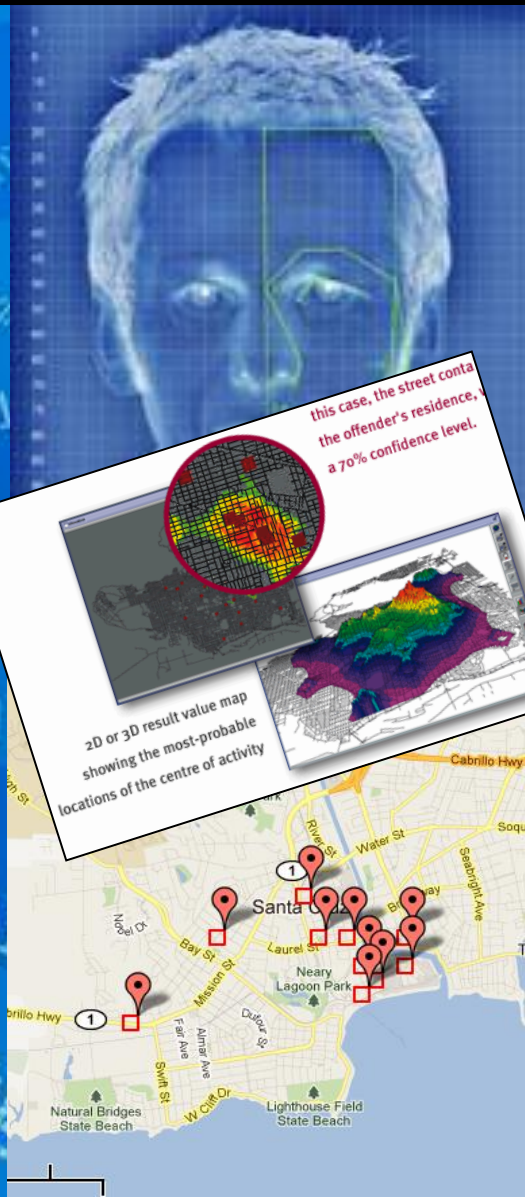
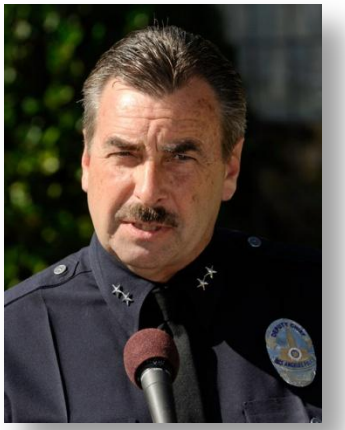
The Los Angeles Predictive Policing Experiment



Charlie Beck, Chief of Police
Los Angeles Police Department

The PoliceChief
The Professional Voice of Law Enforcement



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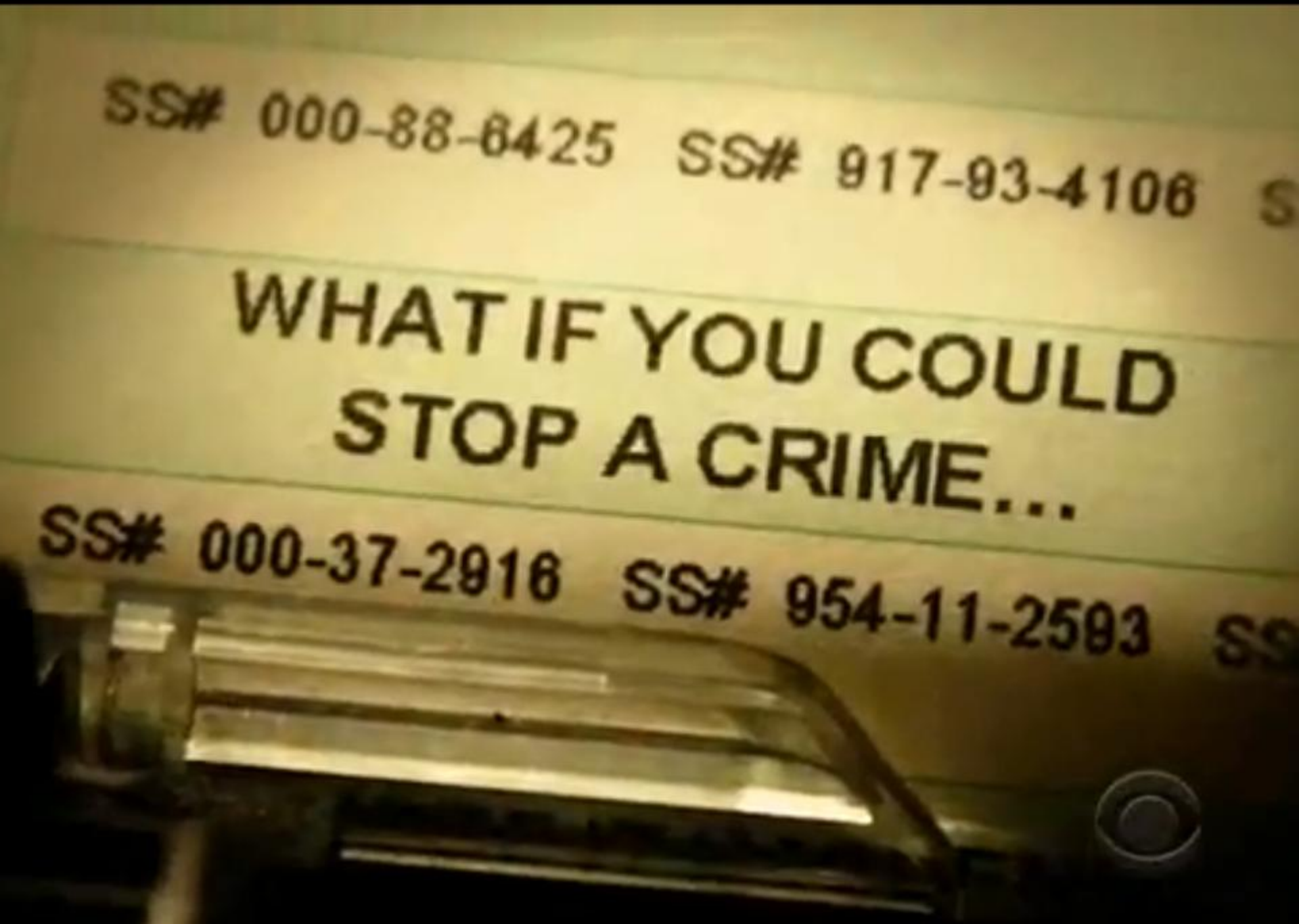
Predictive Policing: What Can We Learn from Wal-Mart and Amazon about Fighting Crime in a Recession?

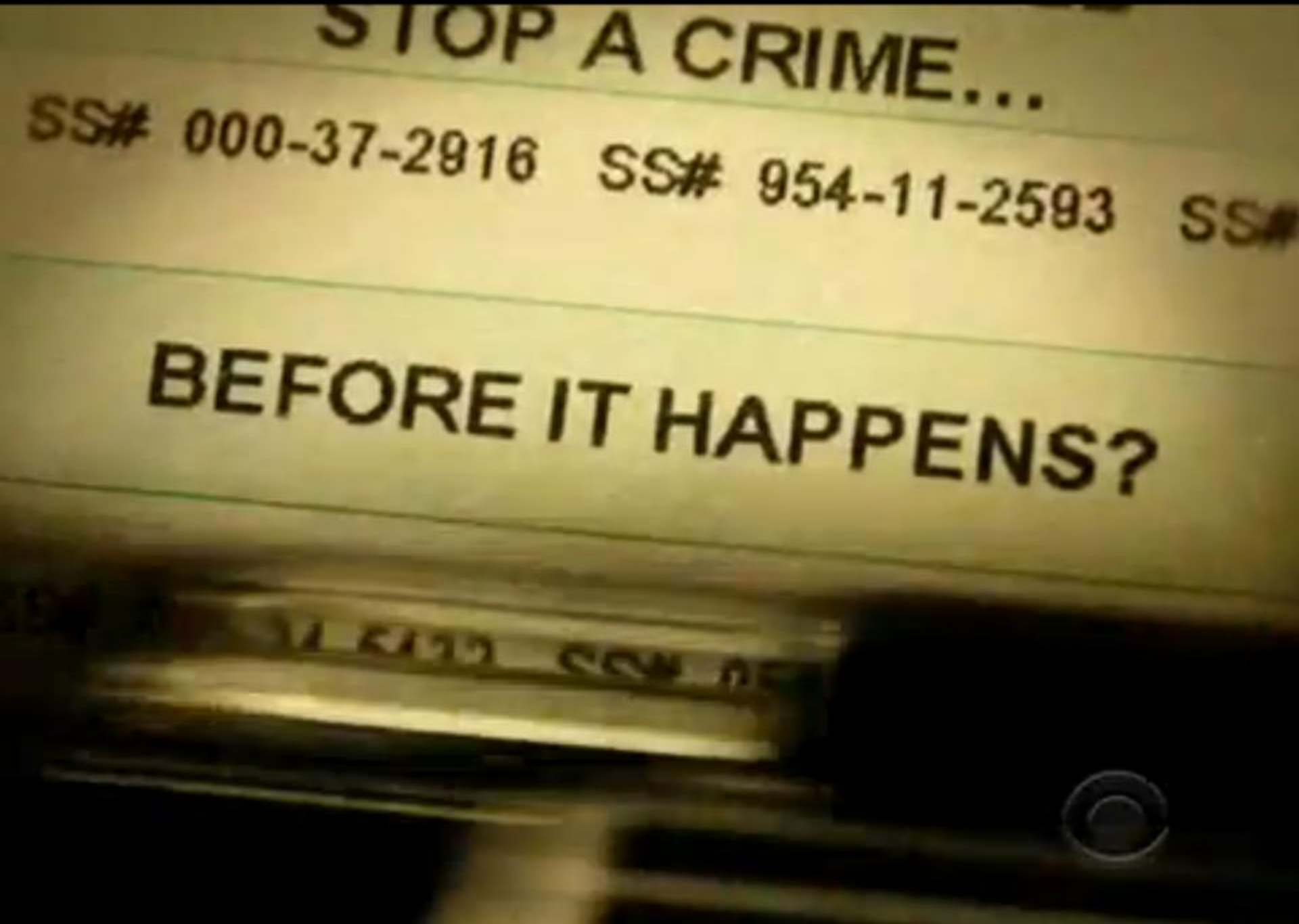
By Charlie Beck, Chief of Detectives, Los Angeles Police Department, and Colleen McCue, President and Chief Executive Officer, MC2 Solutions, LLC, Midlothian, Virginia

In the current economic climate, police departments are being asked to do more with less. In some localities, significant budget reductions are requiring police managers and command staff to consider reductions in the retention of sworn personnel. Personnel costs represent the single largest budget line item in most public safety organizations. The ability to use this resource more efficiently has become absolutely essential to police managers under current budgetary restrictions. Now, new tools designed to increase the effective use of police resources could make every agency more efficient, regardless of the availability of resources.

As these new budgetary restraints and limitations are faced, the question to ask with more urgency is "Why just count crime when you can anticipate, prevent, and respond more effectively?" Predictive policing allows command staff and police managers to leverage advanced analytics in support of meaningful, information-based tactics, strategy, and policy decisions in the applied public safety environment. As the law enforcement community increasingly is asked to do more with less, predictive policing represents an opportunity to prevent crime and respond more effectively, while optimizing increasingly scarce or limited resources, including personnel.

Reporting, collecting, and compiling data are necessary but not sufficient to increase public safety. The public safety community relies heavily on reporting what has happened already. Annual crime reports, monthly summary reports, and year-to-date reports all focus on events in the past. Even alerts focus almost exclusively on incidents that occurred in the past, albeit with increasing speed and efficiency. The predictive-policing vision moves law enforcement from focusing on what happened to focusing on what will happen and how to effectively deploy


SS# 000-88-6425 SS# 917-93-4106
WHAT IF YOU COULD
STOP A CRIME...
SS# 000-37-2916 SS# 954-11-2593


STOP A CRIME...
SS# 000-37-2916
SS# 954-11-2593
BEFORE IT HAPPENS?

