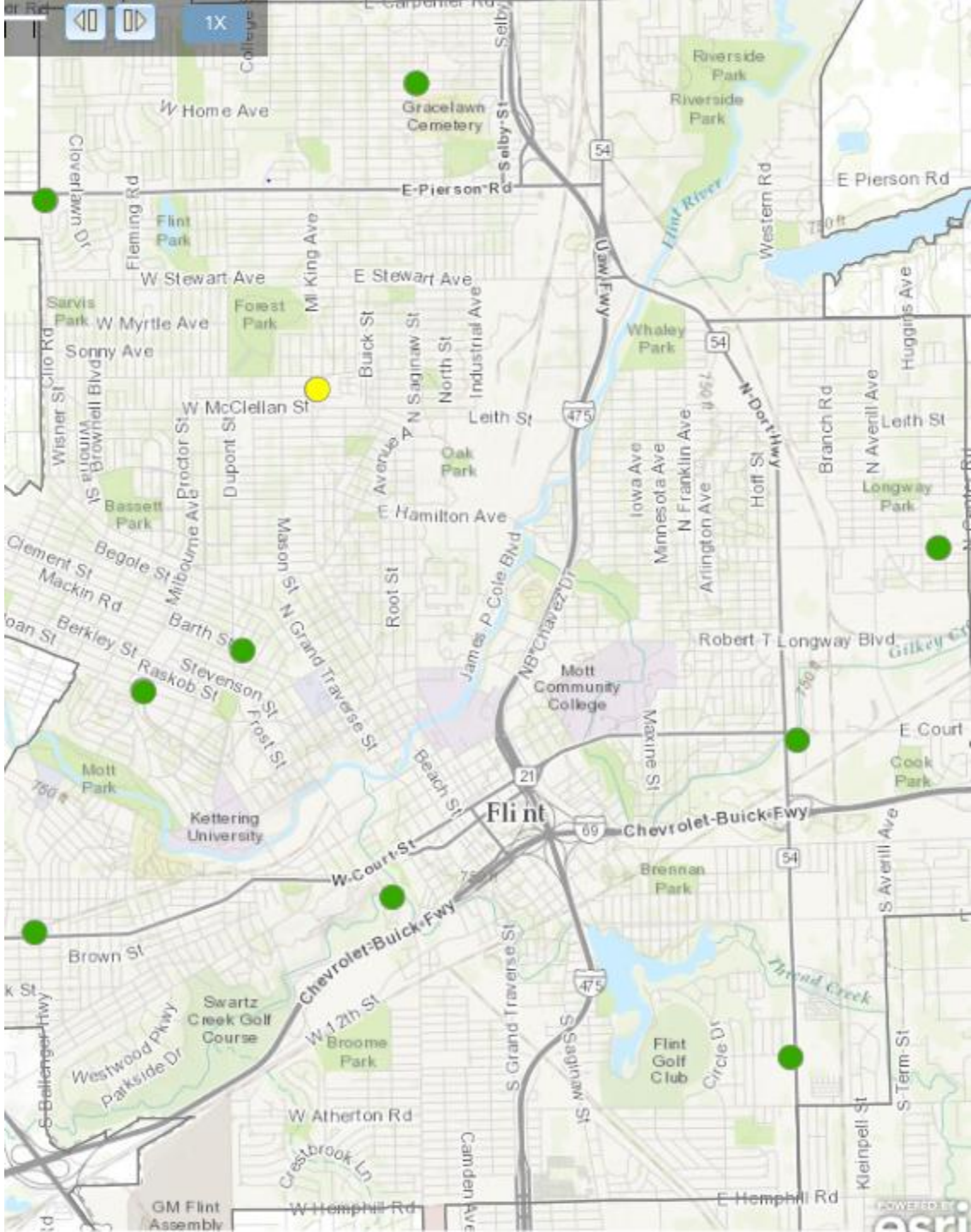
Combined EPA/Flint Recurring Chlorine Monitoring

- Added 24 Cl_2 monitoring sites
- Mostly churches, schools, childcares
- Combined with the 10 Utility sites, total = 34 Cl_2 monitoring locations weekly
- Concentrations mapped on EPA website, updated biweekly



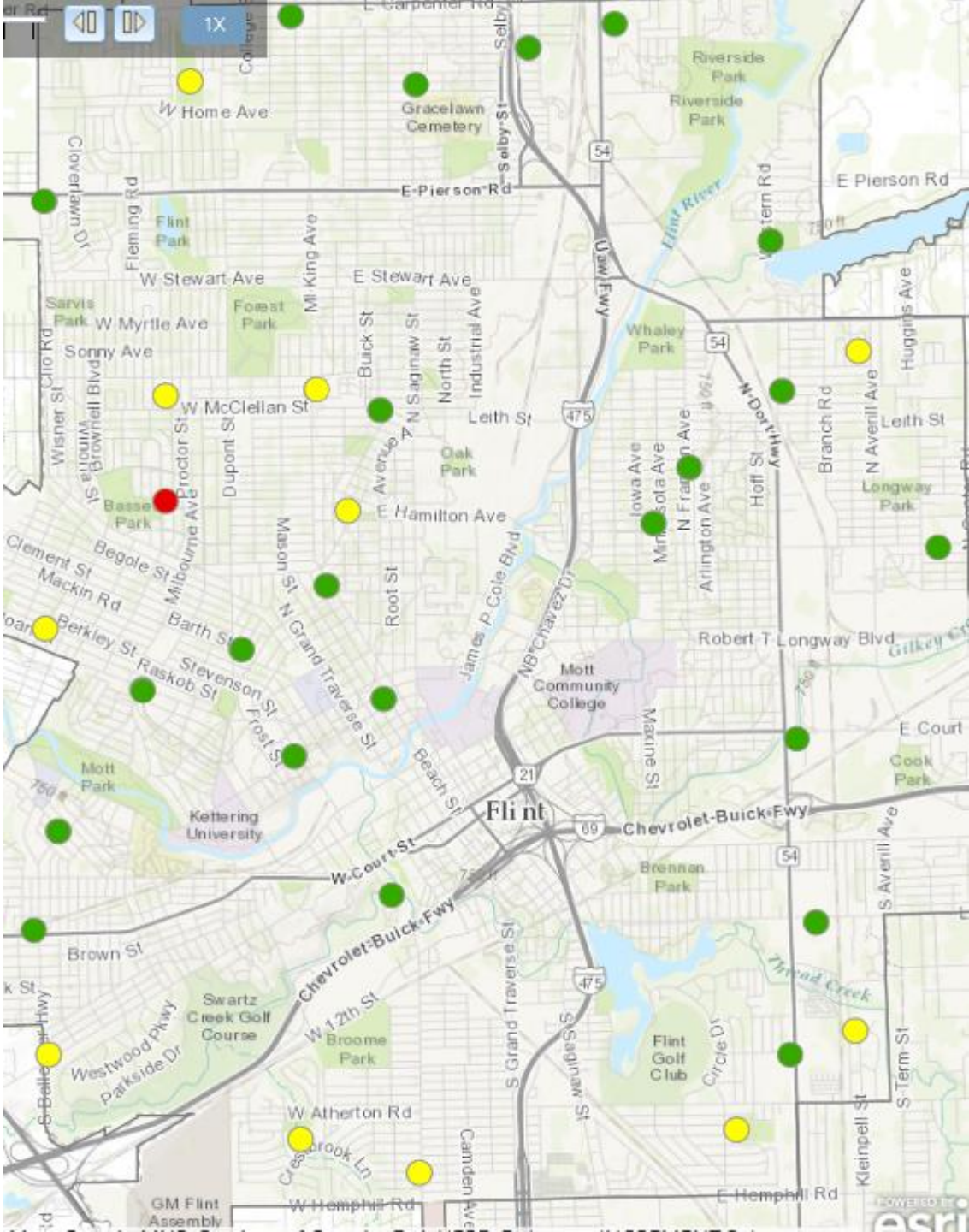
Flint Chlorine Monitoring

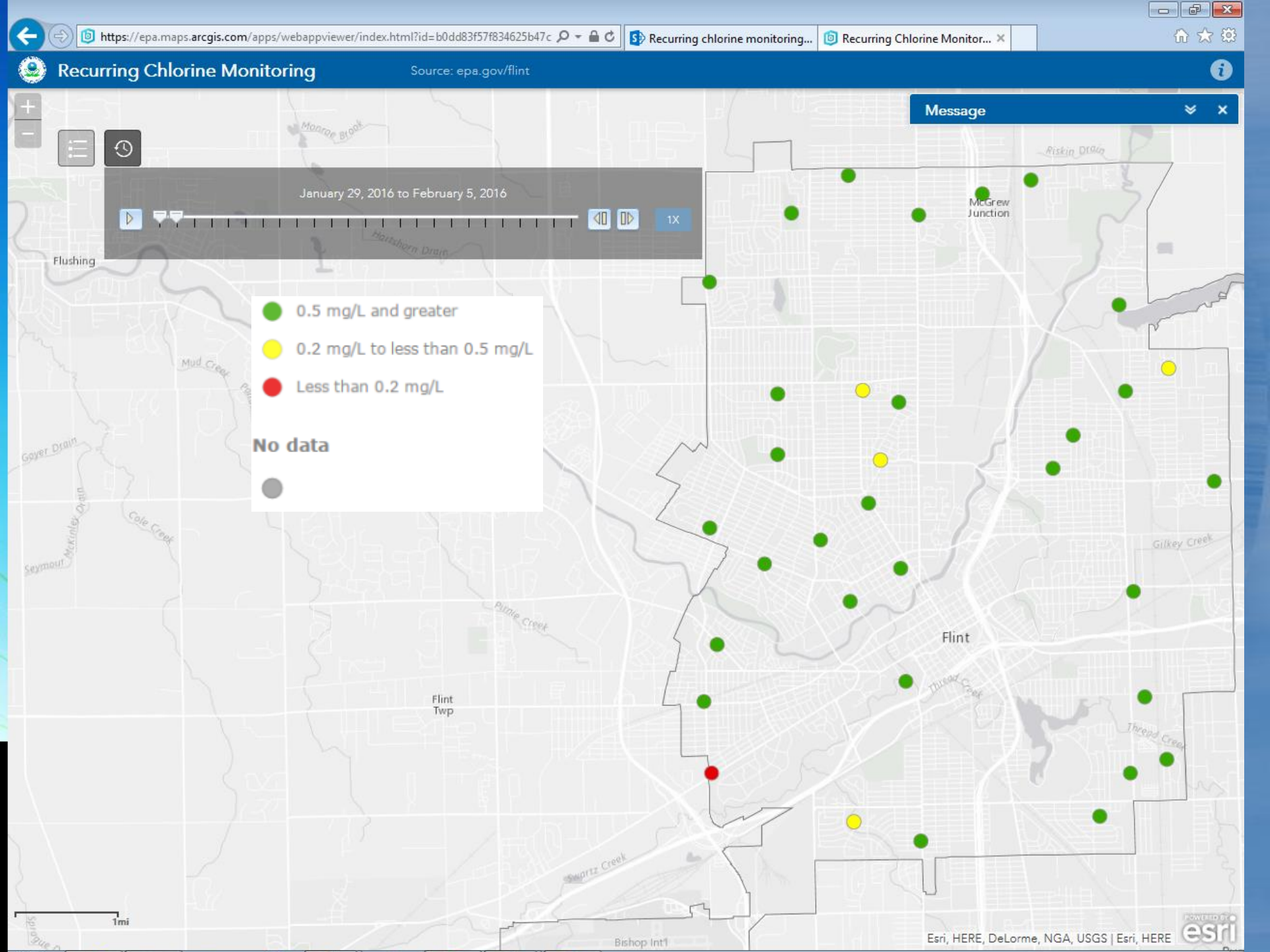
- Cl_2 residuals
- Week: June 13
- 10 Utility TCR monitoring locations
- Working with Utility to implement best practices
- Including flushing program for localized low residual areas



Combined EPA/Flint Recurring Chlorine Monitoring

- Cl_2 residuals
- Week: June 13
- 10 Utility TCR monitoring locations + 24 EPA Cl_2 monitoring locations

