Crowdsourcing for Operations Case Study
City of Louisville, Kentucky

U.S. Department of Transportation
Federal Highway Administration

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Introduction

The City of Louisville, the largest in the Commonwealth of Kentucky, facilitates over 500,000 vehicle miles per day of travel on local roads, and manages 1,020 traffic signals, each requiring numerous signal timing plans.[1] Louisville's geographic expanse makes it costly to develop a fiber-optic backbone for connecting traffic signals. The City's Department of Civic Innovation and Technology (CIT) collaborated with the Department of Public Works (DPW) to convert traffic signal management into a performance-based program. The City partnered with Waze® and established the open-source Waze® Analytics Relational-database Platform (WARP) to help the region develop an unprecedented level of data-centered management of traffic and signal operations at a cost savings from previous methods.

Louisville's Crowdsourcing Journey

Since 2011, Louisville has made a priority of open data and varied data utilization to improve performance. By 2015, when the City joined the Waze® Connected Citizen Program (CCP), the City already hosted 150+ data sets on its open data portal. Louisville used the CCP partnership to share road closure information with Waze®, enabling motorists to use the Waze® navigation app to safely bypass active road closures. Louisville also collects data from Waze® through its CCP partnership to capture event information across its roadway network.

Louisville initiated the WARP open-source project to better use the data available through the CCP. WARP is a multi-cloud tool that pulls data from Waze® into the cloud of an agency's choosing. This project gained quick attention from Waze® and other CCP partnering agencies across the globe; more than 15 agencies have adopted the WARP platform.[2]

Corridor Analysis with Crowdsourced Data

The City of Louisville applied its WARP platform to assess the effects of a signal retiming project along a multilane, high-speed suburban principal arterial located within a fast-growing part of the City; the arterial serves up to 40,000 vehicles per day.[3] The City implemented a new signal timing plan to account for the increasing congestion.

The DPW and CIT developed a dashboard using "jams" count data from Waze® to confirm the effects of the new plan. "Jams" are the Waze® metric for congestion based on data passively collected from Waze® app users. The data verified the effectiveness of the newly implemented plan, as shown in table 1.

Table 1. Comparison of jams frequency before and after the Westport coordinated signal timing implementation.[4]

Month	Before	After	% Change
September	5,389	4,120	-23.5%
October	7,503	3,096	-58.7%
November	7,443	4,966	-33.3%
December	7,158	5,720	-20.1%
January	3,347	2,736	-18.3%
February	2,420	1,990	-17.8%
March	3,193	2,666	-16.5%
TOTALS	**36,453**	**25,298**	**-30.6%**

(Source: City of Louisville.)

[1] Louisville Metro CIT. "Building the Foundation for Smart Traffic Management in Louisville." Medium.com, August 2016.
[2] Louisville Metro Waze® CCP Processor wiki. GitHub, September 2019. https://github.com/LouisvilleMetro/WazeCCPProcessor/wiki/Waze-CCP-Collaborative-Processor#deployed-the-solution.
[3] Edward Blaney. "How we do free traffic studies with Waze® data (and how you can too)." https://medium.com/louisville-metro-opi2/how-we-do-free-traffic-studies-with-waze-data-and-how-you-can-too-a550b0728f65.
[4] Traffic Engineering Project Evaluation for Westport Road, April 2018. https://drive.google.com/file/d/1viZ_IoyP5nyY4bFp9NH7IsHjhO7KkWFn/view.

The City of Louisville typically spent $50,000 per traffic study, which included labor-intensive field data collection. The City developed a dashboard using Waze® jams data, allowing its engineers to conduct traffic studies on-demand and for free in only minutes.[5] Analysts can select a street, direction, time of day, day of the week, and date range to compare the frequency of jams using the interface developed in PowerBI®, a Microsoft enterprise tool for analytics and automated report production. On-demand analytics also enable engineers to identify changes in arterial performance and proactively improve signal timing.