Predictive Policing Time Horizon

Frequency of Statistical Review

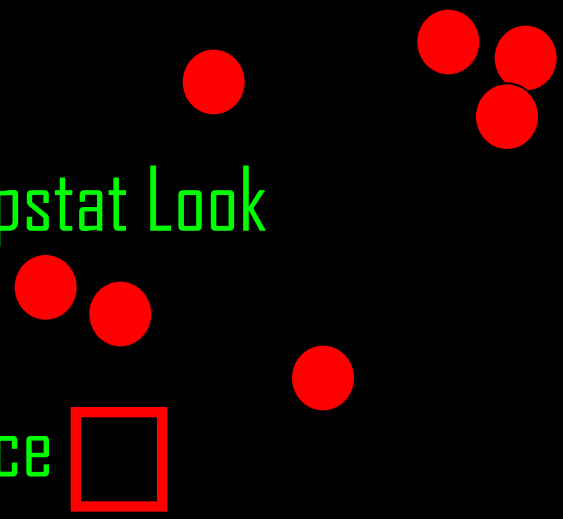
Predictive Policing, Our Definition

"A place-based approach to crime analysis that utilizes algorithm-driven crime forecasts to inform decision making to prevent crime"

- Not individual-based
- Not arrest-based
- Risk-based Deployment of patrol resources
- Builds on community policing
- Builds on Hot Spots
- Offers more specificity
- Sets us up for better long term strategic analysis

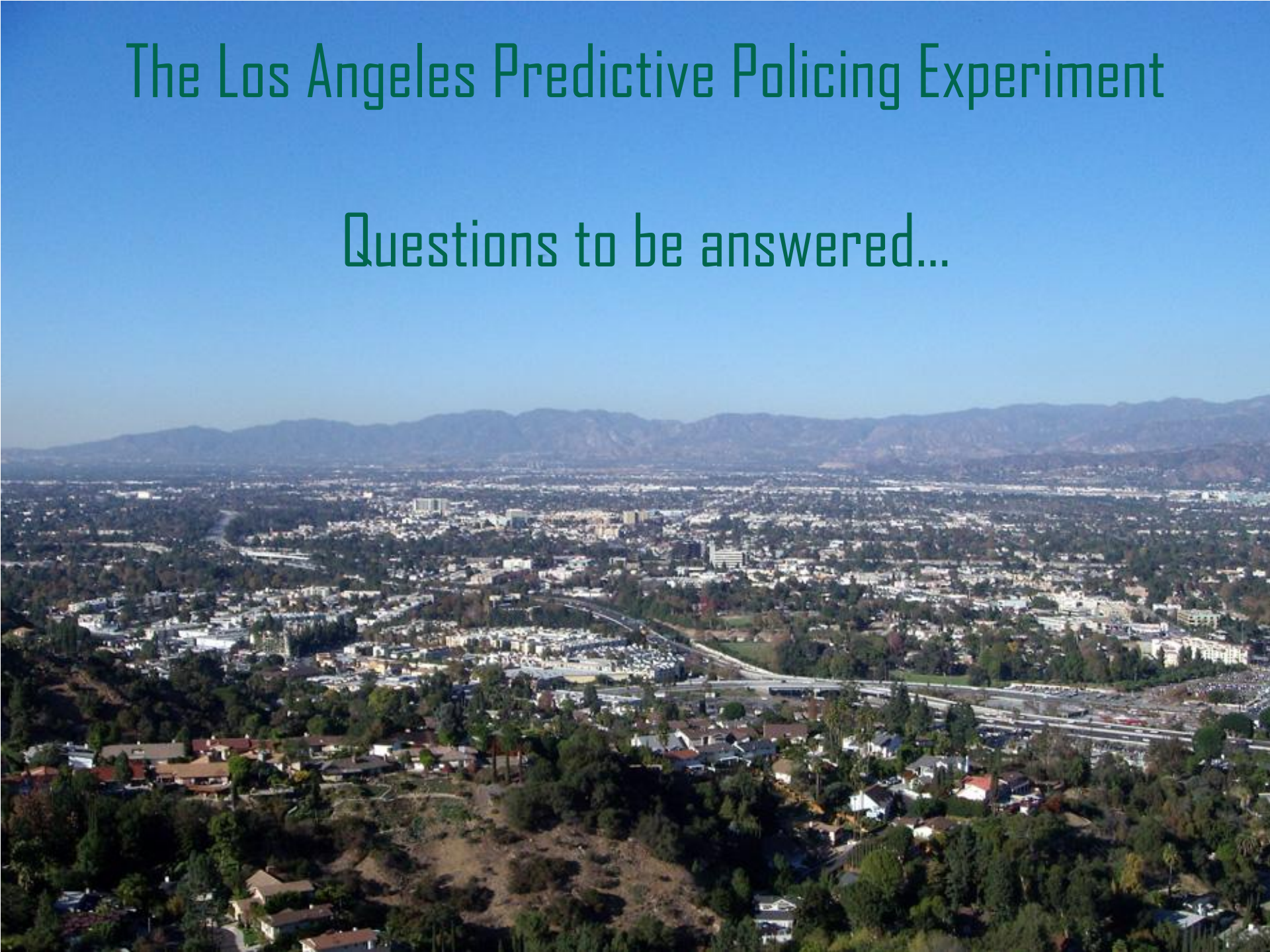
How is this different?

- Evidence-based rather than heuristic
- Forecasting versus Retrospective Compstat Look
- Reduces tendency to "chase the dots"
- Offers more specificity in time and space
- Should eliminate biases (arrests are not used)
- Leverages existing real-time data
- Not a massive multivariate model
- Uses Date, Time, Place and Type of crime
- Allows cops to problem solve in right place at right time
- Dosage findings should increase efficiency



The Los Angeles Predictive Policing Experiment

Questions to be answered...



Questions to be answered...

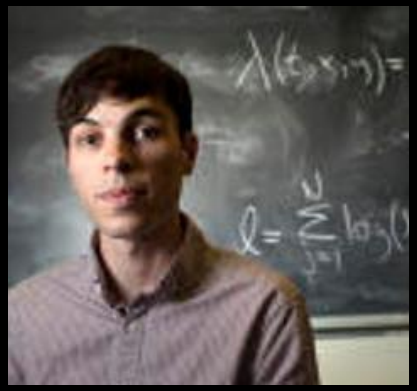
Is it possible to predict crime?

If we predict it, can we prevent it?

If we prevent it,
how can we measure that?

UC MASC PROJECT
MATHEMATICAL AND SIMULATION MODELING OF CRIME

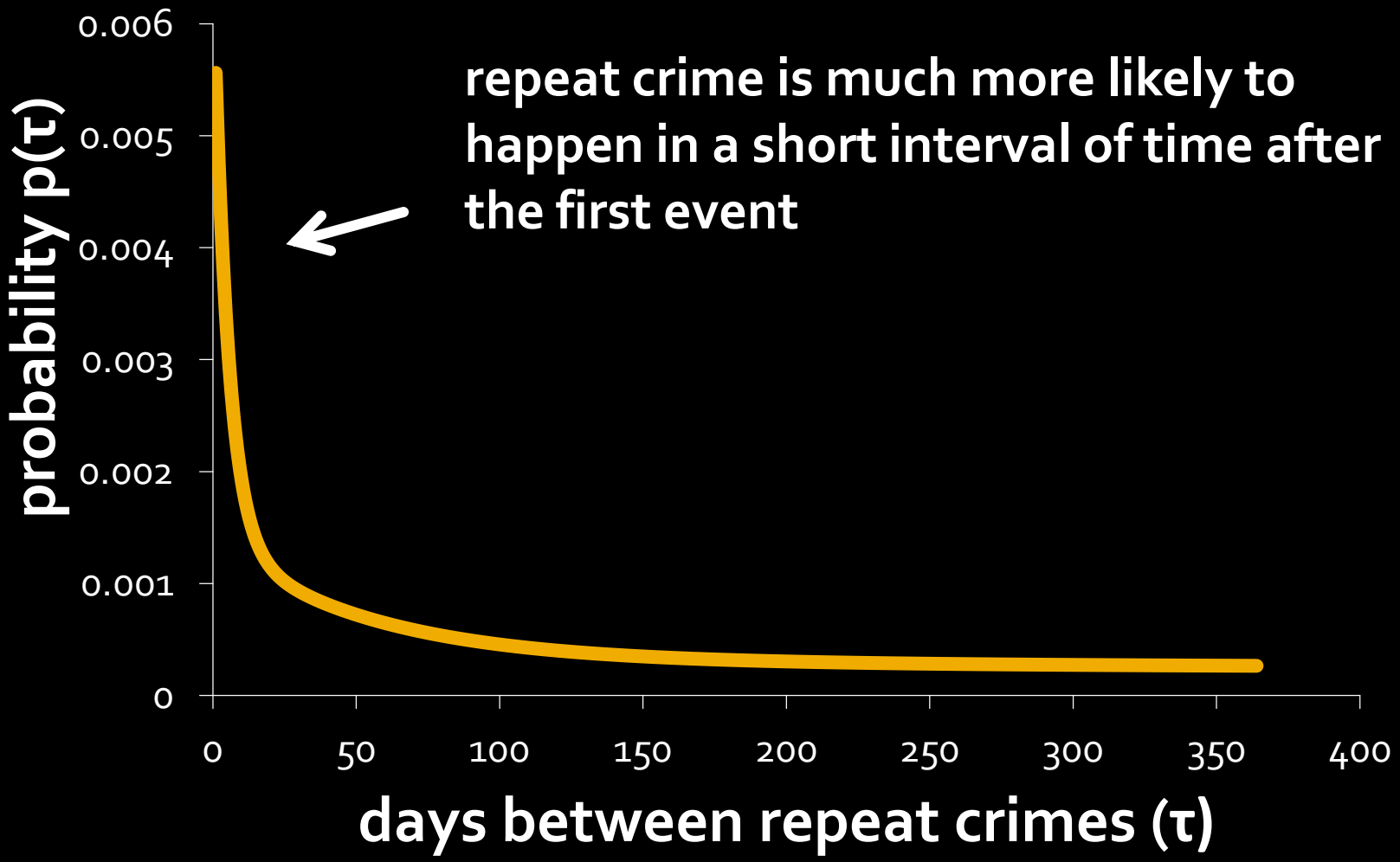
Jeff Brantingham
UCLA Anthropology



George Mohler
Santa Clara Mathematics

George Tita
UCI Criminology, Law and Society

Repeat Victimization



Research Design: The LAPD Experiment

- Rigorous examination of both forecasting value and of dosage
- Careful design of experiment is crucial to determine if Predictive Policing "works"
- Several designs possible, but only one – randomization – represents the "gold standard" of scientific design

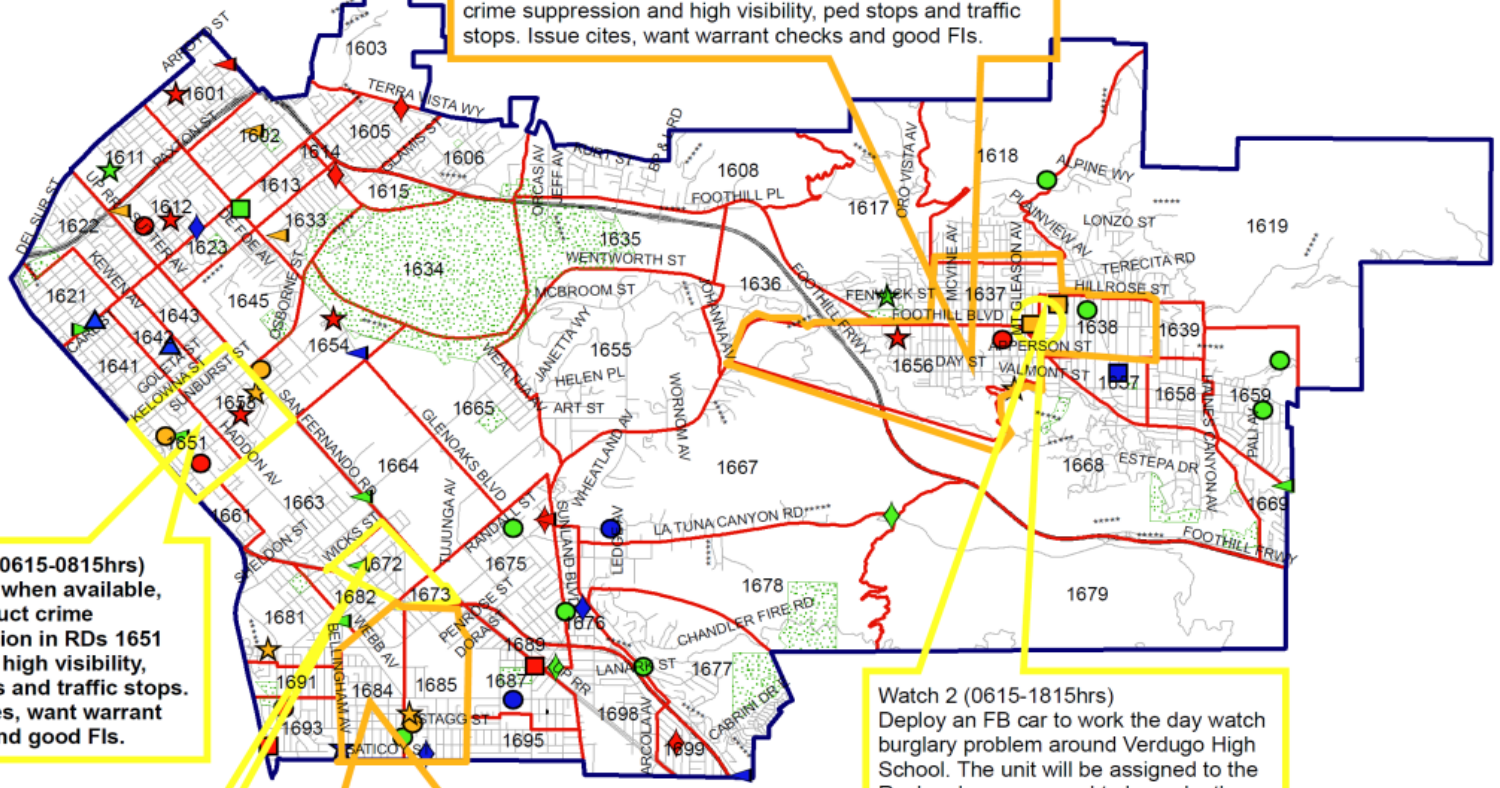
Daily Randomization

- Foothill Division serves as both the treatment and control area (seamless to the subjects)
- On random treatment days, the "daily mission" is determined by the Predictive Policing model; otherwise, mission is determined using existing methodology
- Experiment will run for a minimum of 6 months and evaluate whether total crimes lower on days when Predictive Policing model used

ALL WATCHES / ALL BASIC CARS
Be mindful that Residential Burglaries have increased across the entire division during all watches. Tools, jewelry and any type of small valuables that can be hand carried out by suspects are being taken. When time allows, all basic cars please provide extra patrol in residential areas. Be aware of any suspicious vehicles parked in neighborhoods with people or person occupied that may appear to be "casing" locations. Pedestrians that appear to be out of place walking around, conduct consensual encounters, traffic stops, want warrant checks, verify their residences in the area.