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Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
January 29, 2016 to February 5, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE
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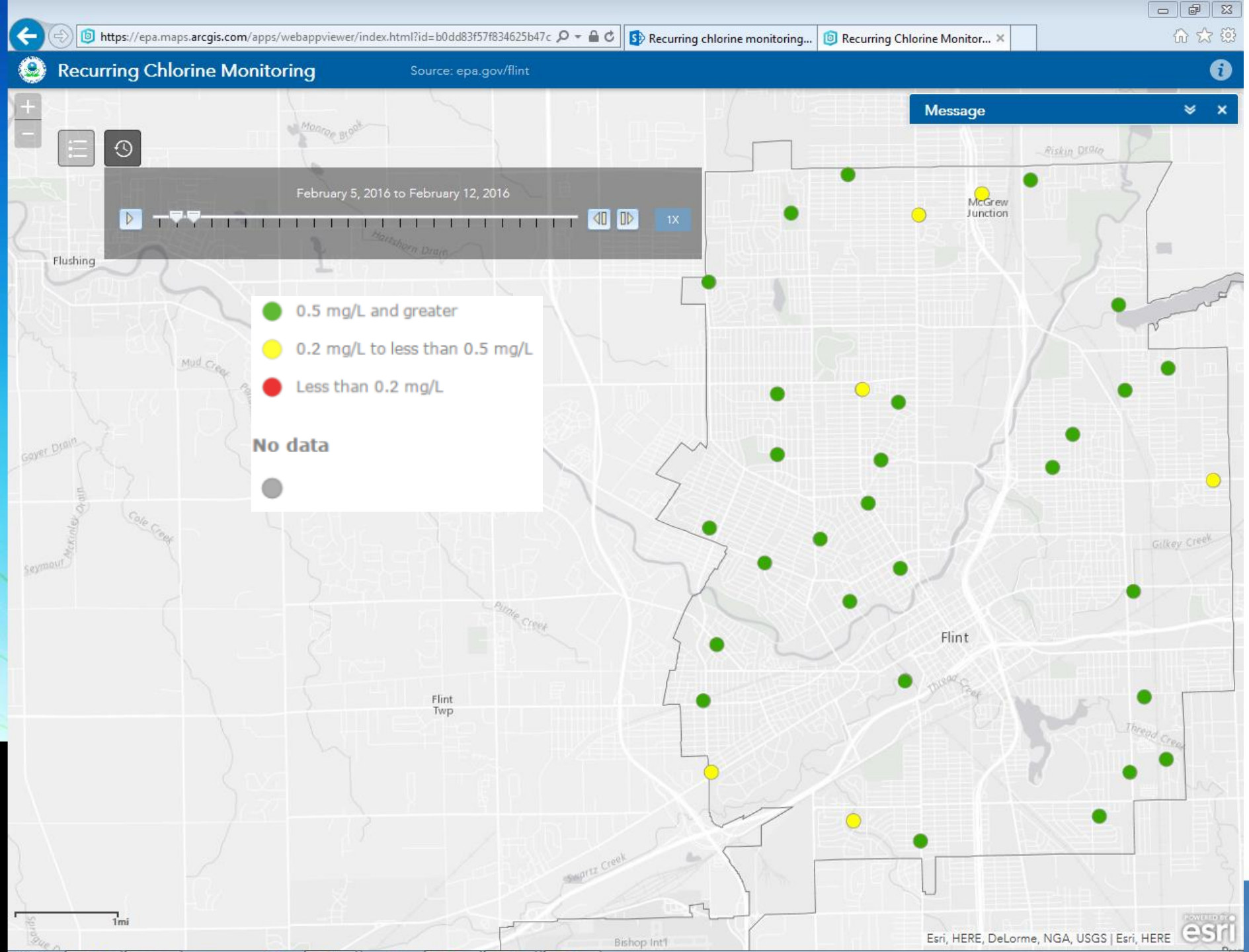
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Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
February 5, 2016 to February 12, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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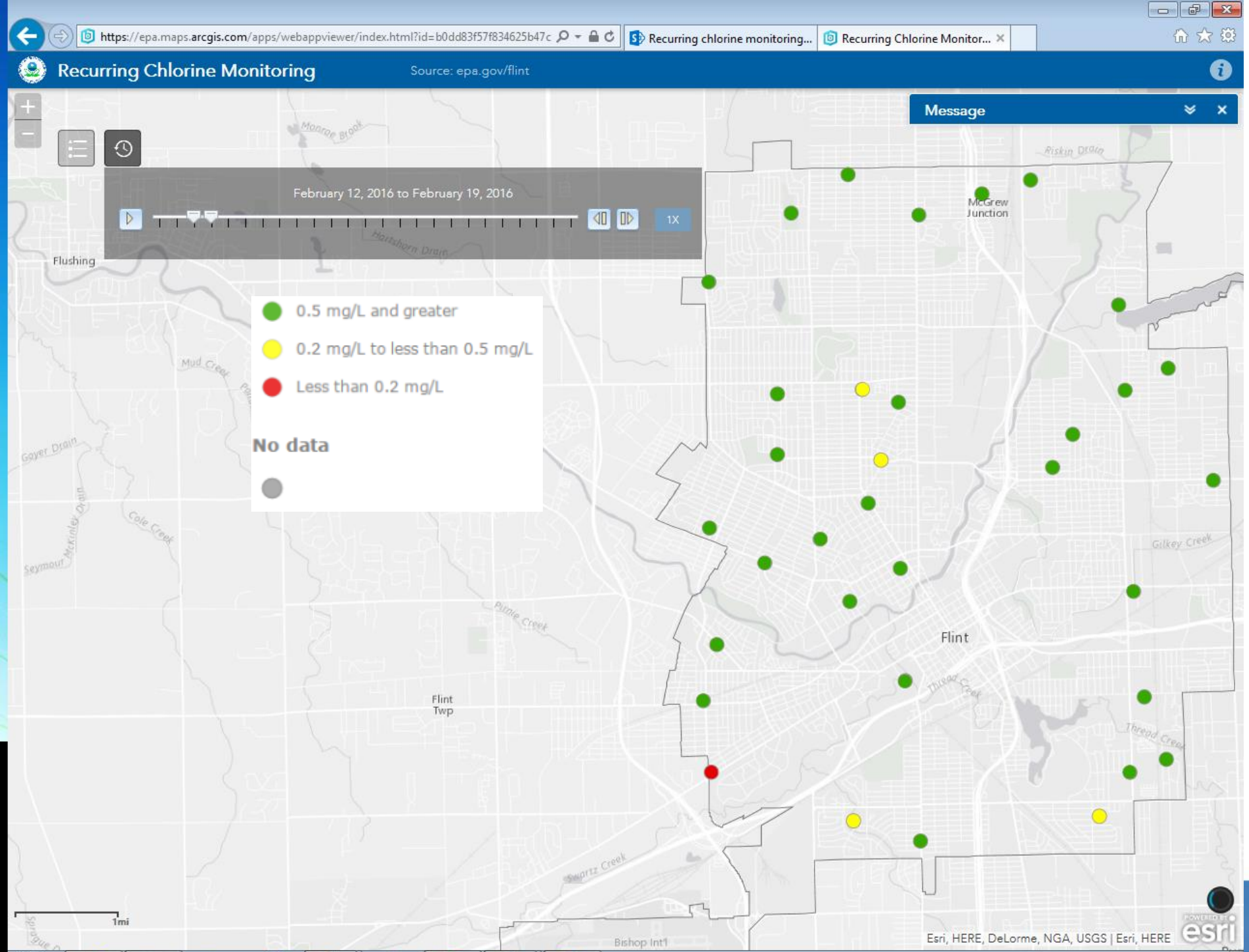
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Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
February 12, 2016 to February 19, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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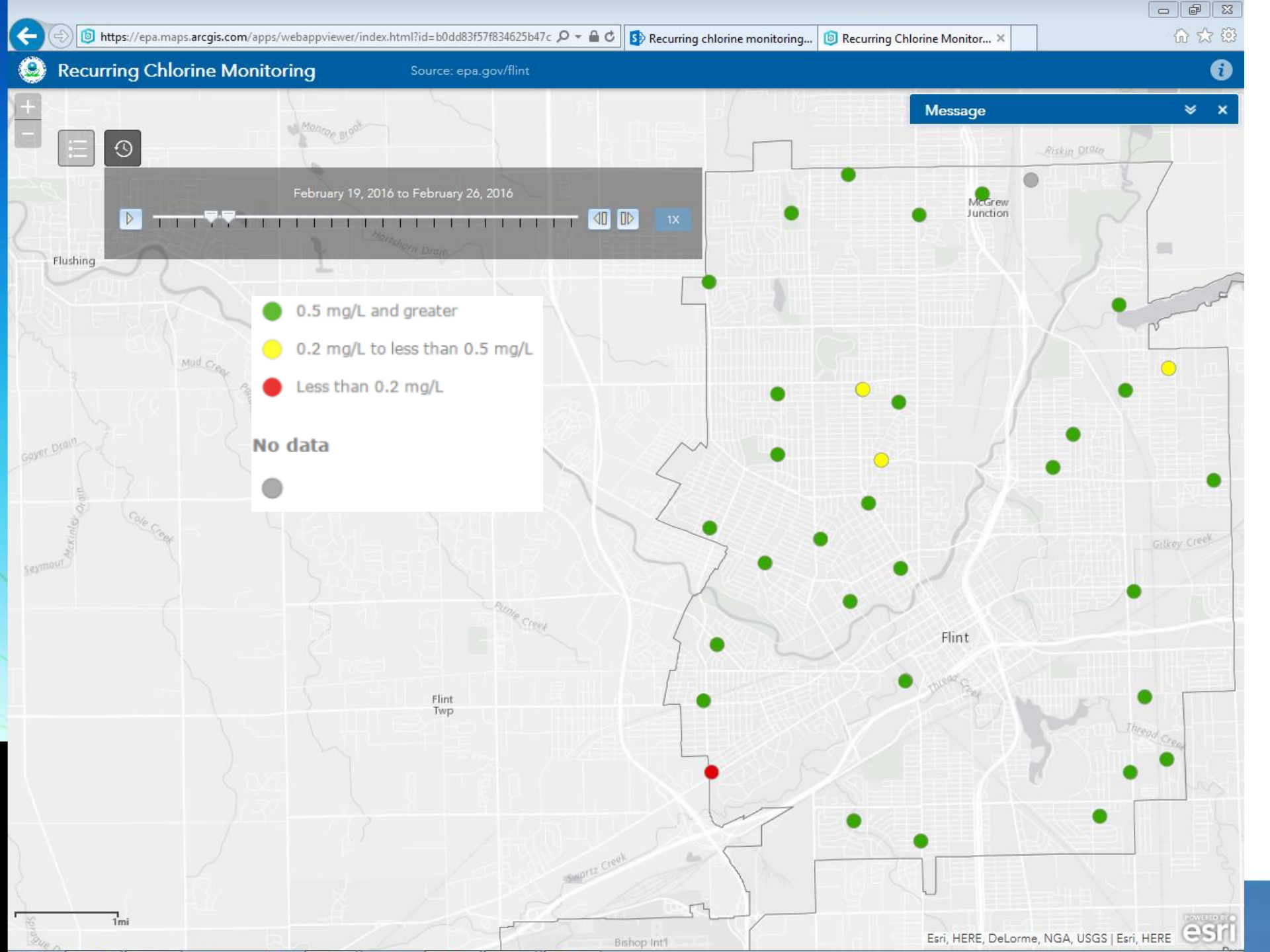
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Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
February 19, 2016 to February 26, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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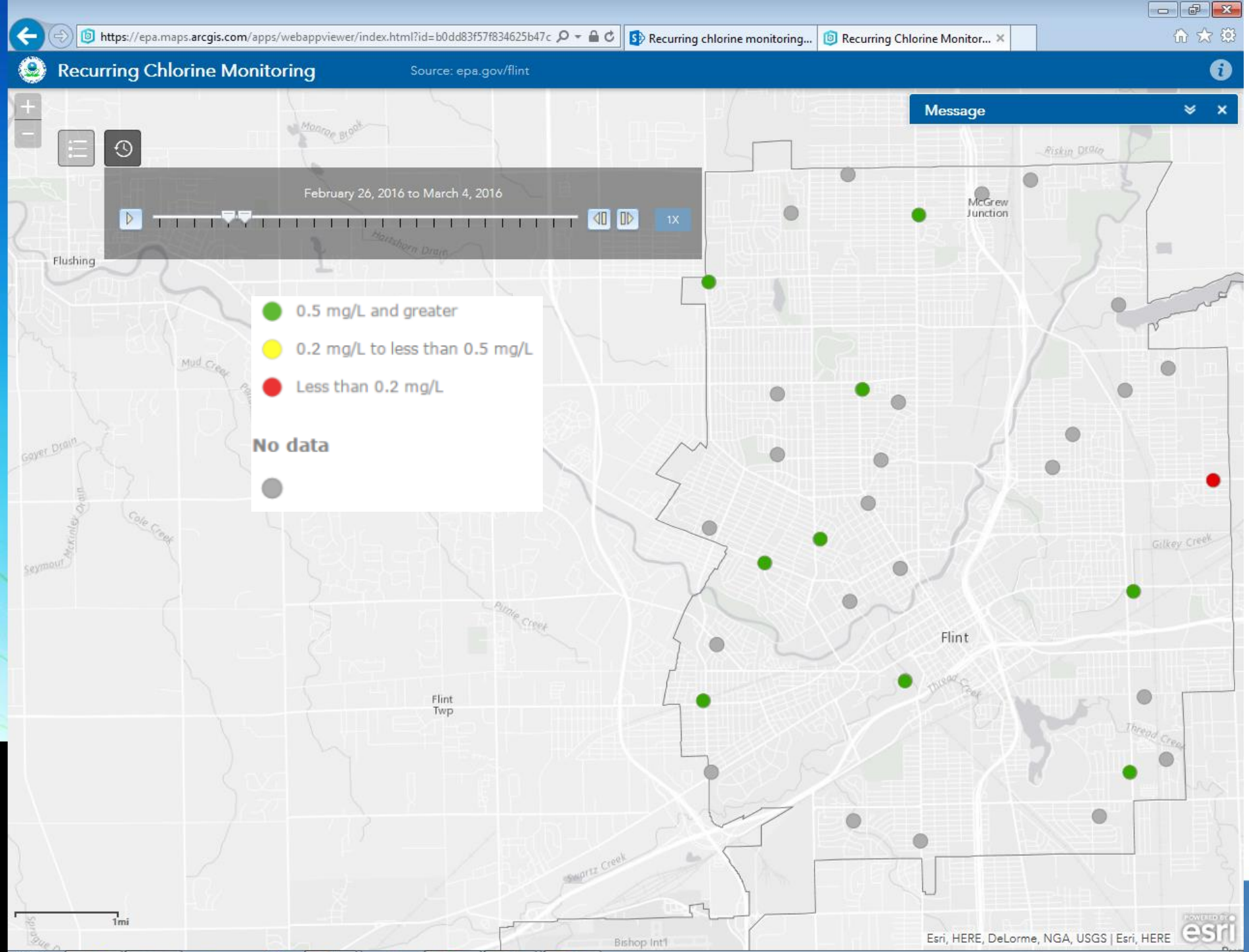
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Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
February 26, 2016 to March 4, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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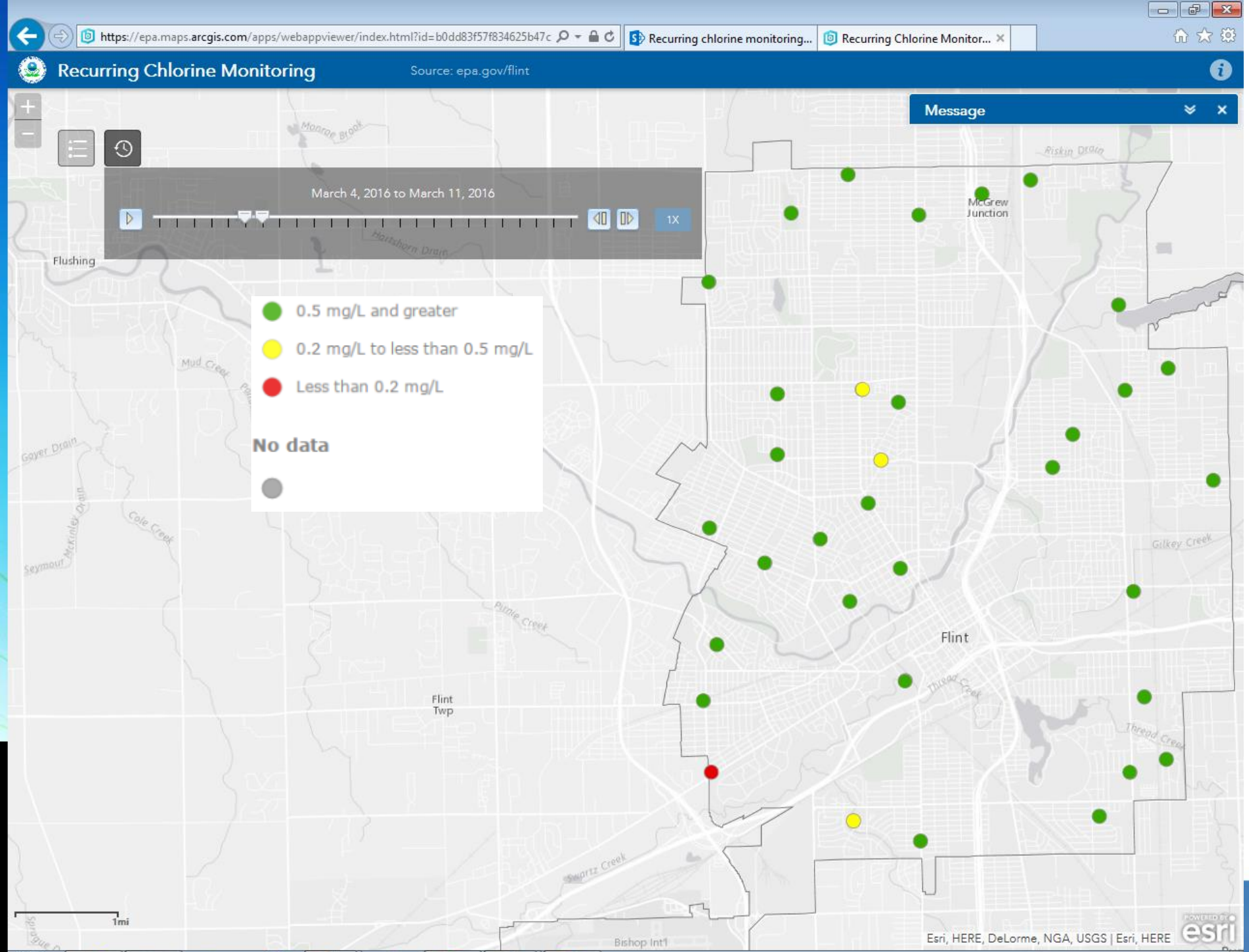
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Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
March 4, 2016 to March 11, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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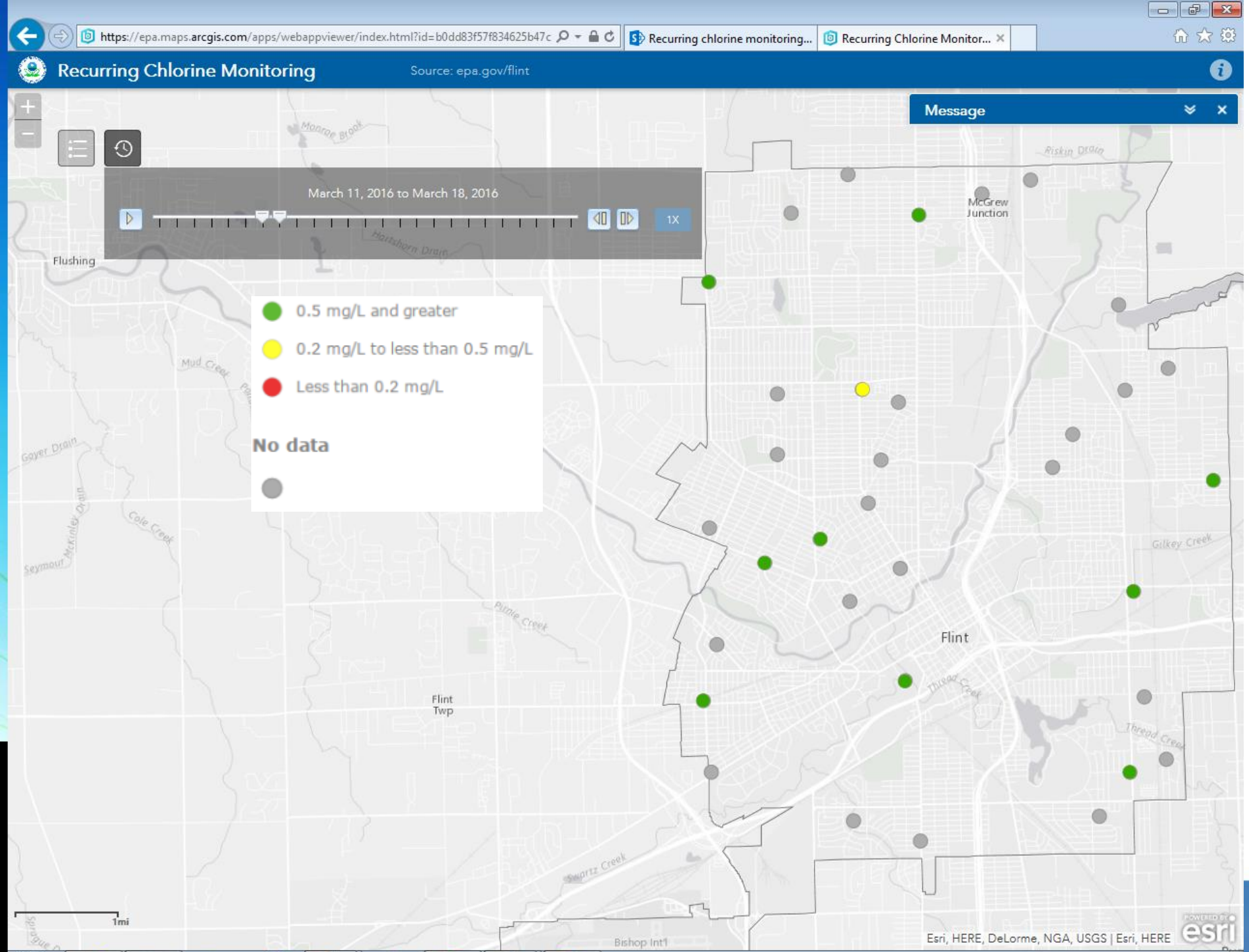
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Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
March 11, 2016 to March 18, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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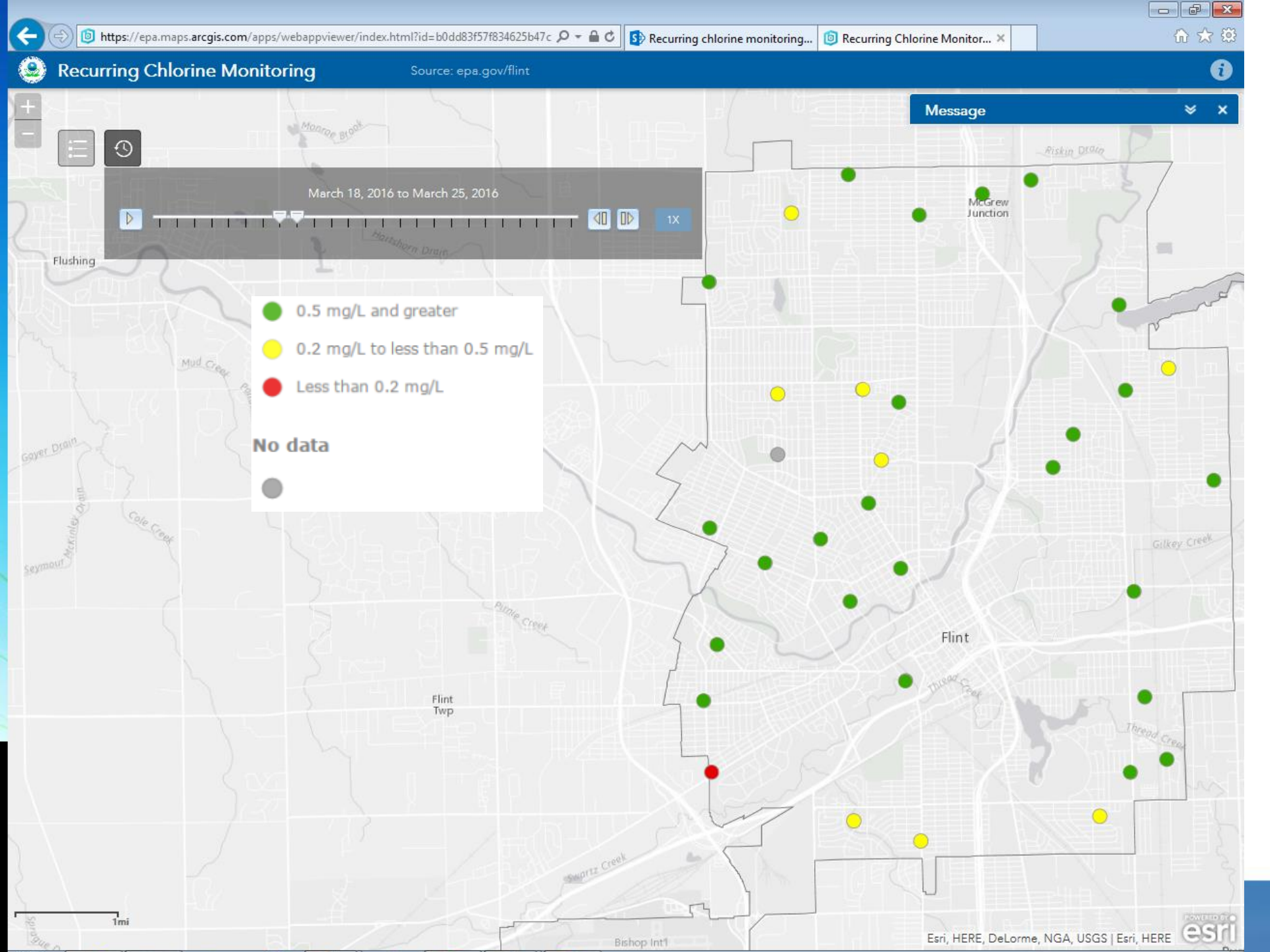
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Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
March 18, 2016 to March 25, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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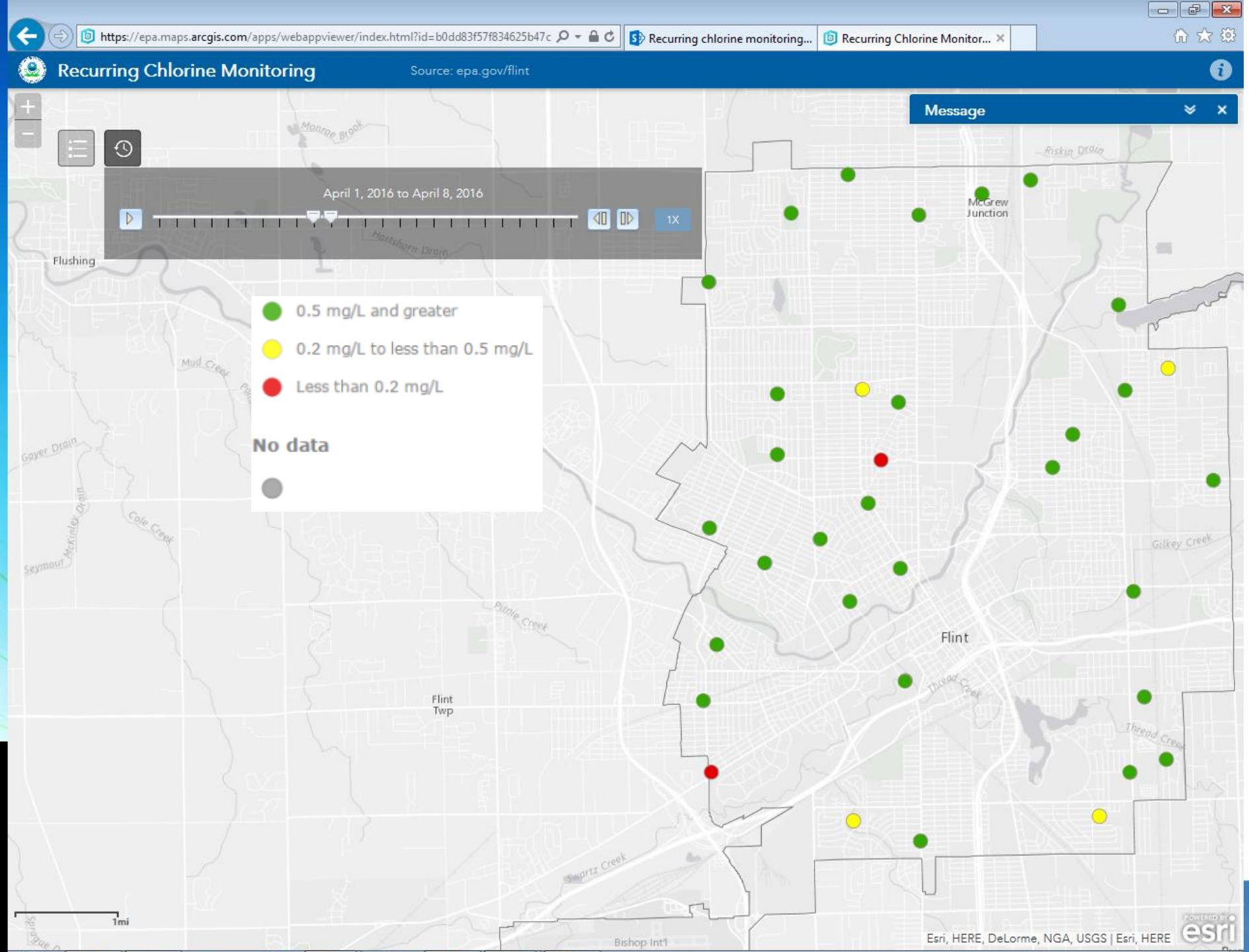
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Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
