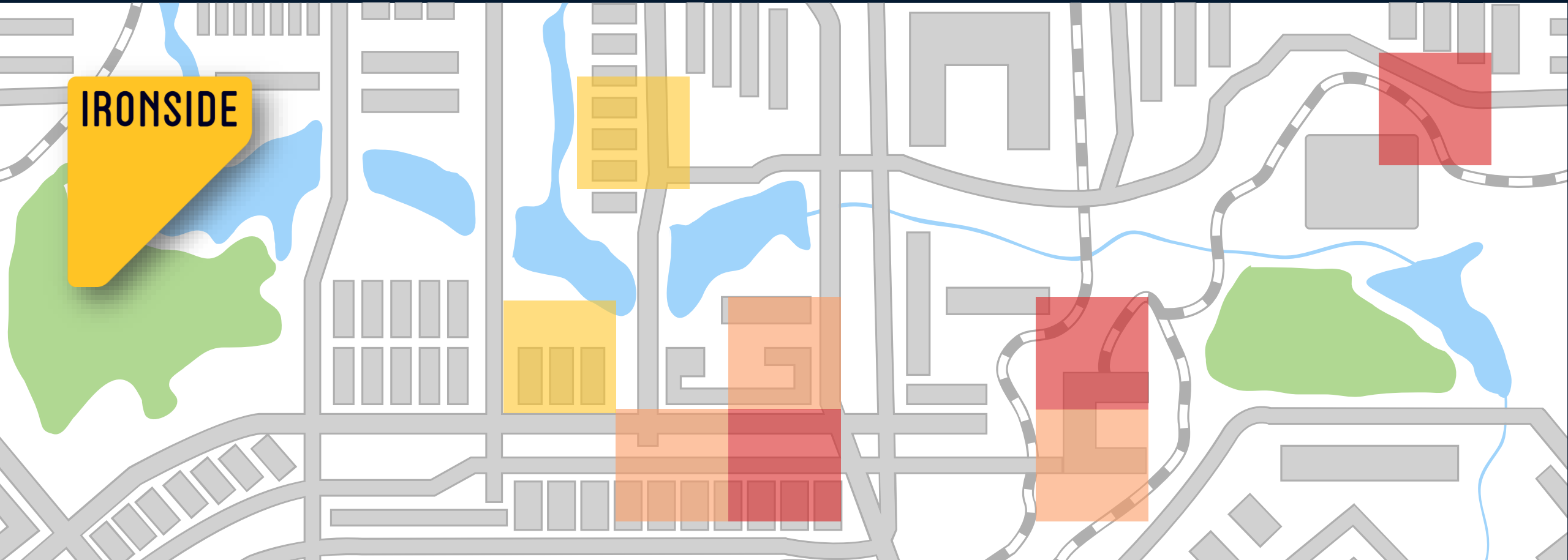


Real World Predictive Policing



Manchester, NH Police Department

Let's Connect



Greg Bonnette

Vice President, Strategy & Innovation

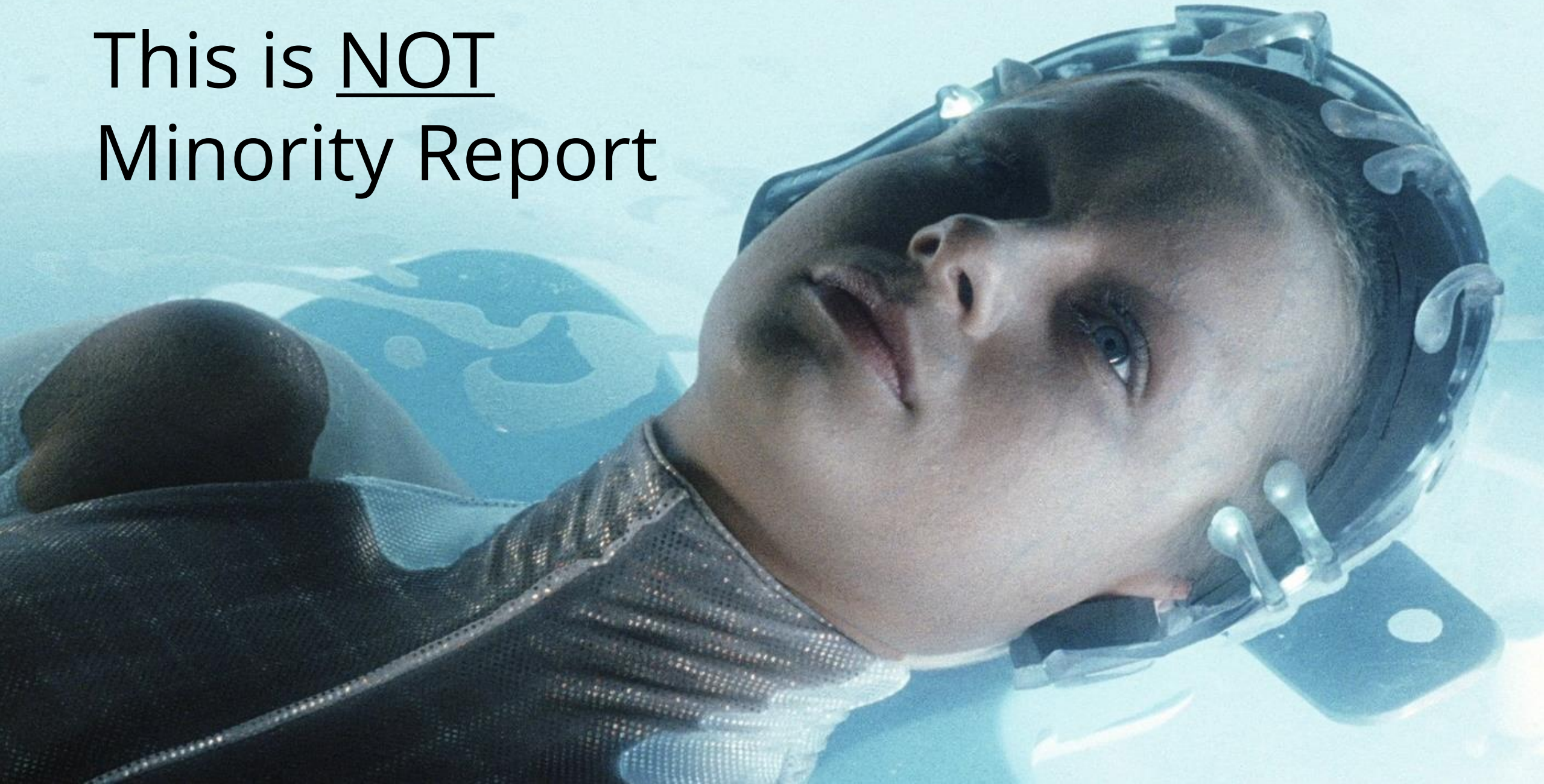


@gregbonnette



[linkedin.com/in/gbonnette](https://www.linkedin.com/in/gbonnette)

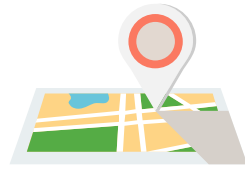
This is NOT
Minority Report



Manchester, NH



POPULATION
110,000



SQUARE MILES
35



CRIME (2014)
649 Violent
4743 Property



SWORN OFFICERS
237



Our Challenges



Rise in Crime (5 Year)

- Robbery
- Burglary
- Theft from MVs



Lack of Resources

- Reduced Manpower
- Increased Demand
- Shrinking Budgets



It is not uncommon at many police departments, according to the National Alliance on Mental Illness, for **more than 20% of daily calls for service to involve people who are emotionally disturbed.**

“Some are looking to the police department to do things that you never imagined. Dealing with the mentally ill is part of that.”

NEWPORT RI POLICE LT WILLIAM FITZGERALD

“We have replaced the hospital bed with the jail cell, the homeless shelter and the coffin”

REP. TIM MURPHY, R-PA.

“Law enforcement did not ask for this additional challenge.”

SEN. DICK DURBIN, D-ILL.

“Police should not be involved this process at all, but nobody else can or wants to do it.”

TULSA POLICE MAJ. TRACIE LEWIS

They end up here (the criminal justice system), because we are the only system that can't say no.”

COOK COUNTY SHERIFF TOM DART

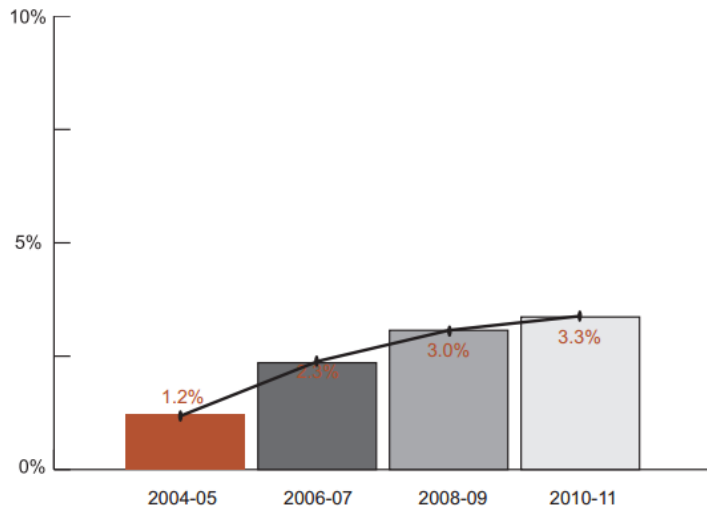
The Heroin Epidemic in New Hampshire



491 OVERDOSE CALLS 59 DEATHS

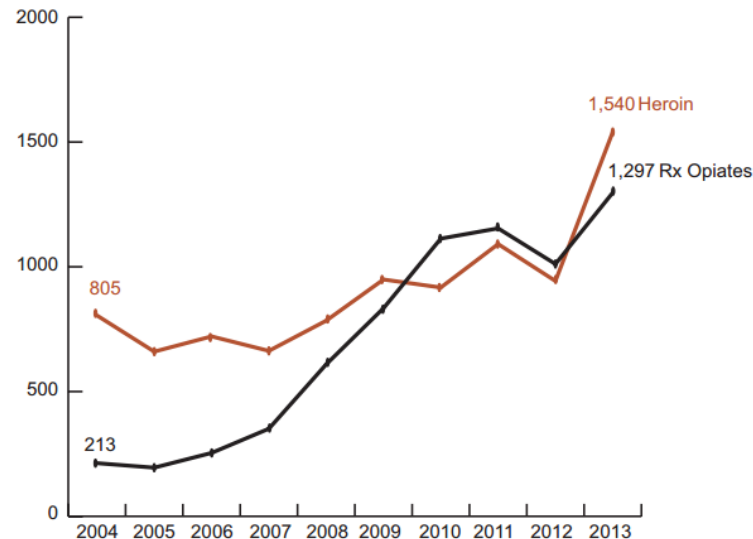
Manchester, NH Police Department 2015 Year To Date

