

computers are bad

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2024-03-01 listening in on the neighborhood

Last week, someone leaked a spreadsheet of SoundThinking sensors to Wired. You are probably asking "What is SoundThinking," because the company rebranded last year. They used to be called ShotSpotter, and their outdoor acoustic gunfire detection system still goes by the ShotSpotter name.

ShotSpotter has attracted a lot of press and plenty of criticism for the gunfire detection service they provide to many law enforcement agencies in the US. The system involves installing acoustic sensors throughout a city, which use some sort of signature matching to detect gunfire and then use time of flight to determine the likely source.

One of the principle topics of criticism is the immense secrecy with which they operate: ShotSpotter protects information on the location of its sensors as if it were state secret, and does not disclose them even to the law enforcement agencies that are its customers. This secrecy attracts accusations that ShotSpotter's claims of efficacy cannot be independently validated, and that ShotSpotter is attempting to suppress research into the civil rights impacts of its product.

I have encountered this topic before: the Albuquerque Police Department is a ShotSpotter customer, and during my involvement in police oversight was evasive in response to any questions about the system and resisted efforts to subject its surveillance technology purchases to more outside scrutiny. Many assumed that ShotSpotter coverage was concentrated in disadvantaged parts of the city, an unsurprising outcome but one that could contribute to systemic overpolicing. APD would not comment.

I have always assumed that it would not really be that difficult to find the ShotSpotter sensors, at least if you have my inclination to examine telephone poles. While the Wired article focuses heavily on sensors installed on buildings, it seems likely that in environments like Albuquerque with city-operated lighting and a single electrical utility, they would be installed on street lights. That's where you find most of the technology the city fields.

The thing is, I didn't really know what the sensors looked like. I've seen pictures, but I know they were quite old, and I assumed the design had gotten more compact over time. Indeed it has.

An interesting thing about the Wired article is that it contains a map, but the MapBox embed produced with Flourish Studio had a surprisingly high maximum zoom level. That made it more or less impossible to interpret the locations of the sensors exactly. I'm concerned that this was an intentional decision by Wired to partially obfuscate the data, because it is not an effective one. It was a simple matter to find the JSON payload the map viewer was using for the PoI overlay and then convert it to KML.

I worried that the underlying data would be obscured; it was not. The coordinates are exact. So, I took the opportunity to enjoy a nice day and went on an expedition.

The sensors are pretty much what I imagined, innocuous beige boxes clamped to street light



Figure 1: ShotSpotter sensor on light pole



Figure 2: ShotSpotter sensor in a neighborhood



Figure 3: ShotSpotter sensor in a neighborhood

arms. There are a number of these boxes to be found in modern cities. Some are smart meter nodes, some are base stations for municipal data networks, others collect environmental data. Some are the police, listening in on your activities.

This is not as hypothetical of a concern as it might sound. Conversations recorded by ShotSpotter sensors have twice been introduced as evidence in criminal trials. In one case the court allowed it, in another the court did not. The possibility clearly exists, and depending on interpretation of state law, it may be permissible for ShotSpotter to record conversations on the street for future use as evidence.

This ought to give us pause, as should the fact that ShotSpotter has been compellingly demonstrated to manipulate their "interpretation" of evidence to fit a prosecutor's narrative---even when ShotSpotter's original analysis contradicted it.

But pervasive surveillance of urban areas and troubling use of that evidence is nothing new. Albuquerque already has an expansive police-operated video surveillance network connected to the Real-Time Crime Center. APD has long used portable automated license plate readers (ALPR) under cover of "your speed is" trailers, and more recently has installed permanent ALPR at major intersections in the city.

All of this occurs with virtually no public oversight or even public awareness.