April 1, 2016 to April 8, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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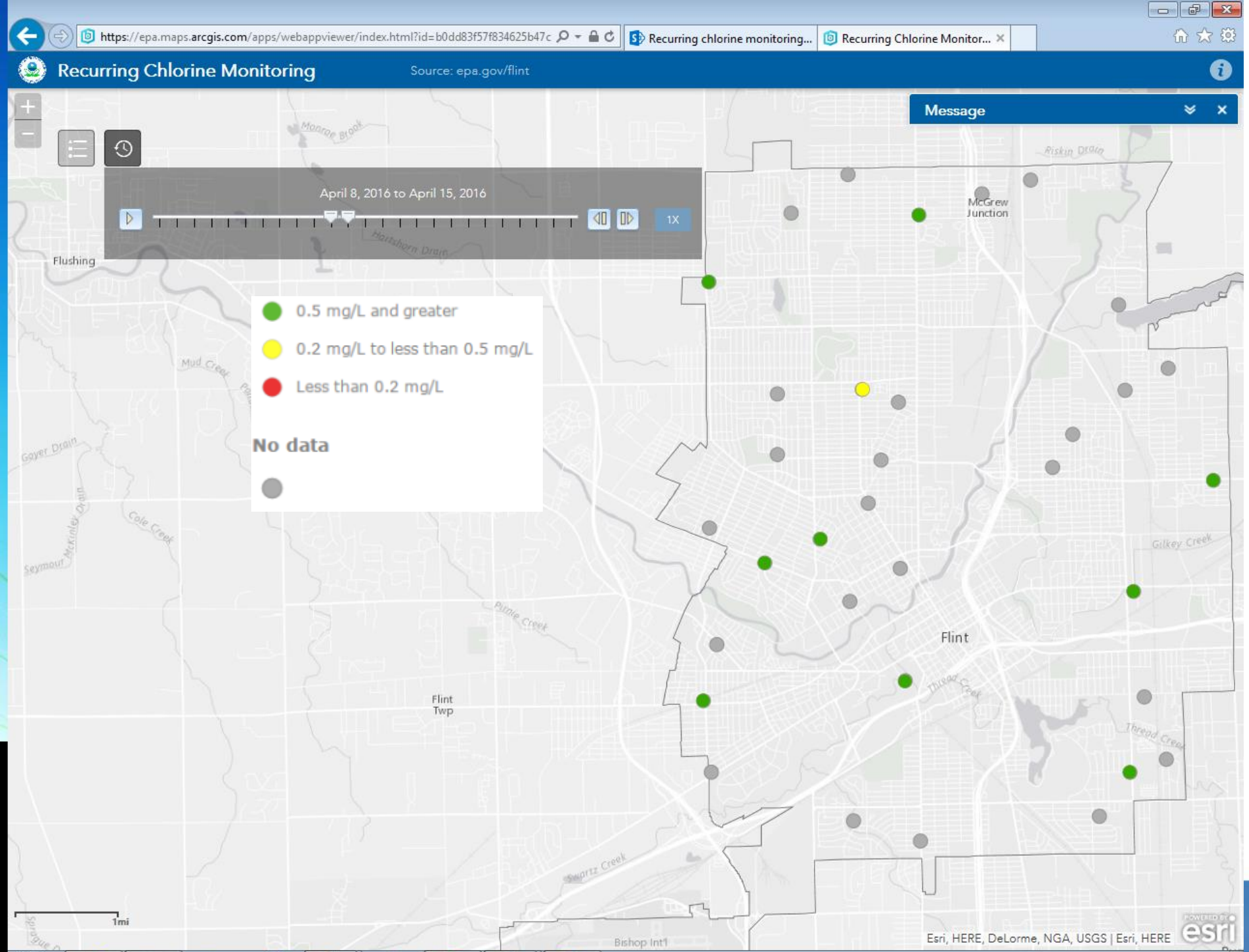
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Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
April 8, 2016 to April 15, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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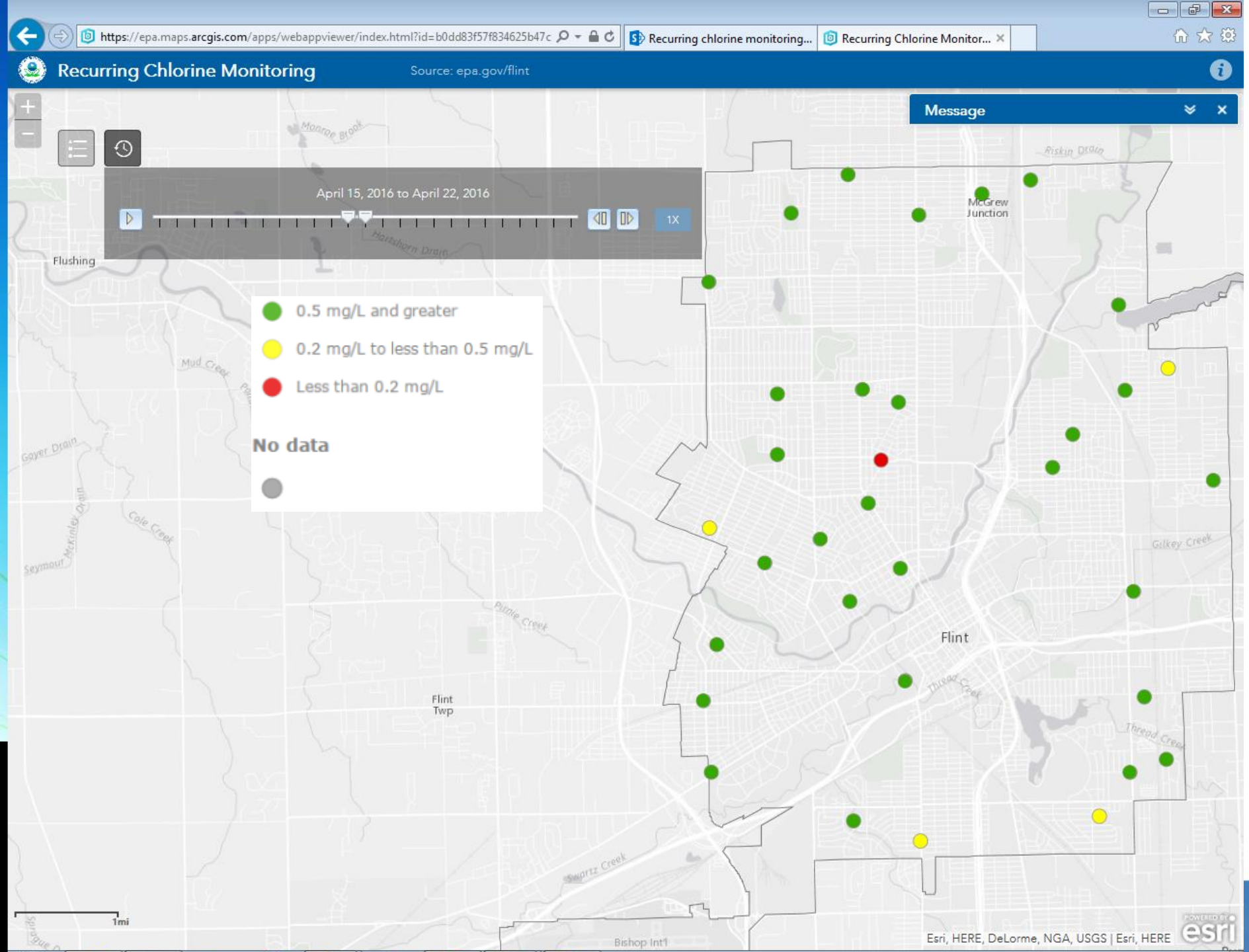
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Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
April 15, 2016 to April 22, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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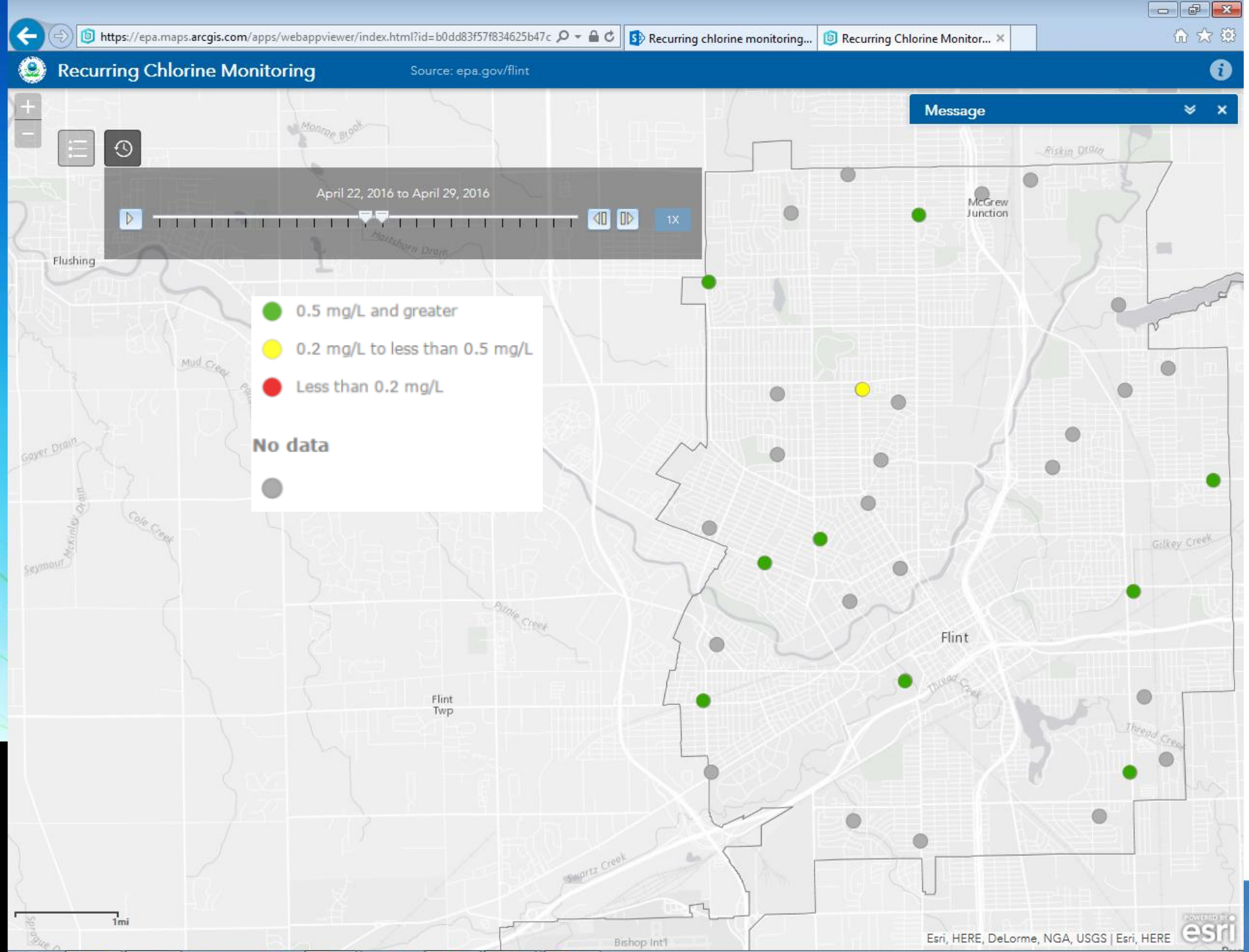
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Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
April 22, 2016 to April 29, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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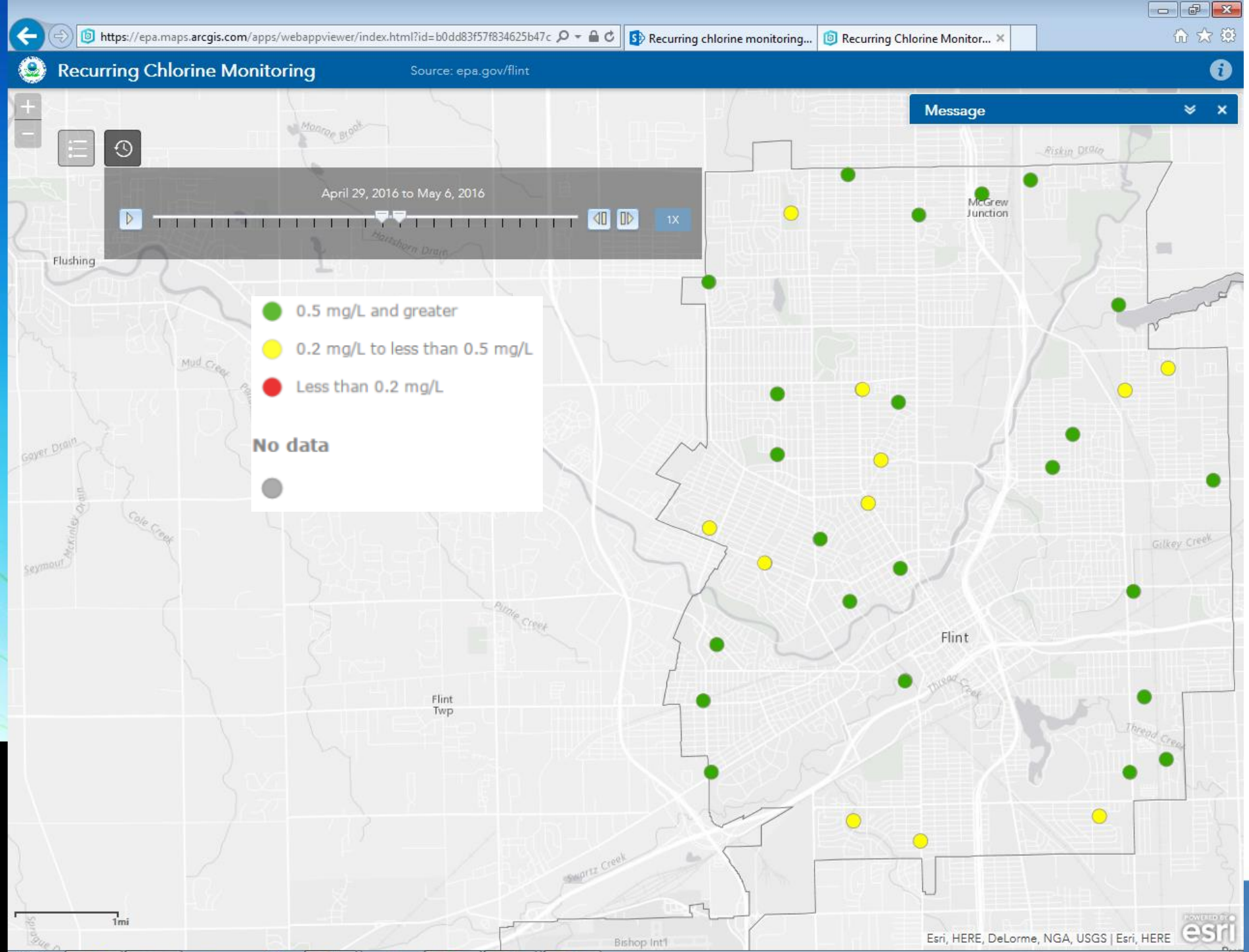
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Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
April 29, 2016 to May 6, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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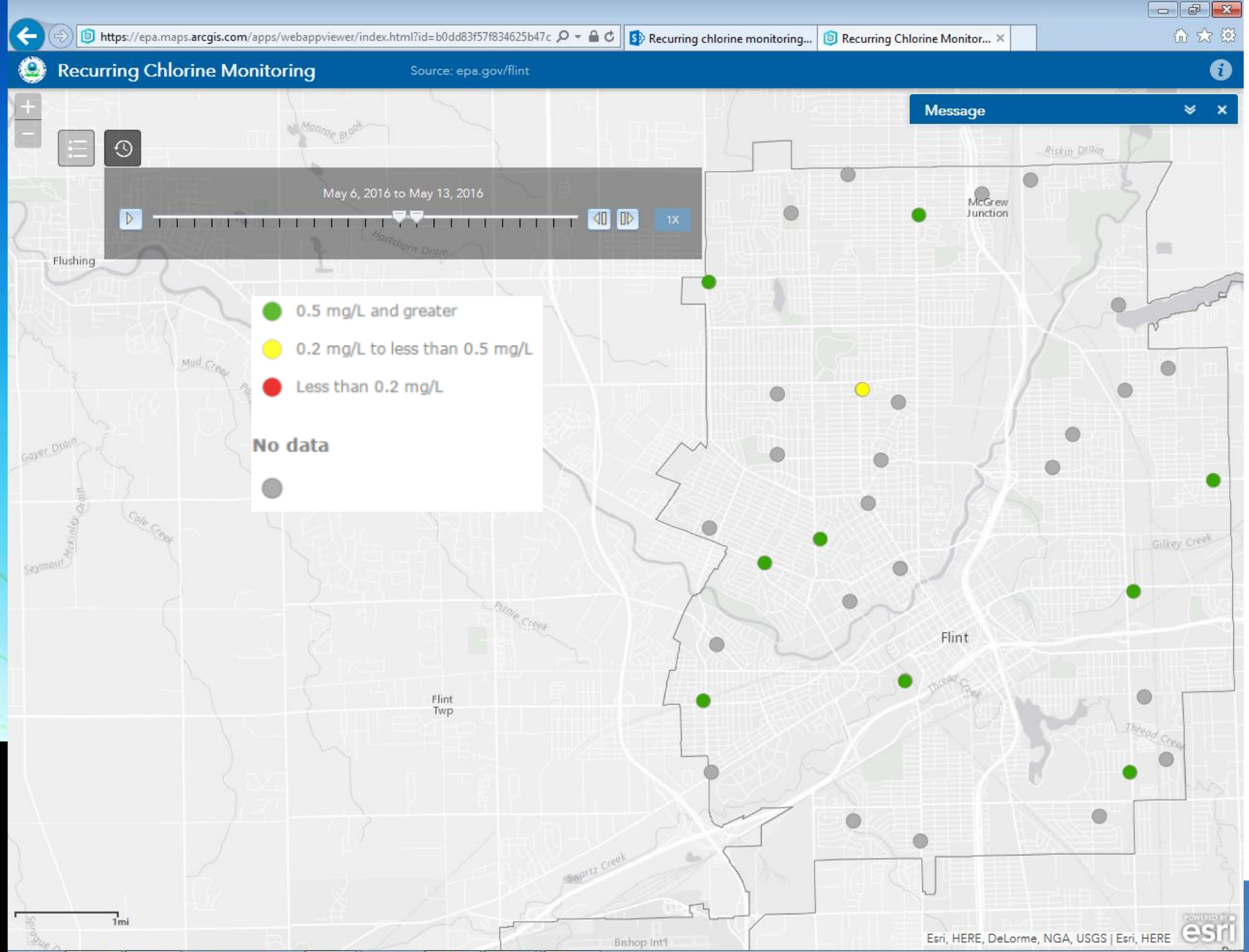
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Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
May 6, 2016 to May 13, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Bishop Int'l
1mi
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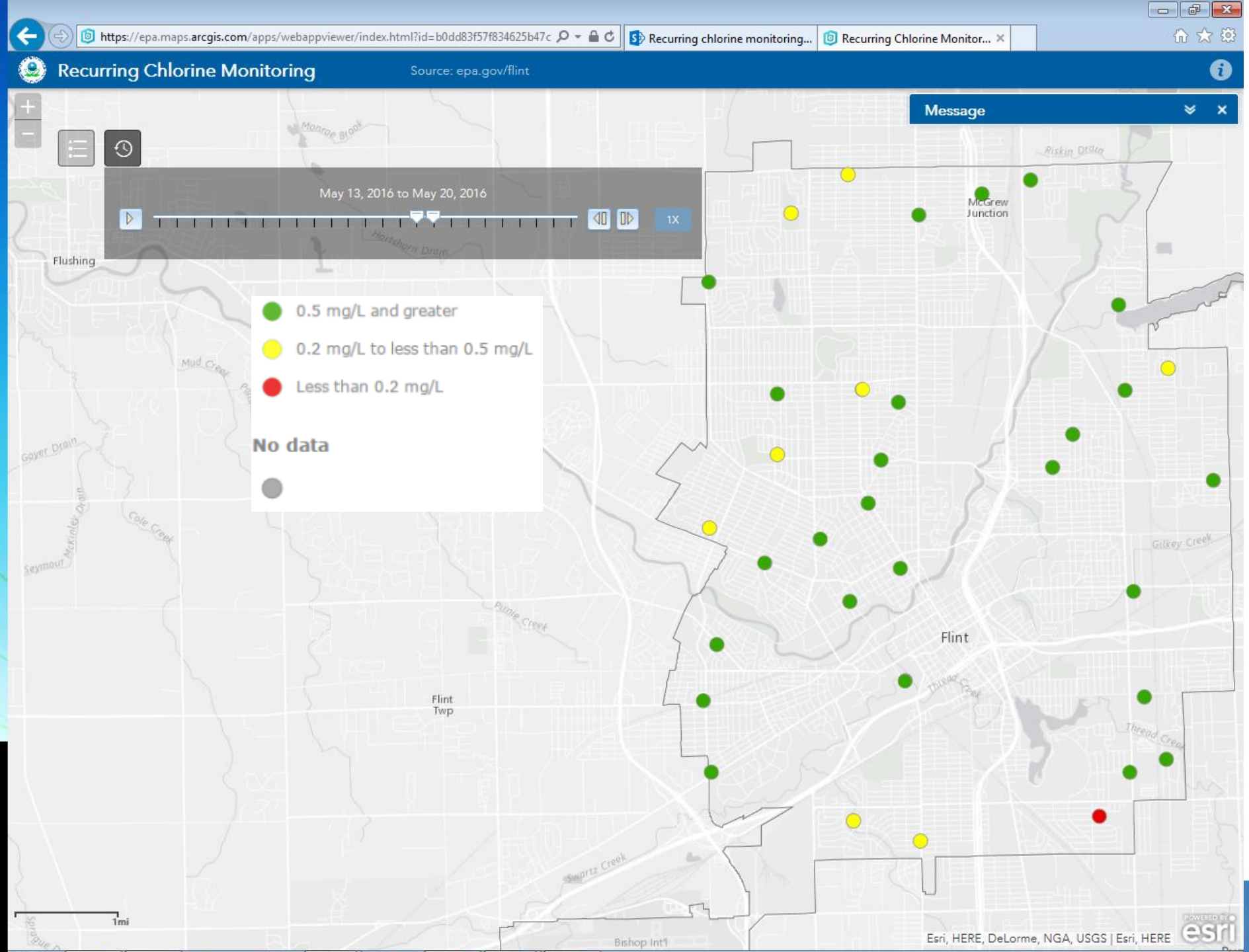
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Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
May 13, 2016 to May 20, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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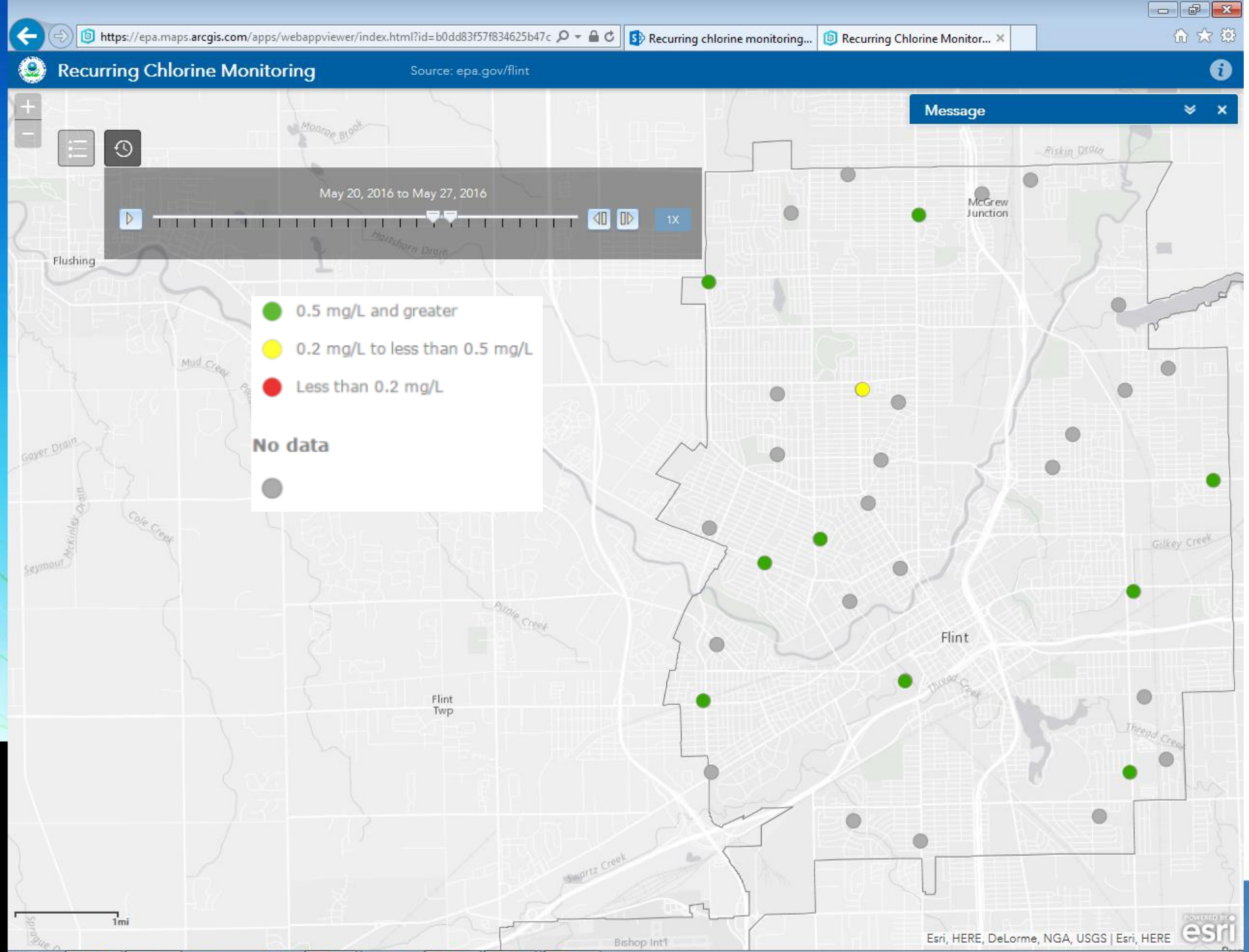
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Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
May 20, 2016 to May 27, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pimple Creek
Gilkey Creek
Thread Creek
Swartz Creek
Bishop Int'l
1mi
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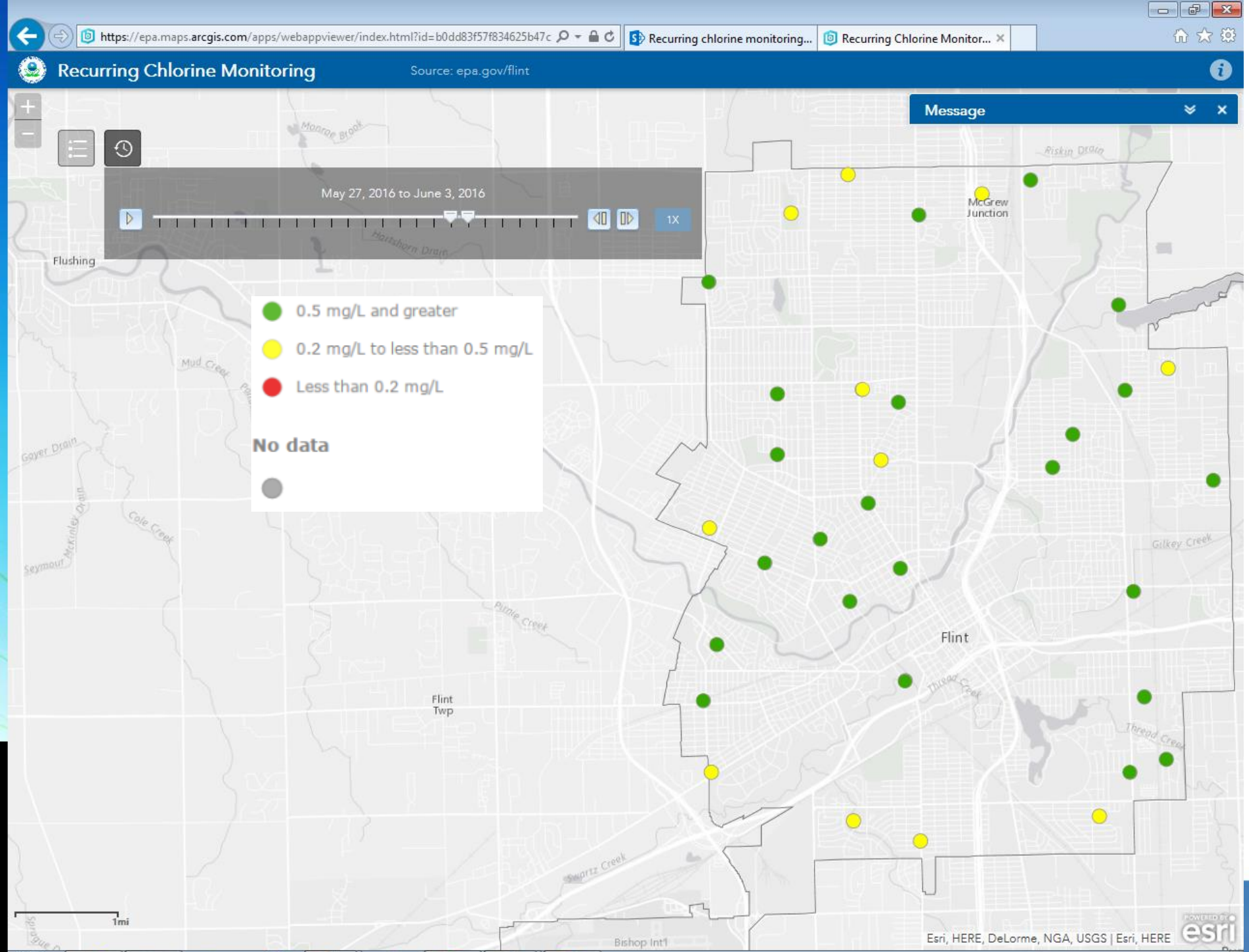
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Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
May 27, 2016 to June 3, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
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Recurring chlorine monitoring...