PERCENTAGE OF NH RESIDENTS 12 AND OLDER REPORTING EVER HAVING USED HEROIN 2004-2005 TO 2010-2011



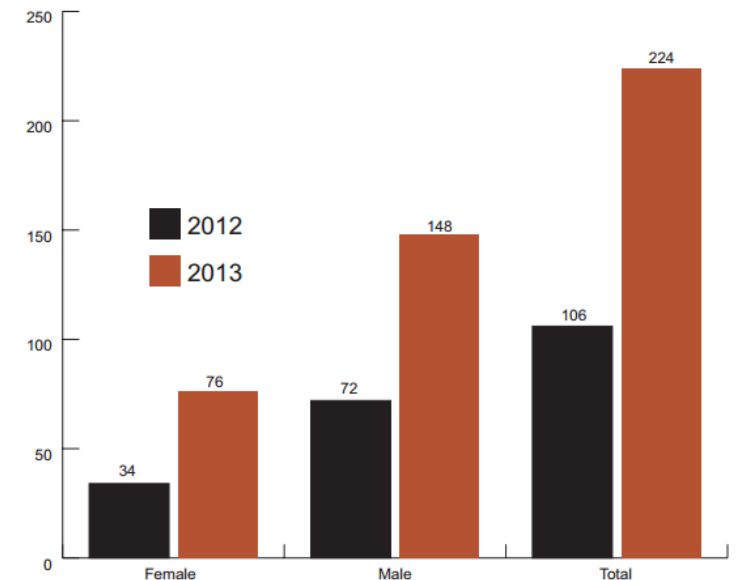
Source: 2012 National Survey on Drug Use and Health

NUMBER OF ADMISSIONS TO STATE-FUNDED TREATMENT PROGRAMS FOR HEROIN AND PRESCRIPTION OPIATES, 2004-2013

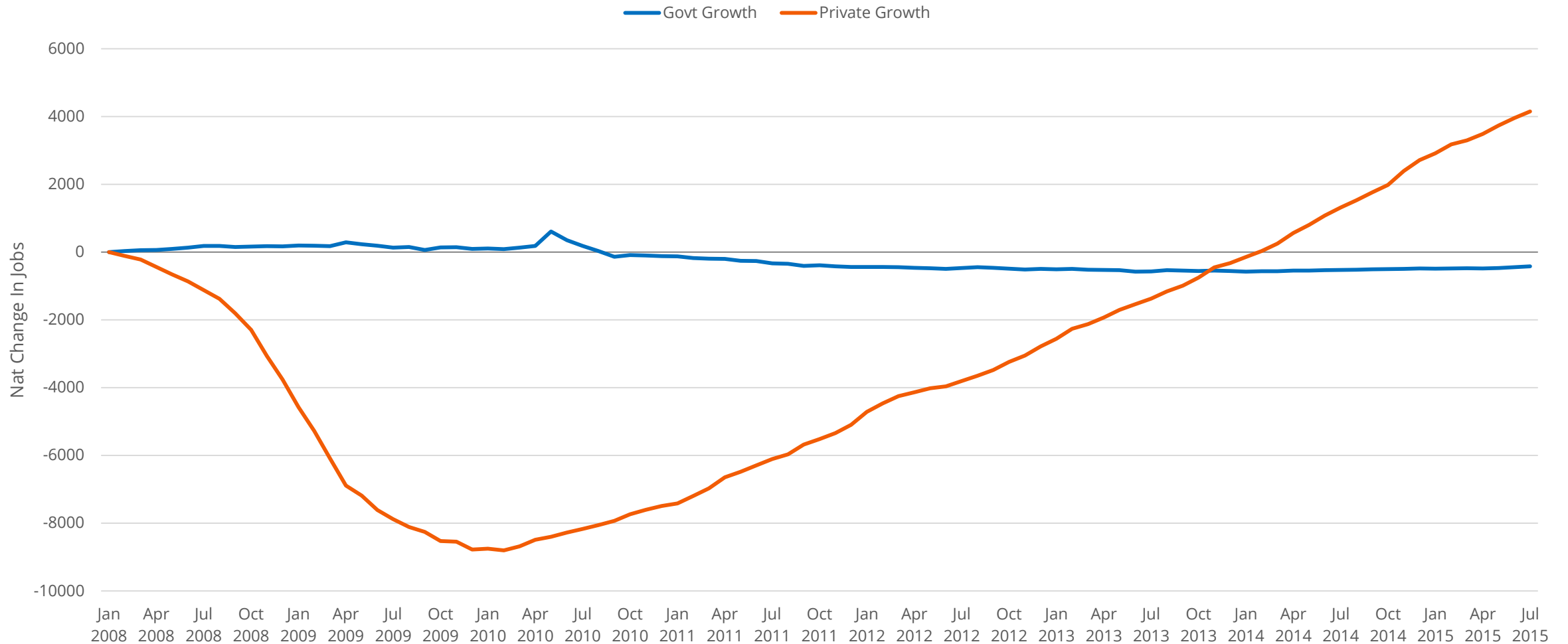


Source: NH Bureau of Drug and Alcohol Services

EMERGENCY ROOM VISITS RELATED TO HEROIN USE BY GENDER, 2012-2013



Public vs. Private Sector Job Growth



The Need



Increase *Actionable* Intelligence for Officers

Improve Agency Efficiency & Effectiveness

Reduce Crime

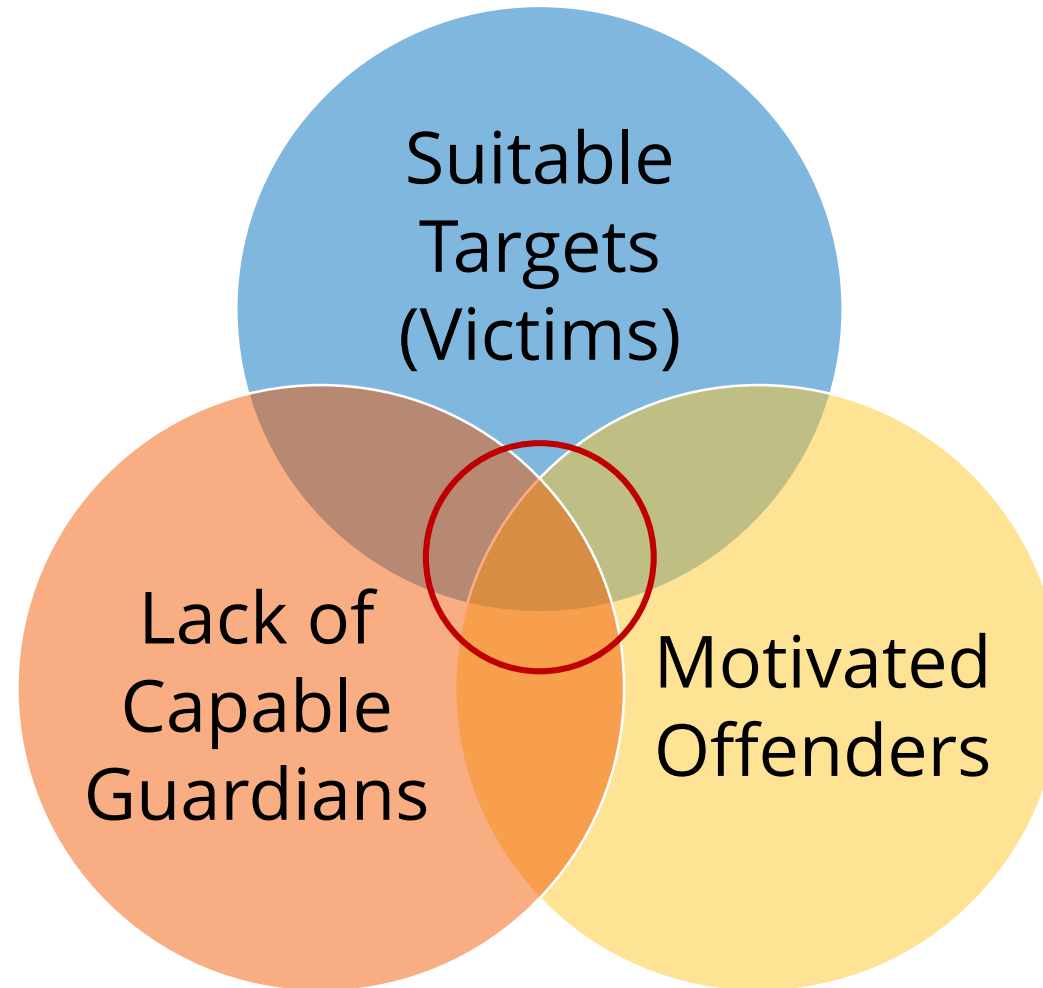
Our Journey



2014: Descriptive Hot Spots

- Data clean up
- Refine policing tactics
- Organizational preparedness

Routine Activities Theory



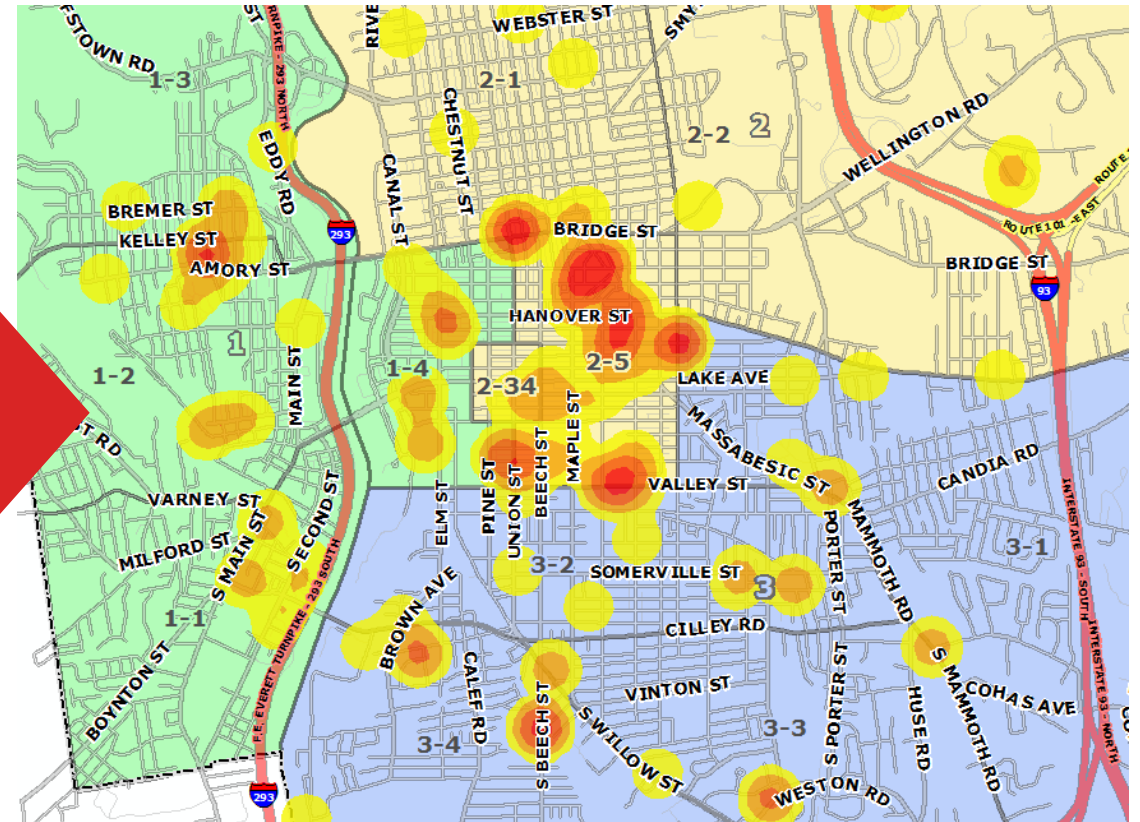
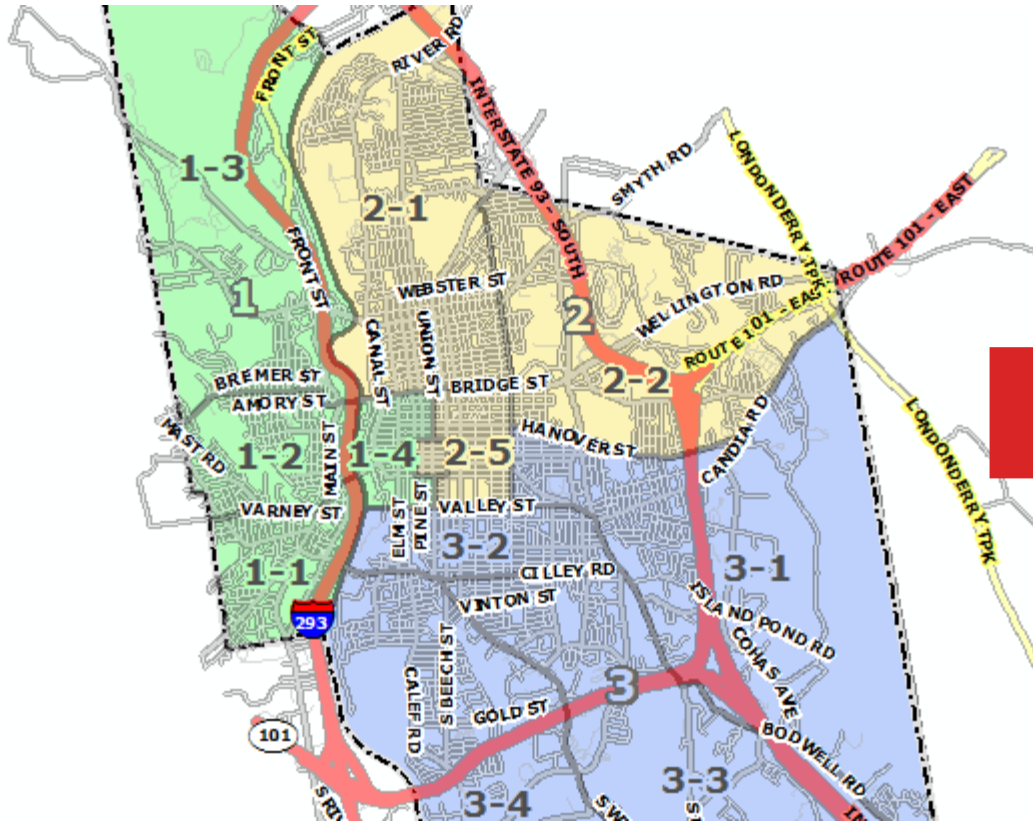
Cohen and Felson (1979)

