



Networks of Philly (v2)

Philadelphia's Hidden Network Infrastructure

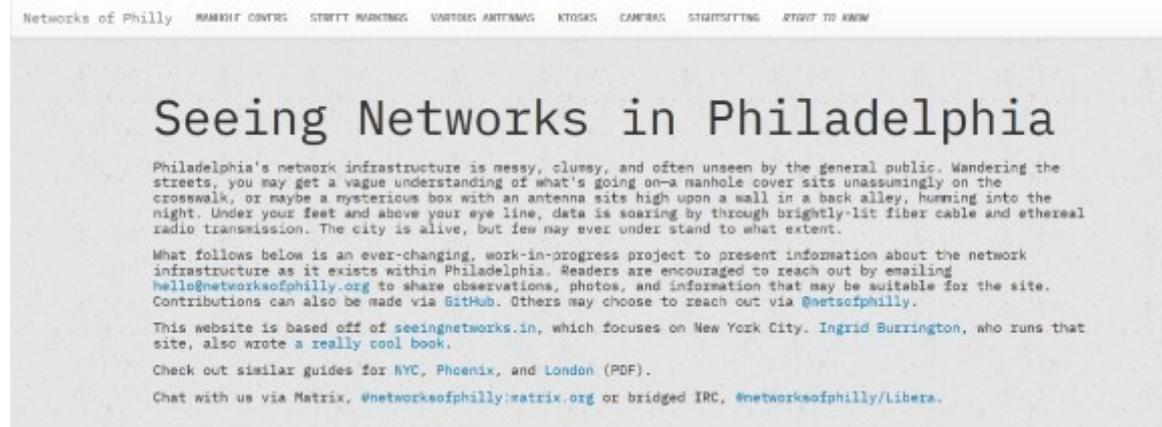


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- Infrastructure! (Manholes, handholes, antennae, misc.)
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- Questions!

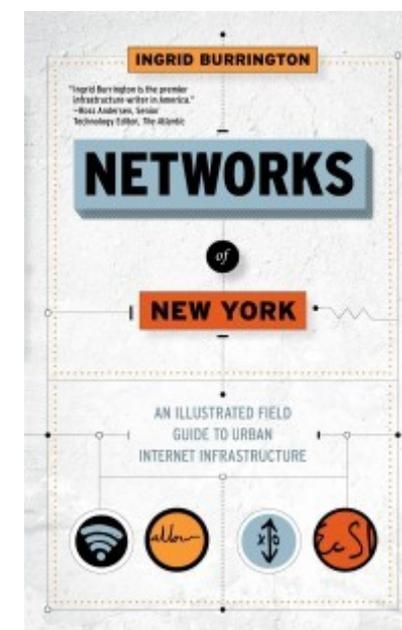
Who am I?