Foothill Area - Watch 2 & Watch 4
Thursday - 09/22/11

Watch 4 (1000-2000hrs)
Deploy one unit to the area of RDs 1656, 1637 and 1638 for crime suppression and high visibility, ped stops and traffic stops. Issue cites, want warrant checks and good FIs.



Watch 2 (0615-0815hrs)
All units, when available, will conduct crime suppression in RDs 1651 and 1653 high visibility, ped stops and traffic stops. Issue cites, want warrant checks and good FIs.

Watch 2 (0615-1815hrs)
Basic Car A77, please provide extra patrol in RDs 1672 and 1673.

Watch 4 (1000-2000hrs)
Deploy one unit to the area of RDs 1684 and 1685 for crime suppression and high visibility, ped stops and traffic stops. Issue cites, want warrant checks and good FIs.

Watch 2 (0615-1815hrs)
Deploy an FB car to work the day watch burglary problem around Verdugo High School. The unit will be assigned to the Rock unless approved to leave by the W/C. The unit is to focus on possible unlawful juvenile activity occurring around the high school, Vons Market and the bus stop on Foothill and Mt. Gleason. We want deterrence through high visibility, ped stops and traffic stops.

Legend

Crime Data (62)

- ROBB PM2 (2)
- AGG AM1 (2)
- AGG AM2 (2)
- AGG PM1 (1)
- AGG PM2 (1)
- BURG AM1 (4)
- BURG AM2 (3)
- BURG PM1 (8)
- BURG PM2 (3)
- GTP PM1 (1)
- GTA AM1 (5)
- GTA AM2 (4)
- GTA PM1 (3)
- GTA PM2 (1)
- BTFV AM1 (4)
- BTFV PM1 (2)
- BTFV PM2 (3)
- THEFT AM1 (2)
- THEFT AM2 (4)
- THEFT PM1 (5)
- THEFT PM2 (2)

7DAY_DOW (62)

Day of Week

- Sunday (4)
- Monday (4)
- Tuesday (5)
- Wednesday (11)
- Thursday (11)
- Friday (15)
- Saturday (12)

AGG - 6
BTFV - 9
BURG - 18
GTA - 13
GTP - 1
ROBB - 2
THEFT - 13

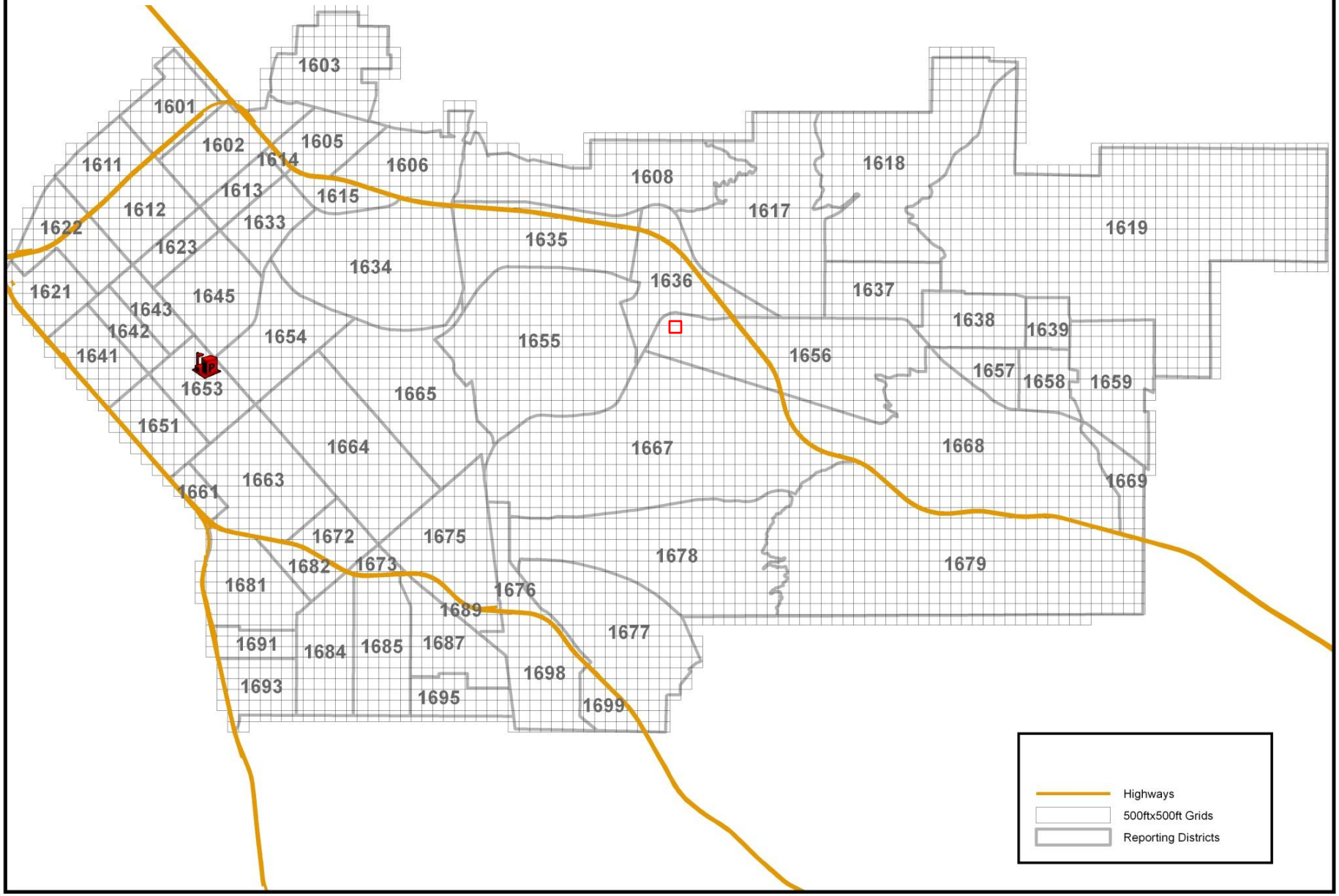
Total: 62

Date	Unit	Fel	Misd	RFC	Cites	FI's	Rpts	WW Chk	Cur/Tru	X Pat/Mins

AM1 = 0000 to 0559 AM2 = 0600 to 1159 PM1 = 1200 to 1759 PM2 = 1800 to 2359

Map prepared by FOOTHILL Area Crime Analysis Detail on 09/21/11. For internal distribution only.

Foothill Patrol Area



Forecasting Tool Interface v 1.0

Google | TG LAPD PP

file:///C:/Users/Jeff/Documents/My%20Dropbox/ResearchDB/CrimeDB/CrimeProjectsDB/PredictivePolicing/PredPol-FinalFoothillApps/Treatment/PredPolApp_Nol

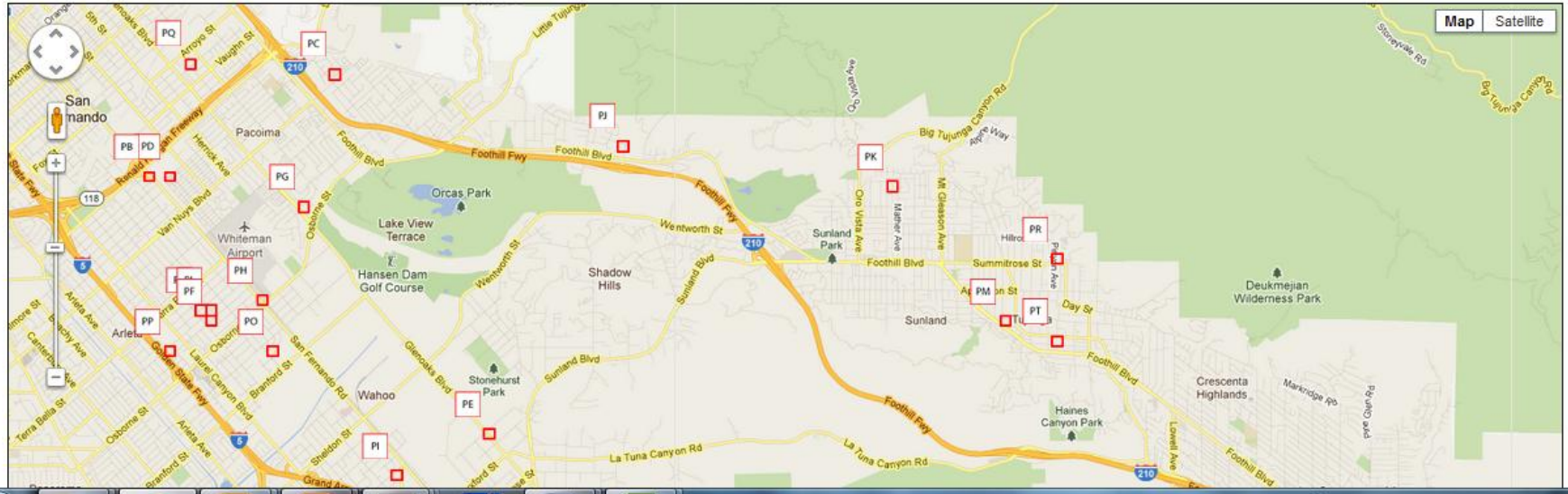
ISI Web of Knowled... | National Gang Cent... | Cell Size and Scale | LAPD Topanga Divis... | Alex (Sandy) Pentlan... | Jacob N. Shapiro, As... | exchange | Academic reference ... | Other bookmarks

LAPD Predictive Policing Experiment

34.27126	-118.42767	40842.125	20
34.27126	-118.42767	40842.125	20
34.27126	-118.42767	40842.125	20
34.2603	-118.32352	40842.21875	20
34.25678	-118.31728	40842.25	10
34.2375	-118.37449	40842.47917	20
34.27478	-118.35292	40842.57465	30
34.25971	-118.32249	40842.89583	20
34.2316	-118.38863	40843.125	20
34.22087	-118.36204	40843.17396	20