Spatial Crime Theories

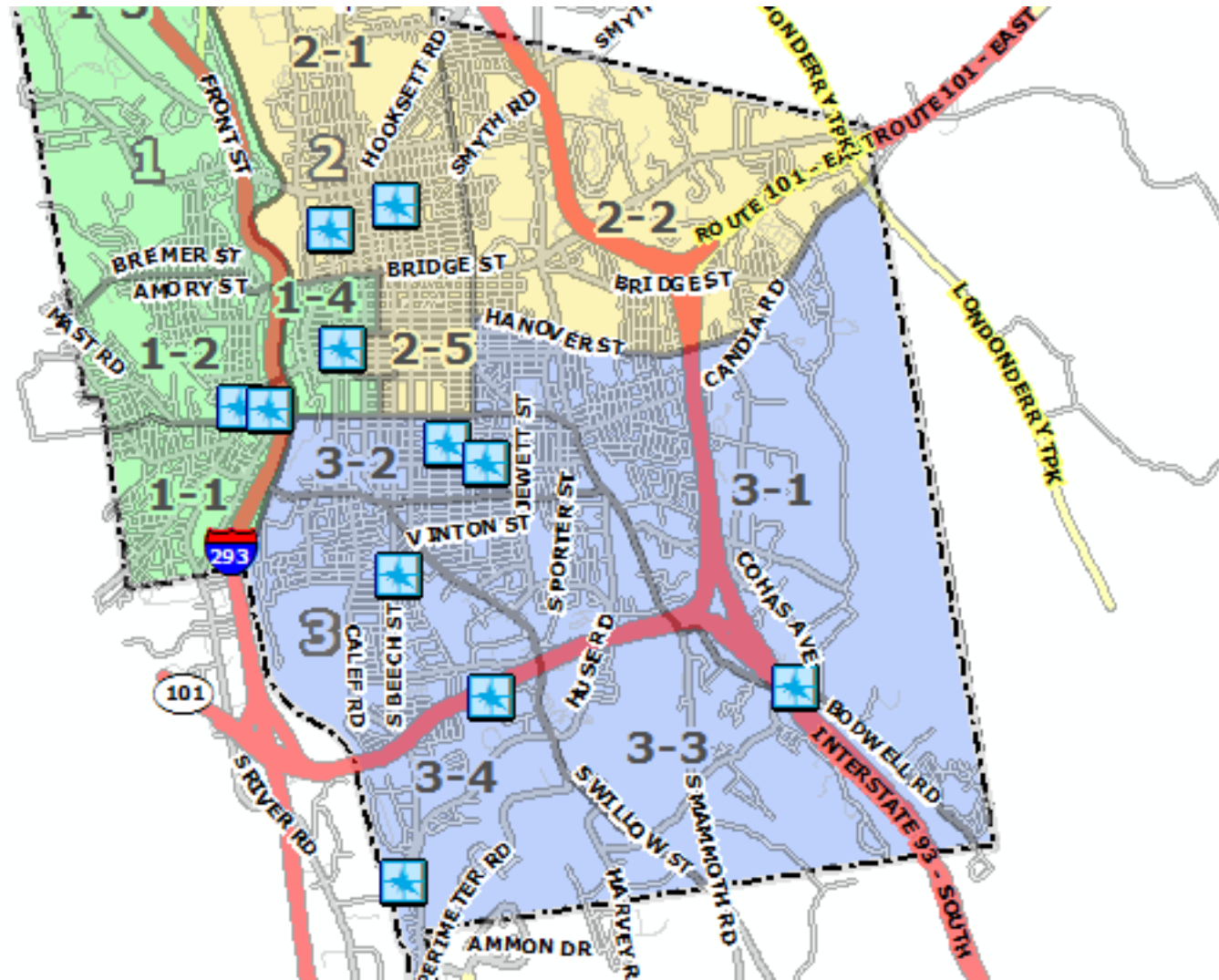
- Crime will cluster in certain sectors of urban zones, while others remain crime free¹
- Over 50% of crimes occur in 3% of places²