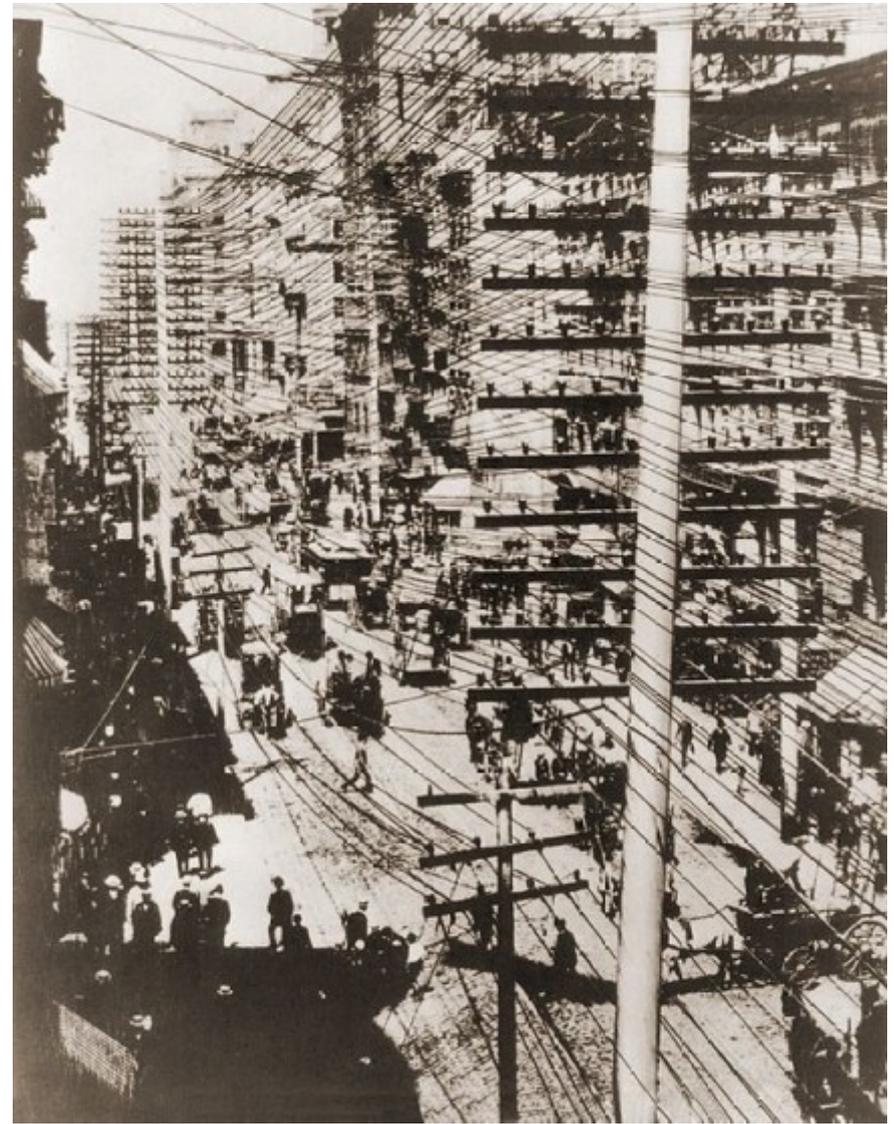
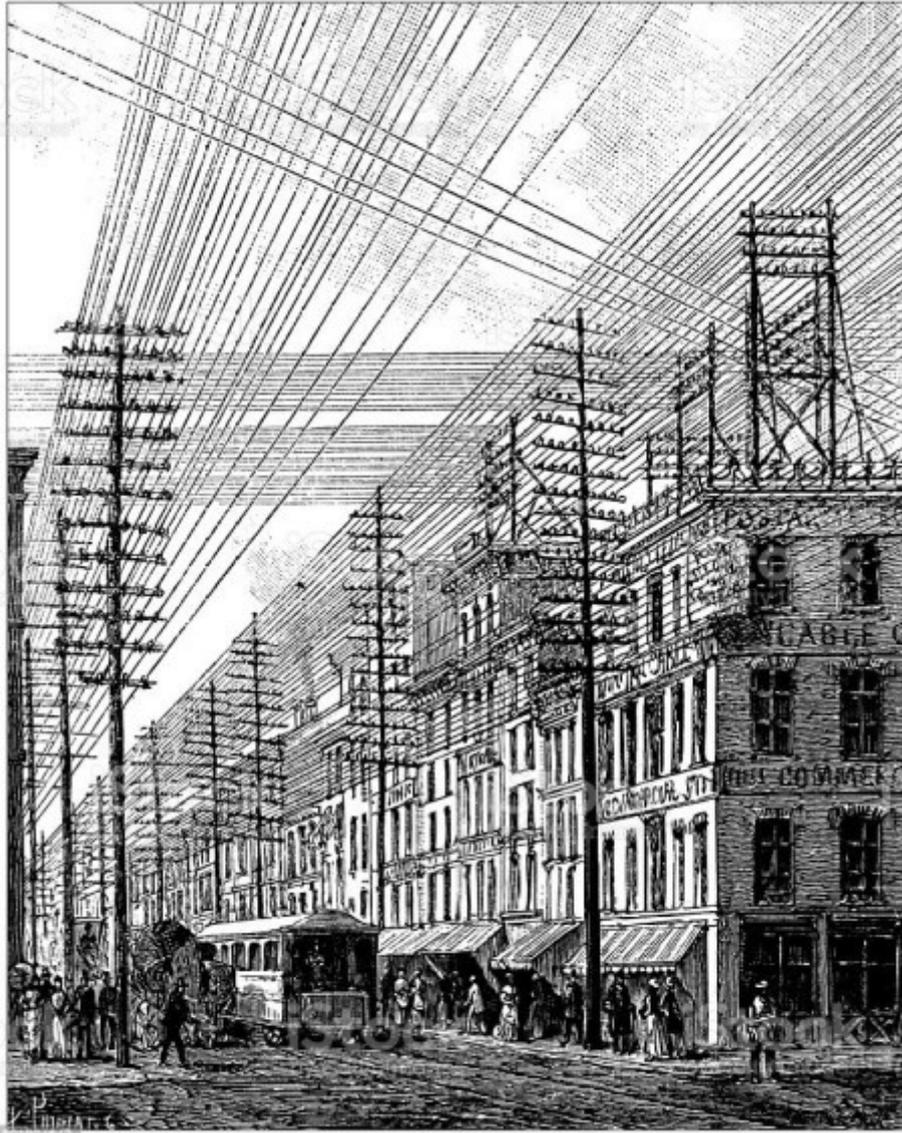
- Not an expert in anything, but really like networks.
- May have met me at *Philly 2600*. 
- Editor of the *N-O-D-E* zines.
- Run **networksofphilly.org**



How did this start?