Recurring Chlorine Monitor...

Recurring Chlorine Monitoring

Source: epa.gov/flint

Message

June 3, 2016 to June 10, 2016

1X

0.5 mg/L and greater

0.2 mg/L to less than 0.5 mg/L

Less than 0.2 mg/L

No data

Monroe Brook

Riskin Drain

McGrew Junction

Flushing

Hartshorn Drain

Mud Creek

Goyer Drain

Seymour McKinley Drain

Cole Creek

Gilkey Creek

Pinnie Creek

Flint

Flint Twp

Thread Creek

Swartz Creek

Bishop Int'l

1mi

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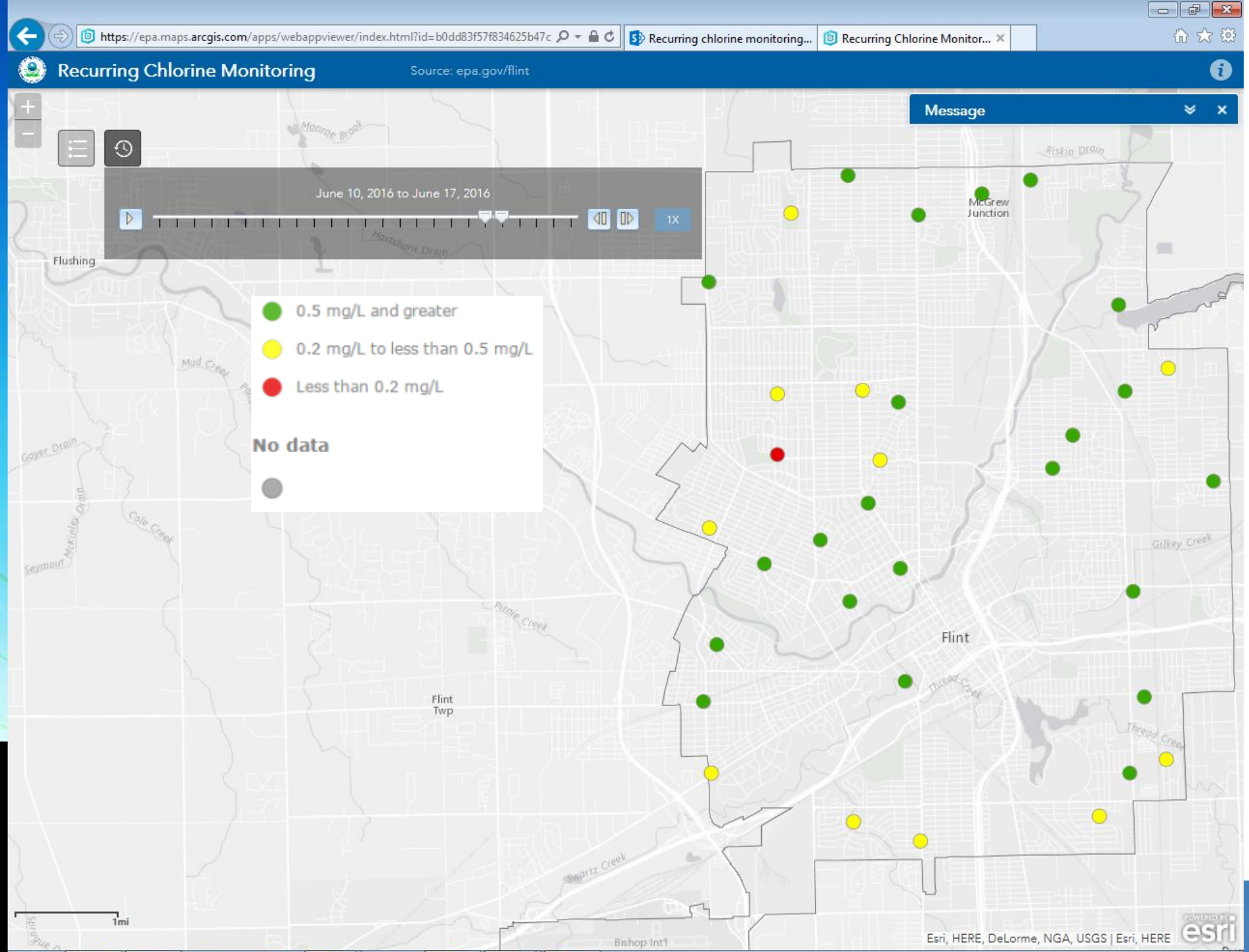
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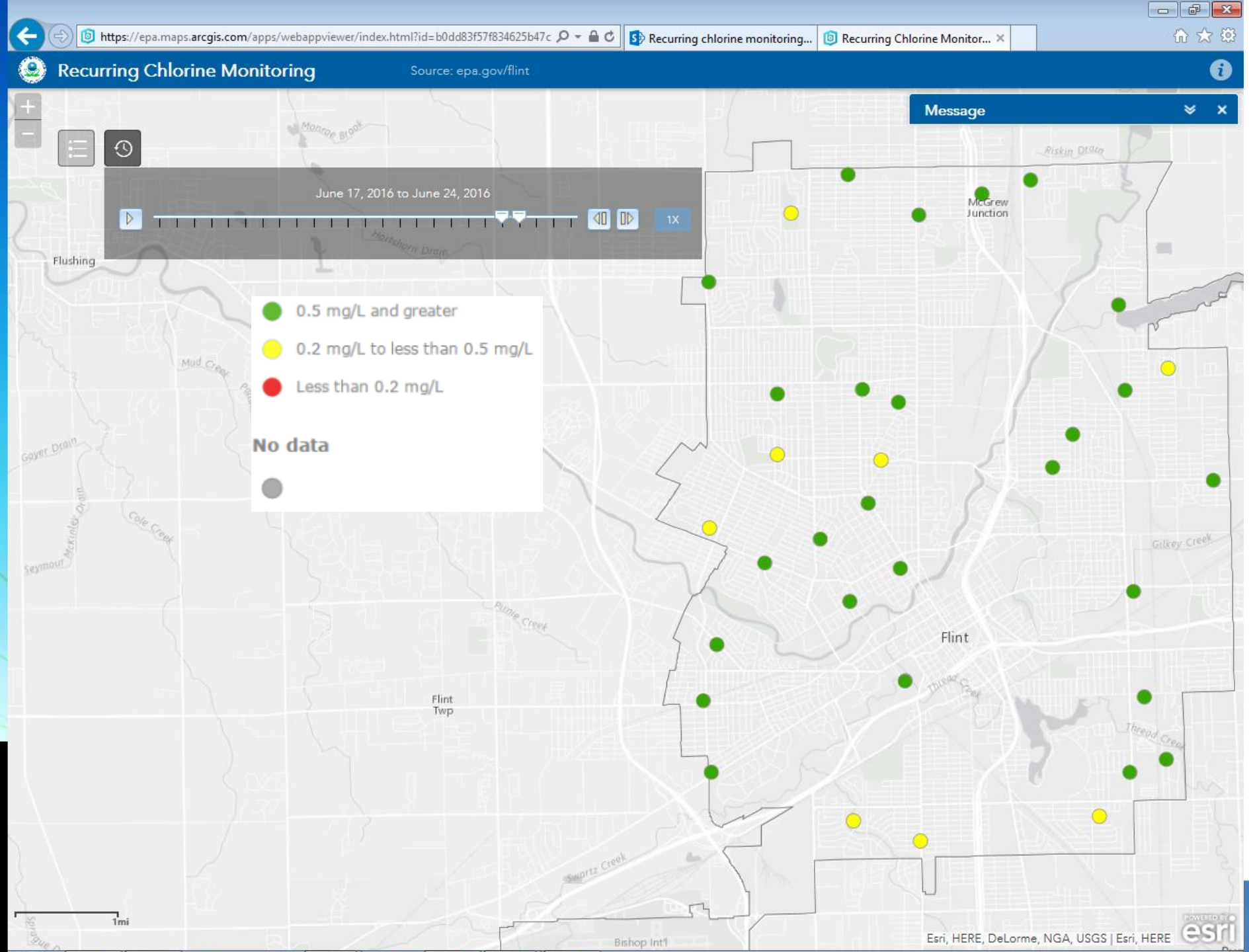
Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
June 10, 2016 to June 17, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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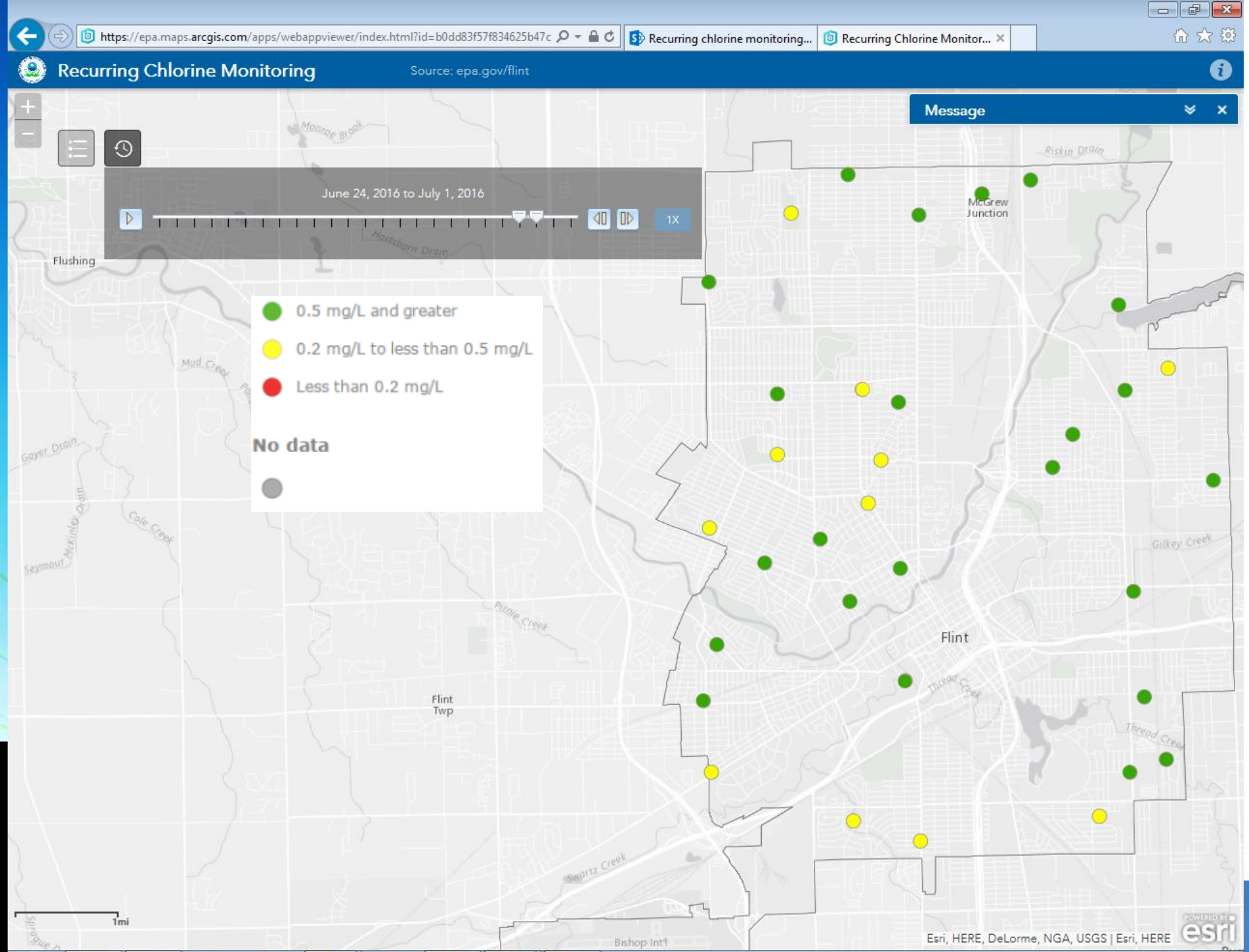
Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
June 17, 2016 to June 24, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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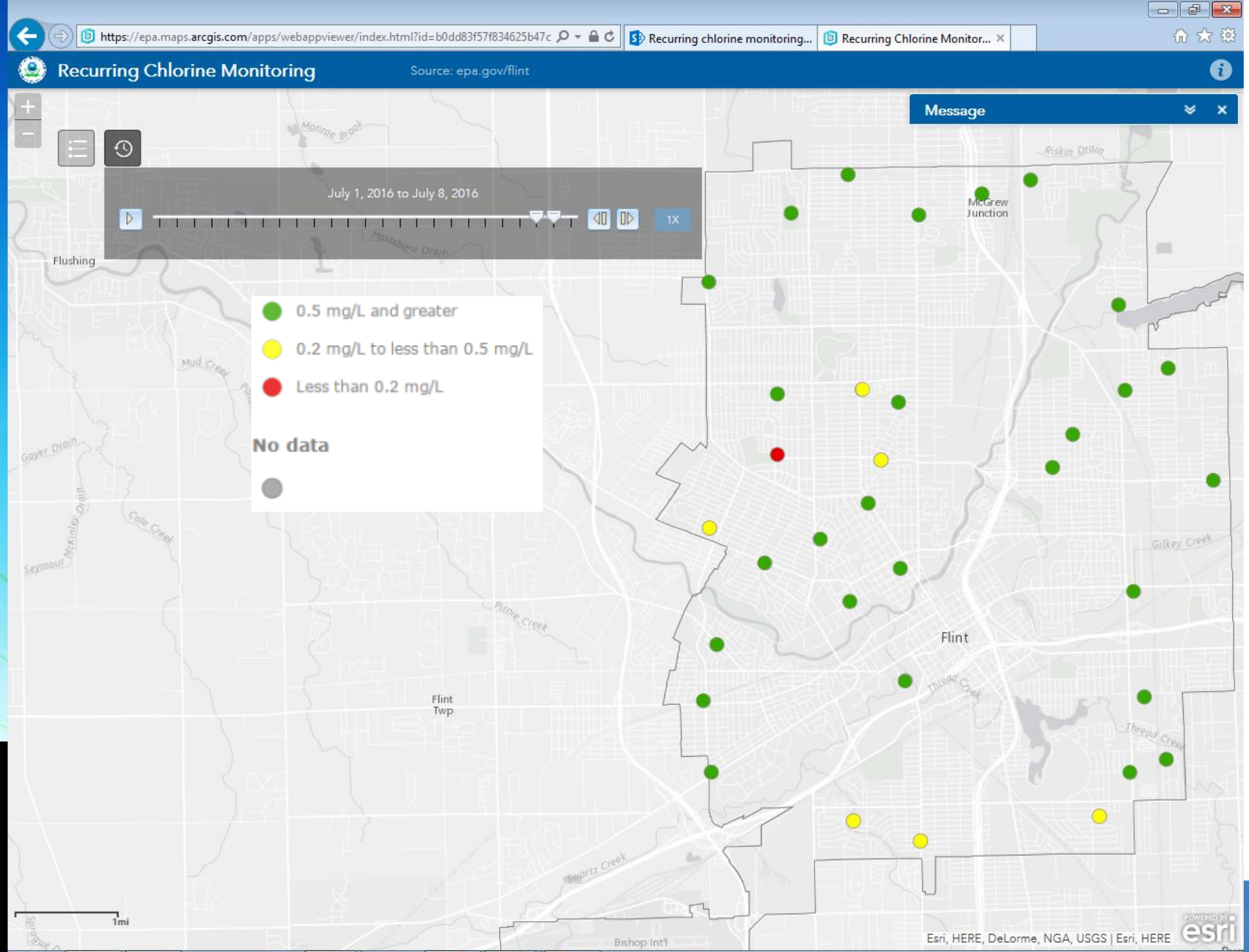
Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
June 24, 2016 to July 1, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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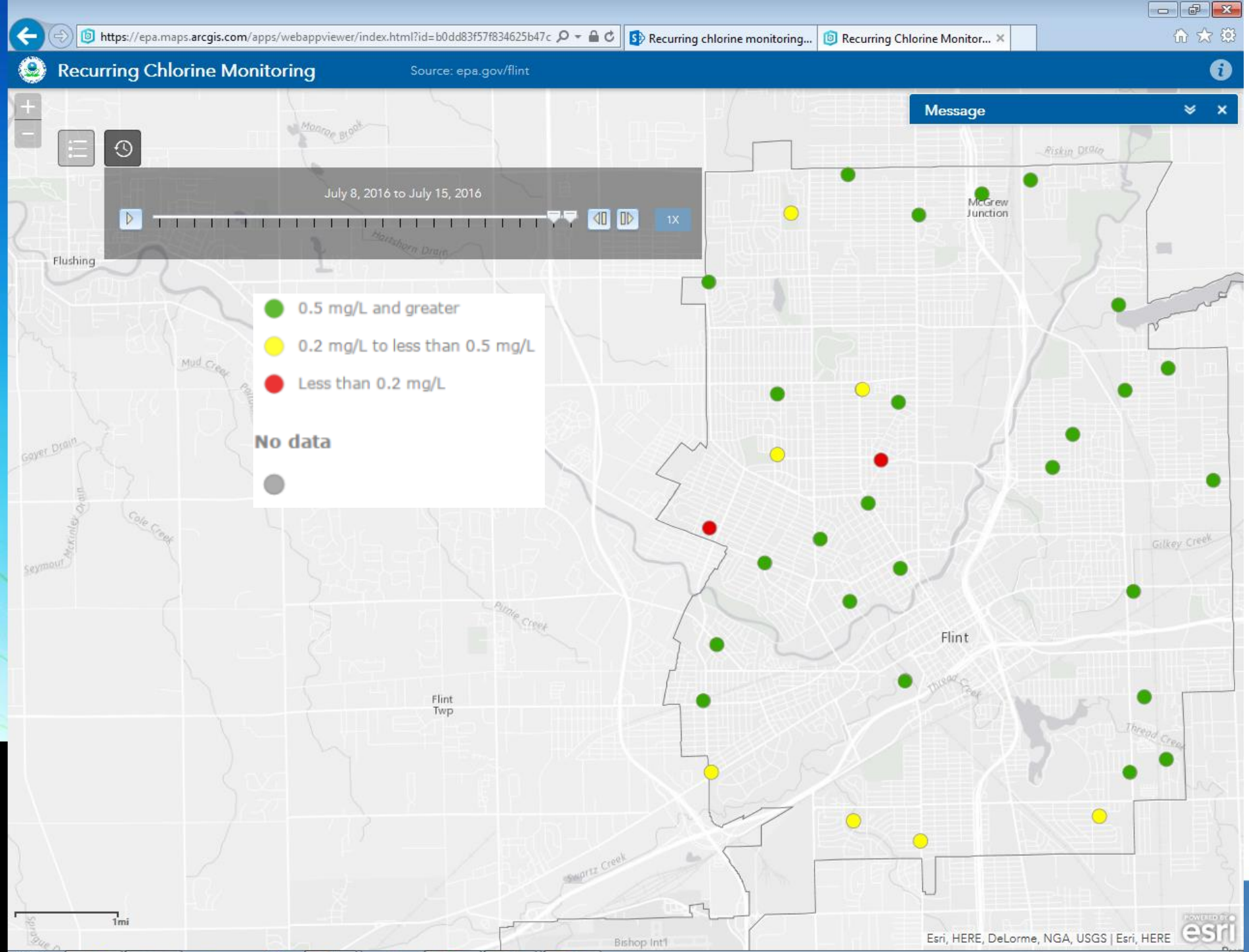
Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
July 1, 2016 to July 8, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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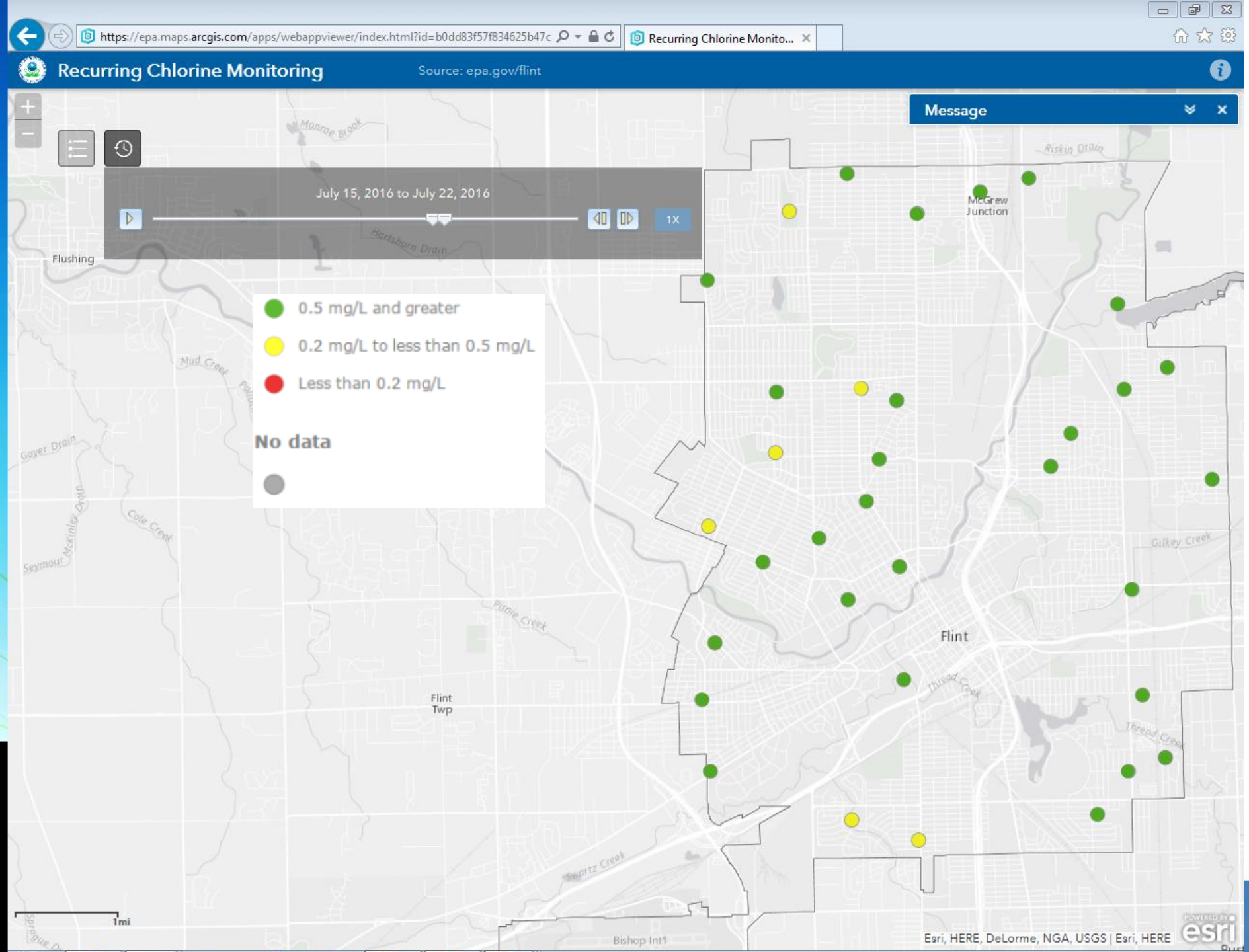
Recurring chlorine monitoring...
Recurring Chlorine Monitor...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
July 8, 2016 to July 15, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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Recurring Chlorine Monito...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
July 15, 2016 to July 22, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pittrie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Bishop Int'l
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE