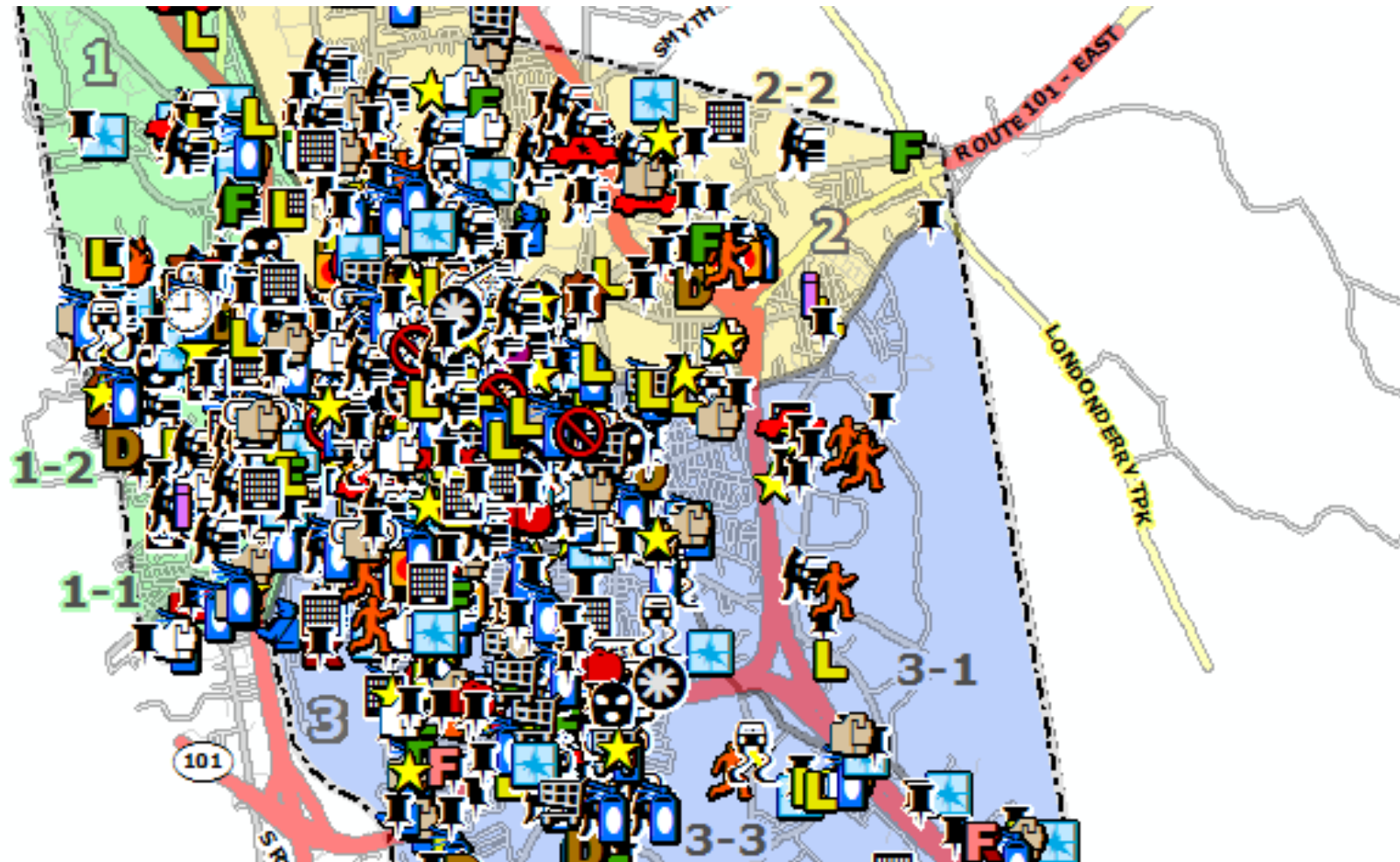
In the Beginning: Descriptive Hot Spots



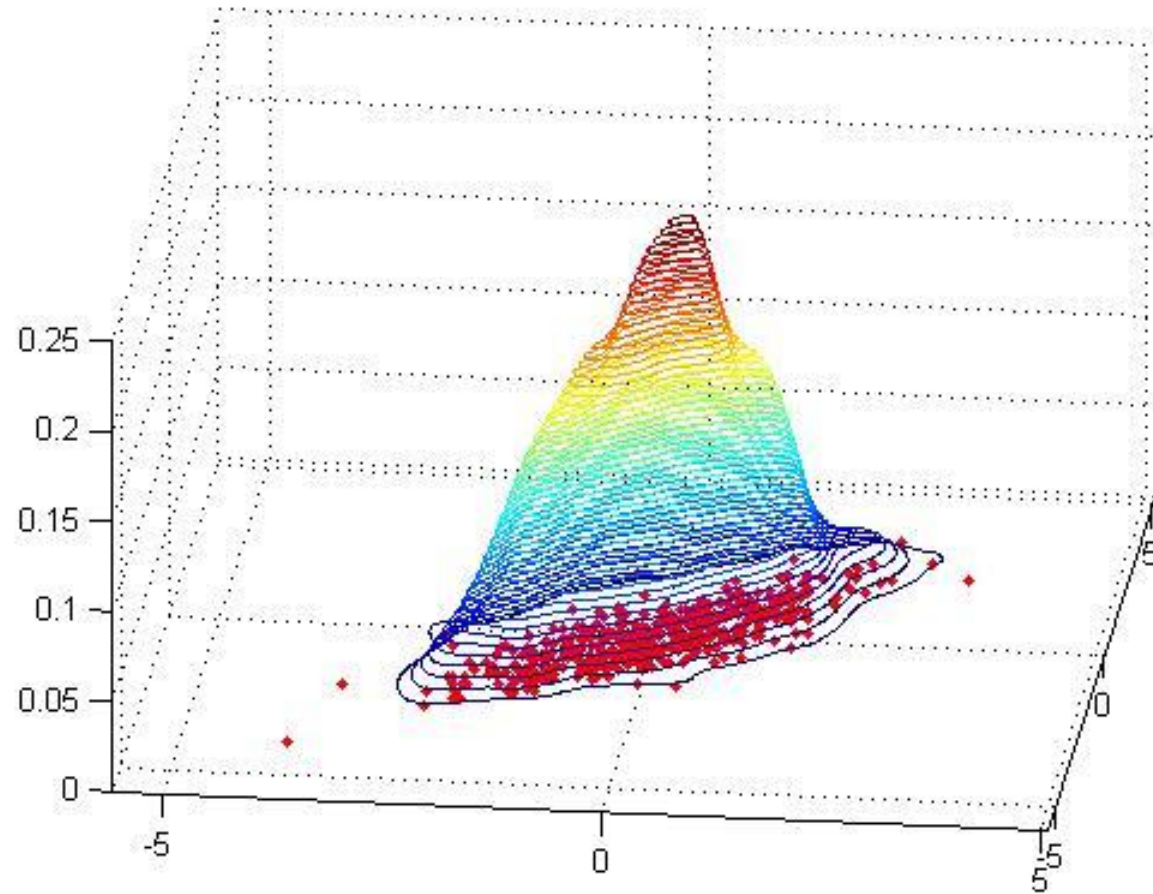
Started with Incident Pin Maps



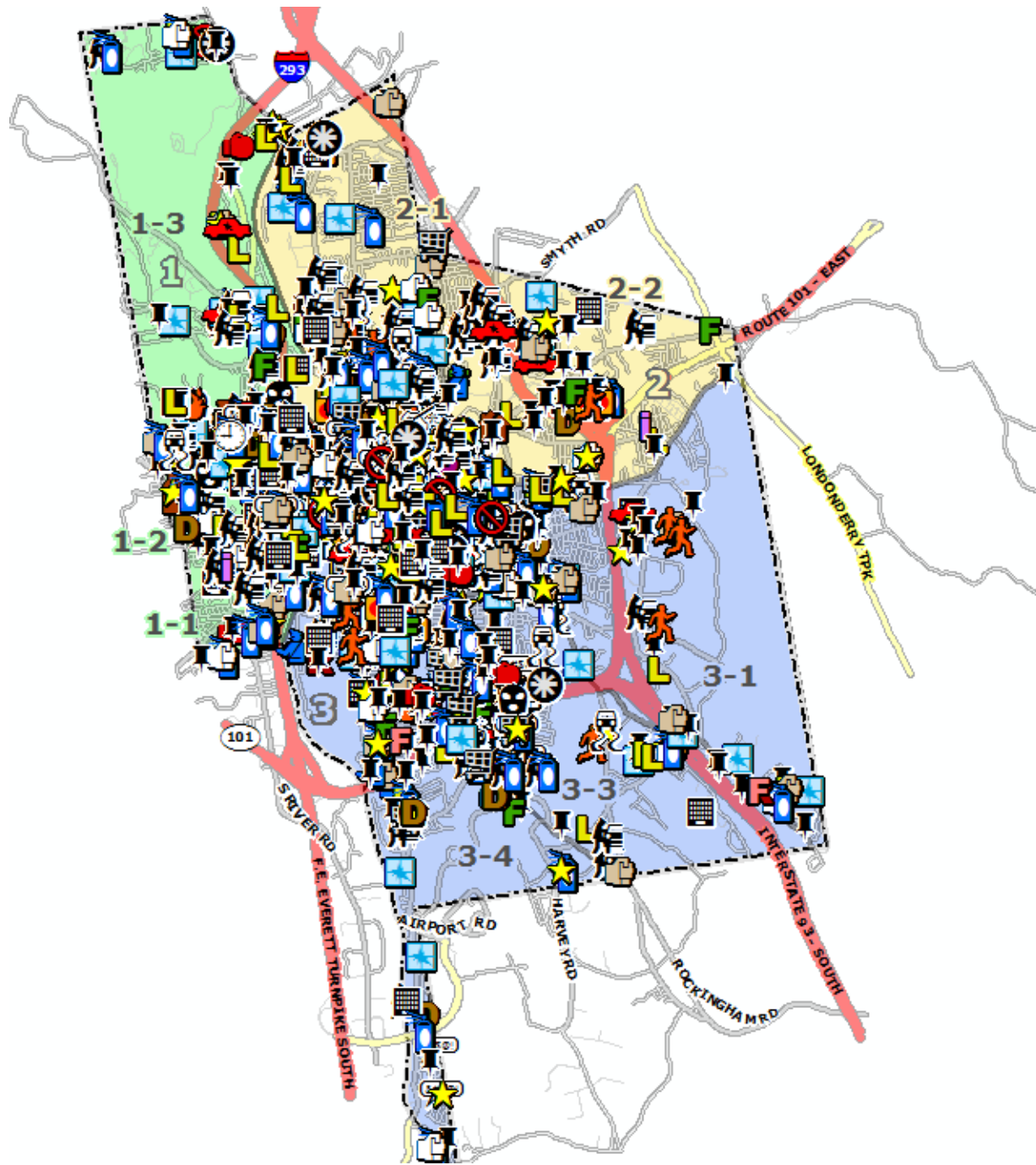
They Don't Scale Well



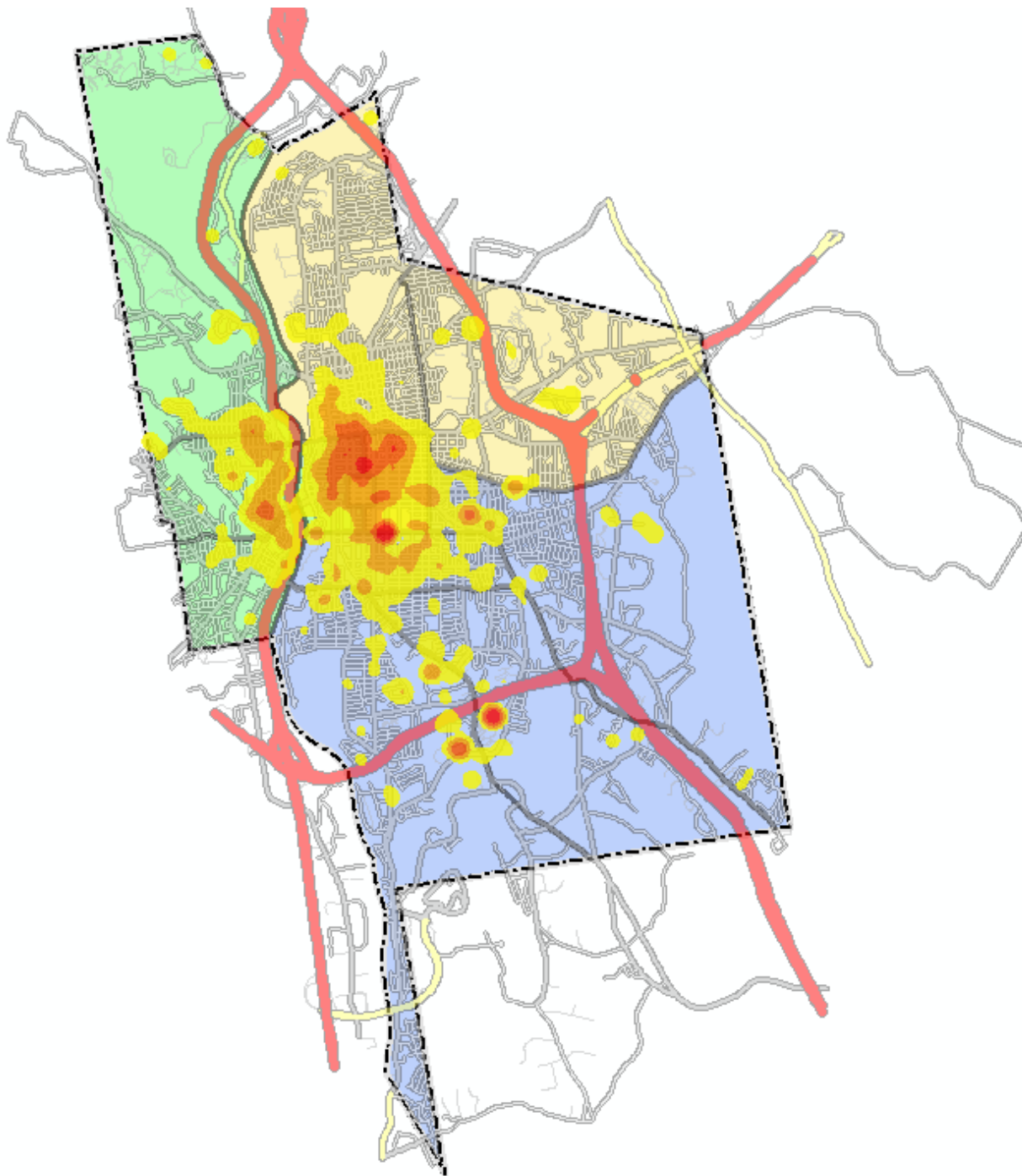
A Better Visualization: Density Mapping



From This



To This



On Data Quality

- Initial results exposed data quality issues
- Process issues caused incident clustering at HQ and Local Hospitals
- Internal campaign to improve data quality



What Can Data Do for You?

Proper entry of these data fields can help:
Provide valid statistics

Valid Statistics Help Predict Crime

Predicting Crime Reduces Crime

Lower Crime = **Less 101's**

Most Reports are Correct!
But, just as a reminder...