- Ingrid Burrington's Book, *Networks of New York: An Illustrated Field Guide to Urban Internet Infrastructure* (2016)





Look at the ground a lot



- | | |
|--|---|
|  RED
Electric Power Lines,
Cables, Conduit and Lighting
Cables |  GREEN
Sewers and Drain Lines |
|  YELLOW
Gas, Oil, Steam, Petroleum
or Gaseous Materials |  PURPLE
Reclaimed Water, Irrigation
and Slurry Lines |
|  ORANGE
Communication, Alarm or
Signal Lines, Cables or
Conduit |  PINK
Temporary Survey Marking |
|  BLUE
Potable Water |  WHITE
Proposed Excavation |

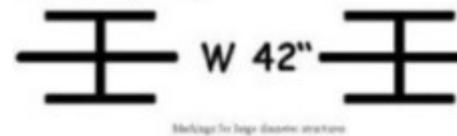
Line Markings



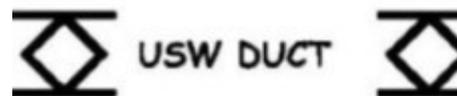
Corridor Markings



Oversized Utility Markings



Conduit Markings



Marking Gas Lines – High Pressure



Marking Termination Point, Dead End, Stub Outs



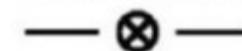
Marking Offsets

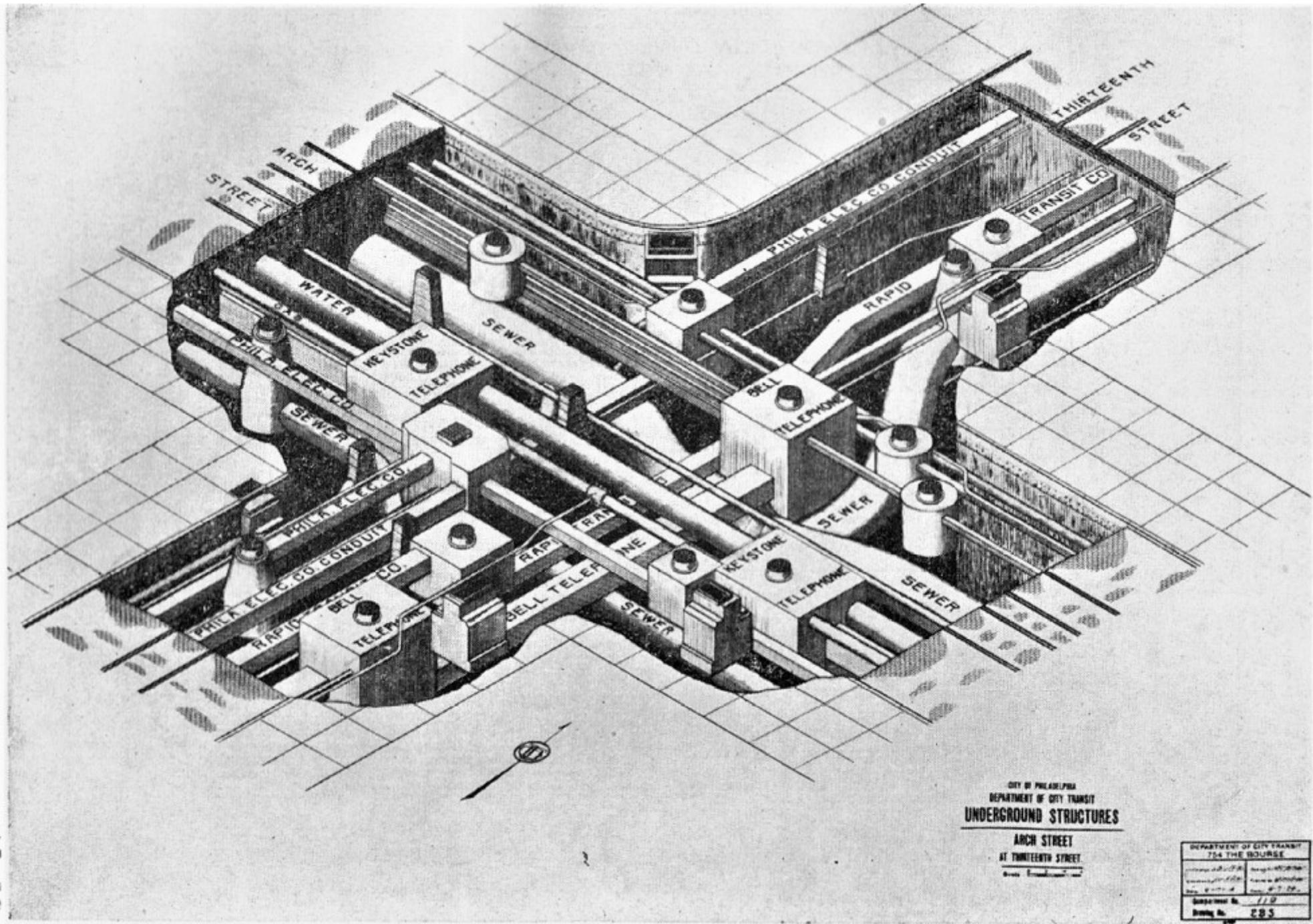


No Conflict (No utilities within the requested area)

NO/MCI NO/EPG

Marking Buried Splices, Valves, Manholes