lat/long/time/crimetype

writeBoxCentroids



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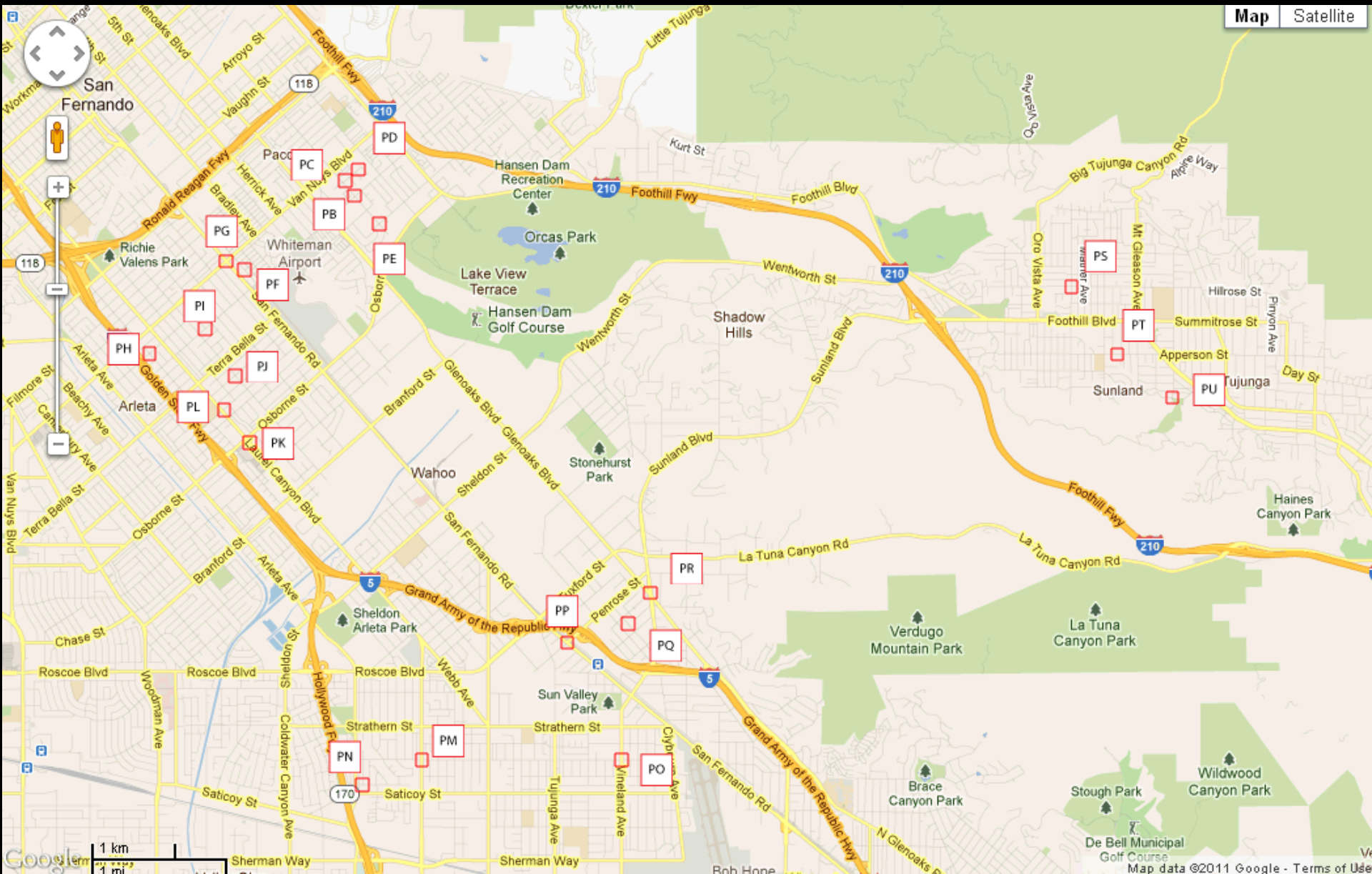
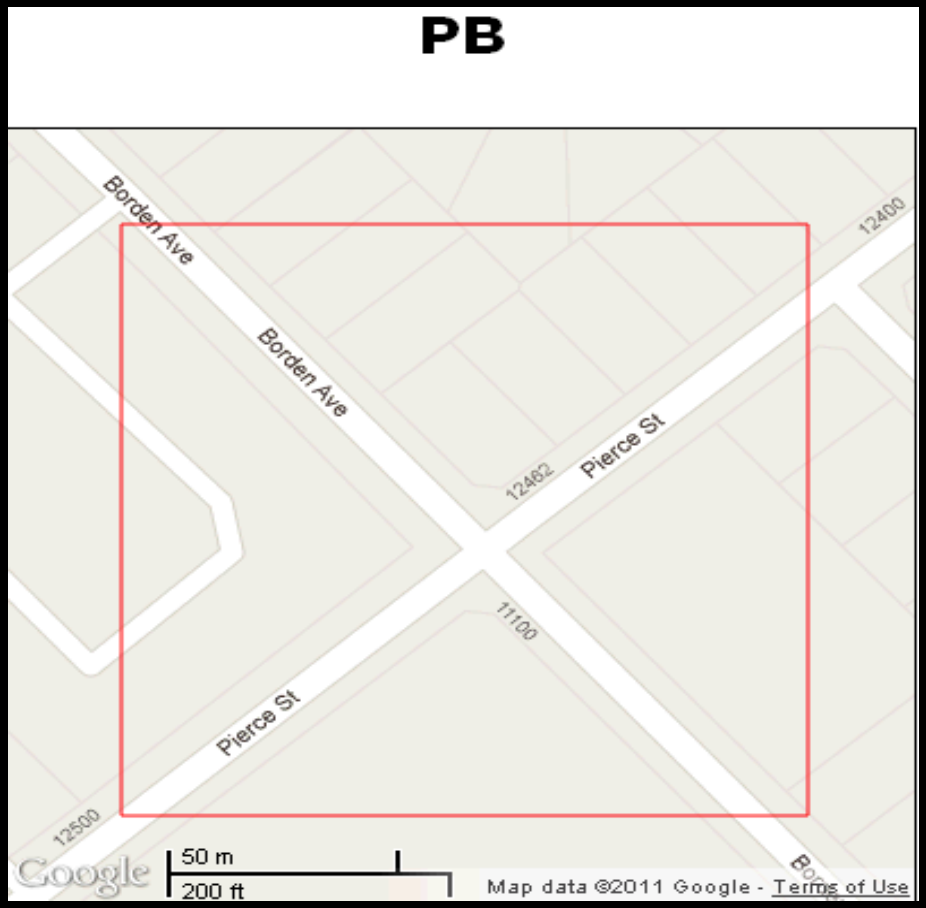
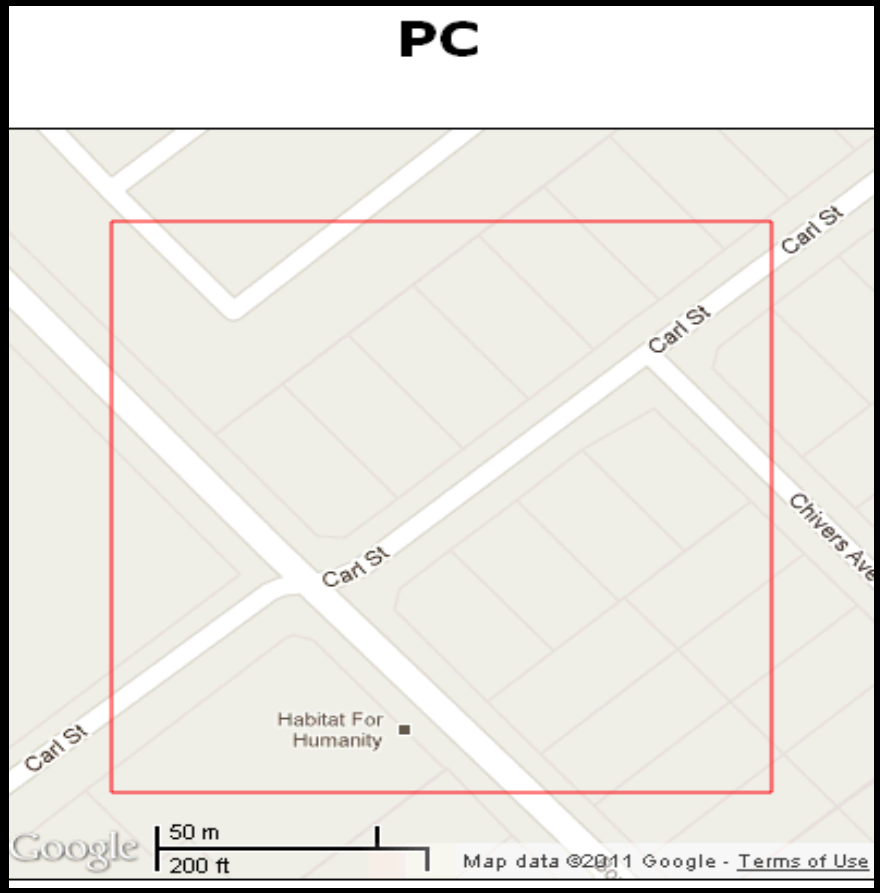
Daily Forecast Map



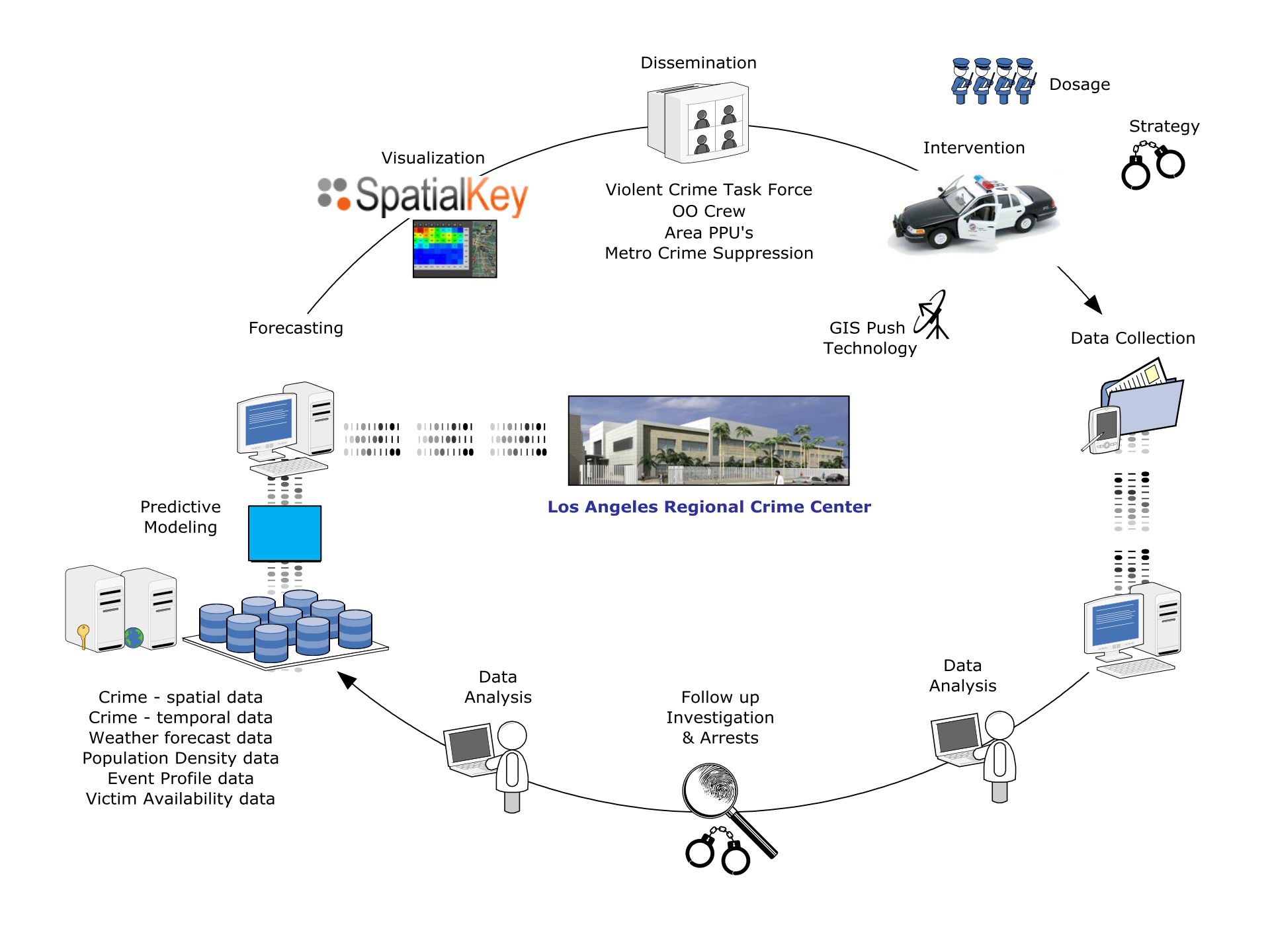
Close-up View of Mission "Boxes"



Pierce St and Borden Ave
RD1613



Carl St between Borden & Chivers Ave
RD 1613


Dissemination
Dosage
Strategy
Visualization
SpatialKey
Intervention
Violent Crime Task Force
OO Crew
Area PPU's
Metro Crime Suppression
Forecasting
GIS Push
Technology
Data Collection
Predictive
Modeling
Los Angeles Regional Crime Center
Crime - spatial data
Crime - temporal data
Weather forecast data
Population Density data
Event Profile data
Victim Availability data
Data
Analysis
Follow up
Investigation
& Arrests
Data
Analysis

The Timeline

- **October 19, 2011:**
  Training on production of forecasts and methodology begins
- **November 6, 2011:**
  Three month randomized study begins
- **March 2012:**
  Evaluation results