Correct Date/Time **Event Started**
Correct Date/Time **Event Ended**

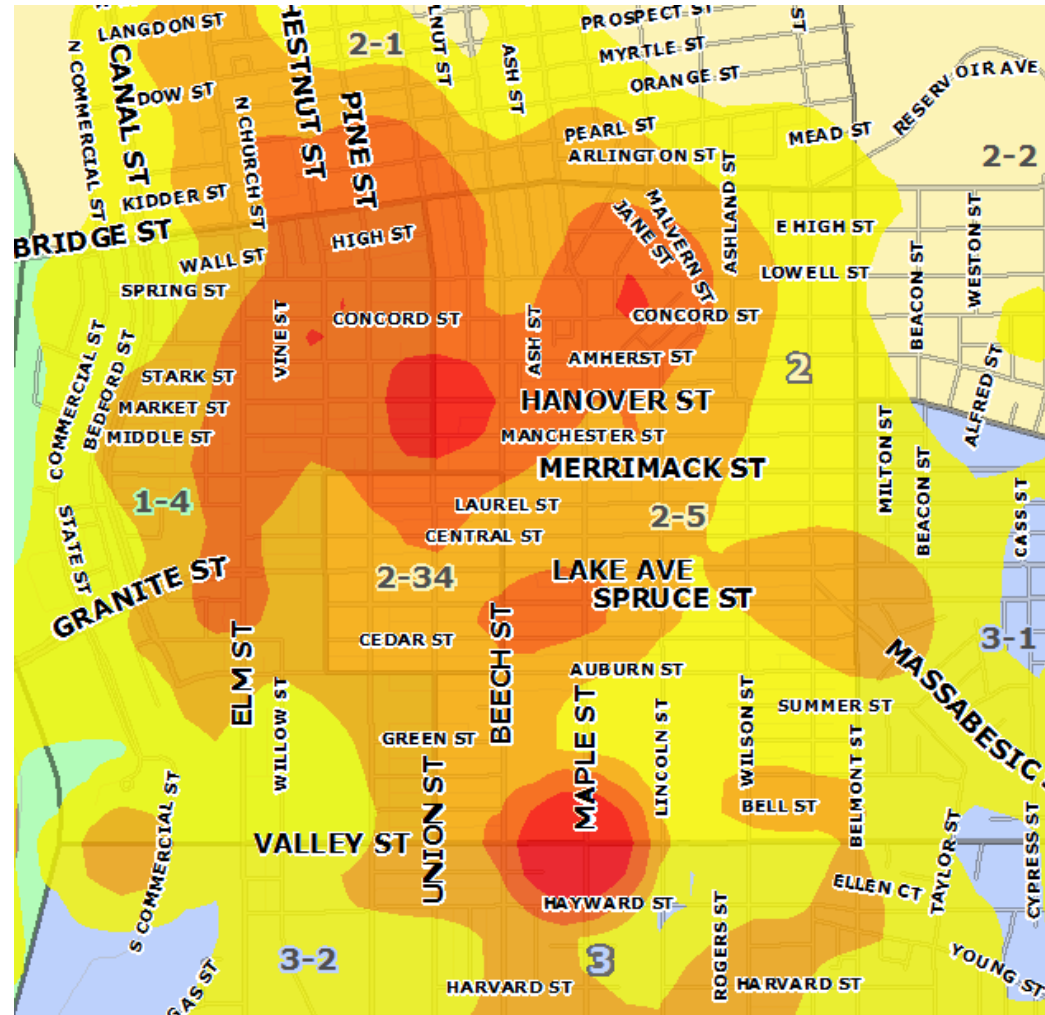
Correct Address **WHERE CRIME OCCURRED**

Correct Charge

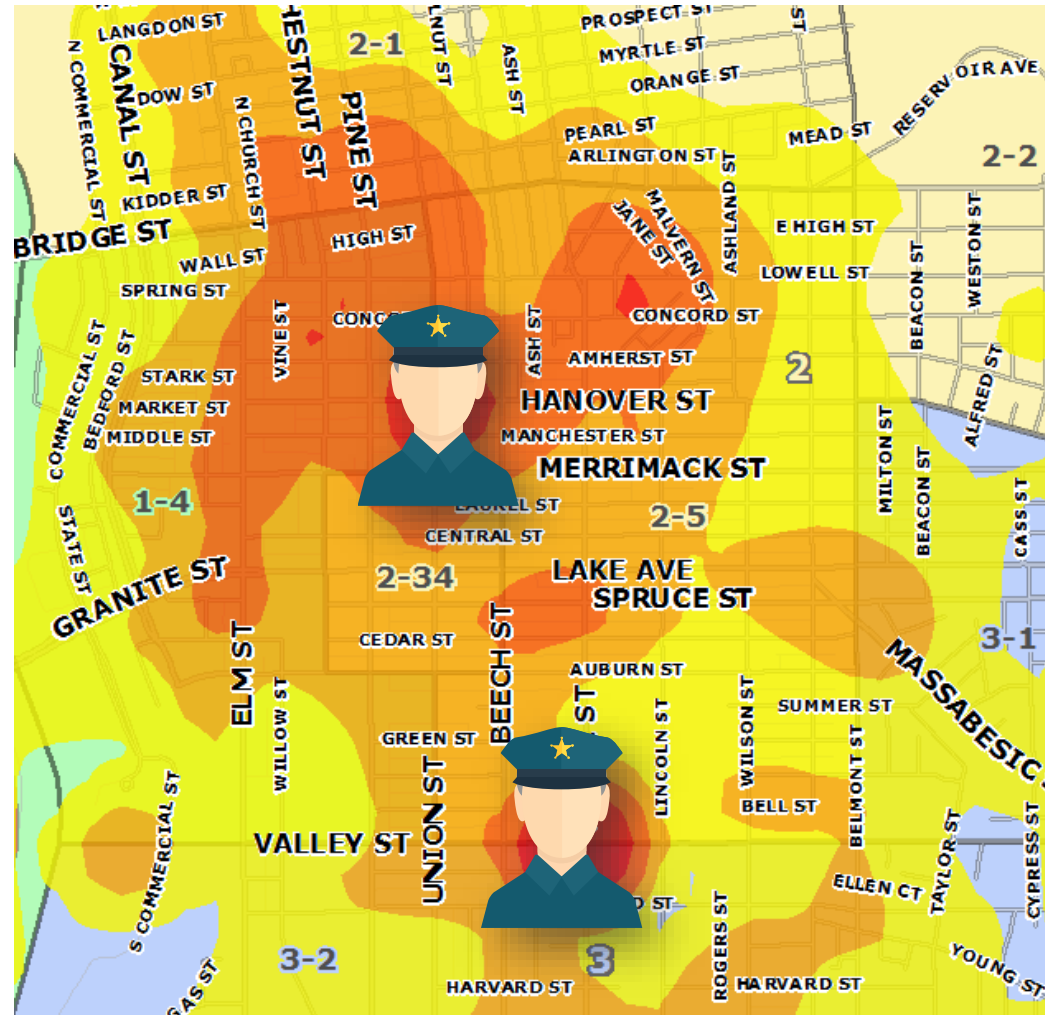
Have an unknown offender?
Don't enter one.
No need for: "Unknown,Unknown"
or "Unknown, Case #"

Every Report.....Every Time

How Do We Take Action?



Deploy Resources & Intervene



Optimizing Deployment of Resources



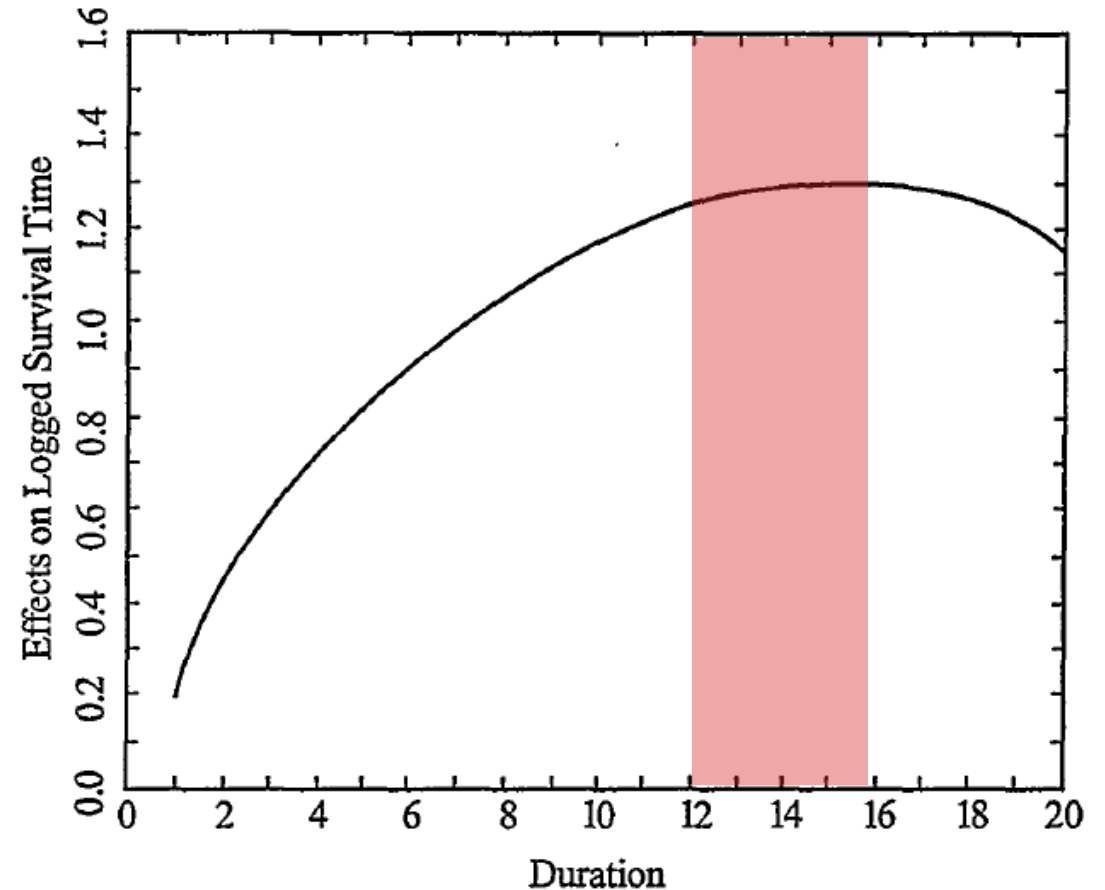
Koper (1995)

- 12-16 Minutes = 2 Hours

Mitchell (2011)