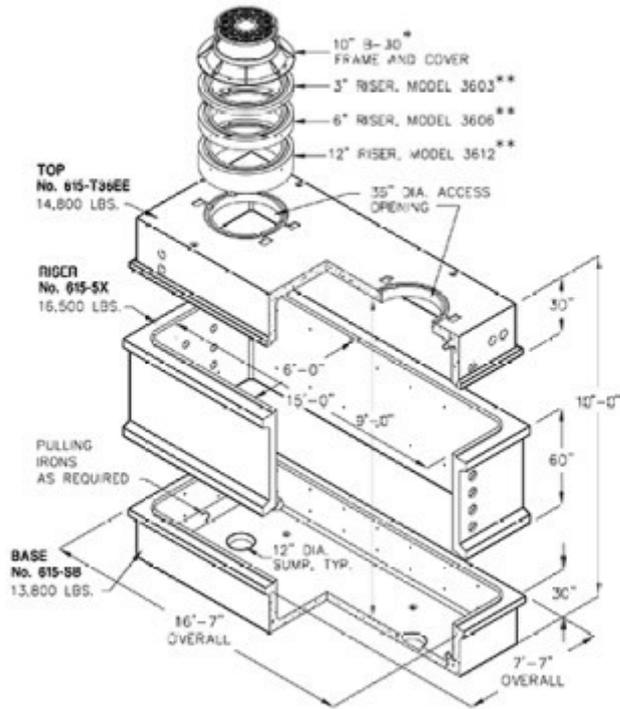




Manholes

615-9 TELEPHONE MANHOLE

6' x 15' x 9' ID.
MANHOLE



BOX DESIGN LOAD:
H-20 TRAFFIC
WITH 1' TO 5' EARTH COVER

FOR COMPLETE DESIGN
AND PRODUCT INFORMATION,
CONTACT JENSEN PRECAST.

2/8/05
615-9.dwg
© 2002 Jensen Precast

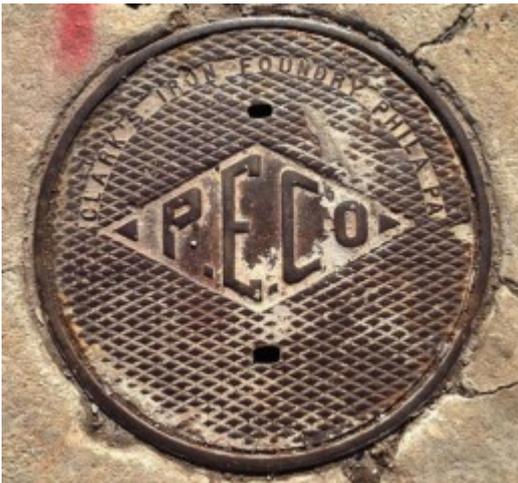
* SEE HARDWARE/APPLIQUANCES SECTION
FOR SPECIFICATIONS.
** RISERS OPTIONAL. SEE COLLAR/RISER
SECTION FOR SPECIFICATIONS.

JENSEN
PRECAST



PECO

- Formerly **Philadelphia Electric Company**, founded 1881.
- Owns 1,607 miles of high-voltage transmission lines, 15,250 square miles of underground distribution cable, and 12,933 miles of aerial distribution lines.
- Part of **Exelon** as of 2000.



Steam

- System dates back to 1889 when a power station at 908 Sansom used exhaust to heat nearby 917 Walnut St.
- Third largest steam system in the United States.
- Steam runs through pipes at 450F to 162 customers.
- Now owned by Vicinity Energy, previously Veolia, Trigen, PECO.