https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=b0dd83f57f834625b47c

Recurring Chlorine Monito...

Recurring Chlorine Monitoring

Source: epa.gov/flint

Message

July 22, 2016 to July 29, 2016

1X

0.5 mg/L and greater

0.2 mg/L to less than 0.5 mg/L

Less than 0.2 mg/L

No data

Flushing

McGrew Junction

Flint

Flint Twp

Monroe Brook

Riskin Drain

Hartshorn Drain

Mud Creek

Gover Drain

Seymour McKinley Drain

Cole Creek

Pittnie Creek

Gilkey Creek

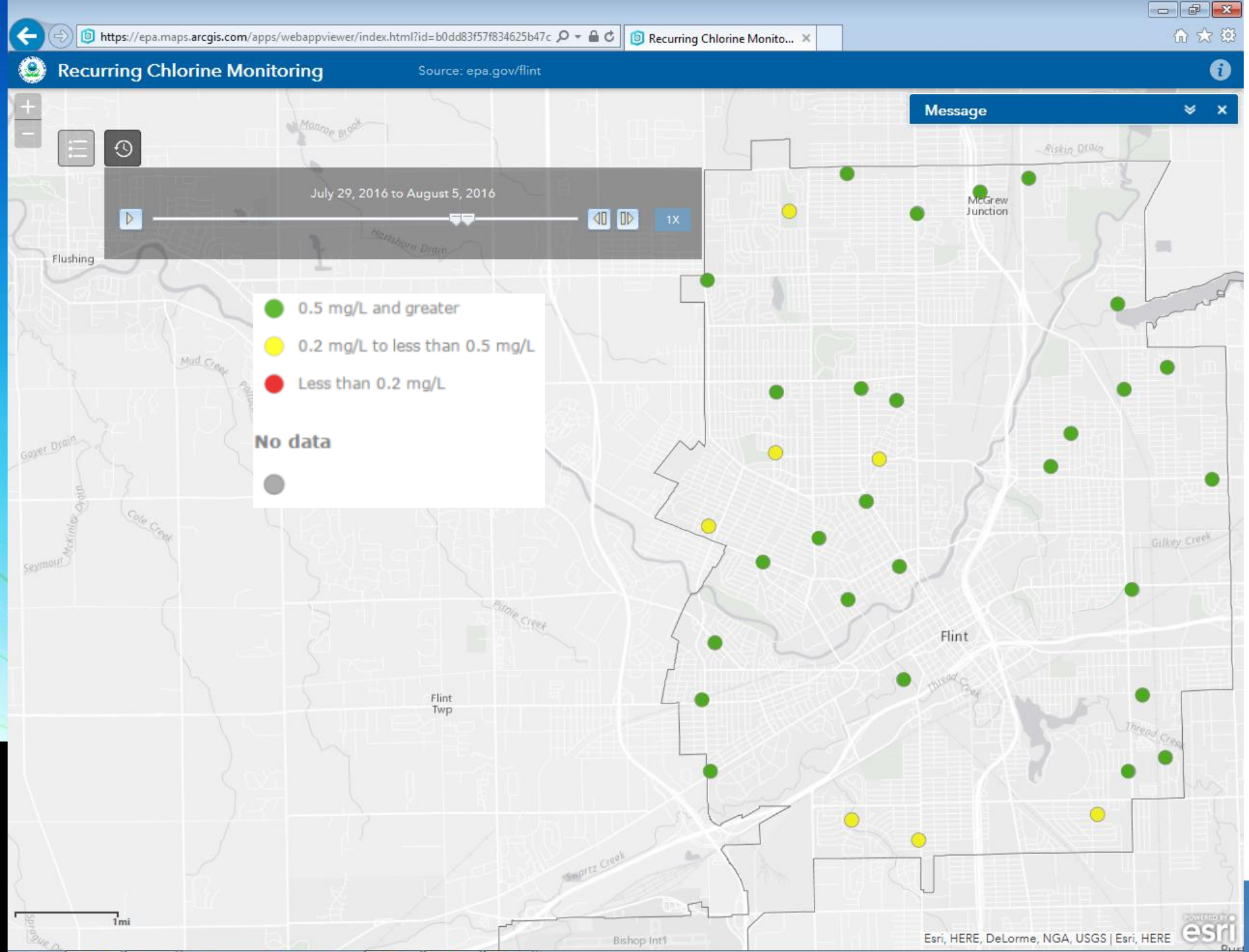
Thread Creek

Swartz Creek

Bishop Int'l

1mi

Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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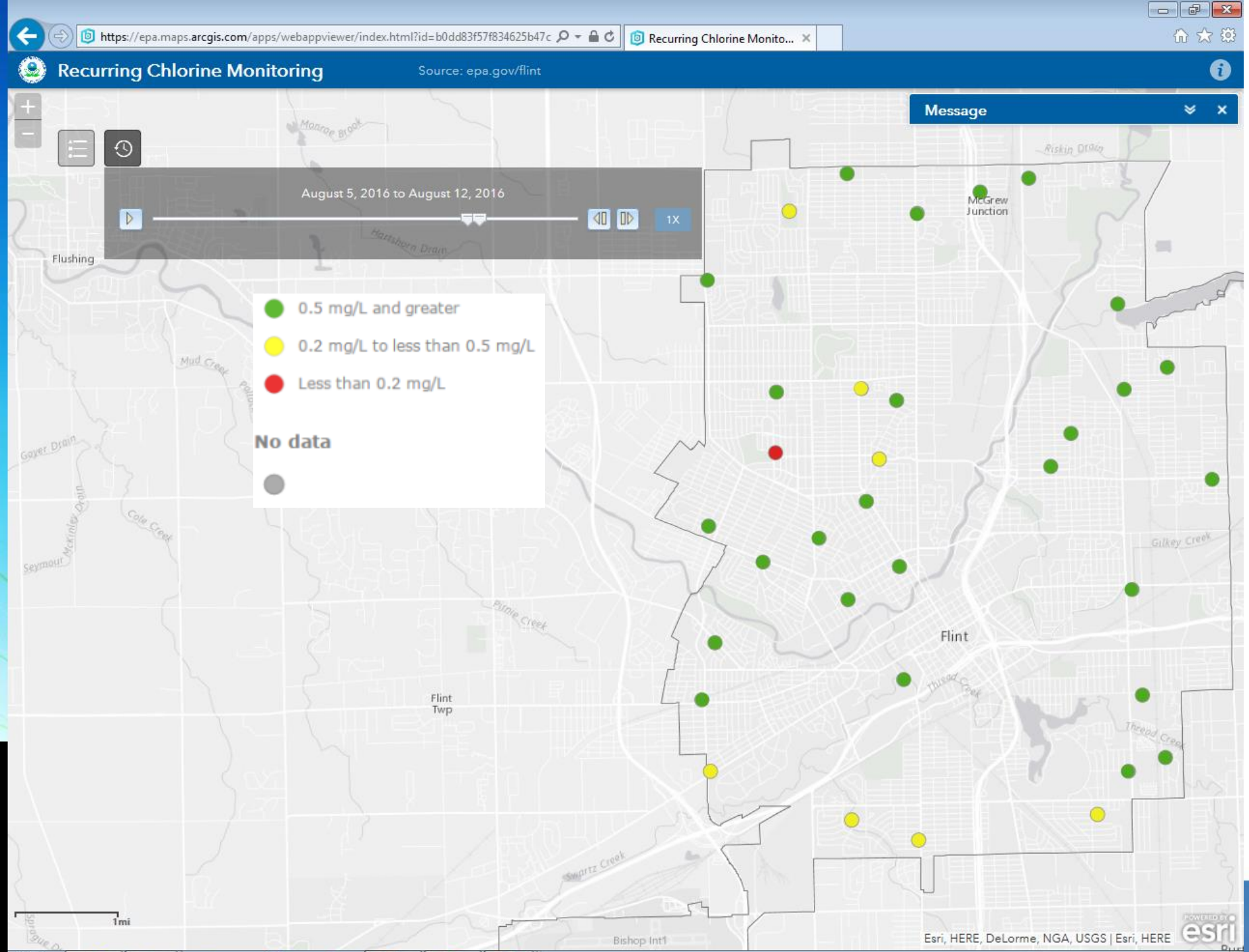
Recurring Chlorine Monito...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
July 29, 2016 to August 5, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pittrie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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Recurring Chlorine Monito...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
August 5, 2016 to August 12, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pittnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Bishop Int'l
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE

https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=b0dd83f57f834625b47c

Recurring Chlorine Monito...

Recurring Chlorine Monitoring

Source: epa.gov/flint

Message

August 12, 2016 to August 19, 2016

1X

0.5 mg/L and greater

0.2 mg/L to less than 0.5 mg/L

Less than 0.2 mg/L

No data

Flushing

McGrew Junction

Flint

Flint Twp

Monroe Brook

Riskin Drain

Hartshorn Drain

Mud Creek

Gover Drain

Seymour McKinley Drain

Cole Creek

Pittnie Creek

Gilkey Creek

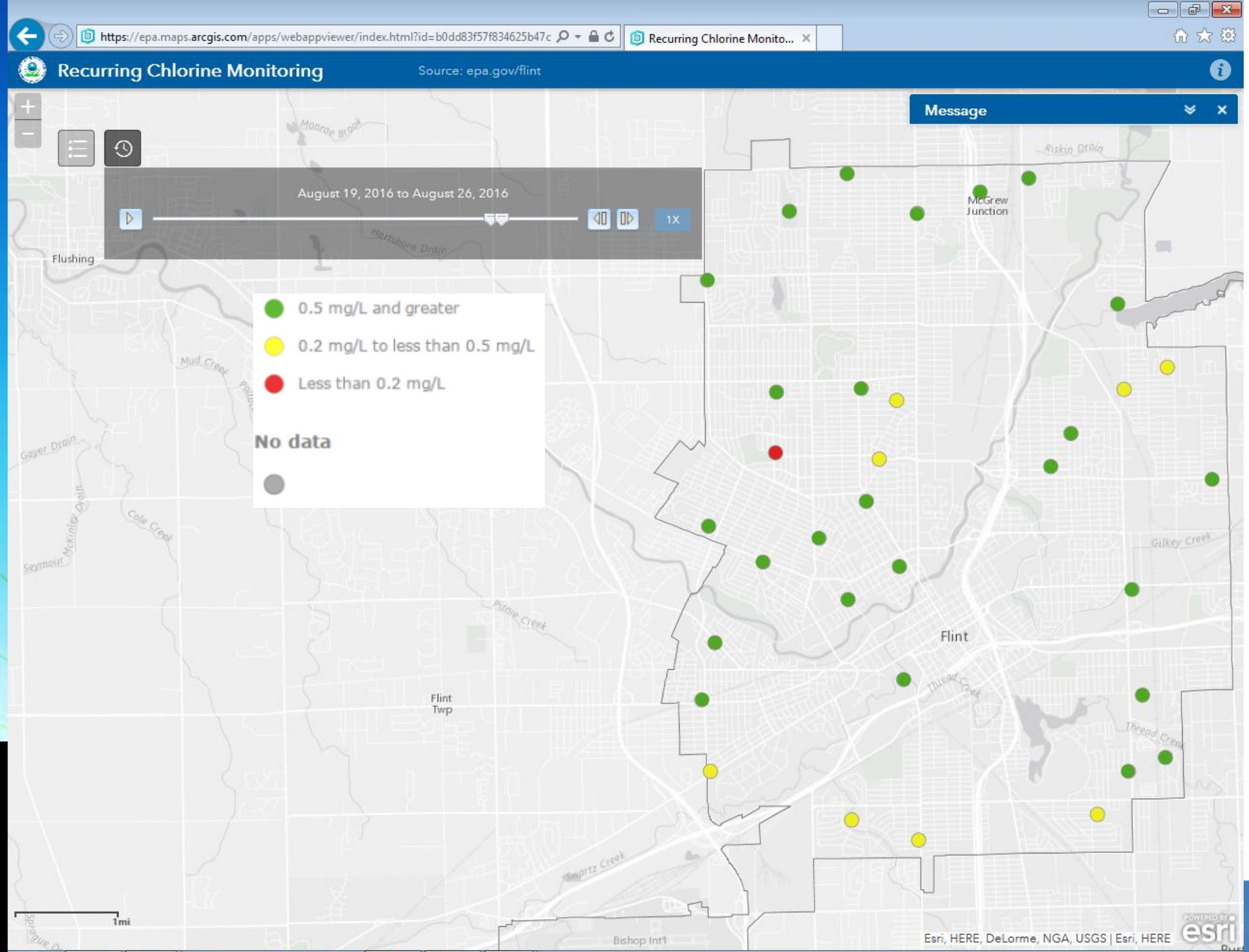
Thread Creek

Swartz Creek

Bishop Int'l

1mi

Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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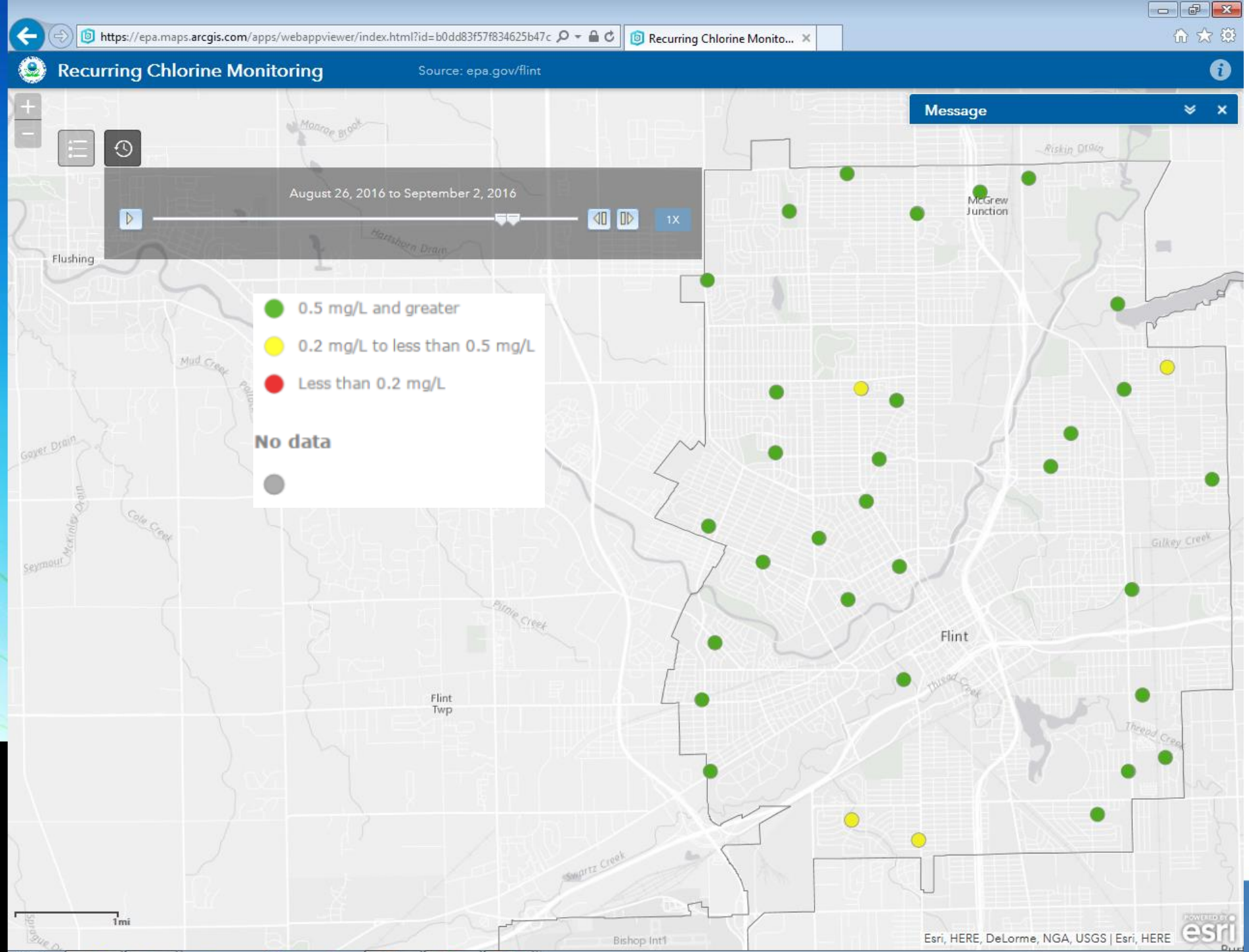
Recurring Chlorine Monito...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
August 19, 2016 to August 26, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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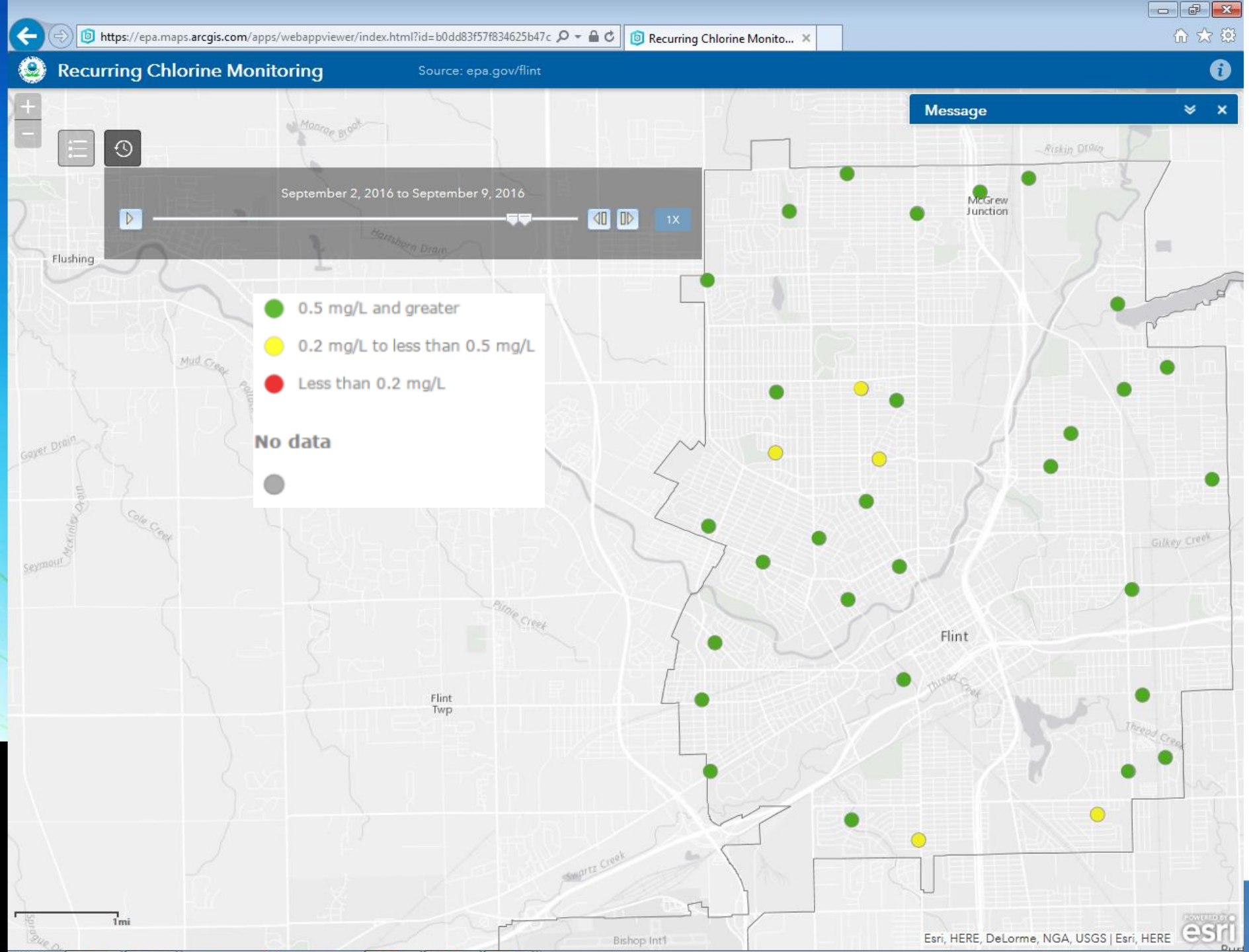
Recurring Chlorine Monito...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
August 26, 2016 to September 2, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pittnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Bishop Int'l
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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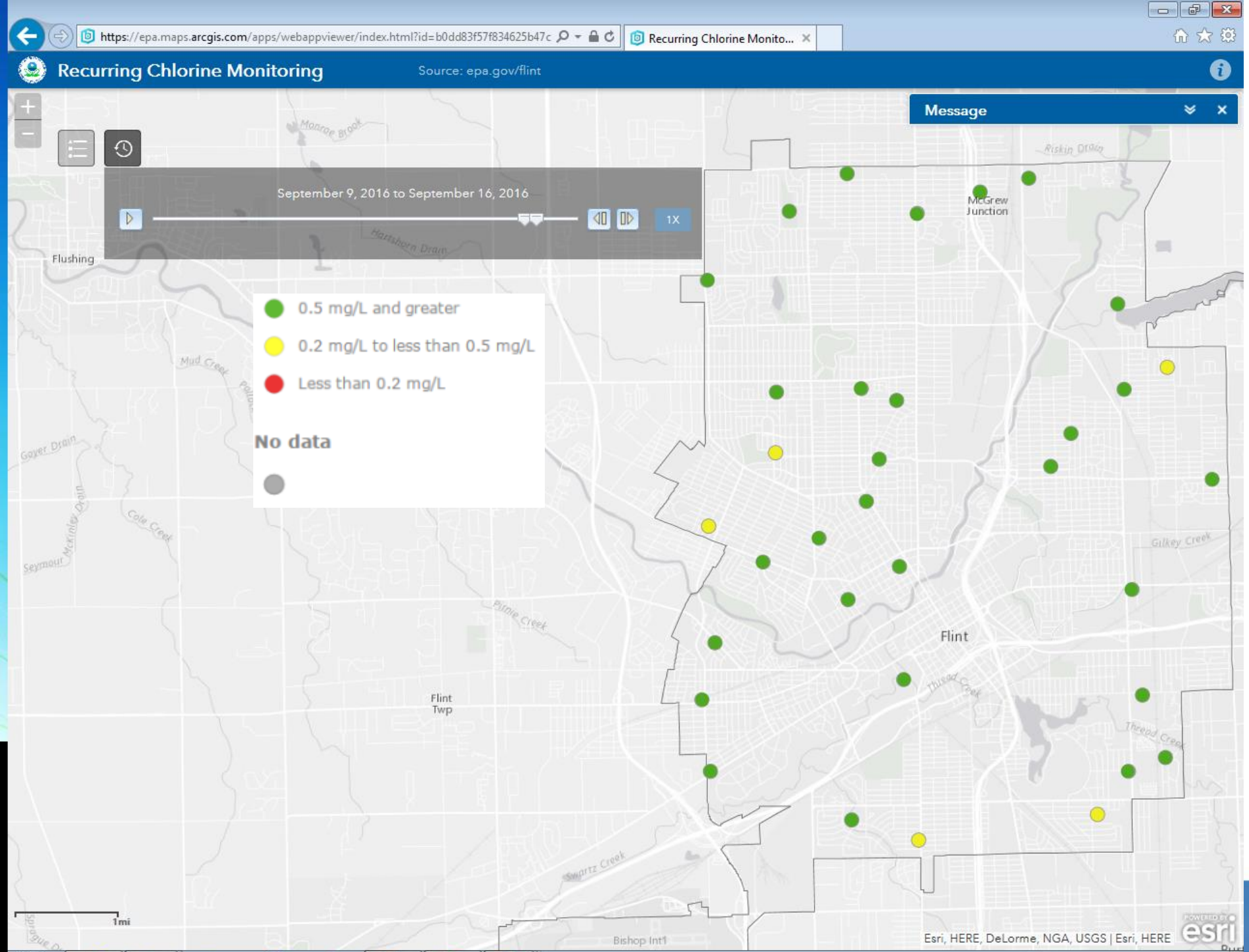
Recurring Chlorine Monito...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
September 2, 2016 to September 9, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pittnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Bishop Int'l
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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Recurring Chlorine Monito...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
September 9, 2016 to September 16, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pittnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE