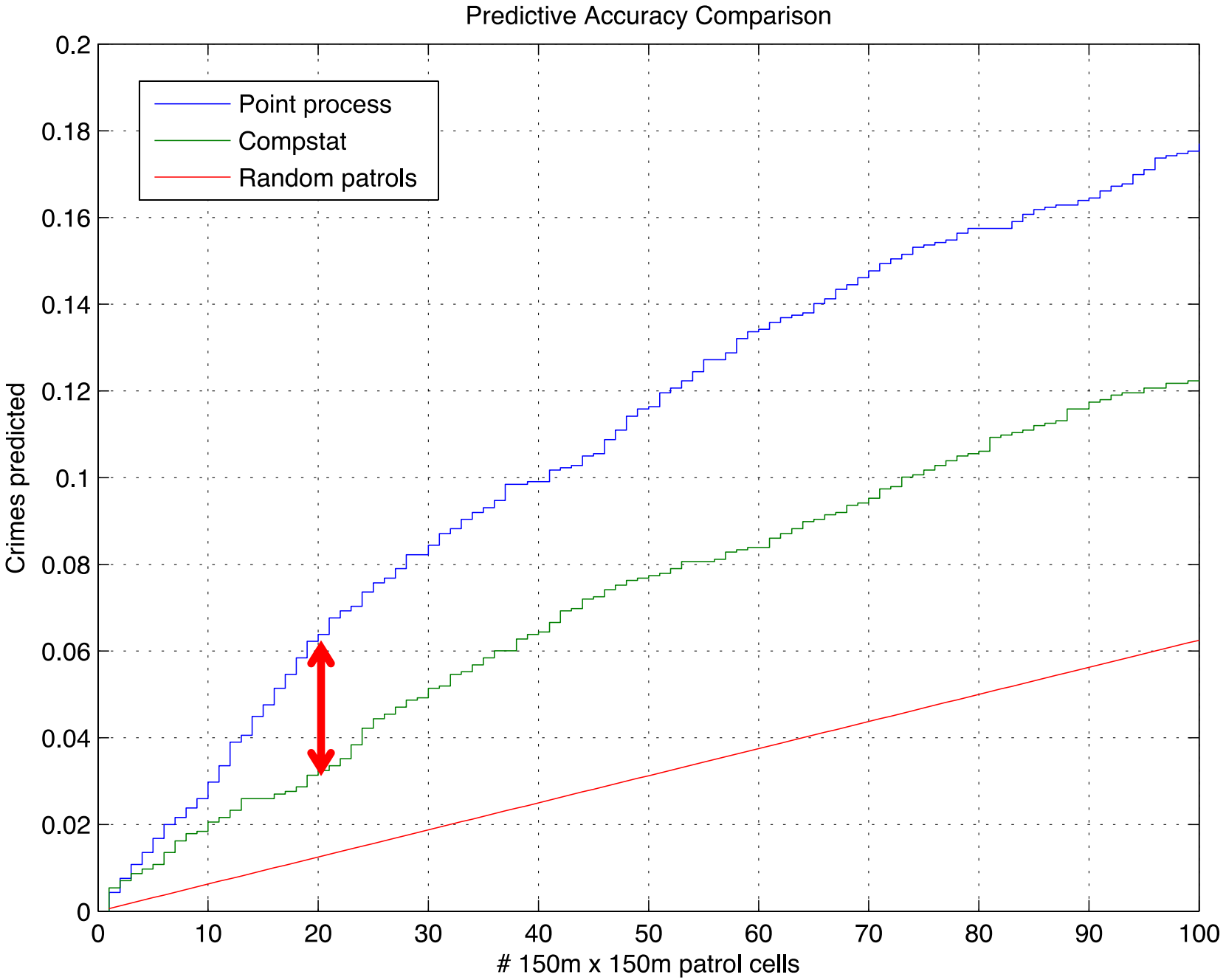
  Continued iterative process to test both the algorithm as well as the dosage and interventions.

Initial Observations…

- Bottomline:
- How accurate are the forecasts?
- Versus random and versus state of the art
- How effective in crime fighting
- Crime numbers time series
- Dosage discussion
- Weekend vs. weekday finding
- Ease of use improvements
- 4 times per day by watch
- Roll out plans

Preliminary results

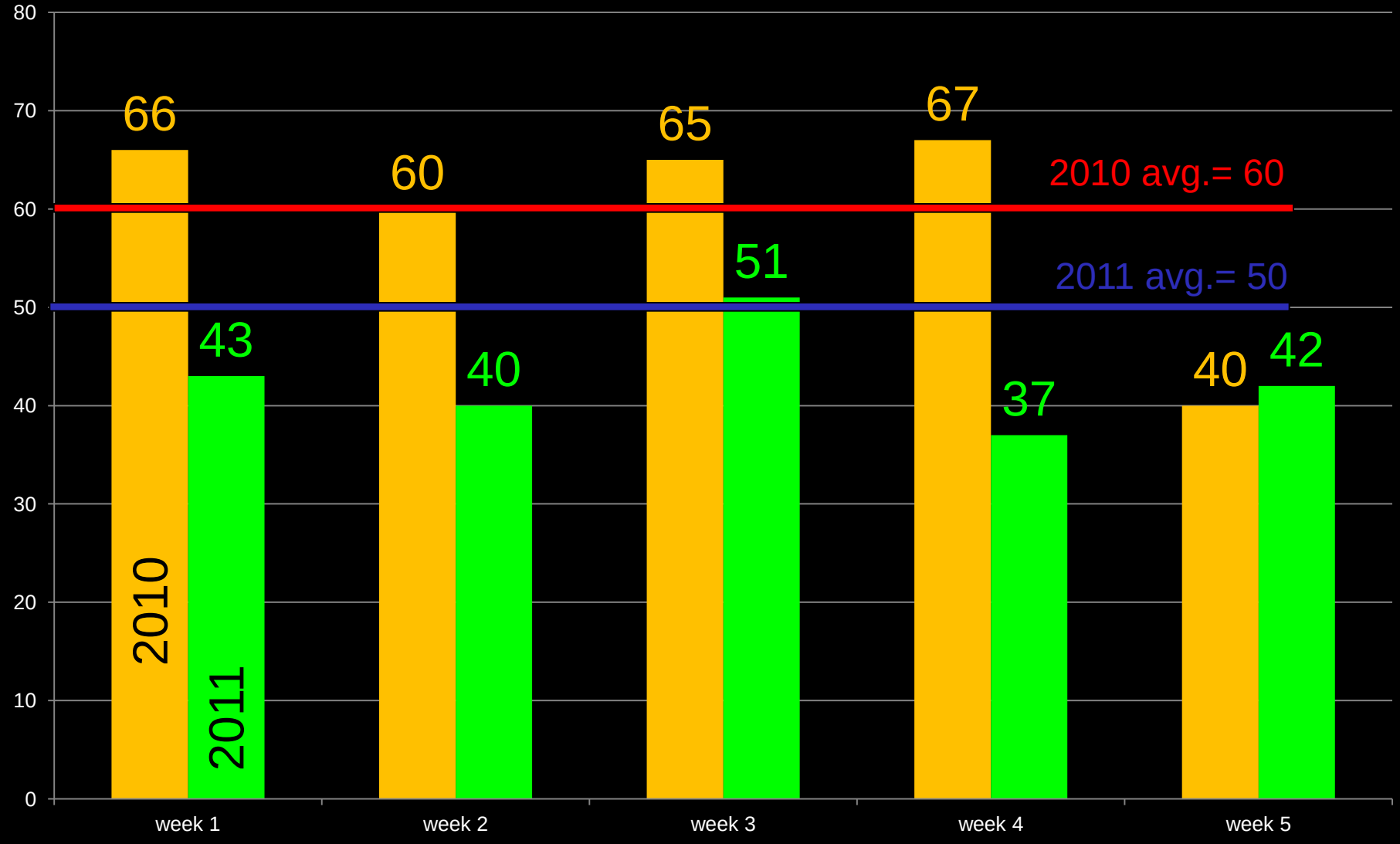
- soft numbers pending completion of statistical study
- focusing on weekdays only
  - accuracy of PredPol algorithm vs. best-practice
    - PredPol vs. independent control group: 10.6% vs. 9.8%
    - PredPol applied to control group: 11.4% vs. 9.8%
  - PredPol is 8-16% more accurate compared to best practice



Predictive Policing is promising in historical data analysis

Crime Numbers (Burg, BFMV & GTA)

Test Period Weeks 1 thru 5 - 2010 v. 2011



Test Period 2010 avg.= 60

Test Period 2011 avg.= 42

LOS ANGELES POLICE DEPARTMENT FOOTHILL AREA

PATROL ALERT

Playing the Probabilities.

Sean W. Malinowski, Captain, Commanding Officer, Foothill Patrol

Today, November 7, 2011, is historic.

Thanks to the hard work of Foothill Area personnel over the past year we are heading into the last two months of 2011 with record low crime totals. We are down more than 15% in Part I crime versus last year. That translates into about 600 fewer people being victims because of your crimefighting efforts.

Now we have an opportunity to reduce crime even further by utilizing cutting edge forecasting technology. UCLA Mathematicians have developed a software program that uses the past three years of Foothill property crime data to make a daily prediction about what areas within the division have the highest probability for a property crime to occur. We will use these forecasts to produce a new kind of mission map for patrol. The map you will get daily will outline approximately twenty very specific 500 square foot boxes that represent areas with the highest likelihood of a BFMV, a 459 or a GTA occurring for that day. What we are asking you to do is when you have available time, get into those boxes, look around for people or conditions that indicate a crime is likely to occur and then take enforcement or preventive action to stop it. When you are entering a box we need you to either voice or update your status on the MDC to allow communications to know you are clear but in one of the high probability areas, which will be coded "PB" to PZ." You can simply say, "16A81, we will be in PB unif

ther." This will be important at the end of th month pilot when we will be analyzing wh not the forecasts added value or not. You tice that these boxes are really small, bu okay, as crime drops, we need to get s specific in terms of crime versus tim order to be effective. I know this science fiction, but I believe in t you to suspend your disbelief for the next three months. S using a versi this Summ matic res thing li ty cri bein th

is most those the d and

Foothill Patro

"Home of the 16th Cava

LOS ANGELES POLICE DEPARTMENT FOOTHILL AREA

PATROL ALERT

Get in the Box. Its Working.

Sean W. Malinowski, Captain, Commanding Officer, Foothill Patrol

Well, we are three weeks into our landmark study of the use of forecasts in crime fighting here in Foothill. We are really making great strides against burglaries, GTA's and BFMV's based in part to the forecasts but mostly due to our officers' willingness to get in there and do what they do best....POLICE WORK!!!

Time in the Box

In Week One, officers spent 18 hours addressing the missions outlined on the forecast maps. In Week Two they spent an additional 9 hours for a total of 27 hours "in the boxes", a 50 % increase week to week. Then in Week Three when we got everyone up to speed on how to report their time addressing the missions and we had the folks from Santa Cruz come down to talk about their experience, we saw a tremendous jump in patrol time spent addressing the forecasted mission areas. In Week Three patrol officers spent a whopping 72 hours of their available time working these missions. That's up 167% over the previous week and represents an outstanding effort. So, THANK YOU ALL for that.

Crime in the Box

As you recall, we are forecasting and assigning missions to address burglaries, BFMV's and GTA's combined. The initial numbers are encouraging. In 2010, our average weekly number of these targeted property crimes was **60**. During the first three weeks of the proposed three month test period we recorded **an average of 40 to 42** burglaries, BFMV's and GTA's. That's a 30% reduction versus a typical week in 2010 and represents on average about 20 fewer victims per week compared to a typical week last year. When you look at these particular three weeks versus the same three weeks last year (see chart in the box). We are seeing a 31% to 36% drop in burglaries, BFMV's and GTA's in 2011 when compared to the same week in 2010. This drop has resulted in about 60 fewer crimes being committed over the last three weeks.

Let's put that into perspective. That is 60 fewer people waking up in the morning to find their car window smashed and their property missing or coming home after working all day to find their house ransacked by a burglar or going out to get in their car and finding an empty space. This is significant both in terms of quality of life for the people who live here in Foothill and in terms of cost efficiency.

By preventing these crimes from occurring, we have had to spend less time taking reports. If you figure we took 60 fewer reports over the course of the last three weeks, that translates into what?...somewhere between 60 and 130 hours of personnel time? If we invest the time addressing these very specific missions, we should save time scratching out reports and I know that all of you would rather be out there preventing crime than be back at the station writing. We are reaching a tipping point, so, let's keep it going. What you are doing is making a huge difference and could change the way we fight crime in the future. Thanks for your continued support of this predictive policing effort.