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Steam Distribution System

- 30 miles of pipeline
- System covers approximately 4.5 square miles
- 473 vaults



High Pressure Fire Service

- HPFS started 1903 as a better way to fight fires.
- Could shoot a two-inch stream 230 feet vertically at 400 PSI.
- Red hydrants with two independent gates, weighting 1000lbs.
- The 56-mile system was decommissioned in 2005 due to disrepair.



Philadelphia Transportation Co

- Main public transit operator from 1940 to 1968.
- Replaced **Philadelphia Rapid Transit Company** (PRT) founded in 1902, now replaced by **SEPTA**.

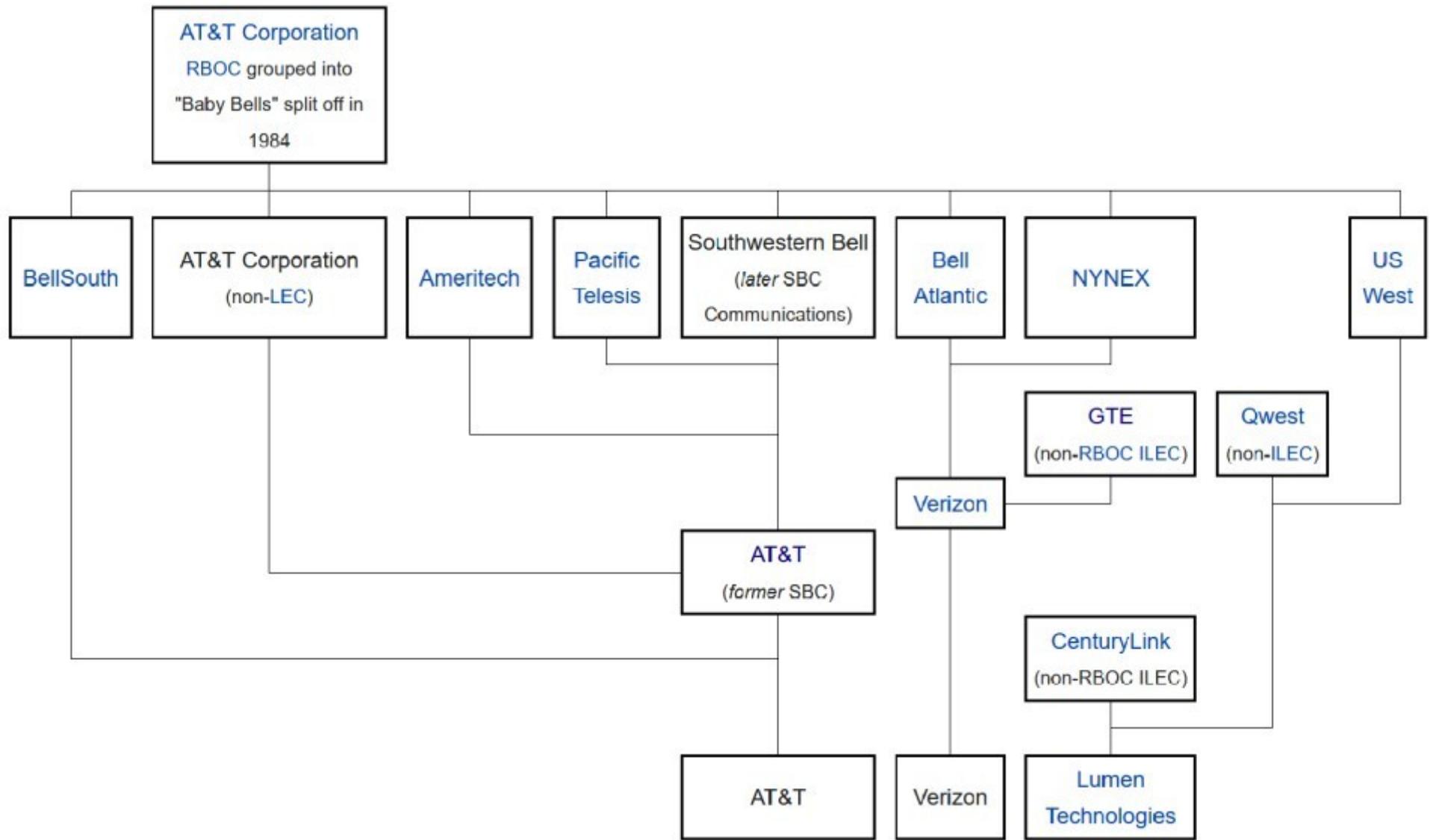


Bell Telephone Company



- **Bell Telephone Company** began as a company in 1879.
- **Bell Telephone Company of Pennsylvania** started the same year.
- Bell was broken up in 1984, Philly's RBOC became **Bell Atlantic**.





