



# Leveraging Data Analytics to Turn Abandoned Mine Data into Insight

Doug Cushing  
Katie Deheer  
October 23, 2019

# Introduction

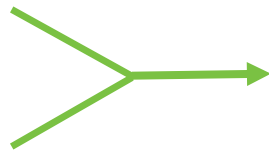
- **Doug Cushing, PE, PMP – Vice President of Digital Capital**
  - Master's degrees in Environmental Engineering and Information Systems
  - 25+ years of experience with environmental and water engineering firms
  - Significant experience with EPA Superfund program and data analytics
  
- **Katie Deheer, MBA – Manager of Advanced Analytics**
  - Master's degree in Business Analytics
  - 10+ years of experience in business technology and analytics across multiple industries

# Setting the Stage

- Analytics and Big Data are everywhere
- Immense impact across industries
- Data rich  $\neq$  information rich (by default)

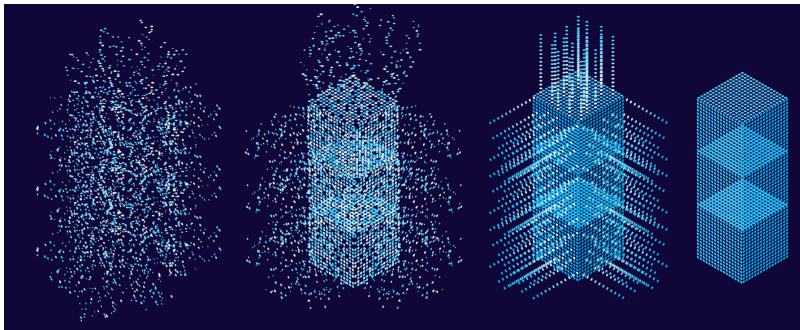
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227767 552441 377746 410405 144575 354378
908585 607778 294707 772027 578596 380994
180581 722598 244284 418329 636172 318009
772373 854756 172142 725637 506926 222954
328292 745858 29959 154283 459292 184891
743142 967951 296192 924058 483123 308080
392723 667540 513524 696520 983148 398972
155451 100658 275279 963993 258627 399687
954307 749775 394531 524299 278141 352474
418837 761774 585020 880287 732143 465004
464620 886393 939223 584668 532038 807776
495150 5548 214438 394043 214566 192803
777682 65314 293138 111361 257993 746404
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378385 30643 264656 481816 498955 526374

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378385 30643 264656 481816 498955 526374
```



# Applying Analytics to Environmental Data

- Not in focus:
  - Multi-layer geospatial analysis
  - Alternative analysis of classic, high quality laboratory data
  - Classical statistics using Excel or statistical packages
- In focus:
  - Teasing trends out of large, complex and often dirty or incomplete multidimensional data sets
  - Directional correctness, not transactional accuracy



# Our Search for Data in Abandoned Mine Space

- Bonita Peak Superfund Site
- Colorado School of Mines
- National Park Service
- Publicly Available Abandoned Mine Land Databases
  - OSMRE
  - USGS
  - US Forest Service
  - State of Colorado
- None of the above resulted in content for a powerful data analytics demonstration.
  - Not as large or robust
  - Better served by classic GIS or statistical techniques than data analytics

# Demonstration of What is Possible

- Data Set: Sanitary and Combined Sewer Overflows
- Self reported – 1 state, 10 years, 20K events, NPDES data
- First analysis on dirty data to understand major causes
- Minor data cleanup
- Conclusions were so strong, we needed to anonymize the data!





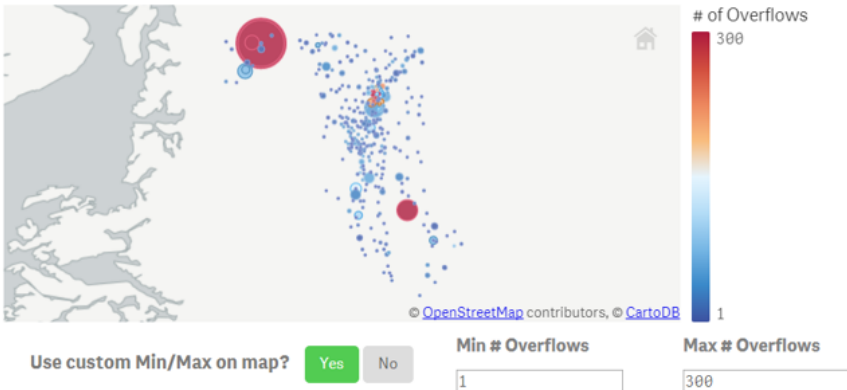
# Demonstration

# Demonstration

## SSO/CSO Overview

### Number of Overflows and Net Overflow Amount by Postal Code

Size indicates est. volume of overflows (in gallons). Color indicates number of sewer overflow events. True minimum # of Overflows = 1. True maximum # of Overflows = 3,793.