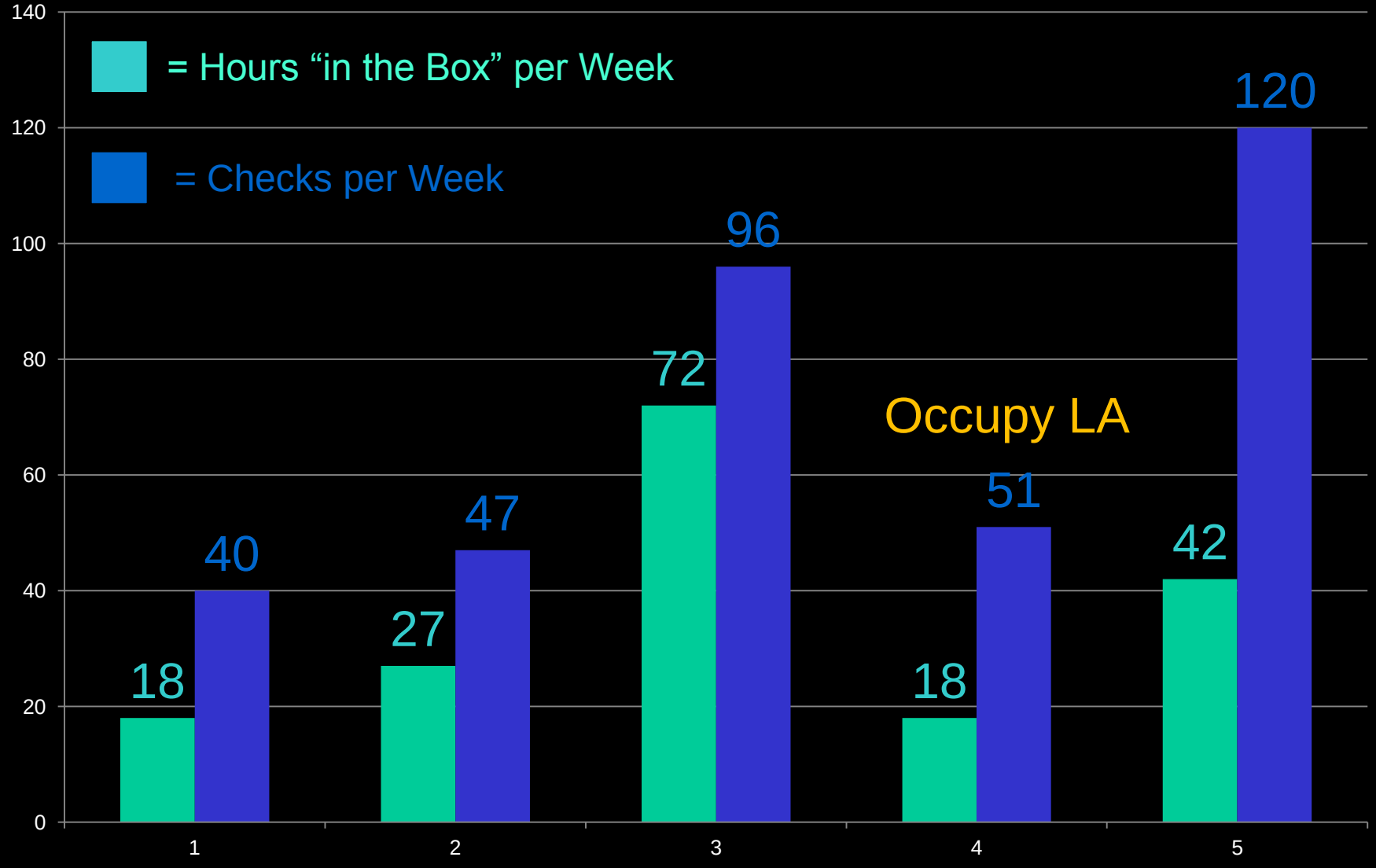
- Sean M.

Foothill Patrol Division

"Home of the 16th Cavalry"

Patrol Activity (addressing forecasted mission areas)

Test Period Weeks 1 thru 5

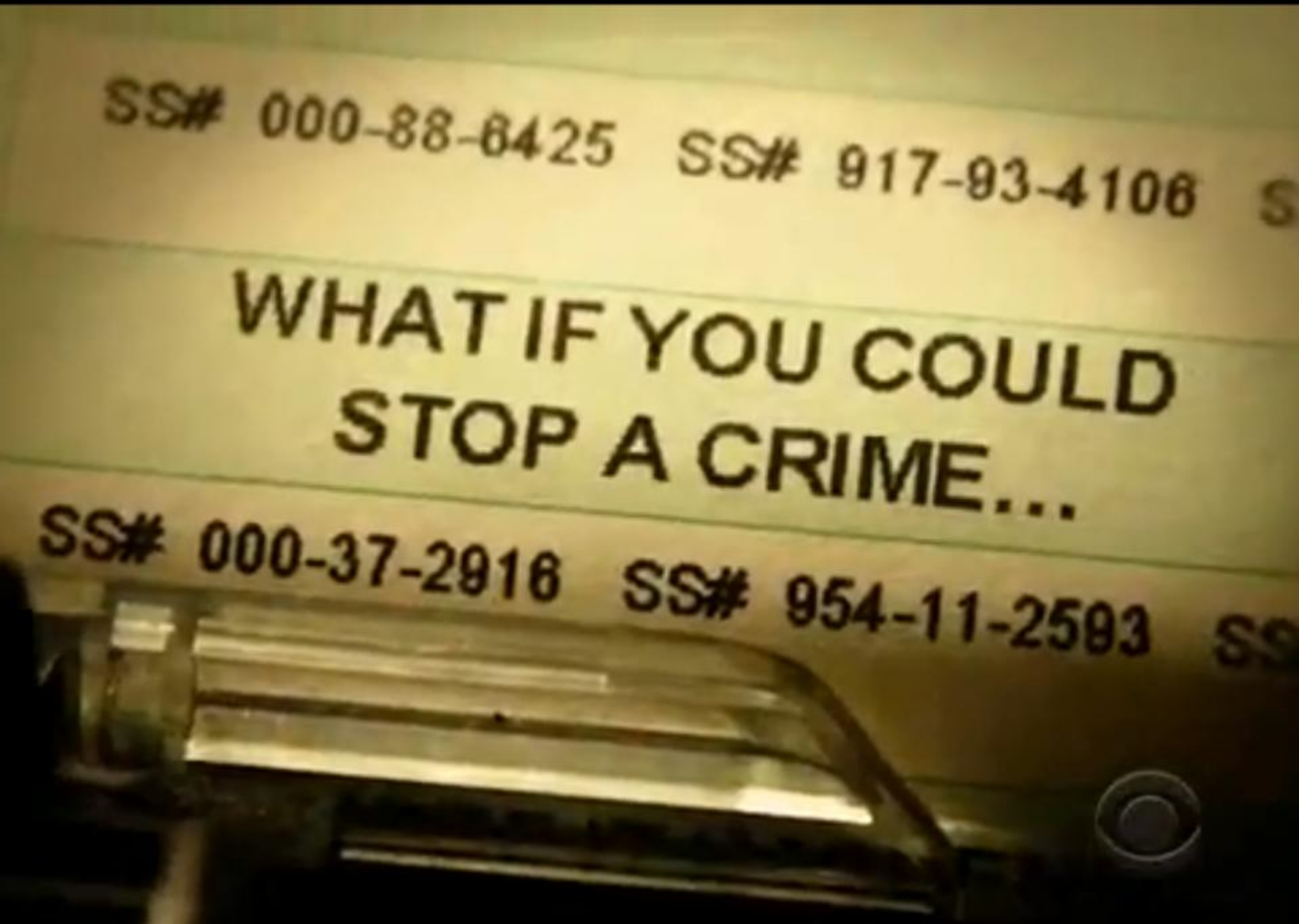


Avg Hours in the Box per Week = 35 hrs

Avg Checks per Week = 71 checks

New Version of Software…

- Weekend vs. weekday finding
- Ease of use improvements
- 4 times per day by watch
- Roll out plans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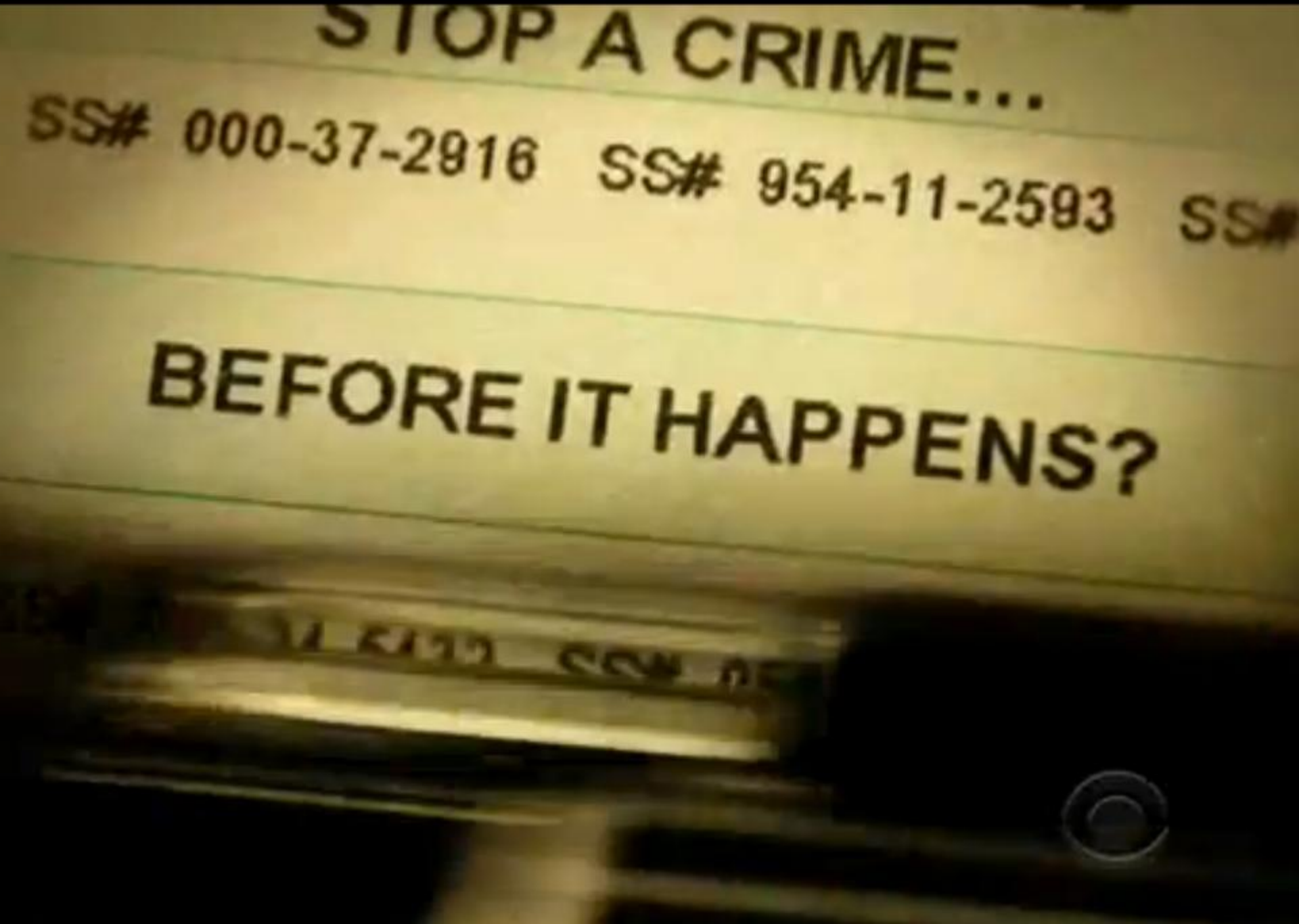
STOP A CRIME...
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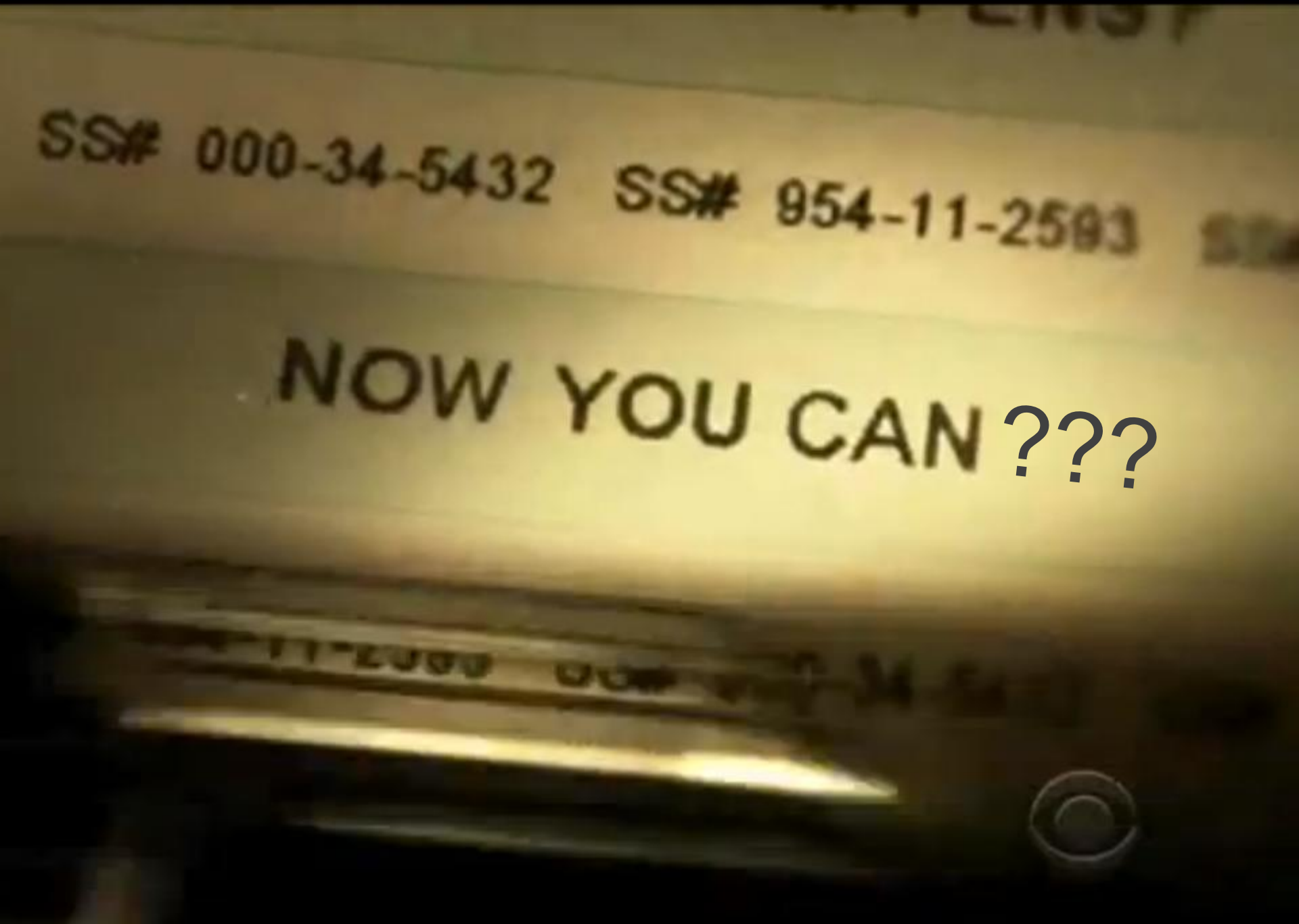
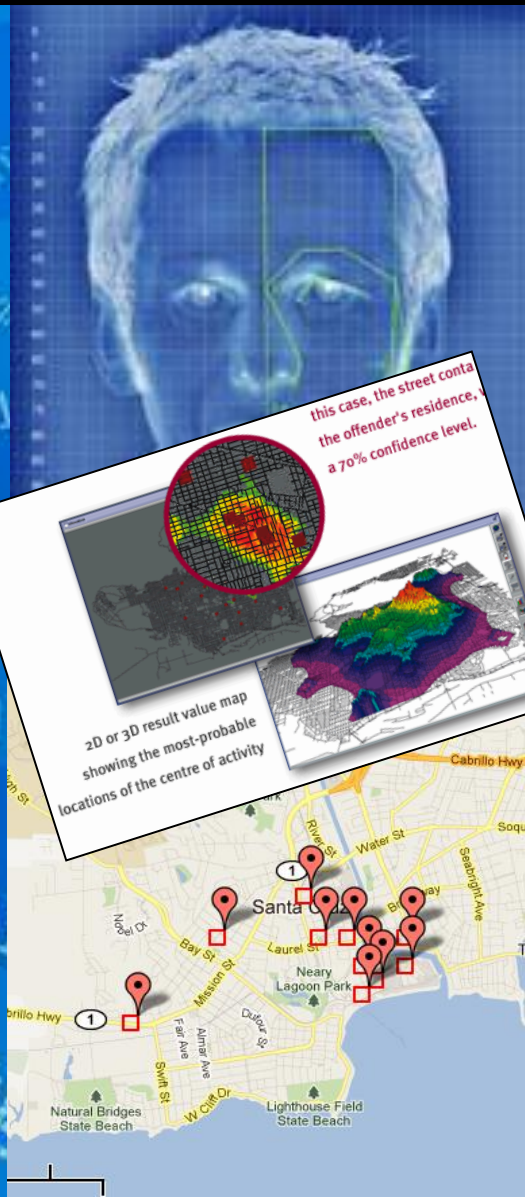
SS# 954-11-2593
BEFORE IT HAPPENS?