- Violent & Property (Part 1) Crimes Down 25%

Figure 1. Duration Response Curve



Our Journey



Descriptive Hot Spot Policing

Predictive Hot Spot Policing

Results

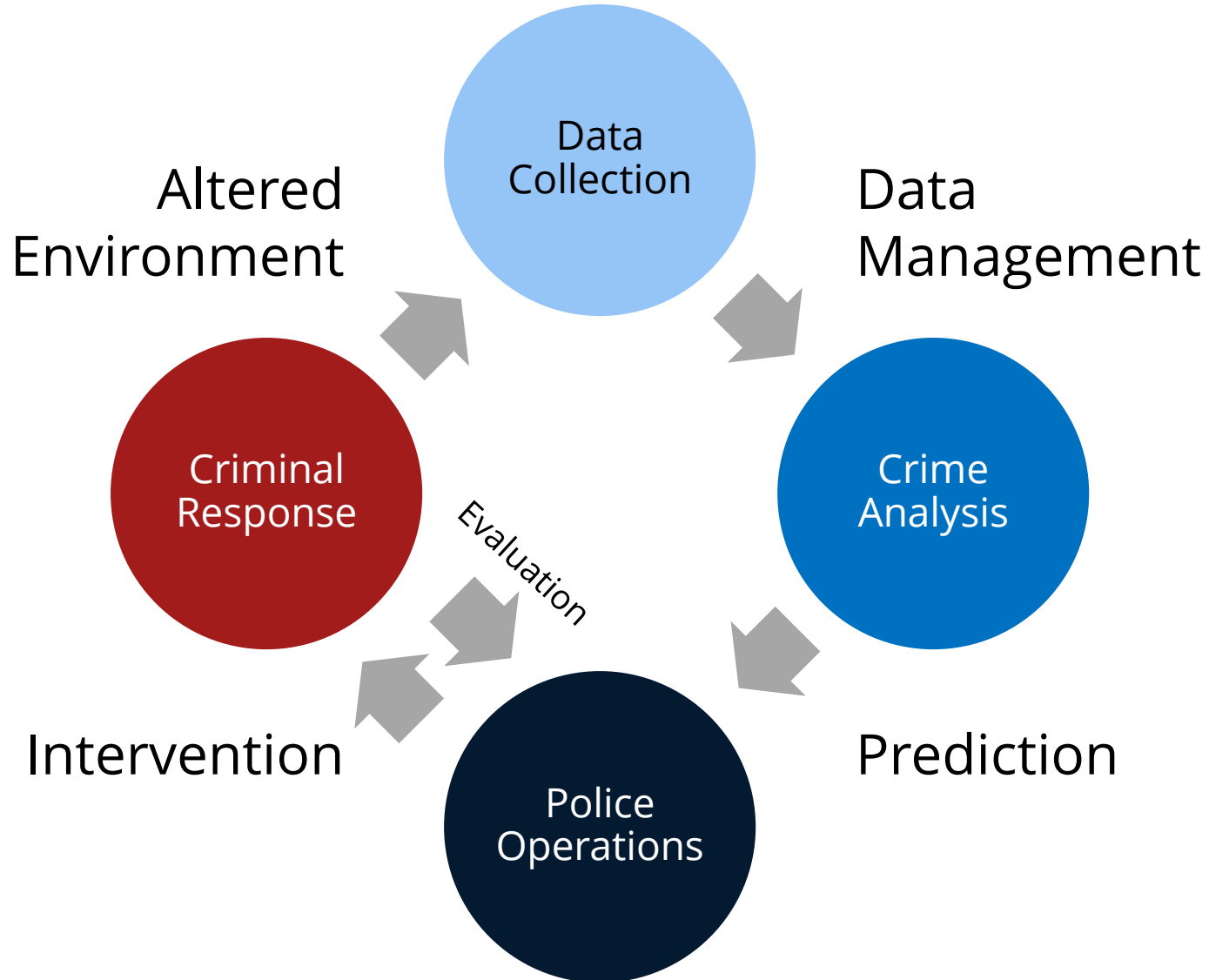
2014: Descriptive Hot Spots

- Data clean up
- Refine policing tactics
- Organizational preparedness

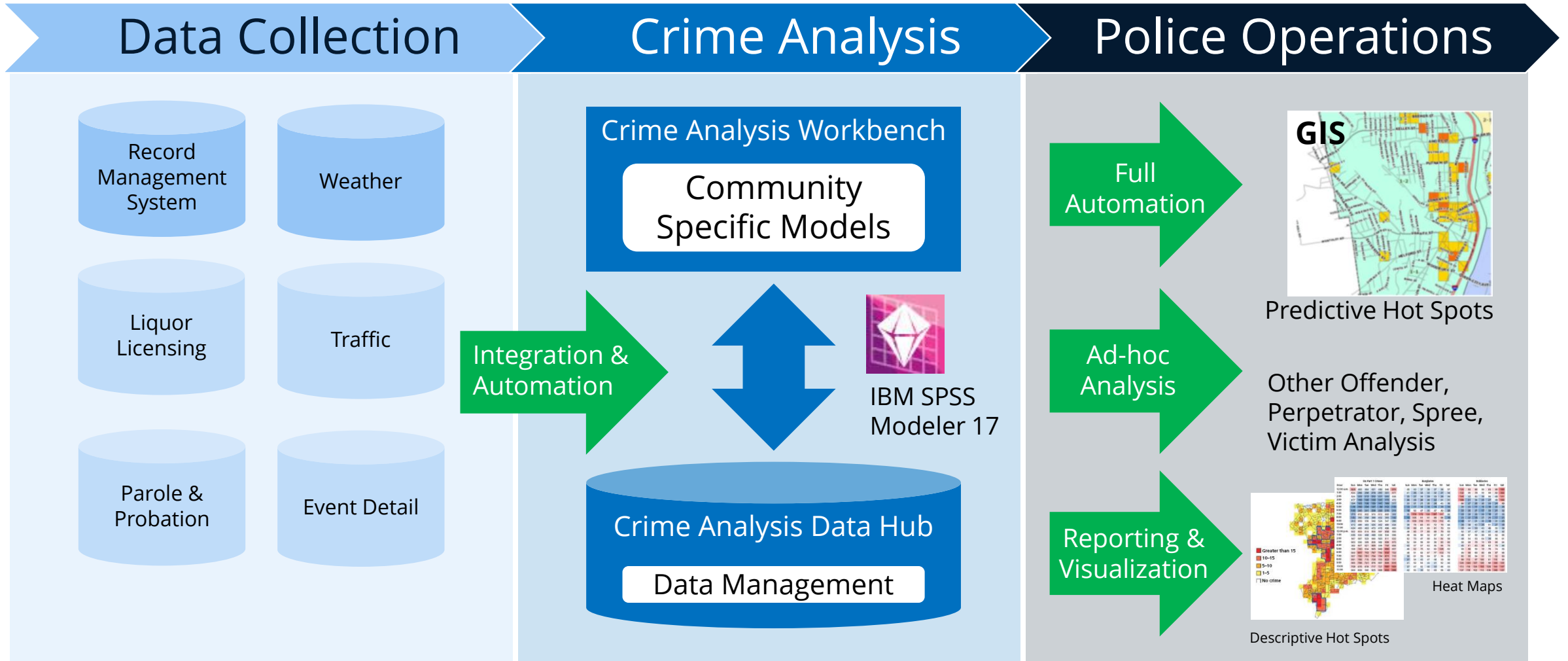
Q1 2015: Ironside

- Initial Proof of Concept
- Acquired IBM SPSS Modeler
- Data Science Mentoring & Development

The Predictive Policing Business Process



A Predictive Policing Solution Architecture



Why We Chose IBM & Ironside



IBM SPSS Modeler

- Not a black box - we wanted to know what was going on underneath
- Graphical - Light on coding, easy to learn
- Not limited to hot spots only
- Easy to merge multiple sources



Ironside

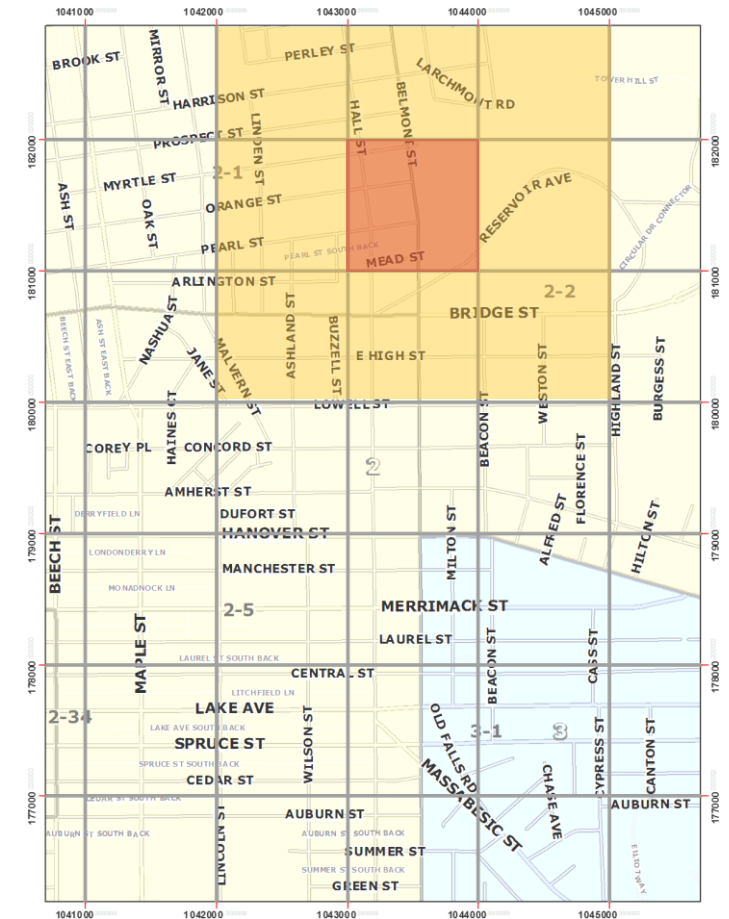
- POC demonstrated significant improvement over retroactive hot spots
- Brought strong data science mentors who knew the technology
- High-touch side-by-side model build to transfer all knowledge

End result was acquiring a department capability to do all things predictive policing, **not just a hot spot scoring engine.**

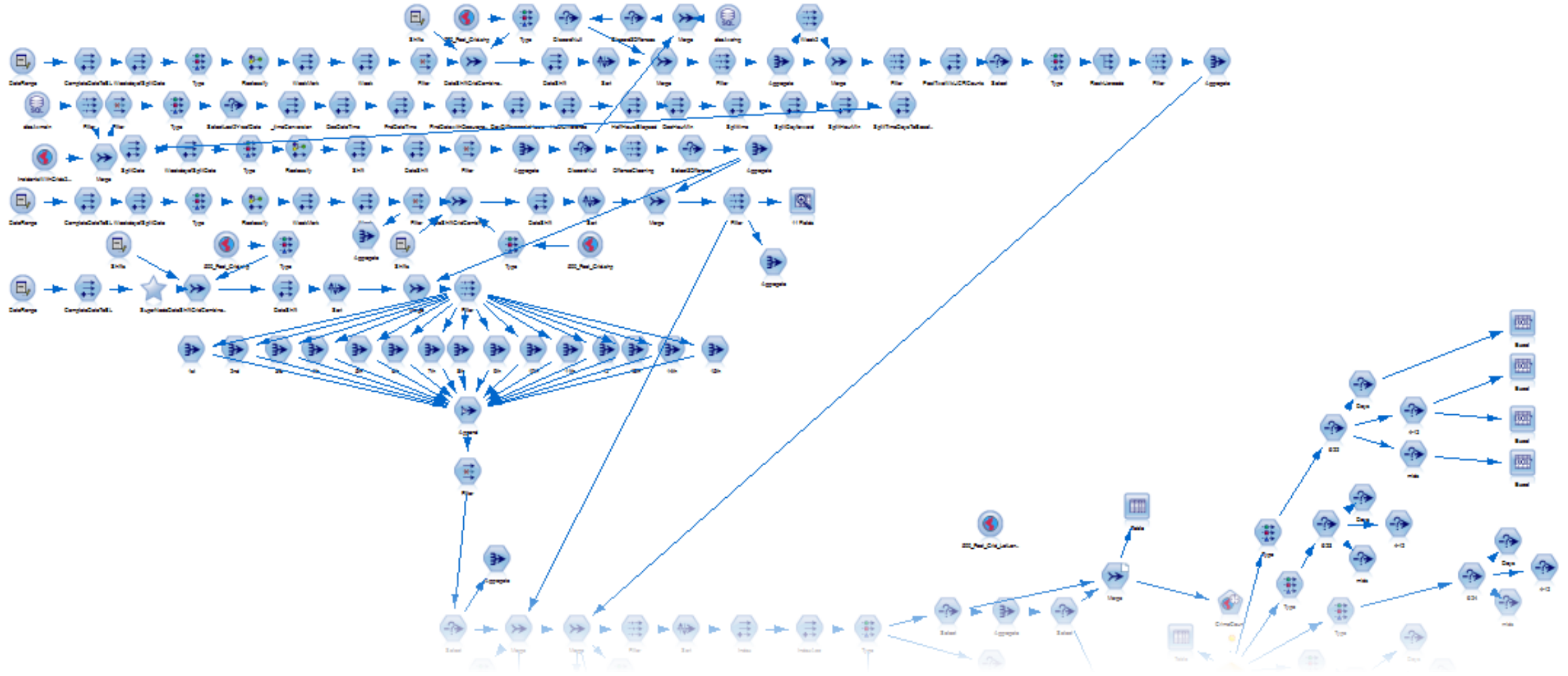
Prediction of Crime Occurrence



- History in this square and 8 adjacent
- Crime History & Incident Category
- Time of Day
- Day of Week
- Weather Conditions