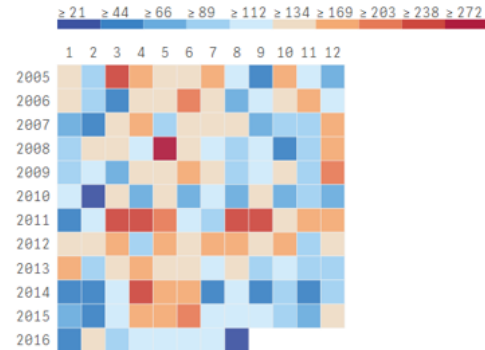


### Number of Overflows by Year



### Number of Overflows by Month/Year

Color indicates number of sewer overflow events.



# of Overflows  
**18.78k**

Net in Gallons (Estimated)  
**4.45G**

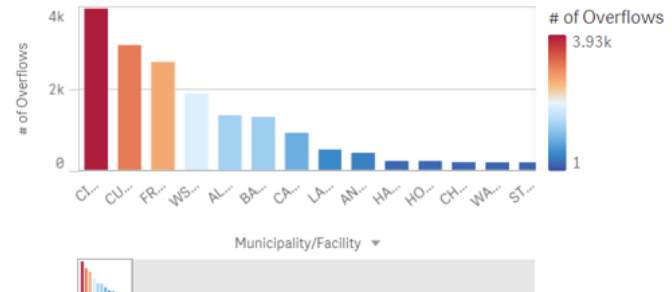
# of Locations  
**333**

Municipality/Facility

Year Discovered

Month Discovered

### Number of Overflows by Selected Criteria

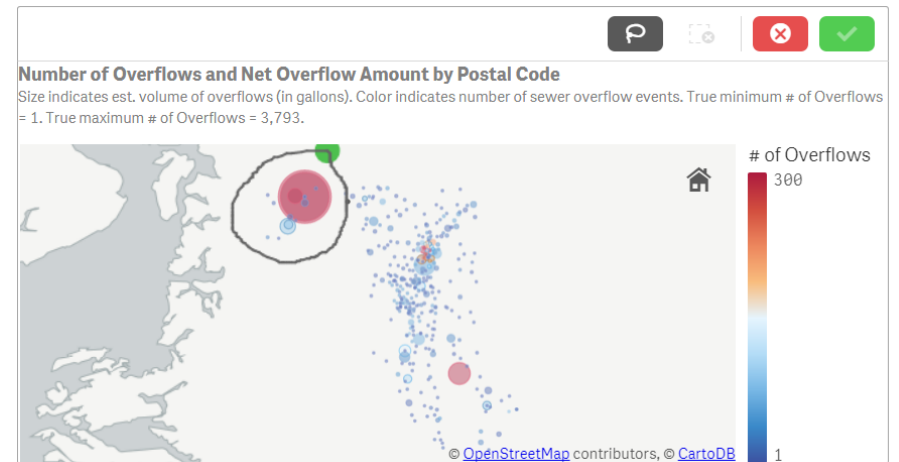
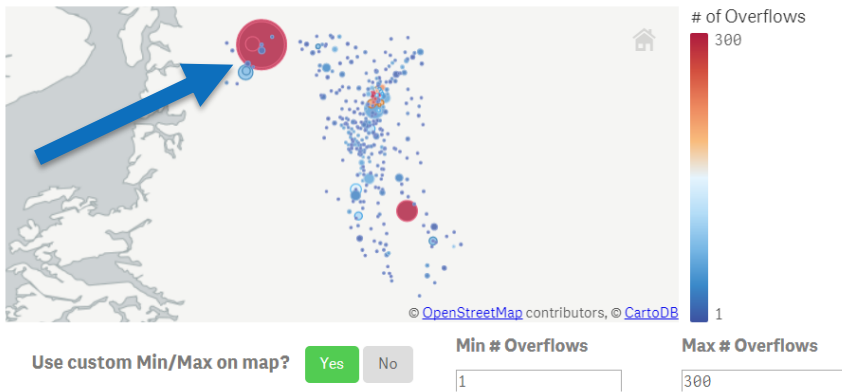