Keystone Telephone Company

- Founded 1900 as a direct competitor to **Bell Telephone Company**, bought by Bell in 1945.
- First telephone company in the world to have completely buried wires.
- Catered to businesses.
- Used for city communications.



Electrical Bureau

- City department from 1856 – 1951.
- Maintained communications systems (call boxes) for police and fire.
- Now Communications group within the Department of Public Property.



Western Union Telegraph Co

- Began operation in 1851.
- Telegraphy was spun off to **Western Union International** in 1963.
- Sold telegraphy system to **MCI** in 1983.



Metromedia Fiber Network

- Launched in 1993 as **National Fiber Network**.
- Dark fiber to communications carriers in the U.S. and EU.
- Bankrupt by 2002, back in 2003 as **Abovenet**, bought by **Zayo** in 2012.



MCI Metro

- Division of **MCI** that layed fiber in the '90s.
- Bought by **WorldCom** in 1998.
- **MCI** Acquired by **Verizon Communications** in 2006 after bankruptcy.



Level 3 Communications

- Started building nation-wide fiber in 1998.
- Received \$411 million from the DOD in 2012.
- Bought by **CenturyLink** in 2017, now **Lumen Technologies**.
- Tier 1 Network Operator.

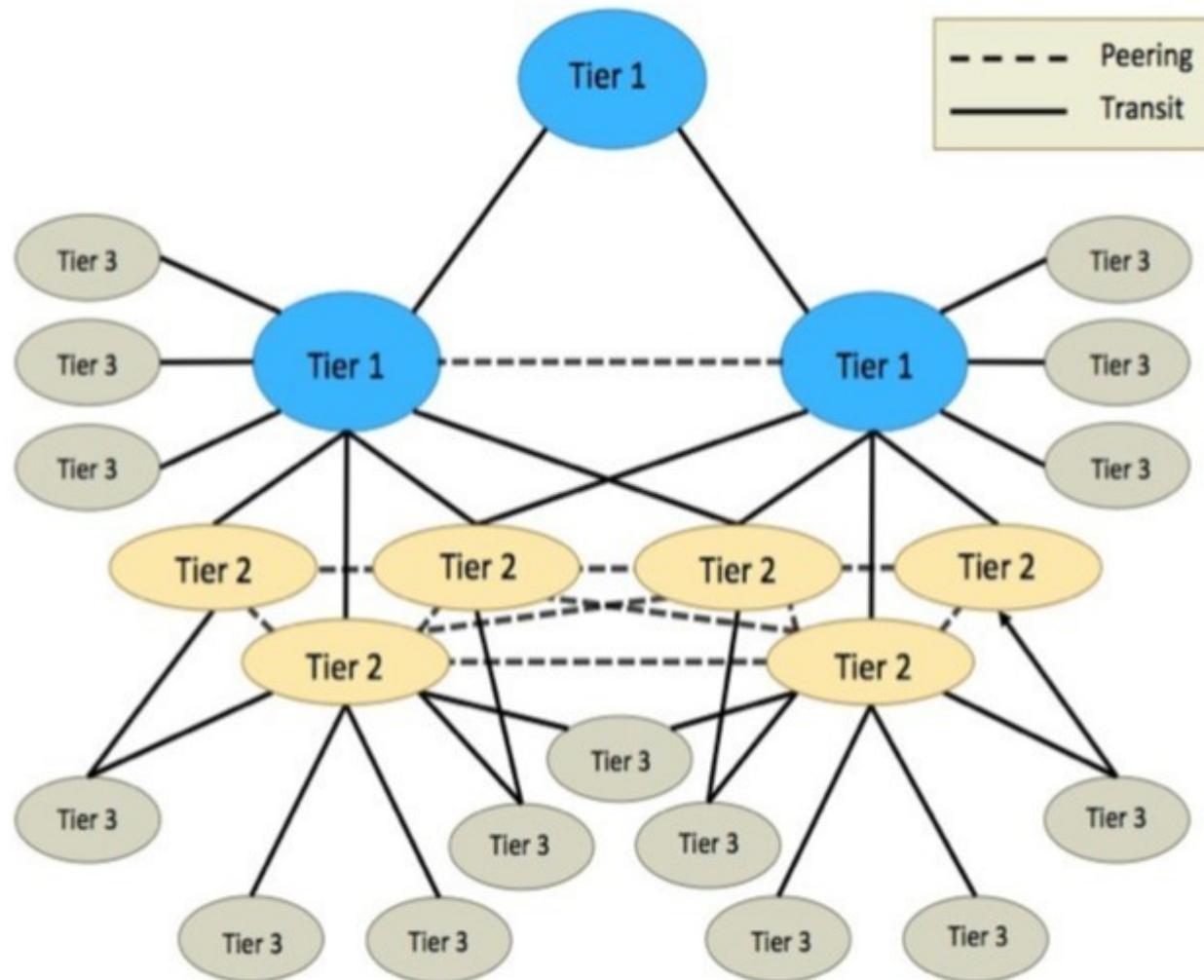
Level(3)[®]