Event Analysis Using Crowdsourced Data

By 2018, Louisville advanced its analytical capabilities to support geospatial analyses with more complex comparisons of traffic patterns across multiple corridors and for individual intersections. The comparison can be reviewed as a map and through tabular statistics. For example, figure 1 illustrates the delay in seconds at the close of *Thunder Over Louisville*, a fireworks event to kickoff two weeks of Kentucky Derby festivities.

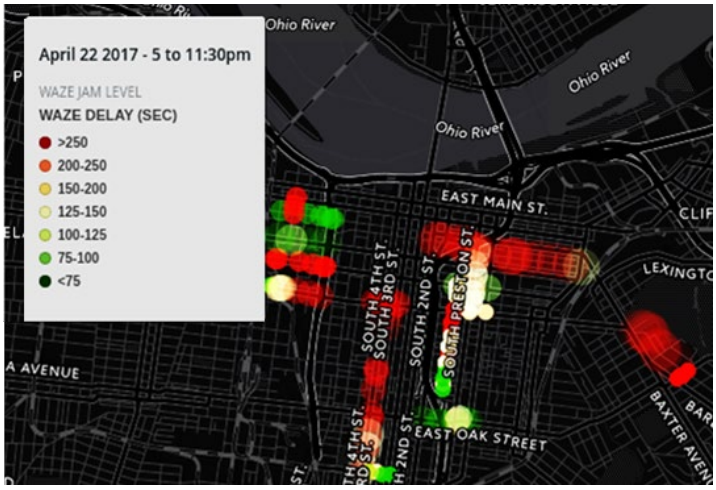

Figure 1. Map. Delays at close of **Thunder Over Louisville.** *(Source: City of Louisville.[6])*

Other Uses of Crowdsourced Data

In addition to supplanting or complementing traffic studies, the agency uses data from Waze® to analyze "hot spots" and help prioritize and focus the agency's resources. The City also uses data from Waze® to detect faulty equipment; for example, roadside sensor data that contradicts Waze® jams or delay trends may indicate an issue with that roadside sensor.

Data Crowdsourced from 311 Platform

Louisville citizens can report a range of issues using phone, email, web, and the Metro311 mobile app to report issues like faulty roadway lighting or traffic signal outages. The agency explored the overlap between 311 and Waze® pothole reporting, illustrated in figure 2. They observed that Waze® pothole reports cover major arterials, while 311 reports cover local streets.

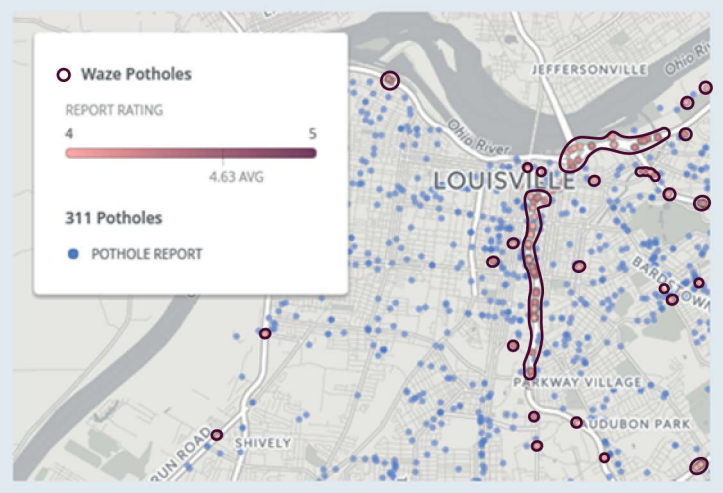

Figure 2. Map. Waze® and 311 pothole reports. (Source: City of Louisville.[7])

The City is now exploring ways to derive even greater value from crowdsourced data by examining its use for real-time alerts and emergency vehicle routing, Vision Zero analyses, and citizen-facing notifications.

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[5] Schnuerle, Michael. Using Waze® Crowdsourced Data and Free Tools as Traffic Sensors. Adventures in Crowdsourcing Webinar Series. National Operations Center of Excellence, January 2020.

[6] Ibid.

[7] Ibid.

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