# Demonstration

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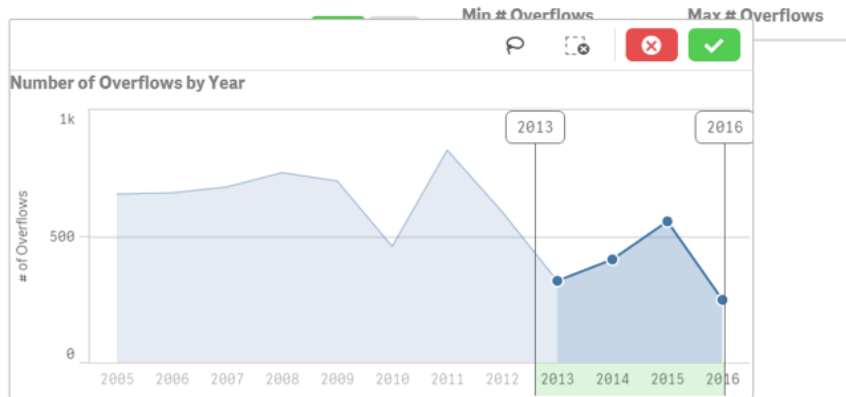
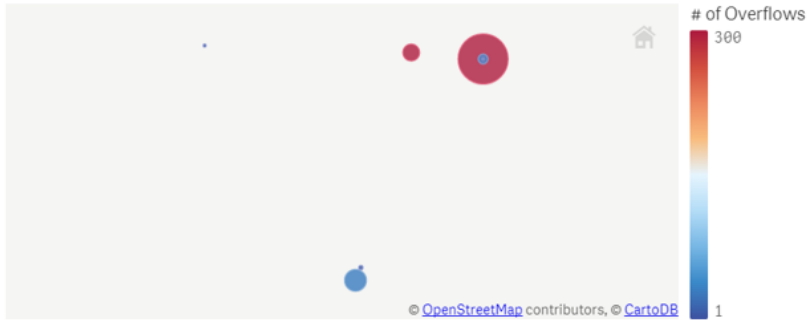


# Demonstration

## SSO/CSO Overview

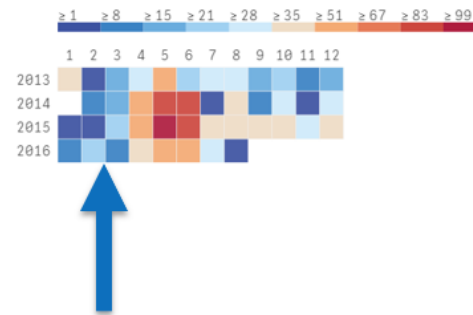
### Number of Overflows and Net Overflow Amount by Postal Code

Size indicates est. volume of overflows (in gallons). Color indicates number of sewer overflow events. True minimum # of Overflows = 1. True maximum # of Overflows = 846.



### Number of Overflows by Month/Year

Color indicates number of sewer overflow events.