https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=b0dd83f57f834625b47c

Recurring Chlorine Monito...

Recurring Chlorine Monitoring

Source: epa.gov/flint

Message

September 16, 2016 to September 23, 2016

1X

0.5 mg/L and greater

0.2 mg/L to less than 0.5 mg/L

Less than 0.2 mg/L

No data

Flushing

McGrew Junction

Flint

Flint Twp

Monroe Brook

Riskin Drain

Hartshorn Drain

Mud Creek

Gover Drain

Seymour McKinley Drain

Cole Creek

Pittnie Creek

Gilkey Creek

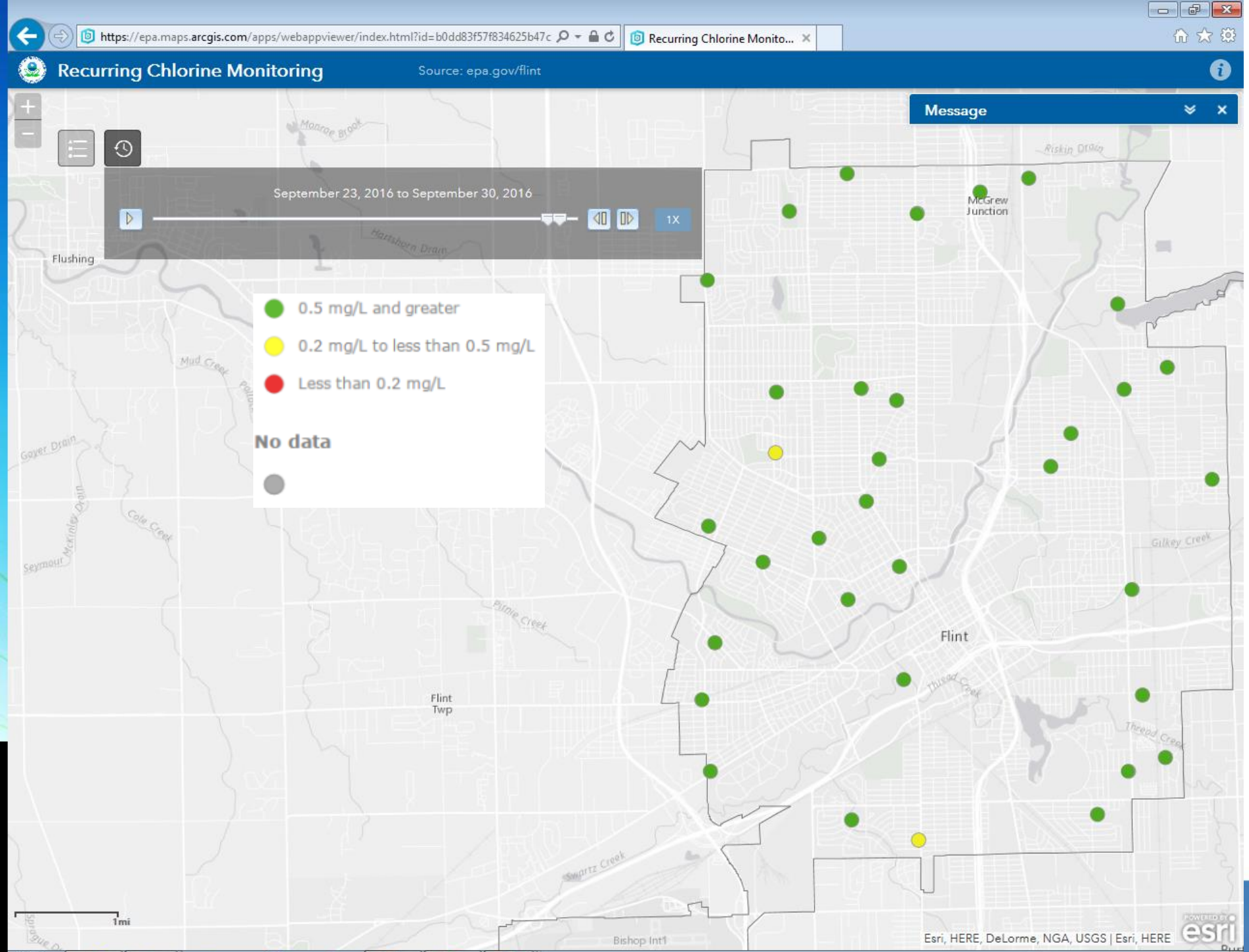
Thread Creek

Swartz Creek

Bishop Int'l

1mi

Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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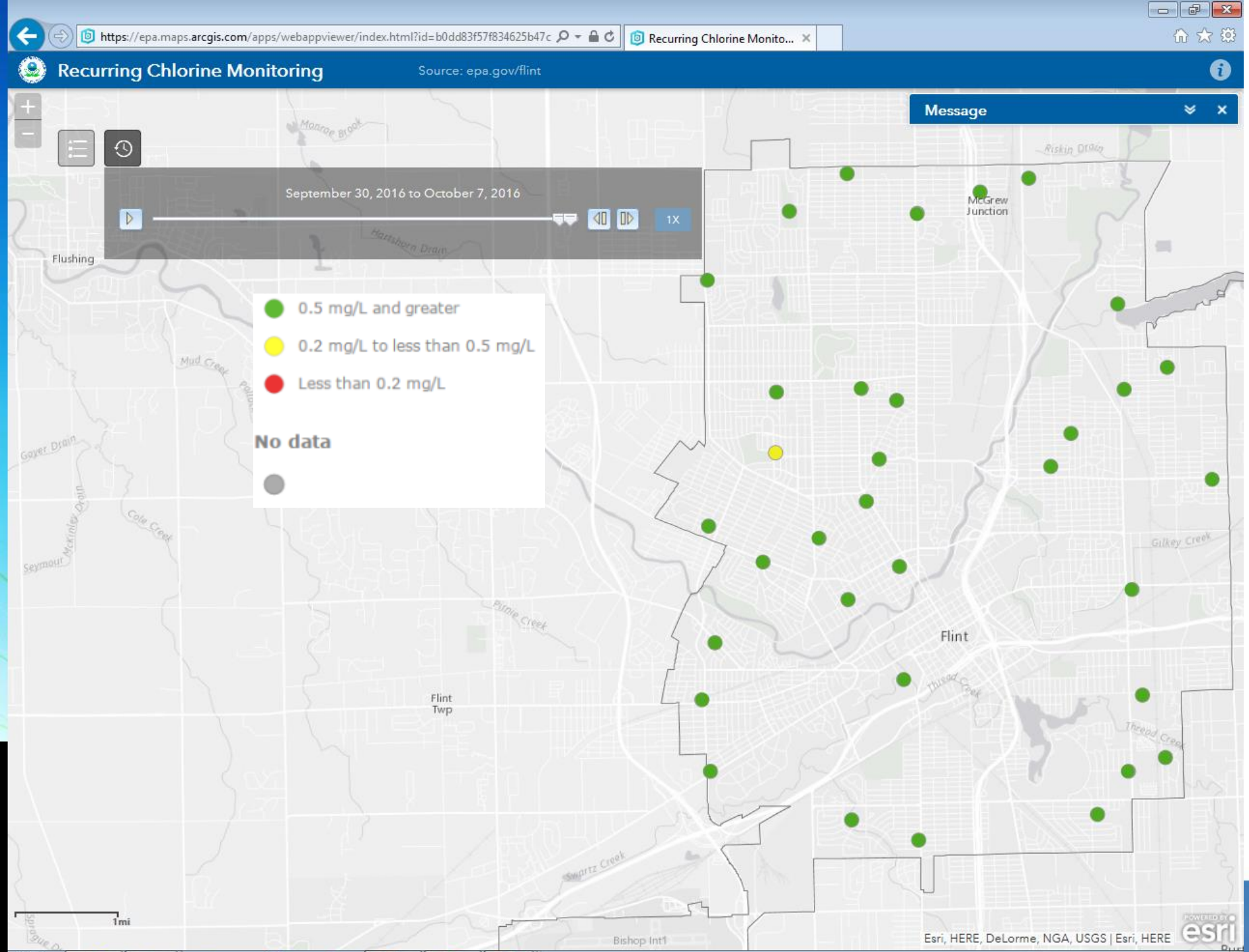
Recurring Chlorine Monito...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
September 23, 2016 to September 30, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Bishop Int'l
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pittnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE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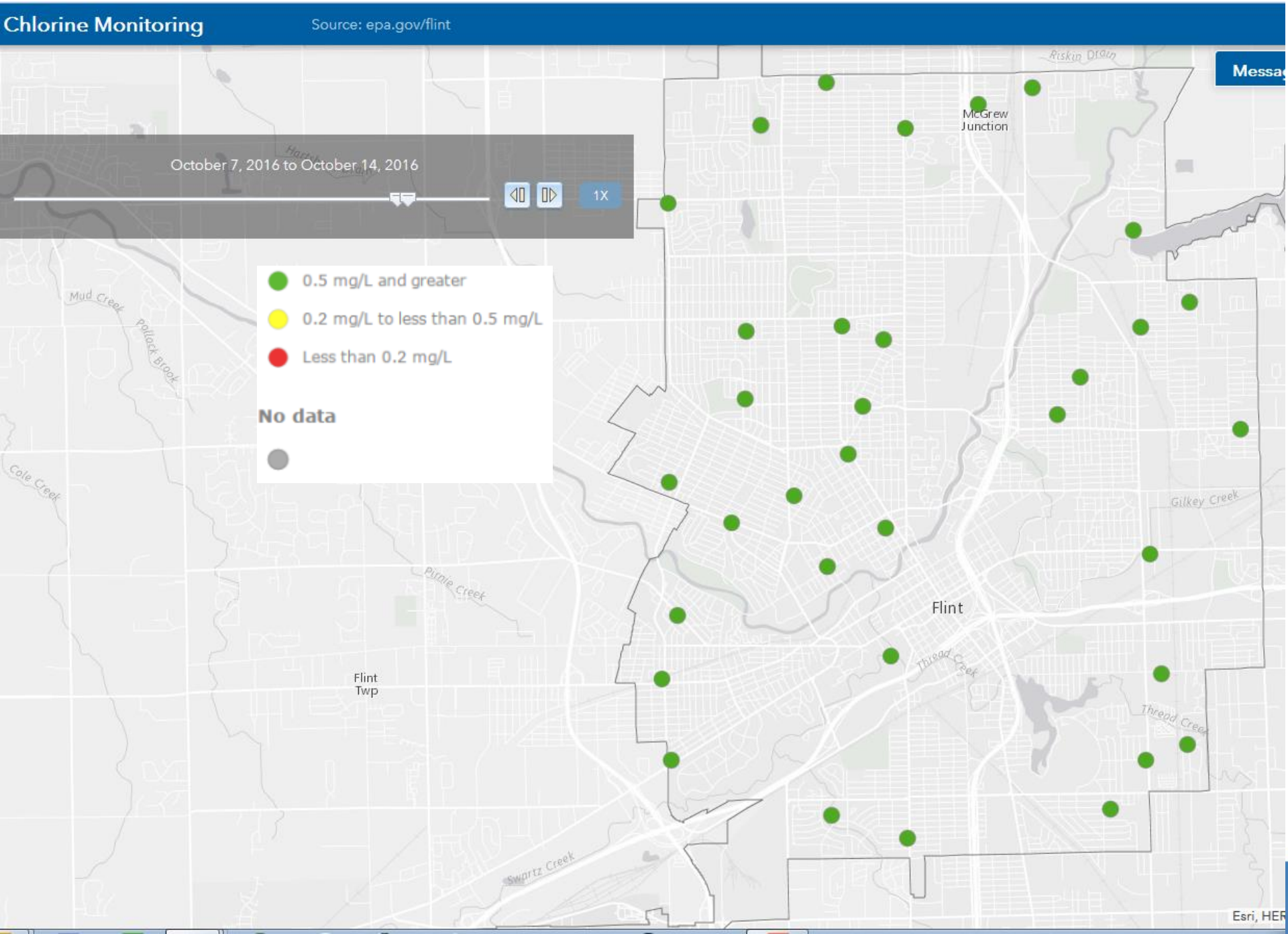
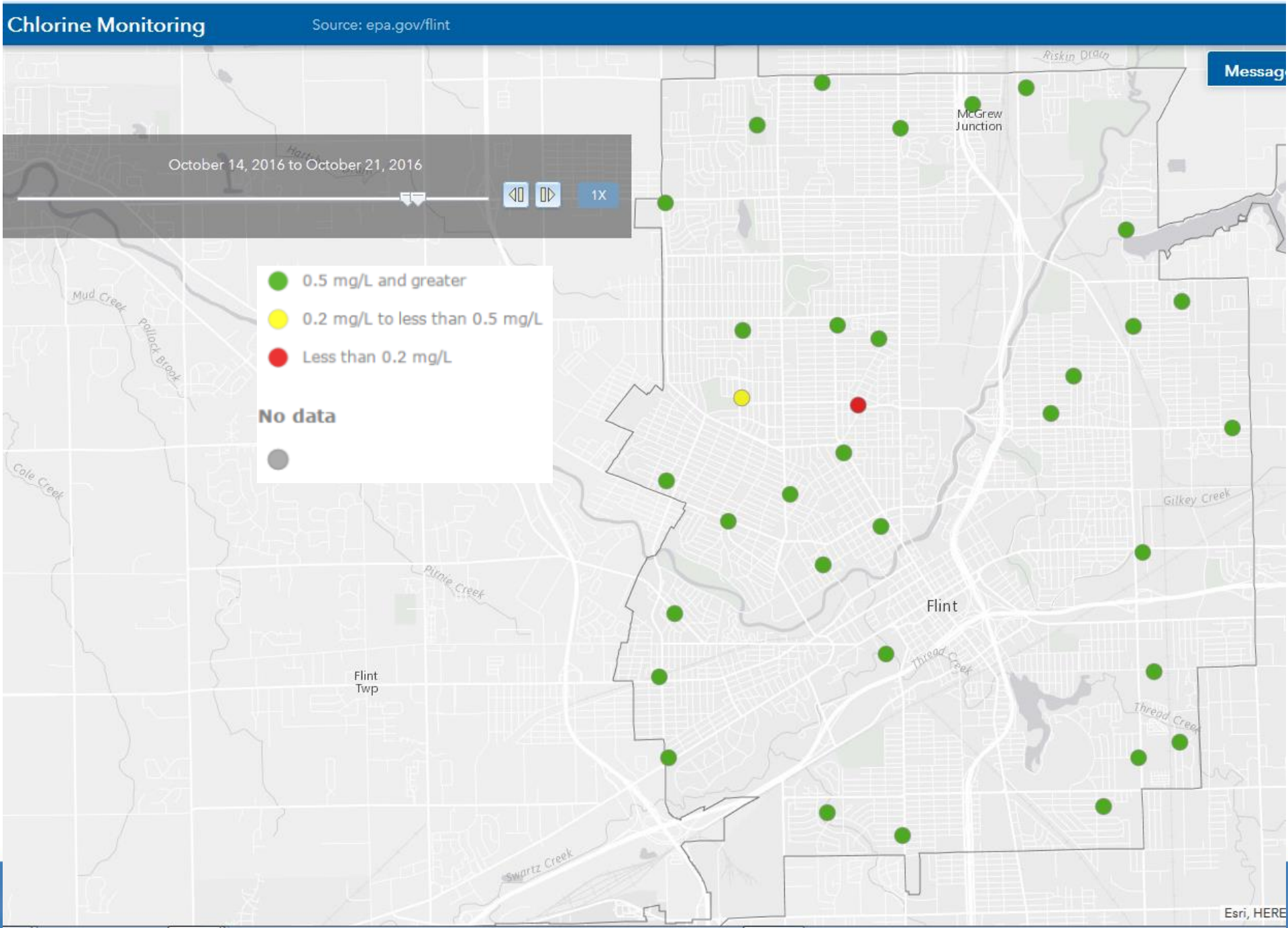
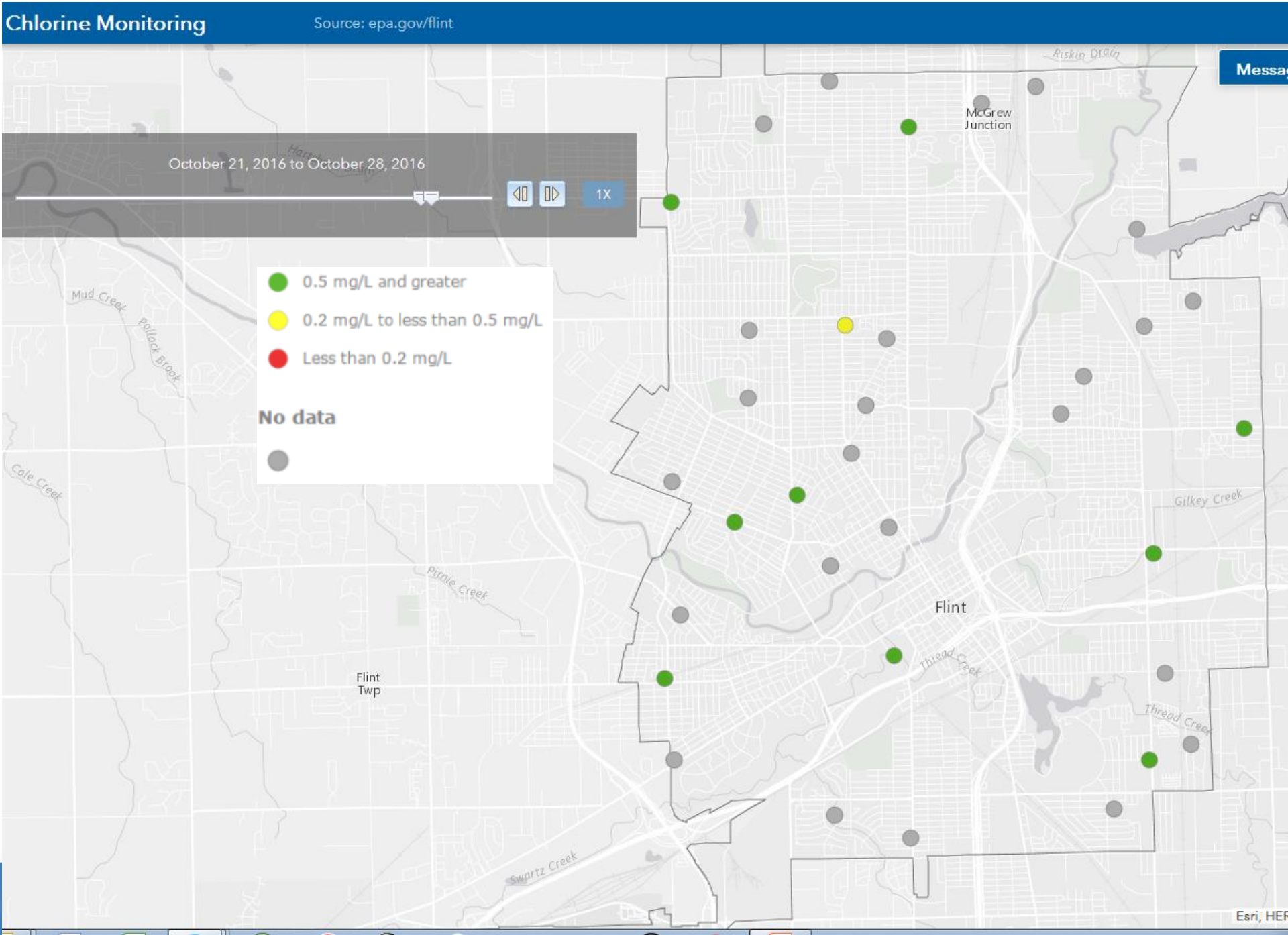
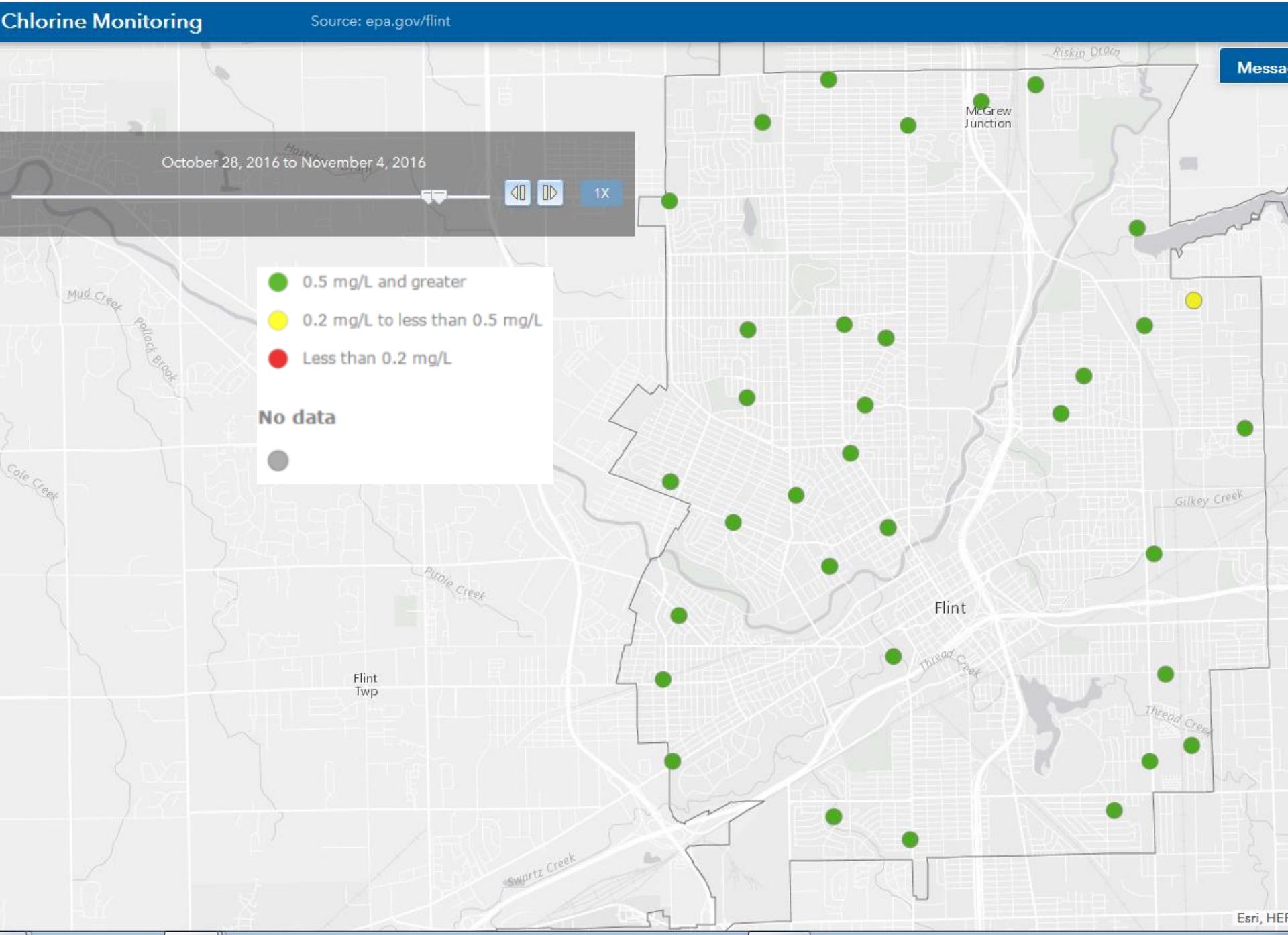
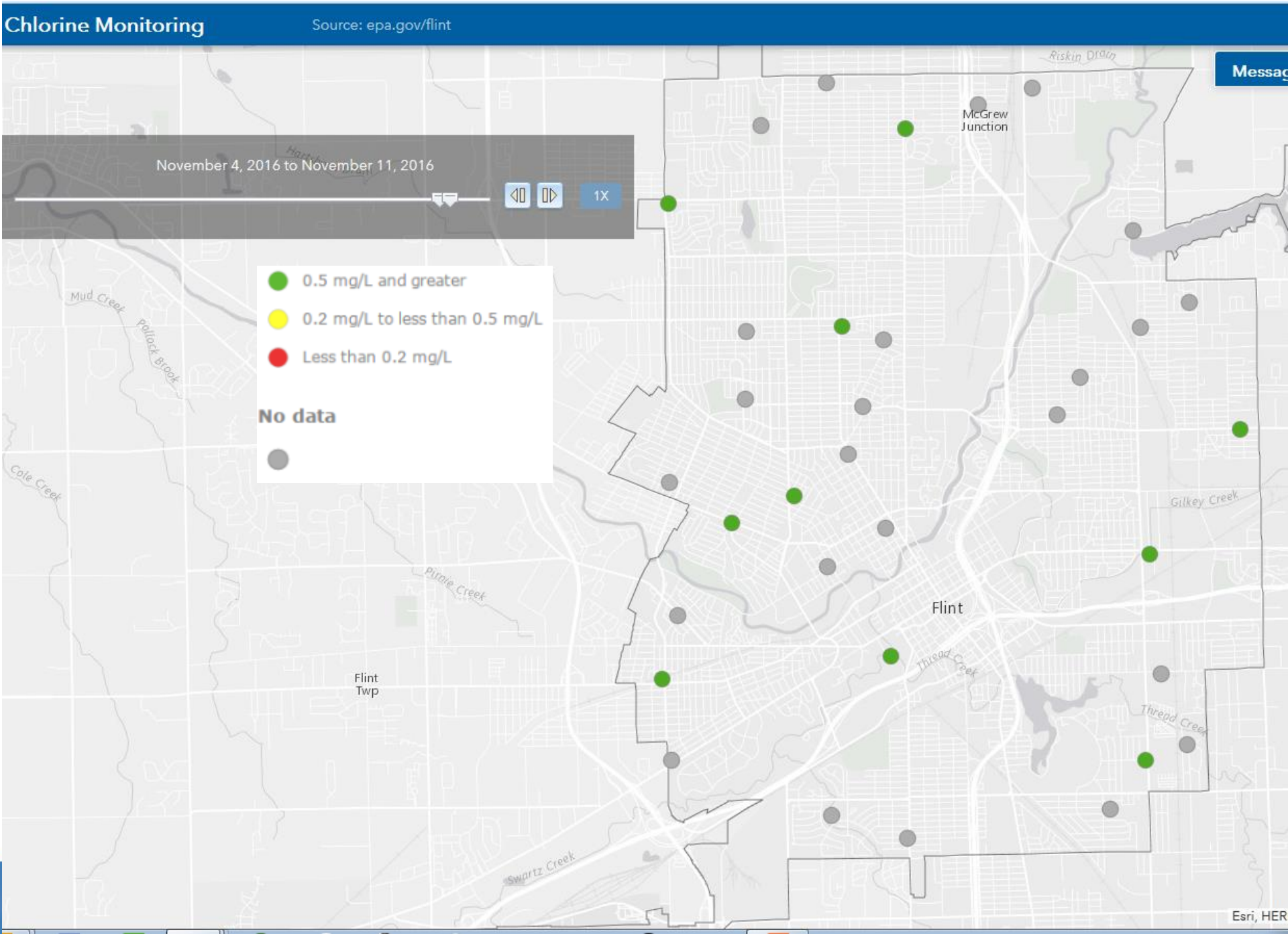
Recurring Chlorine Monito...
Recurring Chlorine Monitoring
Source: epa.gov/flint
Message
September 30, 2016 to October 7, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Flushing
McGrew Junction
Flint
Flint Twp
Monroe Brook
Riskin Drain
Hartshorn Drain
Mud Creek
Gover Drain
Seymour McKinley Drain
Cole Creek
Pittnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Bishop Int'l
1mi
Esri, HERE, DeLorme, NGA, USGS | Esri, HERE