 CenturyLink[®]

LUMEN



What the Internet Looks Like

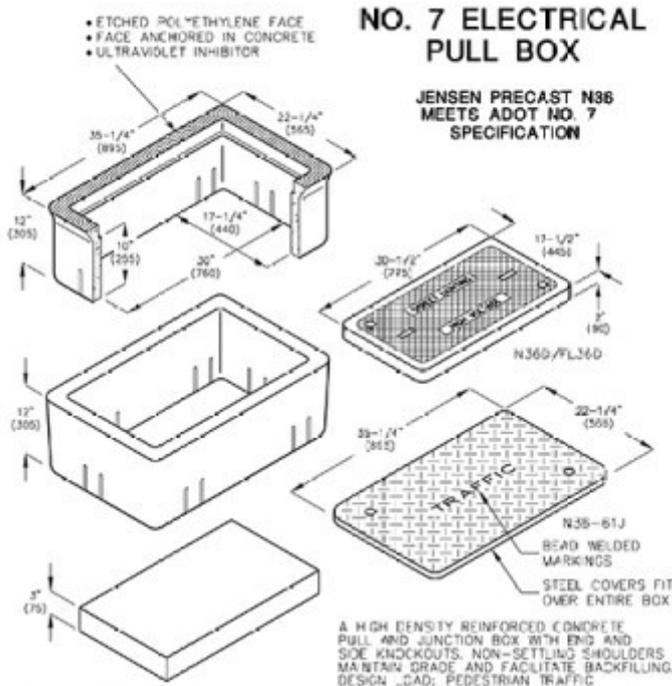


Telephone & Communication

- “Telephone” is likely a replacement.
- “Communication” is for private cables.



Handholes and Boxes



CATALOG NUMBER	PRODUCT	DESCRIPTION	APPROX. WT. (KGS.)
CYN36	BOX	REINFORCED CONCRETE	17.9
FL36D	LID	NONMETALLIC LID W/HOLD DOWN BOLTS	28
CYN36CJ	LID	CAST IRON W/HOLD DOWN BOLTS	74
CYN36-61J	COVER	STEEL CHECKER PLATE W/HOLD DOWN BOLTS	32
CYN36E	EXTENSION	12" HIGH REINFORCED CONCRETE	16.7
CYN36SL	SLAB	REINFORCED CONCRETE	11.3

FOR COMPLETE DESIGN AND PRODUCT INFORMATION, CONTACT JENSEN PRECAST.

NOTE: METRIC DIMENSIONS ROUNDED TO NEAREST 5 MM.