IBM SPSS Modeler

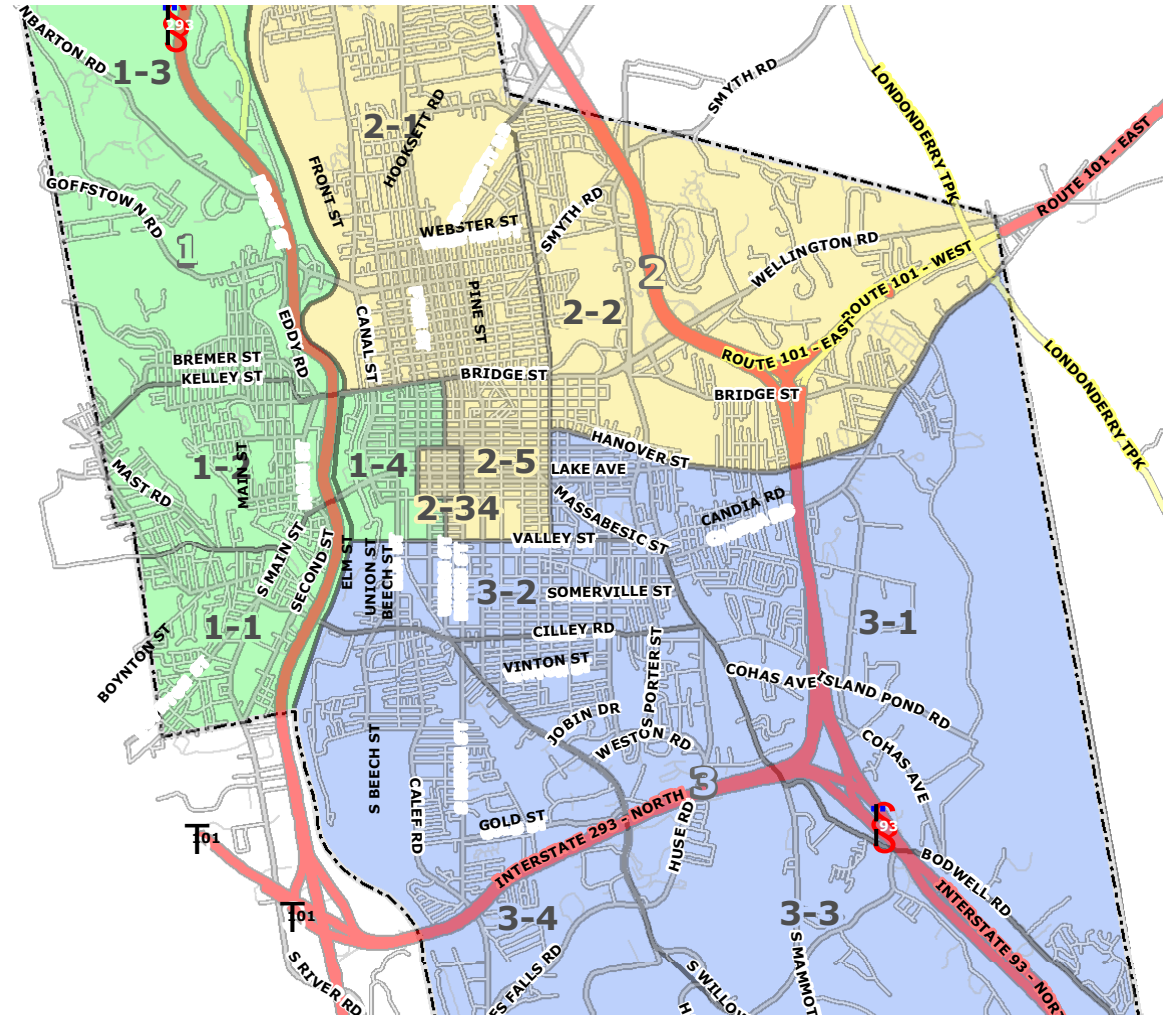


ESRI ArcGIS

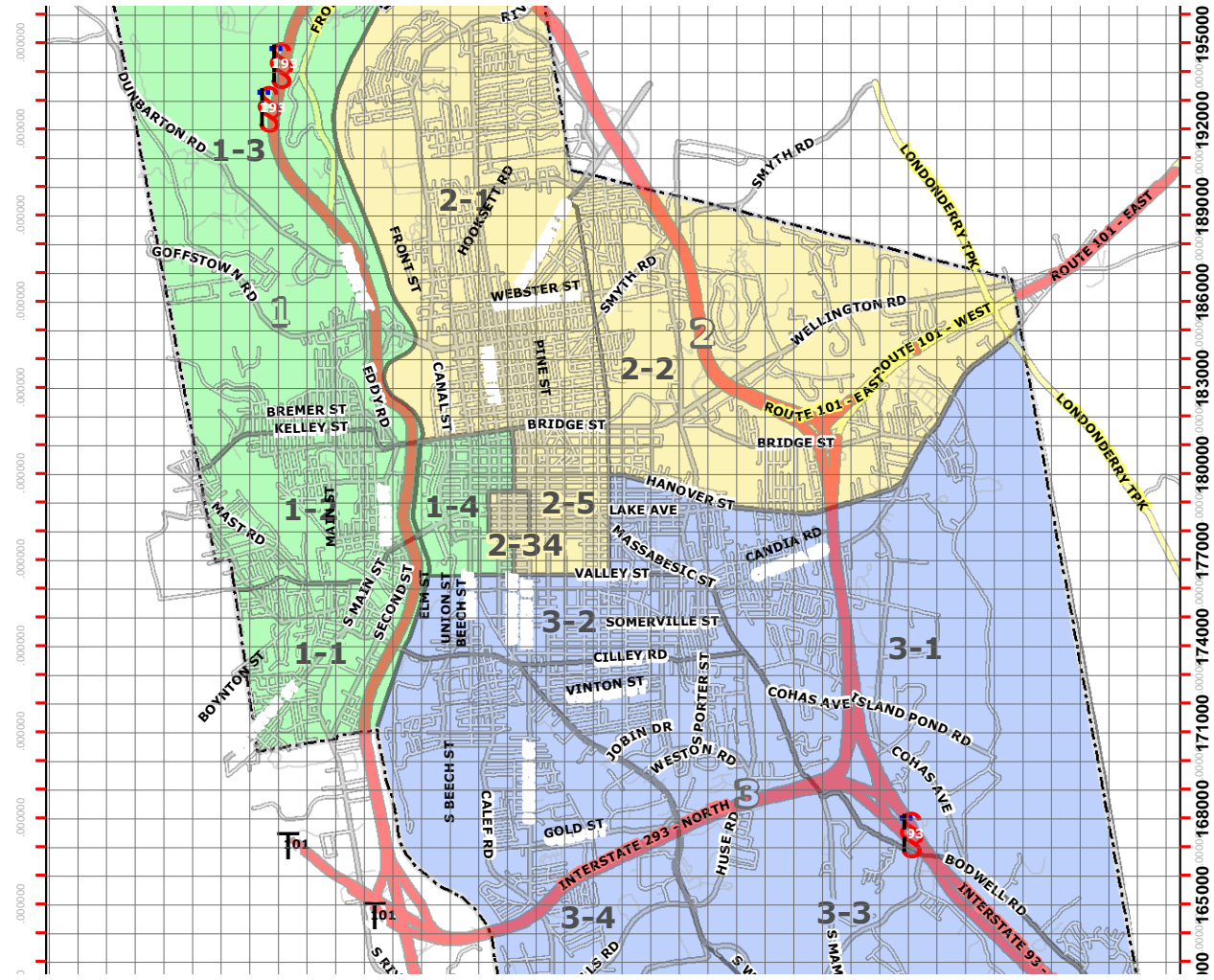


A screenshot of the ESRI ArcGIS software interface. The main window displays a map of Manchester, NH, with various layers and a table of contents. The map shows a grid of streets and areas, with some areas highlighted in green, yellow, and blue. The table of contents on the left lists various layers, including "City Streets 1:100,001 to 1:150,000", "City Streets 1:100,001 to 1:100,000", "City Streets 1:5,001 to 1:10,000", "City Streets 1:1 to 1:5,000", "Area Streets 1:150,001 to 1:200,000", "Area Streets 1:100,001 to 1:150,000", "Area Streets 1:10,001 to 1:100,000", "Area Streets 1:5,001 to 1:10,000", "Area Streets 1:1 to 1:5,000", "Water Bodies", "City Border", "Area Towns", "sde.GISADMIN.Police", and "MHA_parcel". The map shows a grid of streets and areas, with some areas highlighted in green, yellow, and blue. The table of contents on the left lists various layers, including "City Streets 1:100,001 to 1:150,000", "City Streets 1:100,001 to 1:100,000", "City Streets 1:5,001 to 1:10,000", "City Streets 1:1 to 1:5,000", "Area Streets 1:150,001 to 1:200,000", "Area Streets 1:100,001 to 1:150,000", "Area Streets 1:10,001 to 1:100,000", "Area Streets 1:5,001 to 1:10,000", "Area Streets 1:1 to 1:5,000", "Water Bodies", "City Border", "Area Towns", "sde.GISADMIN.Police", and "MHA_parcel". The map shows a grid of streets and areas, with some areas highlighted in green, yellow, and blue. The table of contents on the left lists various layers, including "City Streets 1:100,001 to 1:150,000", "City Streets 1:100,001 to 1:100,000", "City Streets 1:5,001 to 1:10,000", "City Streets 1:1 to 1:5,000", "Area Streets 1:150,001 to 1:200,000", "Area Streets 1:100,001 to 1:150,000", "Area Streets 1:10,001 to 1:100,000", "Area Streets 1:5,001 to 1:10,000", "Area Streets 1:1 to 1:5,000", "Water Bodies", "City Border", "Area Towns", "sde.GISADMIN.Police", and "MHA_parcel".