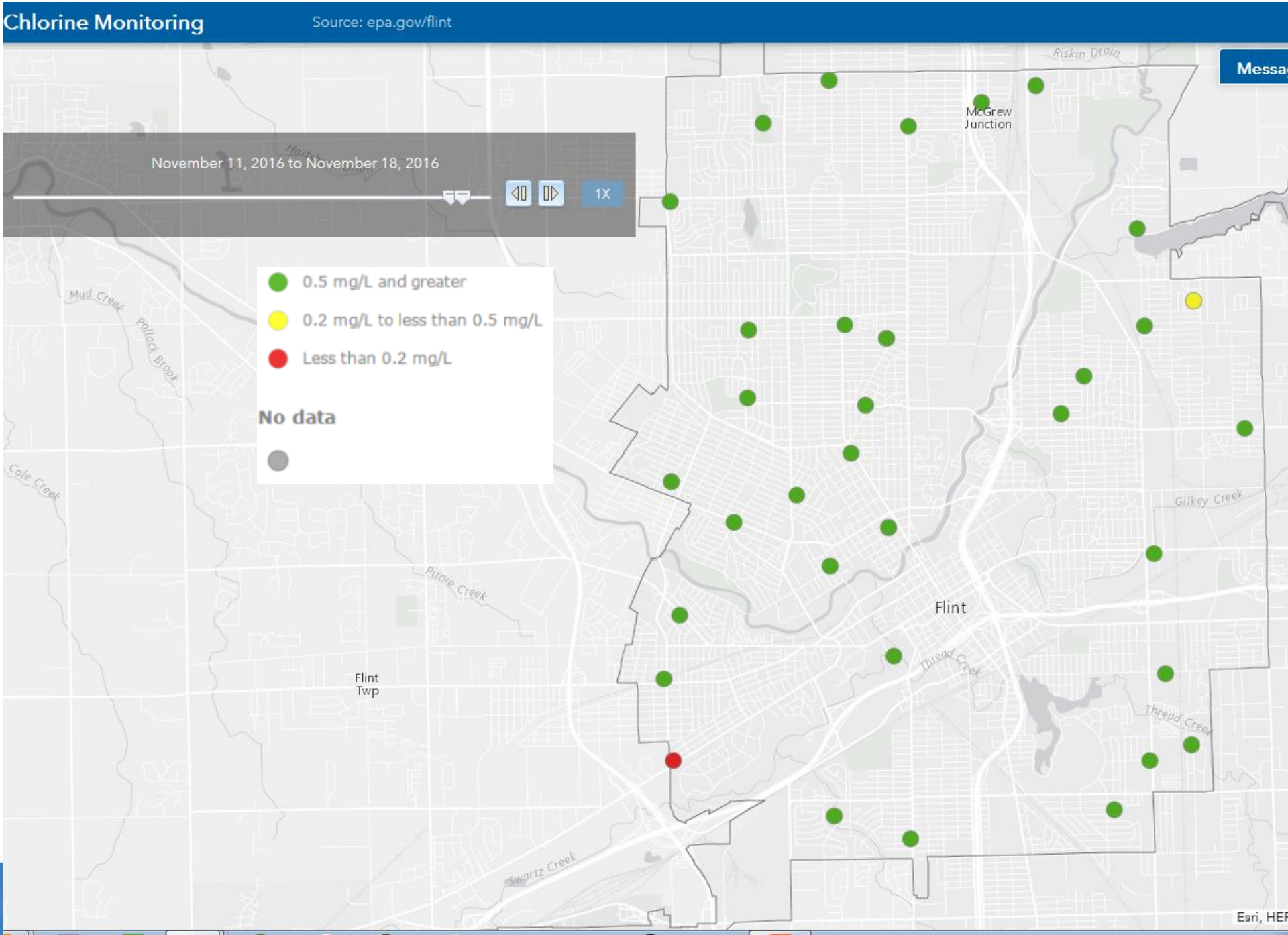

Chlorine Monitoring
Source: epa.gov/flint
October 7, 2016 to October 14, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
McGrew Junction
Flint
Flint Twp
Mud Creek
Pollack Brook
Cole Creek
Pirnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Riskin Drain
Esri, HER

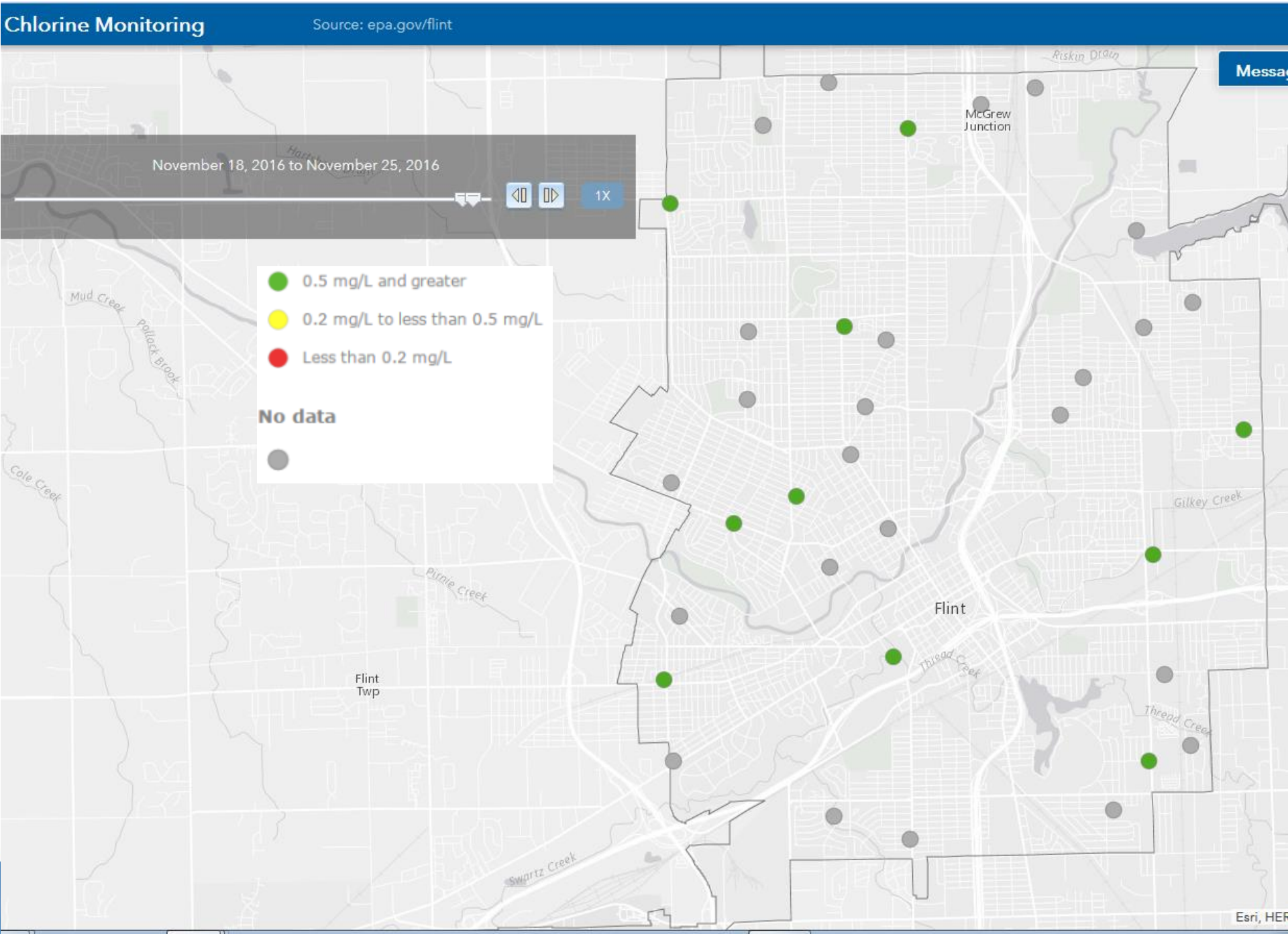

Chlorine Monitoring
Source: epa.gov/flint
October 14, 2016 to October 21, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
McGrew Junction
Flint
Flint Twp
Riskin Drain
Mud Creek
Pollock Brook
Cole Creek
Pirnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Esri, HERE

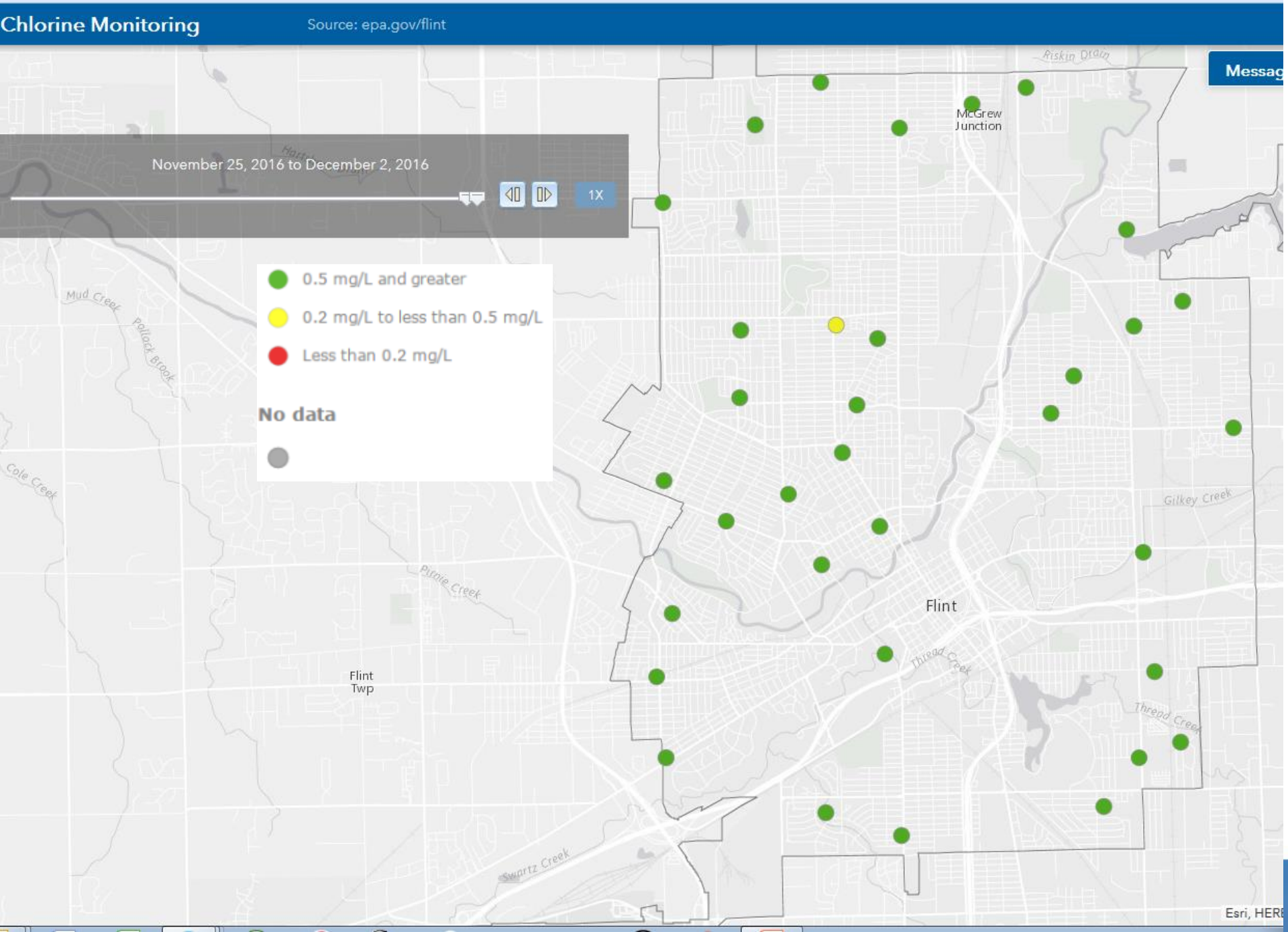

Chlorine Monitoring
Source: epa.gov/flint
October 21, 2016 to October 28, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
McGrew Junction
Flint
Flint Twp
Mud Creek
Pollack Brook
Cole Creek
Pinnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Esri, HER


Chlorine Monitoring
Source: epa.gov/flint
October 28, 2016 to November 4, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
McGrew Junction
Flint
Flint Twp
Mud Creek
Pollock Brook
Cole Creek
Pierce Creek
Gilkey Creek
Thread Creek
Swartz Creek
Riskin Drain
Esri, HE


Chlorine Monitoring
Source: epa.gov/flint
November 4, 2016 to November 11, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
Riskin Drain
McGrew Junction
Mud Creek
Pollack Brook
Cole Creek
Pirnie Creek
Gilkey Creek
Flint
Flint Twp
Thread Creek
Swartz Creek
Esri, HER


Chlorine Monitoring
Source: epa.gov/flint
November 11, 2016 to November 18, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
McGrew Junction
Flint
Flint Twp
Mud Creek
Pollock Brook
Cole Creek
Pirnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Esri, HE


Chlorine Monitoring
Source: epa.gov/flint
November 18, 2016 to November 25, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
McGrew Junction
Flint
Flint Twp
Mud Creek
Pollack Brook
Cole Creek
Pirnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Esri, HER


Chlorine Monitoring
Source: epa.gov/flint
November 25, 2016 to December 2, 2016
1X
0.5 mg/L and greater
0.2 mg/L to less than 0.5 mg/L
Less than 0.2 mg/L
No data
McGrew Junction
Flint
Flint Twp
Riskin Drain
Mud Creek
Pollock Brook
Cole Creek
Pirnie Creek
Gilkey Creek
Thread Creek
Swartz Creek
Esri, HERE

Chlorine Monitoring

Source: epa.gov/flint

November 25, 2016 to December 2, 2016

1X

Riskin Drain

McGrew Junction

Mud Creek

Pollock Brook

Cole Creek

Gilkey Creek

Pierce Creek

Flint Twp

Thread Creek

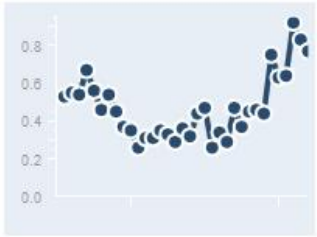
Swartz Creek

(1 of 2)

Recurring Chlorine Results

Recurring Chlorine Over Time (mg/L)

Left-side (y-axis) = Chlorine (mg/L). Bottom (x-axis) = time in 1 week intervals. Hover over point in chart for more info.