SS# 000-34-5432 SS# 954-11-2503
NOW YOU CAN???

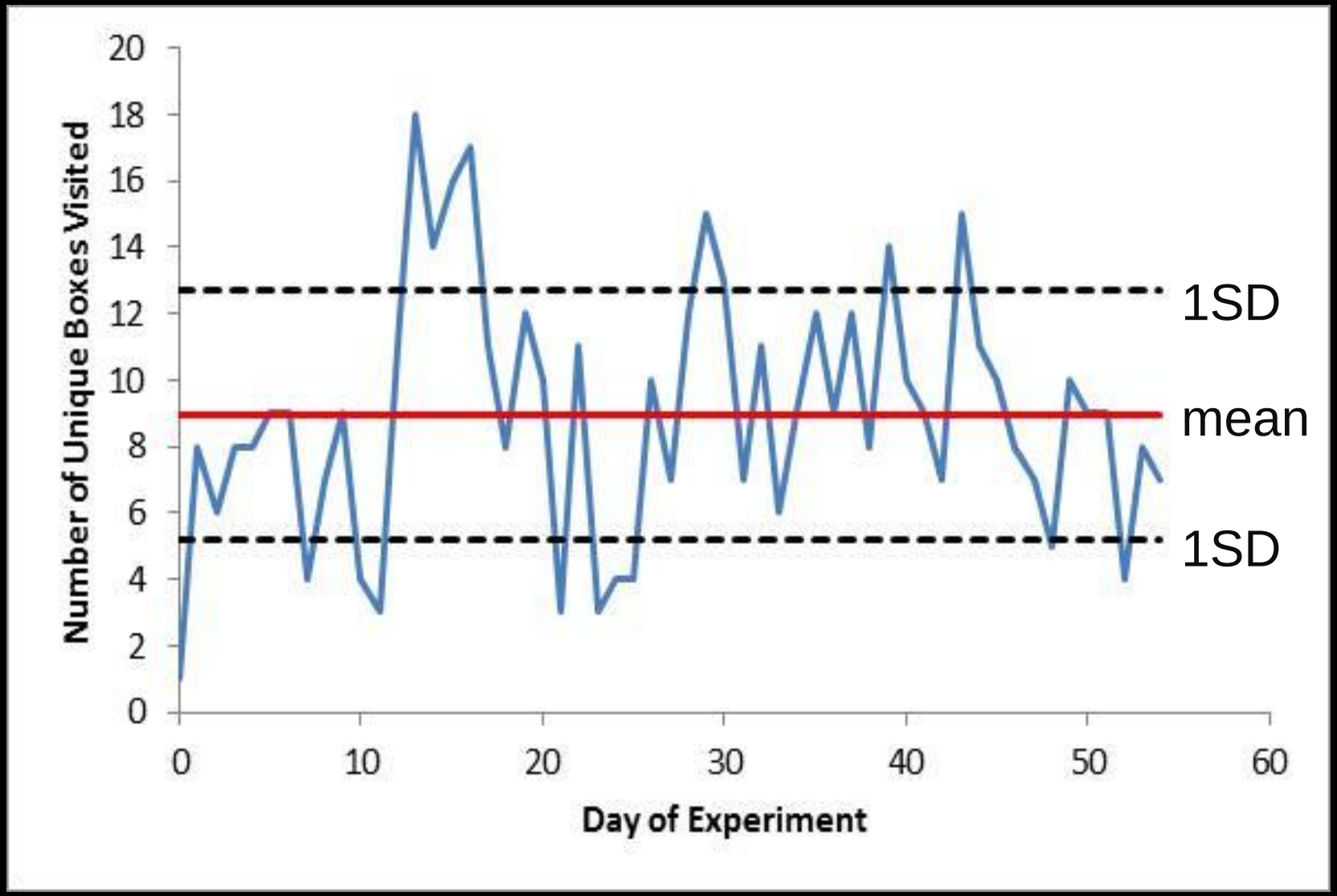
The Los Angeles Predictive Policing Experiment