# of Overflows

1.51k

Net in Gallons (Estimated)

409.5M

# of Locations

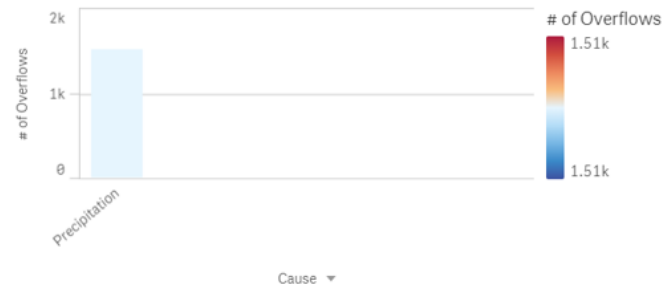
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Municipality/Facility

Year Discovered

Month Discovered

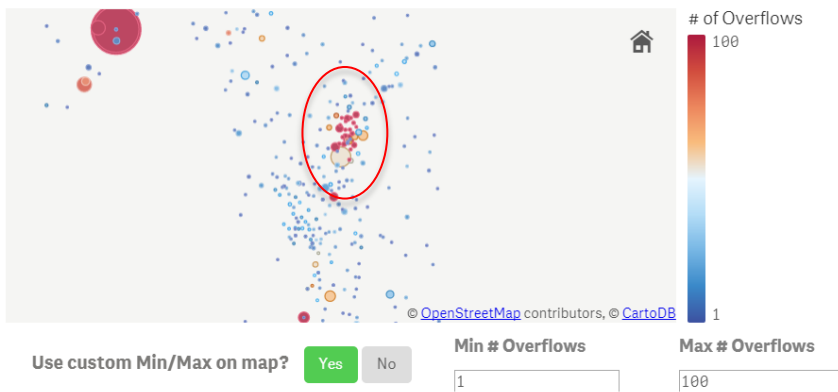
### Number of Overflows by Selected Criteria



# Demonstration

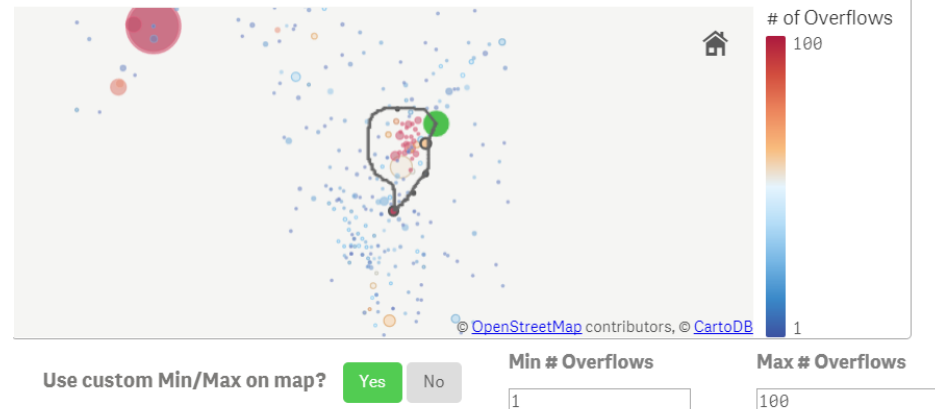
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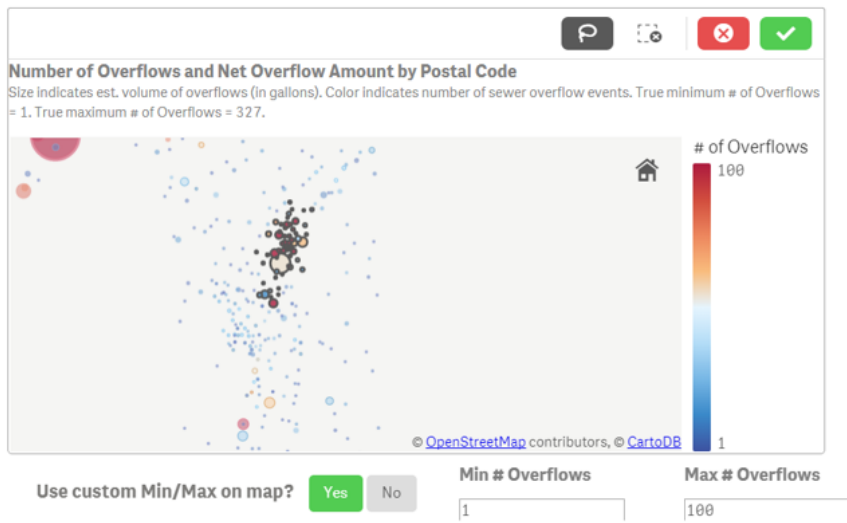


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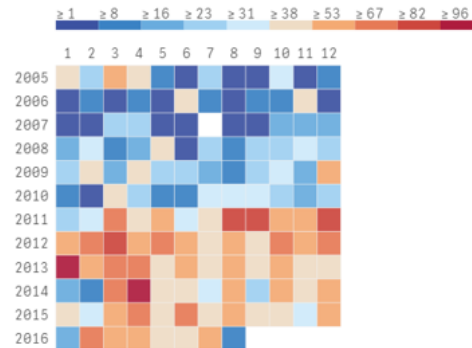


# Demonstration



**Number of Overflows by Month/Year**

Color indicates number of sewer overflow events.