Zoom to

Esri, HER

Chlorine Monitoring

Source: epa.gov/flint

November 25, 2016 to December 2, 2016

1X

(1 of 2)

Recurring Chlorine Results

Recurring Chlorine Over Time (mg/L)

Left-side (y-axis) = Chlorine (mg/L). Bottom (x-axis) = time in 1 week intervals. Hover over point in chart for more info.

Zoom to

McGrew Junction

Flint Twp

Mud Creek

Pollock Brook

Cole Creek

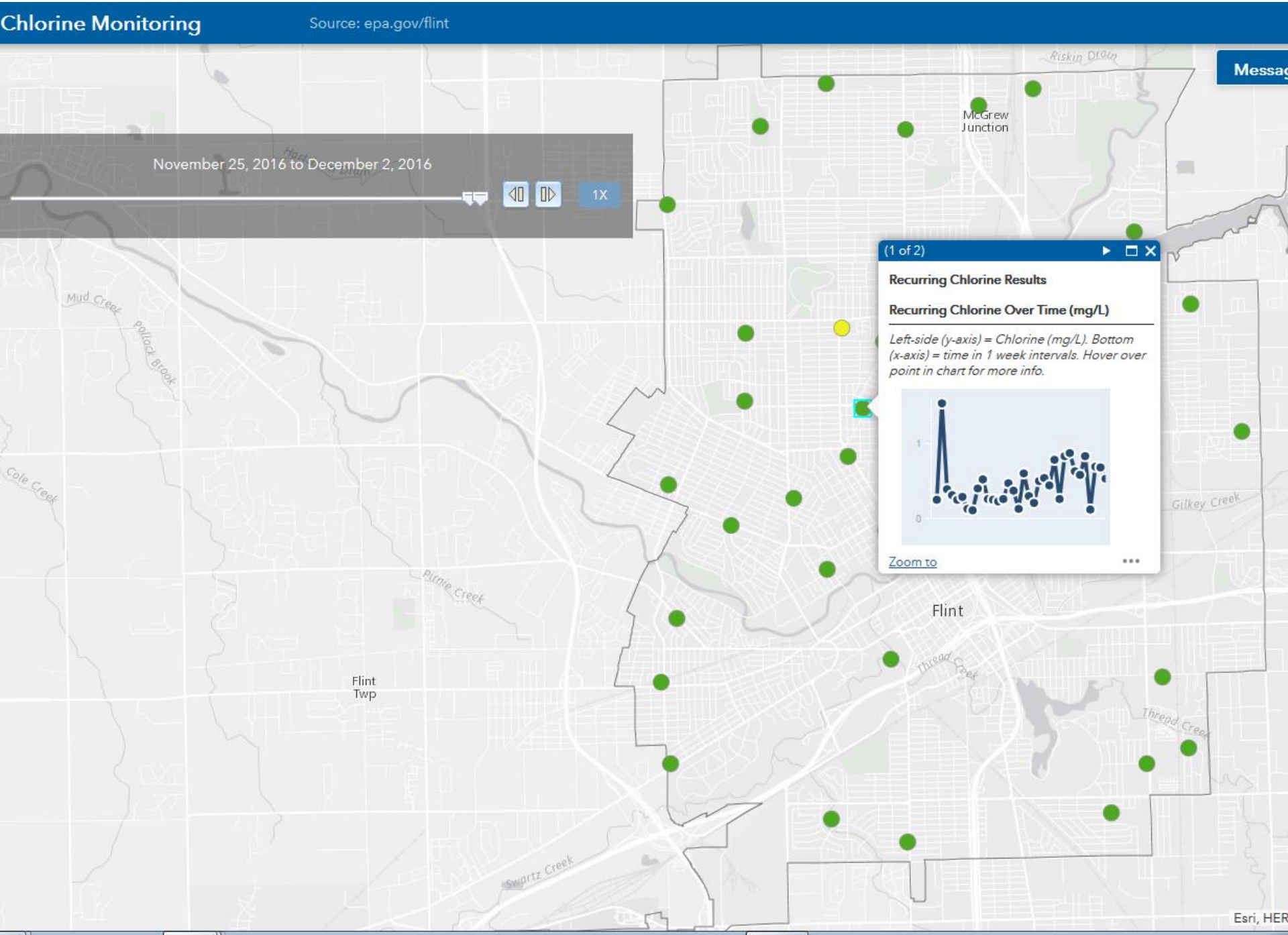
Pirnie Creek

Swartz Creek

Gilkey Creek

Thread Creek

Esri, HE


Chlorine Monitoring
Source: epa.gov/flint
November 25, 2016 to December 2, 2016
1X
(1 of 2)
Recurring Chlorine Results
Recurring Chlorine Over Time (mg/L)
Left-side (y-axis) = Chlorine (mg/L). Bottom (x-axis) = time in 1 week intervals. Hover over point in chart for more info.
1
0
Zoom to
McGrew Junction
Flint
Flint Twp
Mud Creek
Pollock Brook
Cole Creek
Pirnie Creek
Thread Creek
Gilkey Creek
Swartz Creek
Riskin Drain
Esri, HER

Chlorine Monitoring

Source: epa.gov/flint

November 25, 2016 to December 2, 2016

1X

(1 of 2)

Recurring Chlorine Results

Recurring Chlorine Over Time (mg/L)

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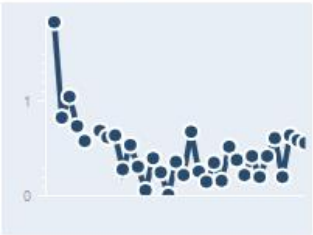


Zoom to

Riskin Drain

McGrew Junction

Mud Creek

Pollock Brook

Cole Creek

Gilkey Creek

Pinnie Creek

Flint

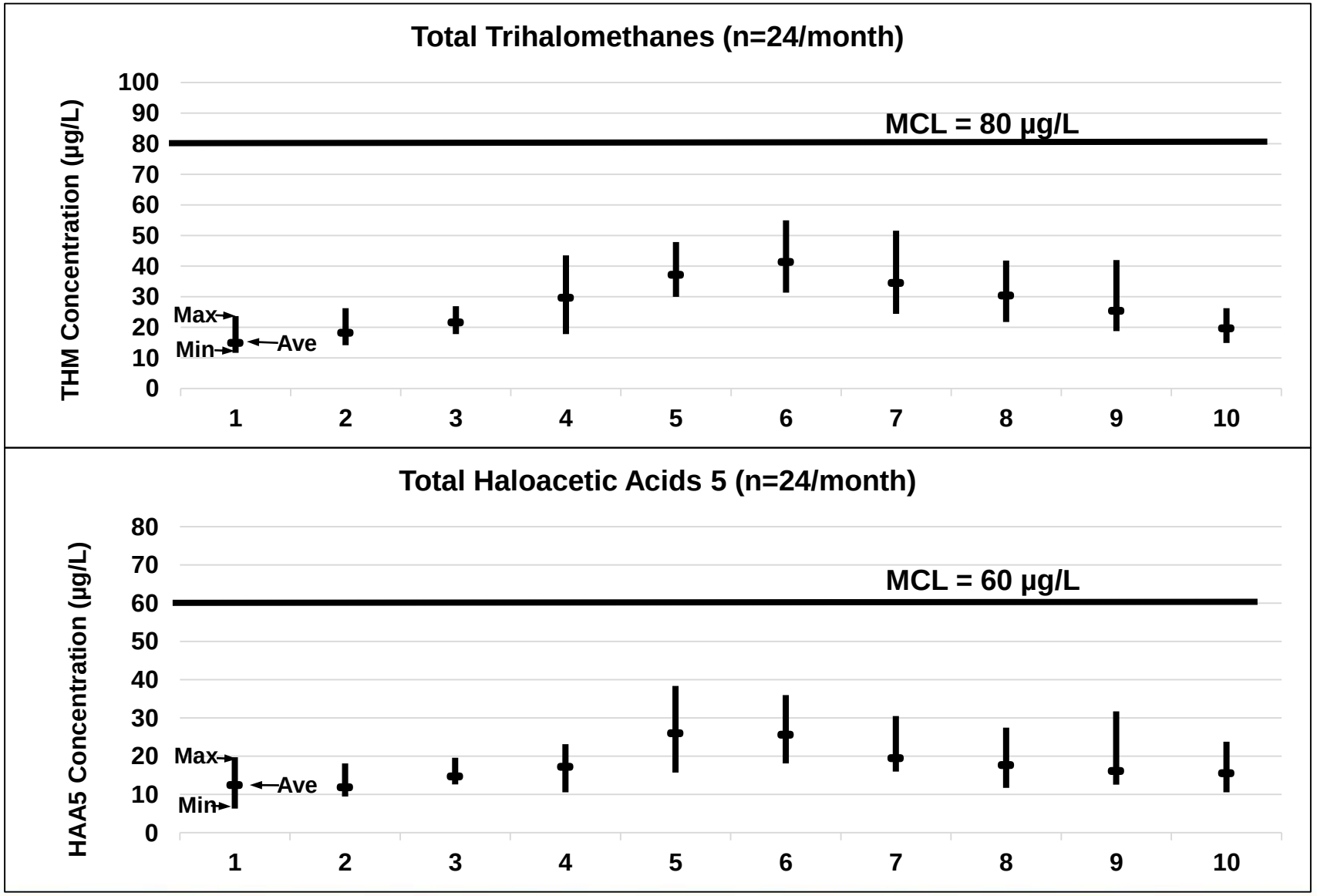
Flint Twp

Thread Creek

Swartz Creek

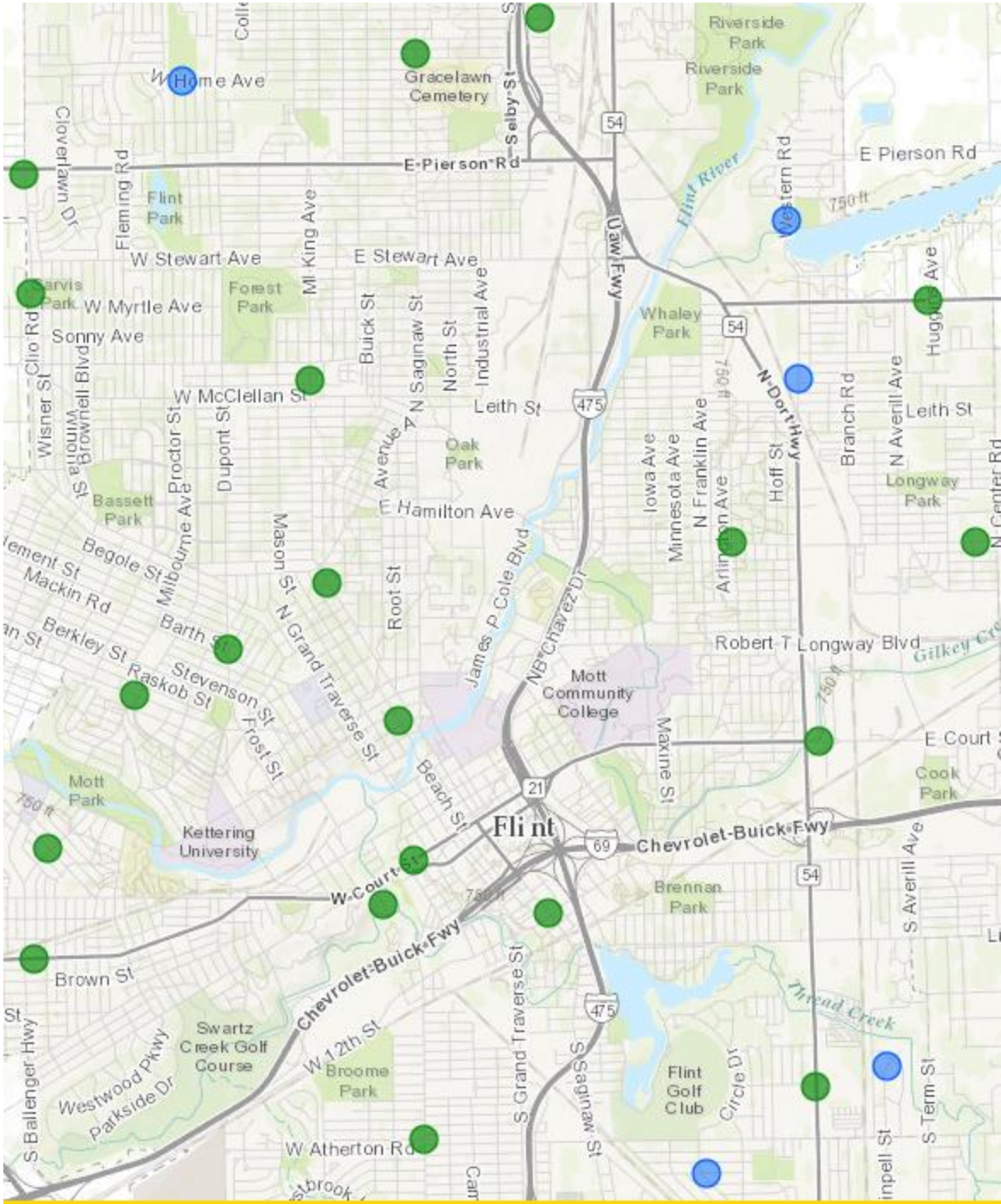
Esri, HER

Regulated Disinfection Byproducts



Flint Draft RTCR Monitoring

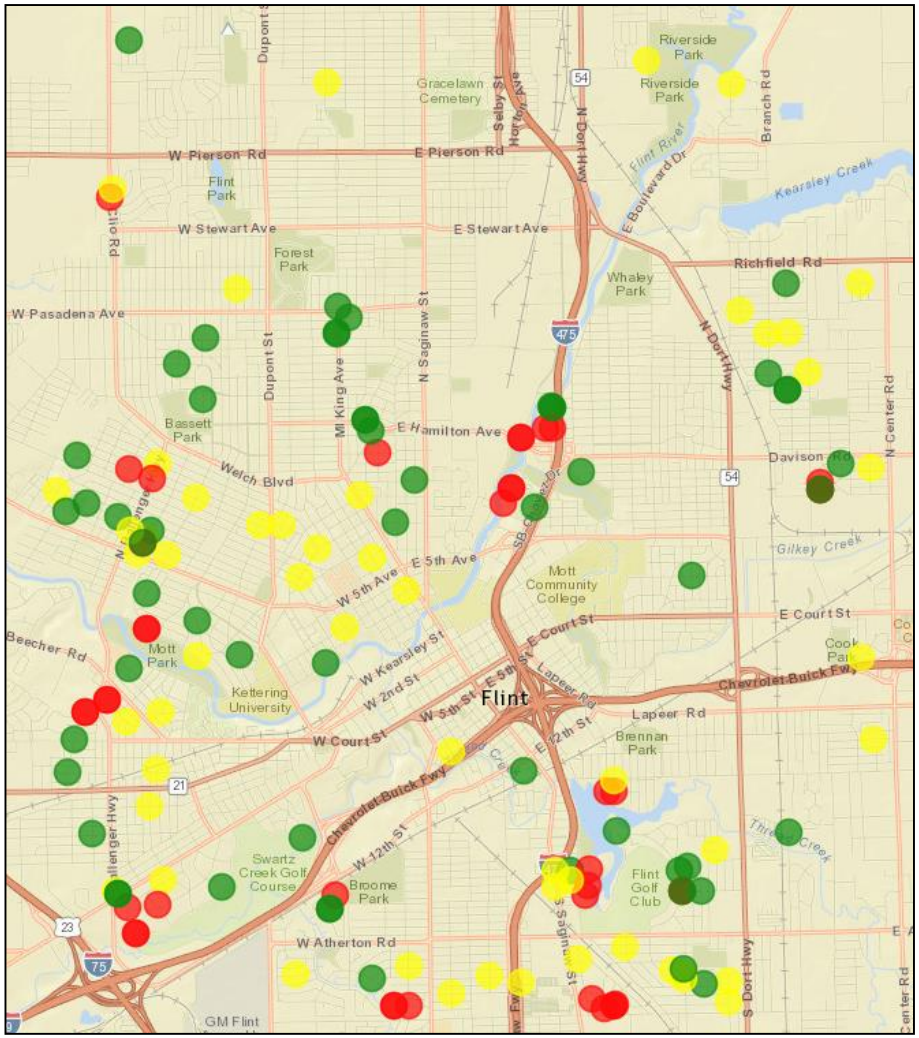
- RTCR-
  - 30/week from 20 sites (green)
- Chlorine Only
  - 5/week (blue)
- Total
  - 35/week from 25 unique locations taken Mon-Fri



Investigative Chlorine Sampling

- Hydrant Sampler – www.epa.gov/hydrant-sampler
- Targeted “critical” areas of the system
- Free & Total Cl_2, pH, and temperature
- April 2016 – Collected 130 samples system-wide
- August 2016 – Targeted additional low Cl_2 areas
- Ongoing sampling conducted by City of Flint throughout summer
- Low chlorine addressed by City of Flint through flushing and valve repair/replacement

Investigative Sampling Results – April 2016



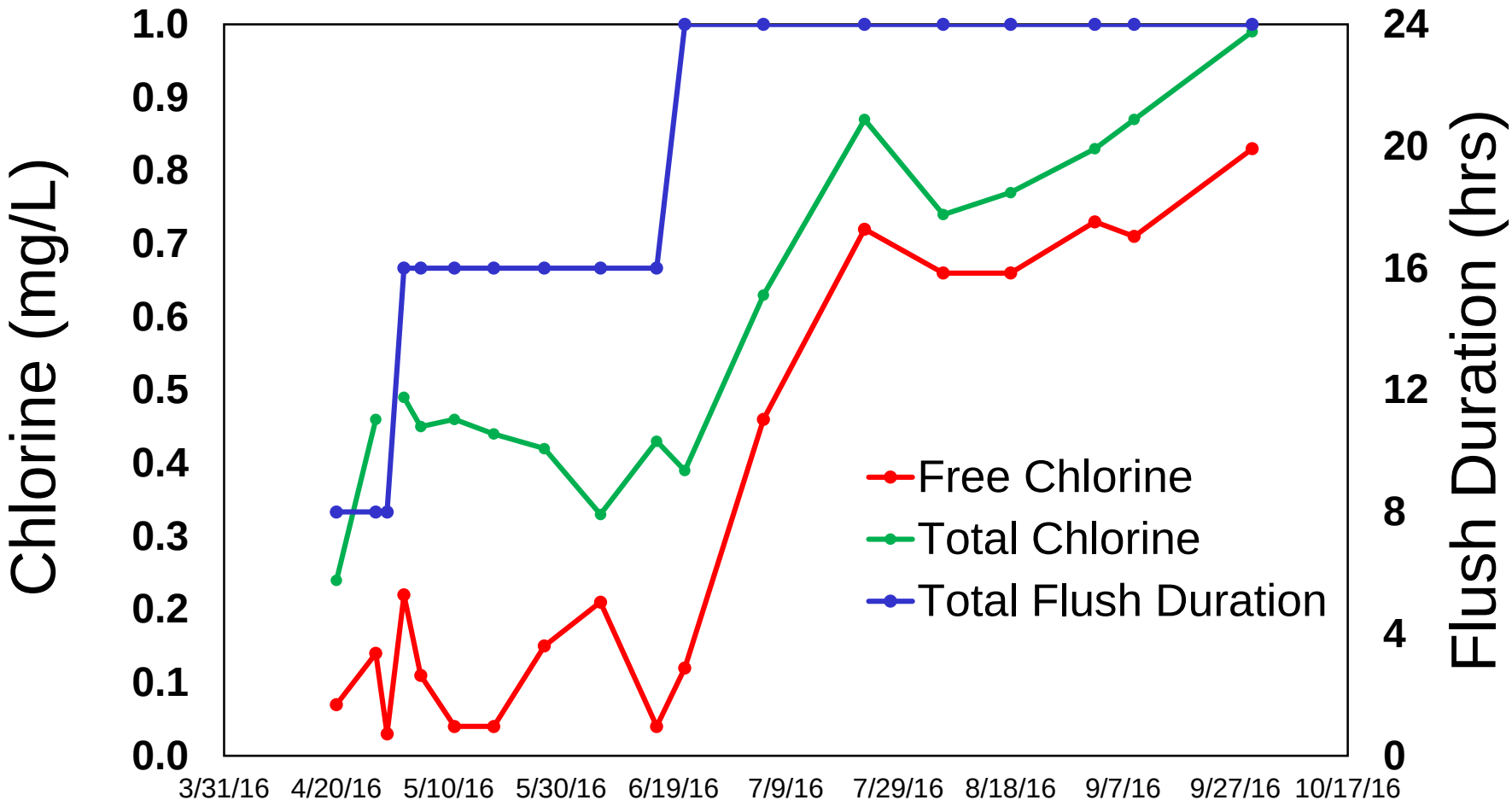
Free Chlorine Residual

- ≤ 0.20 mg/L
- > 0.20 to 0.50 mg/L
- > 0.50 mg/L

Distribution System Flushing Program

- Currently consists of:
  - 13 Automated Flushers
  - 13 Manual Flushers
  - 4 Permanent Auto-Flushers (ordered)
- Modified to flush at low, controlled flow rate
- Cl_2 monitored and settings adjusted routinely

Flushing Program Data



Final Thoughts

- Fresh iron surfaces consume more chlorine
- Reaction demand must be managed
- Increased chlorine mass
  - Higher conc.
  - Decreased residence time
- Reaction demand should decrease over time