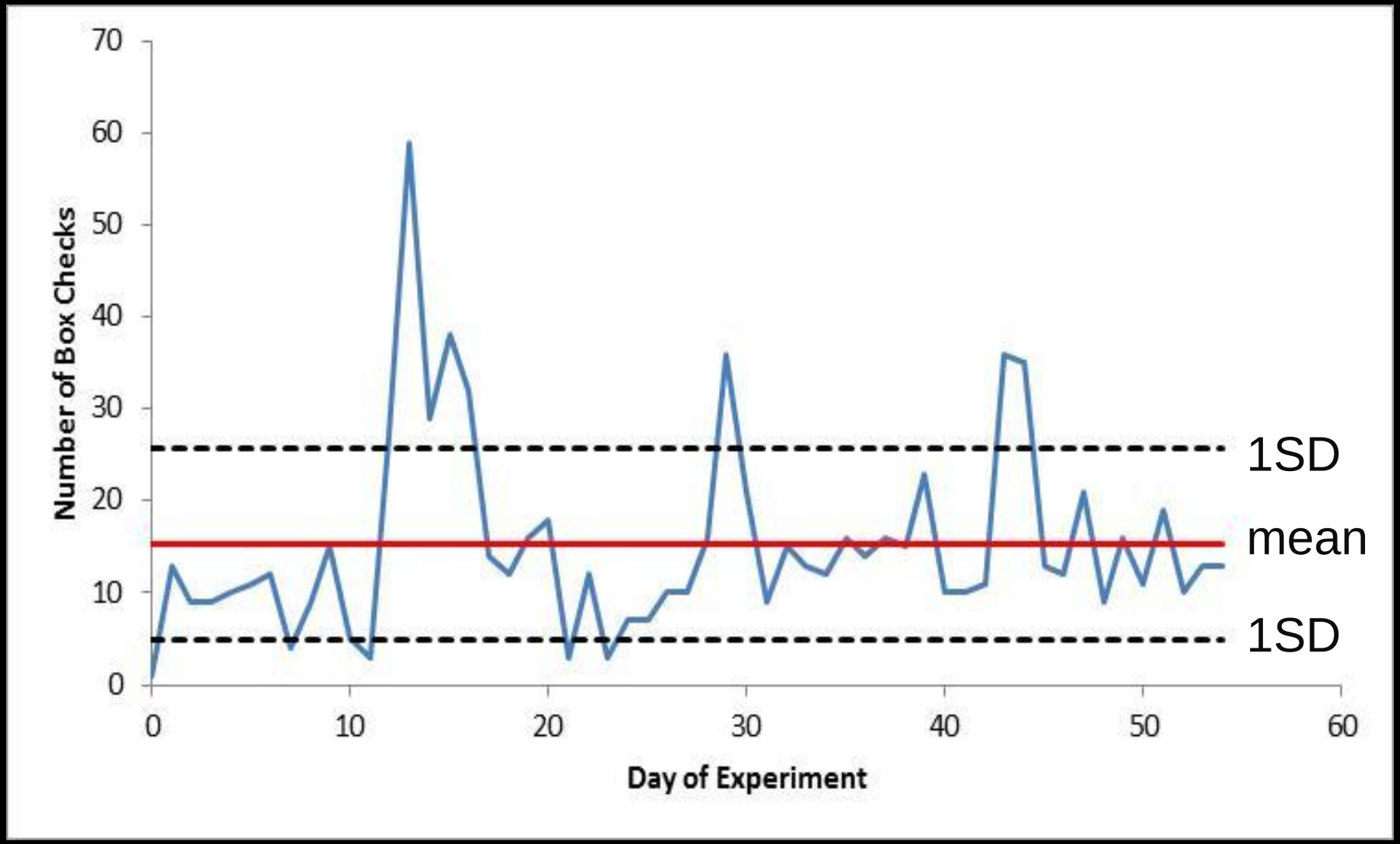


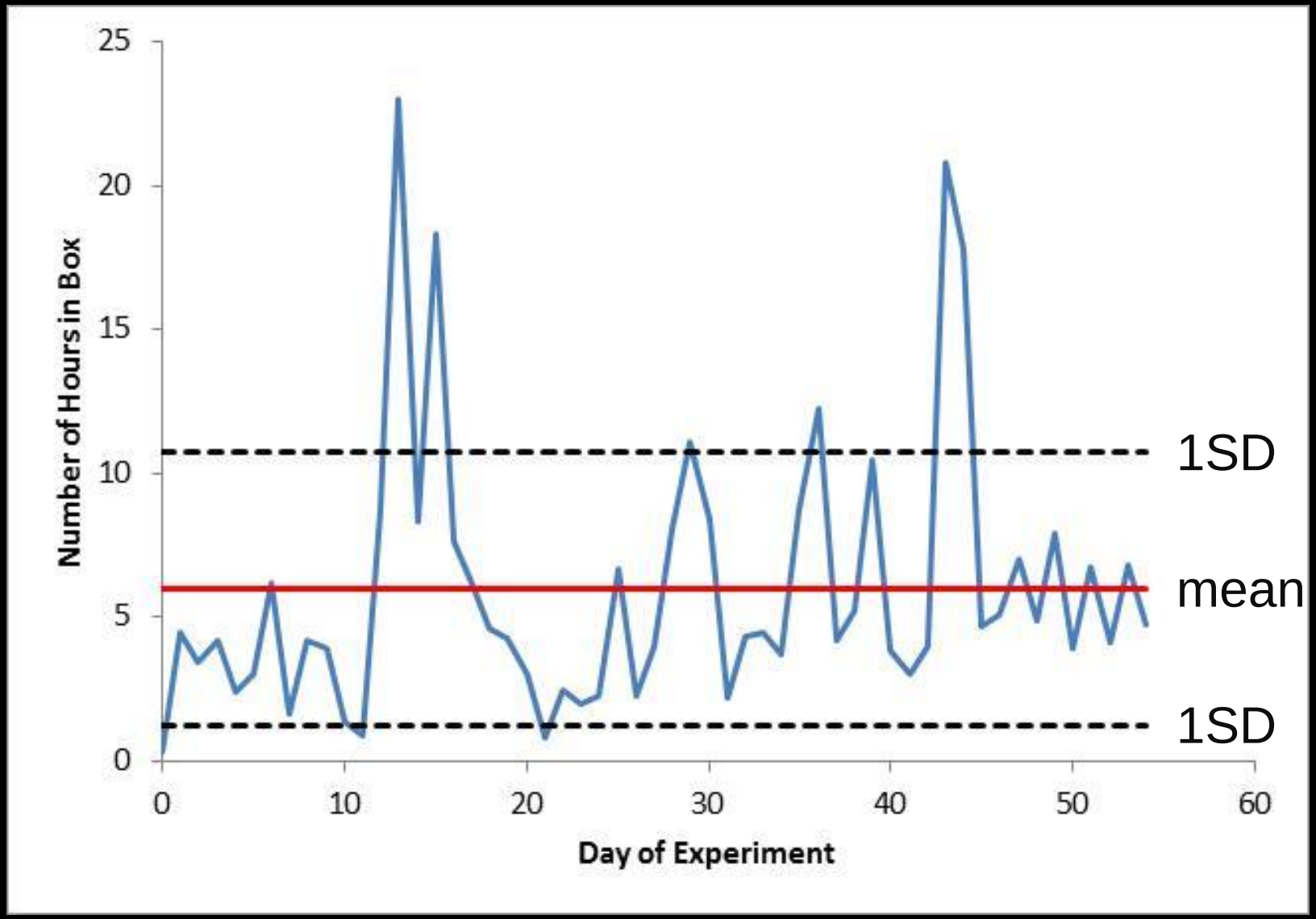
Charlie Beck, Chief of Police
Los Angeles Police Department

Additional Slides if Needed

Foothill "dosage" evidence:
Number of Unique Boxes Patrolled

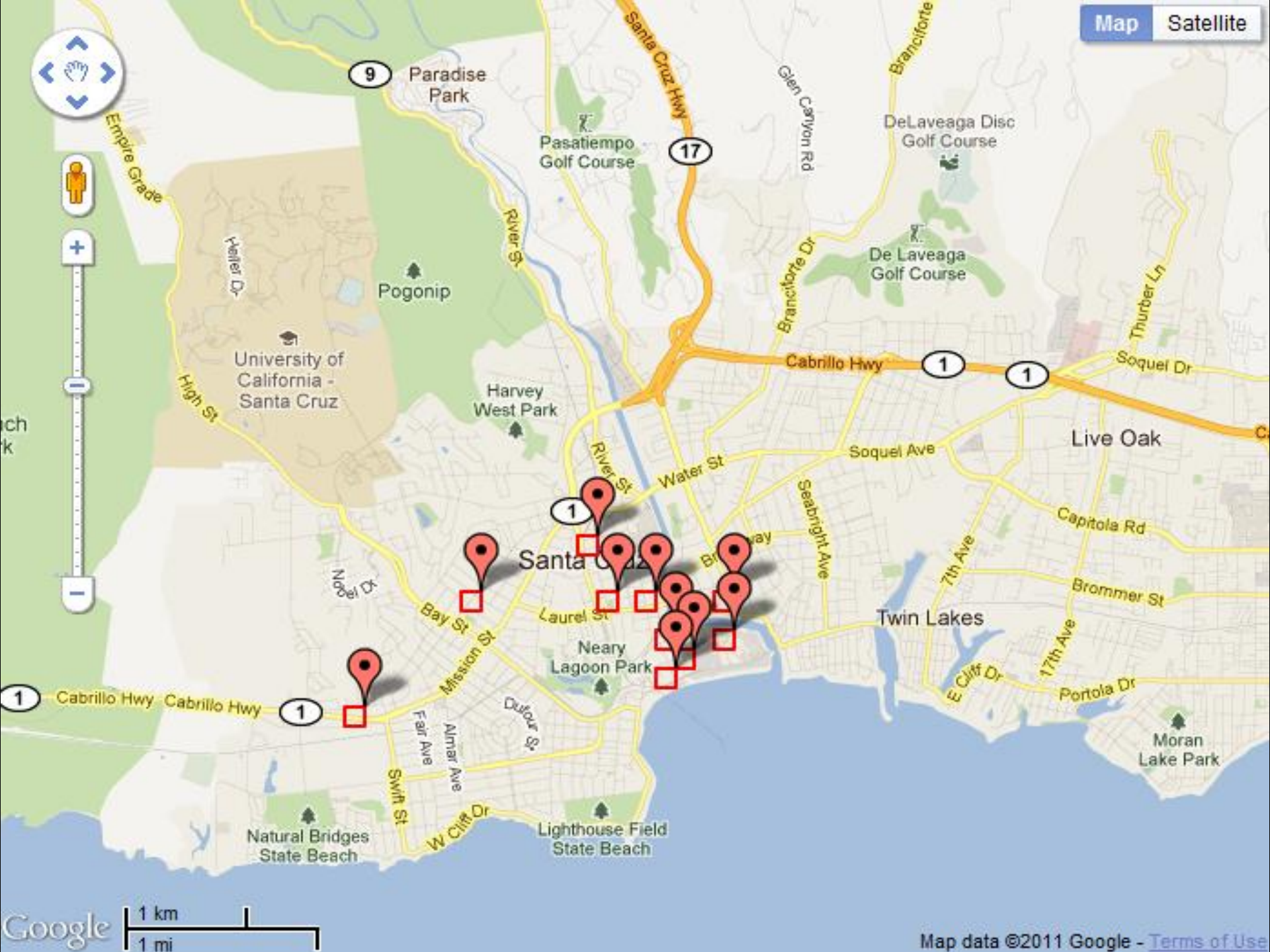



70
60
50
40
30
20
10
0
Number of Box Checks
0
10
20
30
40
50
60
Day of Experiment
1SD
mean
1SD


25
20
15
10
5
0
Number of Hours in Box
0
10
20
30
40
50
60
Day of Experiment
1SD
mean
1SD

Santa Cruz

- Very basic crime analysis prior to Predictive Policing
- Updated daily, the prediction maps identify "boxes" to be patrolled "when free"
- Promising results, but limited ability to do careful evaluation
  - is this because Santa Cruz is now doing crime analysis where before they were not?
  - no controlled comparisons


Map
Satellite
Paradise Park
Pasatiempo Golf Course
Santa Cruz Hwy
Glen Canyon Rd
Branciforte
DeLaveaga Disc Golf Course
De Laveaga Golf Course
Empire Grade
Heller Dr
Pogonip
River St
Branciforte Dr
Thurber Ln
University of California - Santa Cruz
High St
Harvey West Park
Cabrillo Hwy
Soquel Dr
Live Oak
Soquel Ave
Water St
Seabright Ave
Capitola Rd
7th Ave
Brommer St
Twin Lakes
Santa Cruz
Nobel Dr
Bay St
Laurel St
Mission St
Neary Lagoon Park
17th Ave
E Cliff Dr
Portola Dr
Moran Lake Park
Fair Ave
Almar Ave
Dufour St
Swift St
W Cliff Dr
Natural Bridges State Beach
Lighthouse Field State Beach
Google
1 km
1 mi
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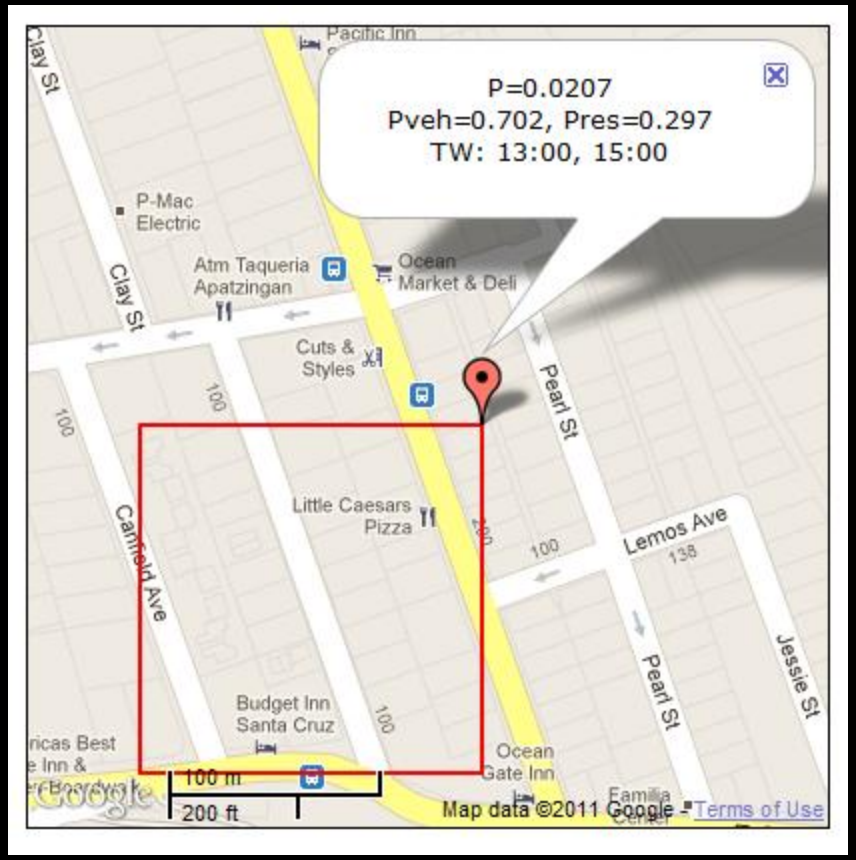
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Pveh=0.702, Pres=0.297
TW: 13:00, 15:00
Pacific Inn
Clay St
P-Mac Electric
Atm Taqueria Apatzingan
Ocean Market & Deli
Cuts & Styles
Pearl St
Little Caesars Pizza
Lemos Ave
Jessie St
Budget Inn Santa Cruz
Ocean Gate Inn
100 m
200 ft
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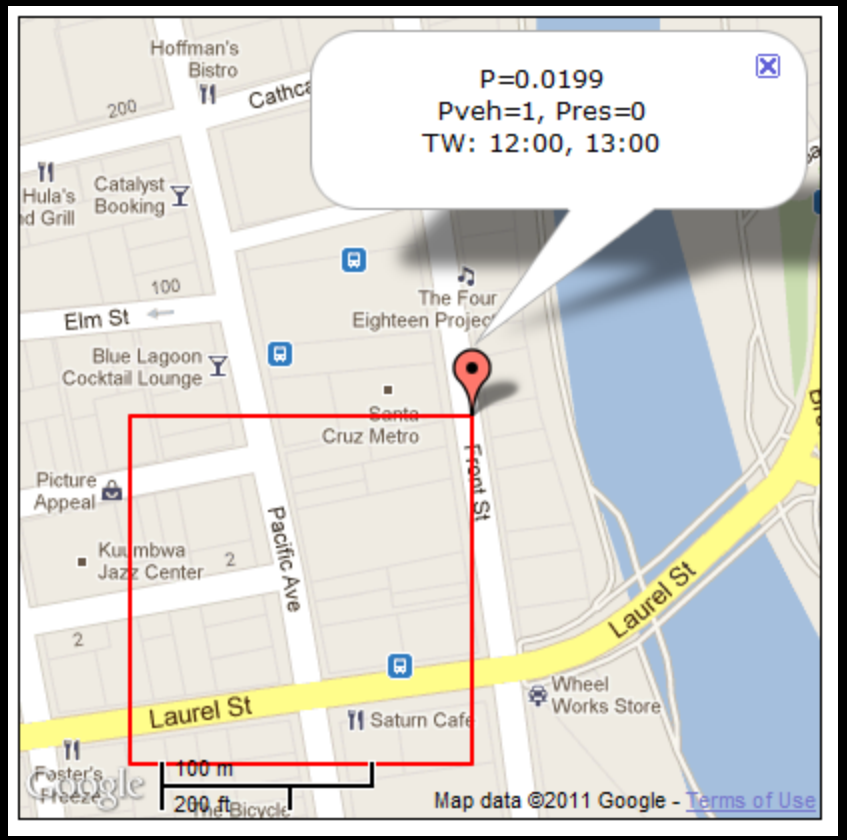
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Pveh=1, Pres=0
TW: 12:00, 13:00
Hoffman's Bistro
Catalyst Booking
Elm St
Blue Lagoon Cocktail Lounge
The Four Eighteen Project
Santa Cruz Metro
Front St
Picture Appeal
Pacific Ave
Laurel St
Wheel Works Store
Saturn Cafe
100 m
200 ft
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