Figure 4: ShotSpotter sensor in a neighborhood

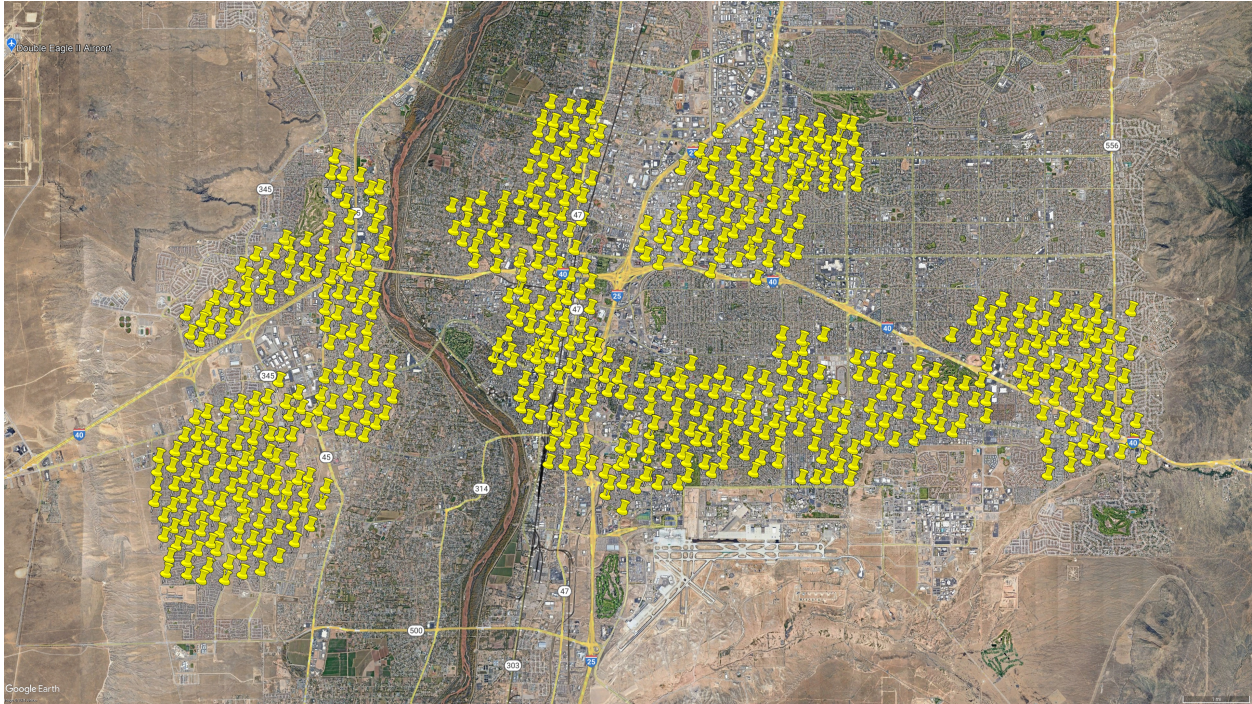


Figure 5: Map of ShotSpotter sensors in Albuquerque

What most surprised me is the density of ShotSpotter sensors. In my head, I assumed they were fairly sparse. A Chicago report on the system says there are 20 to 25 per square mile. Density in Albuquerque is lower, probably reflecting the wide streets and relative lack of high rises. Still, there are a lot of them. 721 in Albuquerque, a city of about 190 square miles. At present, only parts of the city are covered.

And those coverage decisions are interesting. The valley (what of it is in city limits) is well covered, as is the west side outside of Coors/Old Coors. The International District, of course, is dense with sensors, as is inner NE bounded by roughly by the freeways to Louisiana and Montgomery.

Conspicuously empty is the rest of the northeast, from UNM's north campus area to the foothills. Indian School Road makes almost its entire east side length without any sensors.

The reader can probably infer how this coverage pattern relates to race and class in Albuquerque. It's not perfect, but the distance from your house to a ShotSpotter sensor correlates fairly well with your household income. The wealthier you are, the less surveilled you are.

The "pocket of poverty" south of Downtown where I live, the historically Spanish Barelas and historically Black South Broadway, are predictably well covered. All of the photos here were taken within a mile, and I did not come even close to visiting all of the sensors. Within a one mile radius of the center of Barelas, there are 31 sensors.

Some are conspicuous. Washington Middle School, where 13-year-old Bennie Hargrove was shot by another student, has a sensor mounted at its front entrance. Another sensor is in the cul de sac behind the Coors and I-40 Walmart, where a body was found in a burned-out car. Perhaps the deep gulch of the freeway poses a coverage challenge, there are two more less than a thousand feet away.



Figure 6: ShotSpotter sensor in a neighborhood



Figure 7: ShotSpotter sensor in a neighborhood



Figure 8: Detail of a ShotSpotter sensor

In the Downtown Core, buildings were preferred to light poles. The PNM building, the Anasazi condos, and the Banque building are all feeding data into the city's failing scheme of federal prosecutions for downtown gun crime.

The closest sensor to the wealthy Heights is at Embudo Canyon, and coverage stops north of Central in the affluent Nob Hill residential area. Old Town is almost completely uncovered, as is the isolationist Four Hills.

Highland High School has a sensor on its swimming pool building. The data says there are two at the intersection of Gibson and Chavez, probably an error, it also says there are two sensors on "Null Island." Don't worry about coverage in the south campus area, though. There are 16 in the area bounded by I-25 to Yale and Gibson to Coal.

KOB quotes APD PIO Gallegos saying "We don't know, technically, where all the sensors are." Well, I suppose they do now, the leak has been widely reported on. APD received about 14,000 ShotSpotter reports last year. The accuracy of these reports, in terms of their correctly identifying gunfire, is contested. SoundThinking claims impressive statistics, but has actively resisted independent evaluation. A Chicago report found that only 11.3% of ShotSpotter reports could be confirmed as gunfire. APD, for its part, reports a few hundred suspects or victims identified as a result of ShotSpotter reports.

APD has used a local firearms training business, Calibers, to fire blanks around the city to verify detection. They say the system performed well.

But, if asked, they provide a form letter written by ShotSpotter. Their contract prohibits the disclosure of any actual data.