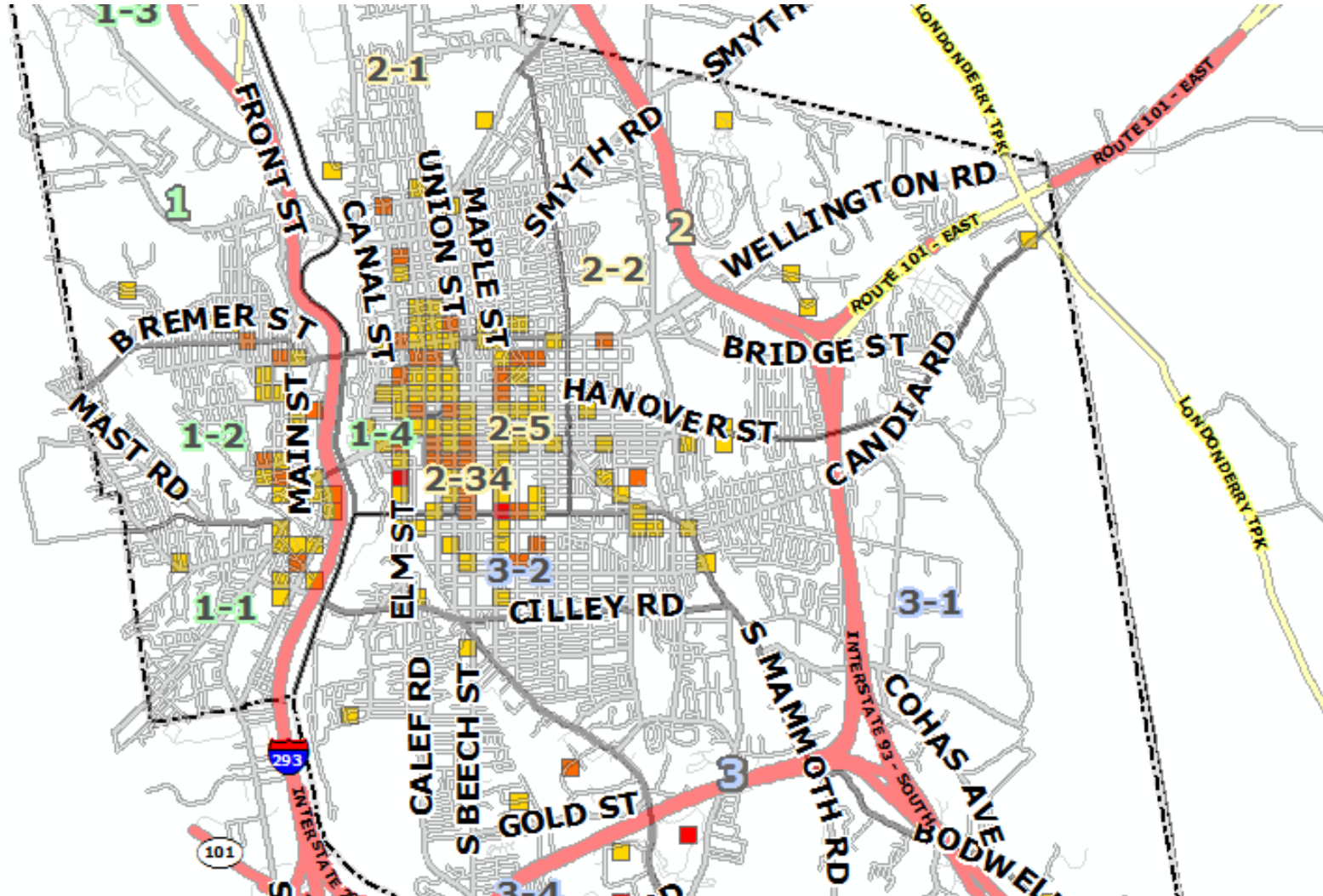
Base Map



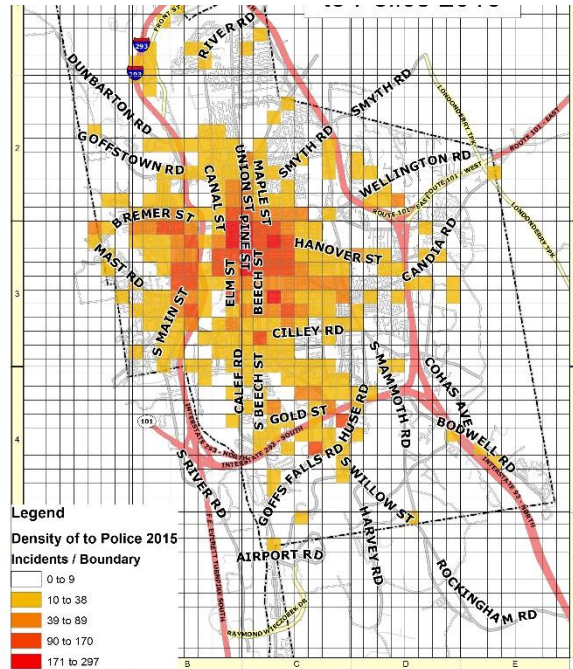
Base Map with 500' Index Grid



Base Map with 500' Grid Predictions



Same Evidence-Based Approach



Predictive Hot Spot Maps

+



15 Minute Hot
Spot Patrols

=



CRIME

Our Journey



Descriptive Hot Spot Policing

Predictive Hot Spot Policing

Results

2014: Descriptive Hot Spots

- Data clean up
- Refine policing tactics
- Organizational preparedness

Q1 2015: Ironside

- Initial Proof of Concept
- Acquired IBM SPSS Modeler
- Data Science Mentoring & Development

Q3 2015: Deployment

- 15 Minute Hot Spot Patrols
- Hot Spot Radio Call-Ins

Initial Results



Robbery

Burglary

Theft from MV

Vs. Prior 15
Week Period

32% ↓

7% ↓

40% ↓

Vs. Same
Period Last
Year

43% ↓

11% ↓

29% ↓



Sep 15, 2015 10:48 AM



Predictive analytics help Manchester police solve crimes with computers, not guns

By: [Celine McArthur](#)

[NH1.com](#)



Concord, NH		°F	°C
SUN	Mostly Sunny	42°	23°
Oct 18	Precip. 0%		
MON	Sunny	49°	34°
Oct 19	Precip. 0%		
TUE	AM Showers	61°	38°
Oct 20	Precip. 50%		
WED	Partly Cloudy	59°	40°
Oct 21	Precip. 20%		
THU	AM Showers	62°	38°
Oct 22	Precip. 50%		



NH1 ON TWITTER

Paul Steinhauser @steinhauserNH1 59m
1-on-1 with @JebBush @JohnKasich

Independent BJA NTTAC Assessment



Manchester NH, Police Department is rated **“Cutting Edge”** with their Predictive Hot Spots Policing Initiative

Predictive Policing is a Team Sport



Mayor Ted Gatsas
& Board of
Alderman

- Approval & Funding



Chief Nick Willard

- Primary Sponsor
- Drove Alignment
- Created Accountability



Officer Matthew
Barter, S.W.A.T.

- Champion / Evangelist
- Crime Analyst
- Subject Matter Expert



Krista Comrie

- Crime Analyst
- Subject Matter Expert



Chi Shu

- Ironside Data Scientist
- Statistics and Machine Learning Domain Expert



Tony Schaffer

- Manchester, NH IS
- City GIS and Data Systems Domain Expert





Checklist for Success

- ✓ Top down support (Police Driven)
- ✓ Willingness to Change
- ✓ Focus on Interested Personnel
- ✓ Collaboration with IT Staff Early & Often
- ✓ Organizational Preparedness
 - ✓ Create System of Accountability (e.g. CompStat)
 - ✓ Align on Data Quality
- ✓ Keep Deployment Simple



The Devil is in the Deployment

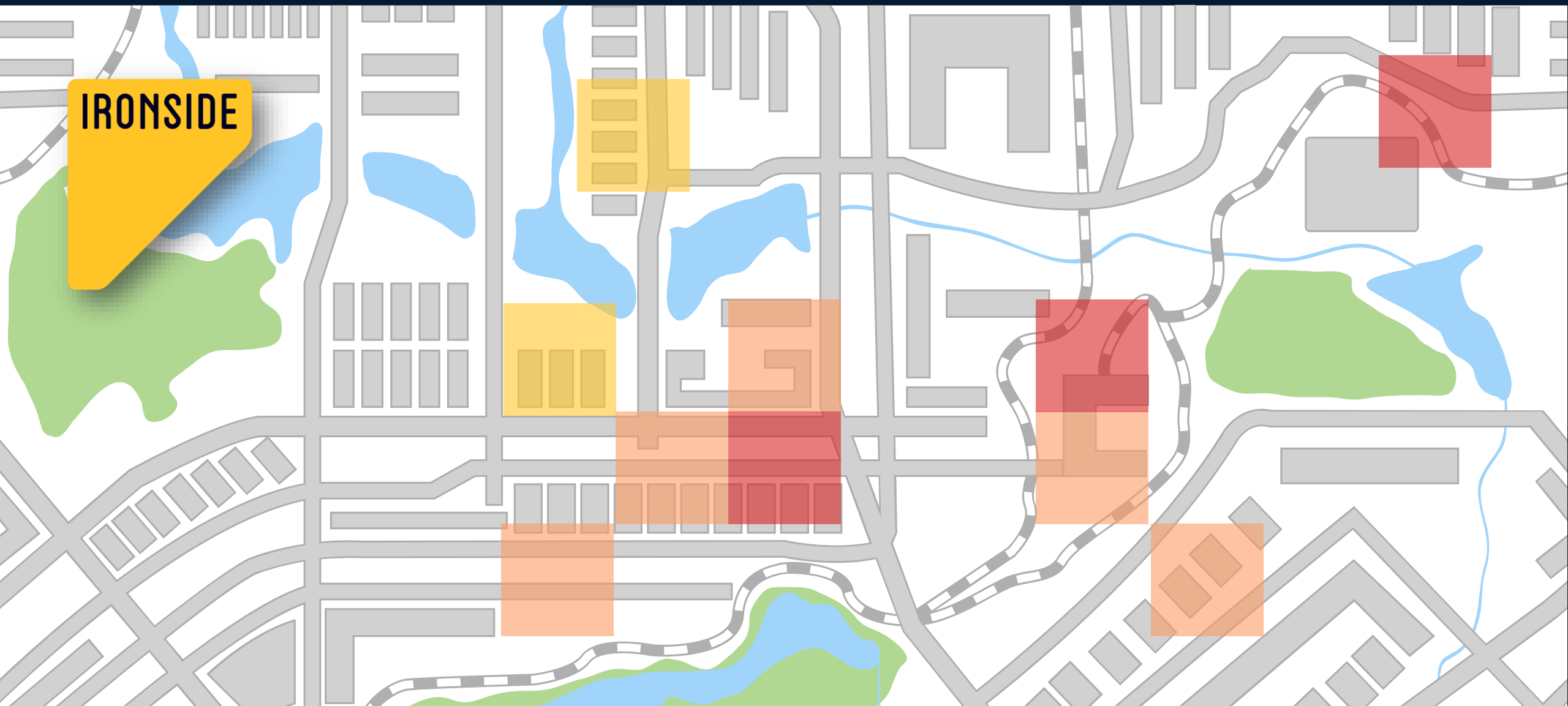
- Less is More
- Be Prescriptive to a Point
- Set Performance Goals
- Make it Competitive
- Make it Accountable
- Highlight Wins Publicly



Next for Manchester, NH

- Offender Based Modeling
- Predictive Hot Spot methodology for traffic accidents
 - Areas to increase traffic enforcement
 - Secure grant funding
- Gun Crime Analysis
- Everyday Data Prep Tasks
 - Faster ability to run queries
 - Create streams so information can be routinely run
- Dash Boards, Improved KPI tracking, etc.

Q&A



References

- <https://youtu.be/BNeMolbEgl8>
- <http://nh1.com/news/predictive-analytics-help-manchester-police-solve-crimes-with-computers-not-guns/>
- <http://www.usatoday.com/story/news/nation/2014/05/12/mental-health-system-crisis/7746535/>
- <http://www.usatoday.com/longform/news/nation/2014/07/21/mental-illness-law-enforcement-cost-of-not-caring/9951239/>
- <http://data.bls.gov/timeseries/CES0500000001>
- <http://data.bls.gov/timeseries/CES9000000001>
- <http://cops.usdoj.gov/html/dispatch/06-2012/hot-spots-and-sacramento-pd.asp>
- <http://www.dhhs.nh.gov/dcbcs/bdas/documents/issue-brief-heroin.pdf>
- http://www.rand.org/pubs/research_reports/RR233.html
- http://www.rand.org/pubs/research_briefs/RB9735.html
- <http://www.rand.org/blog/2013/11/predictive-policing-an-effective-tool-but-not-a-crystal.html>
- http://www.rand.org/pubs/research_reports/RR531.html
- <https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=167664>