# of Overflows

5.28k

Net In Gallons (Estimated)

464.1M

# of Locations

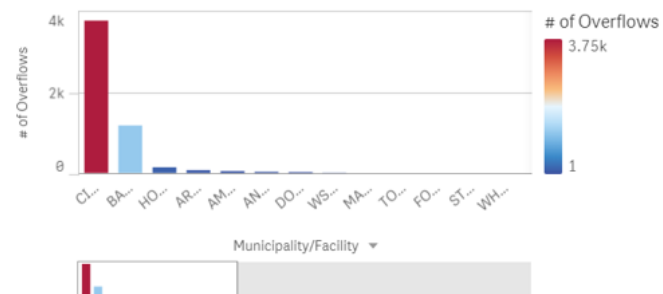
58

Municipality/Facility

Year Discovered

Month Discovered

**Number of Overflows by Selected Criteria**

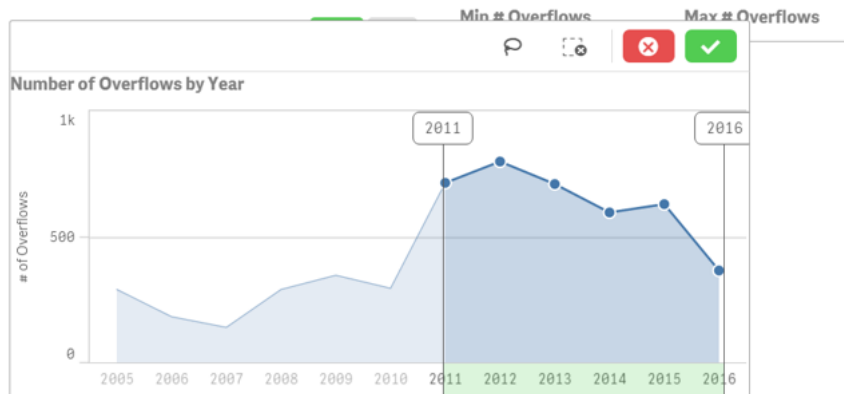
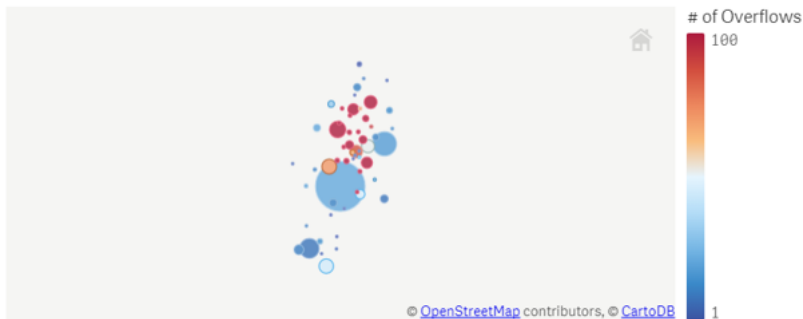


# Demonstration

## SSO/CSO Overview

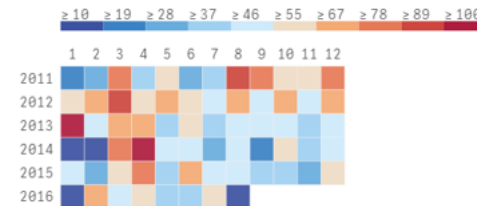
### Number of Overflows and Net Overflow Amount by Postal Code

Size indicates est. volume of overflows (in gallons). Color indicates number of sewer overflow events. True minimum # of Overflows = 1. True maximum # of Overflows = 280.



### Number of Overflows by Month/Year

Color indicates number of sewer overflow events.

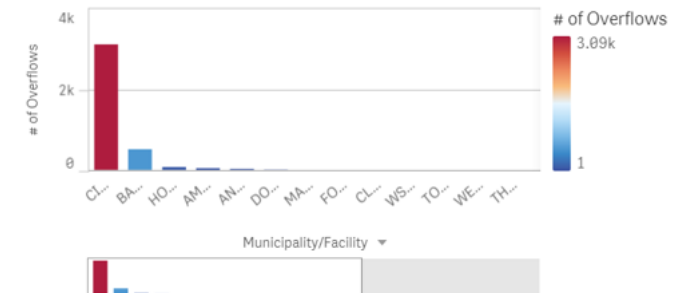


# of Overflows  
3.77k

Net in Gallons (Estimated)  
301M

# of Locations  
56

### Number of Overflows by Selected Criteria



Municipality/Facility

Year Discovered

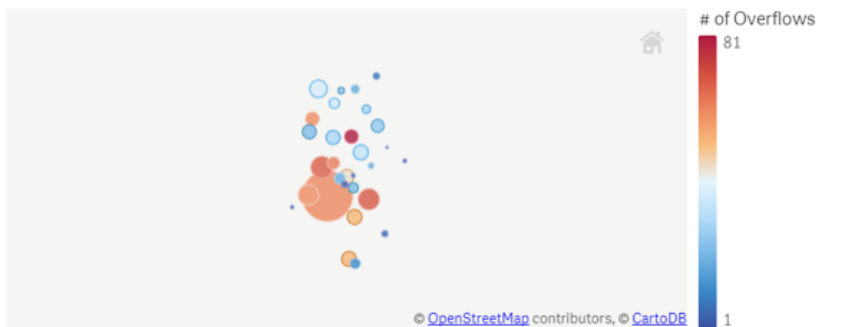
Month Discovered

# Demonstration

## SSO/CSO Overview

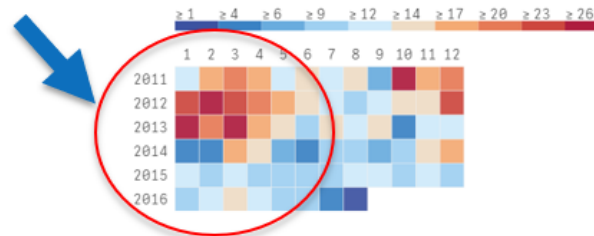
### Number of Overflows and Net Overflow Amount by Postal Code

Size indicates est. volume of overflows (in gallons). Color indicates number of sewer overflow events. True minimum # of Overflows = 1. True maximum # of Overflows = 81.



### Number of Overflows by Month/Year

Color indicates number of sewer overflow events.



# of Overflows  
962

Net in Gallons (Estimated)  
1.12M

# of Locations  
31

Use custom Min/Max on map?  Yes  No

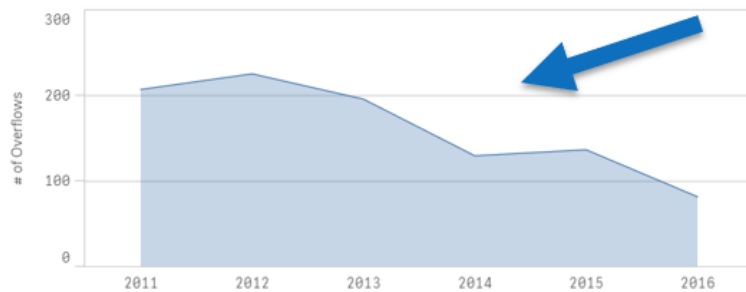
Min # Overflows

1

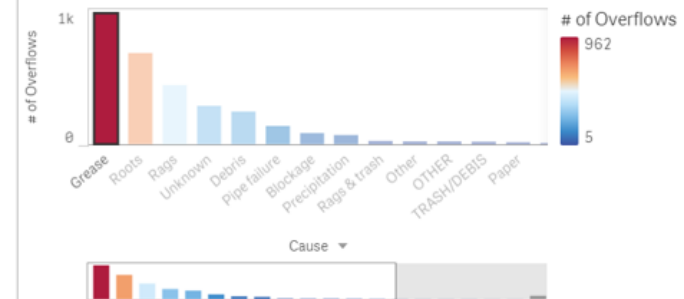
Max # Overflows

100

### Number of Overflows by Year



### Number of Overflows by Selected Criteria



Municipality/Facility

Year Discovered

Month Discovered



End of Demonstration

# Call to Action

Help agencies with their interest in utilizing data analytics at abandoned mine sites by identifying potential data sources that could be leveraged to turn information into insight.





# Questions?





# Thank you!

## Contacts:

- Doug Cushing, CDM Smith, [cushingdl@cdmsmith.com](mailto:cushingdl@cdmsmith.com)
- Katie Deheer, CDM Smith, [deheerk@cdmsmith.com](mailto:deheerk@cdmsmith.com)
- Anna-Marie Cook, EPA, [cook.anna-marie@epa.gov](mailto:cook.anna-marie@epa.gov)
- Stephen Dymont, EPA, [dymont.stephen@epa.gov](mailto:dymont.stephen@epa.gov)

Citation of Demonstration Data: Talley, S., Salter, J., & Lee, W. (2016, December 30). [Sewer Overflow Data]. Published raw data.

- To support anonymity around the contents of this database and the findings within, the reporting organization of this data set is not specifically named in this citation.