1/17/05
ADOT13.dwg
© 2005 Jensen Precast



CATV

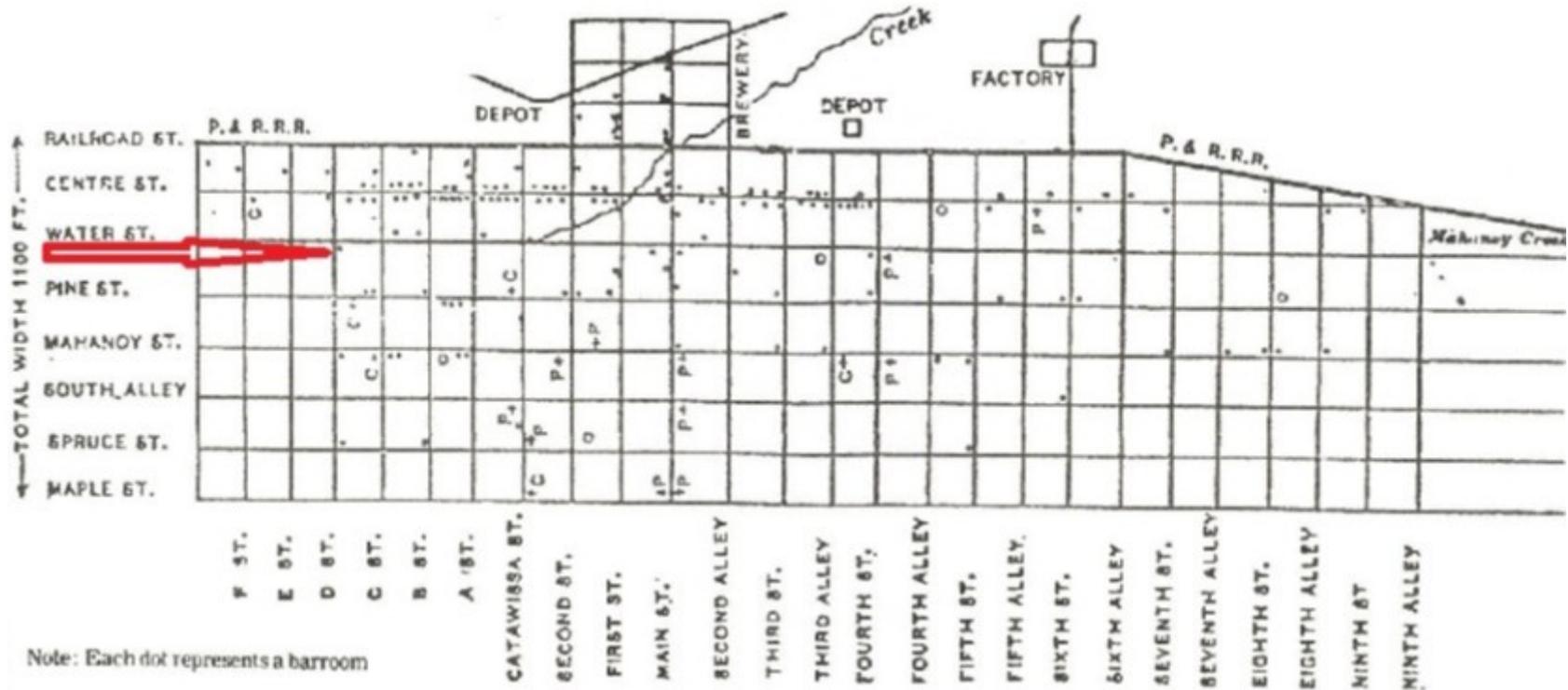
- Cable TV is a Pennsylvania first.
- Handholes provide cable services (coax) to buildings.
- Cable television came to Philadelphia in 1983 under 3 franchises: **Comcast**, **Cablevision Systems of Philadelphia**, and **Philadelphia Inner City Cable** (Wade Cablevision came in 1987).



The Drinking Capital of America

Mahanoy City 1903

Population: 13,725 – A total of 143 barrooms,
or for one for every 98 inhabitants.



Traffic

- Seen on the sidewalk corners near crosswalks.
- Cabling here connects traffic lights to large metal control (SCADA) boxes nearby.
- Adaptive Traffic Control Systems



Bell Atlantic

- Operated 1984 – 2000 as one of the 7 RBOCs.
- Was parent of of **New Jersey Bell**, **Bell of Pennsylvania**, **Diamond State Telephone**, and the **C&P Telephone** companies.
- At its peak, it was the second largest telephone company in the USA with operations in 23 countries and 13 states.



Verizon



- Carries telephone and Internet services within Philadelphia and is *the* current telephone provider for the city.
- Formed in 2000 after merger between **Bell Atlantic** and **GTE**.



Zayo

- Founded in 2007, is a fiber network with 130,000 route miles of fiber laid in North America.
- Tier 1 Network Operator.
- Also work installing small cells.

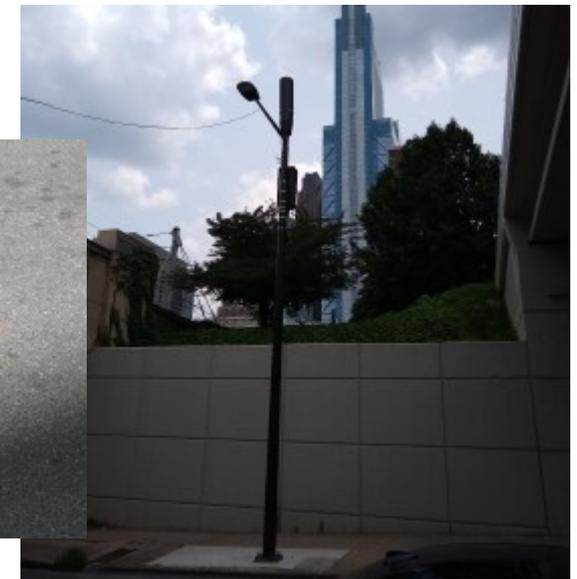


Antennae & Other Devices



Small Cell

- Low-powered cellular radio access nodes.
- Range of 10 meters to a few kilometers.
- **Crown Castle** installs Fiber and Small Cells in the North East, bought **Lightower**, a northeastern network provider in 2017.



Crown Castle (Continued)



Distributed Antenna Systems

- Expand cell coverage, adding capacity in under-serviced areas.
- Repeater vs Active
- Usually cover different frequencies and different carriers.
- These units are manufactured by **JMA Wireless**.



LinkPHL

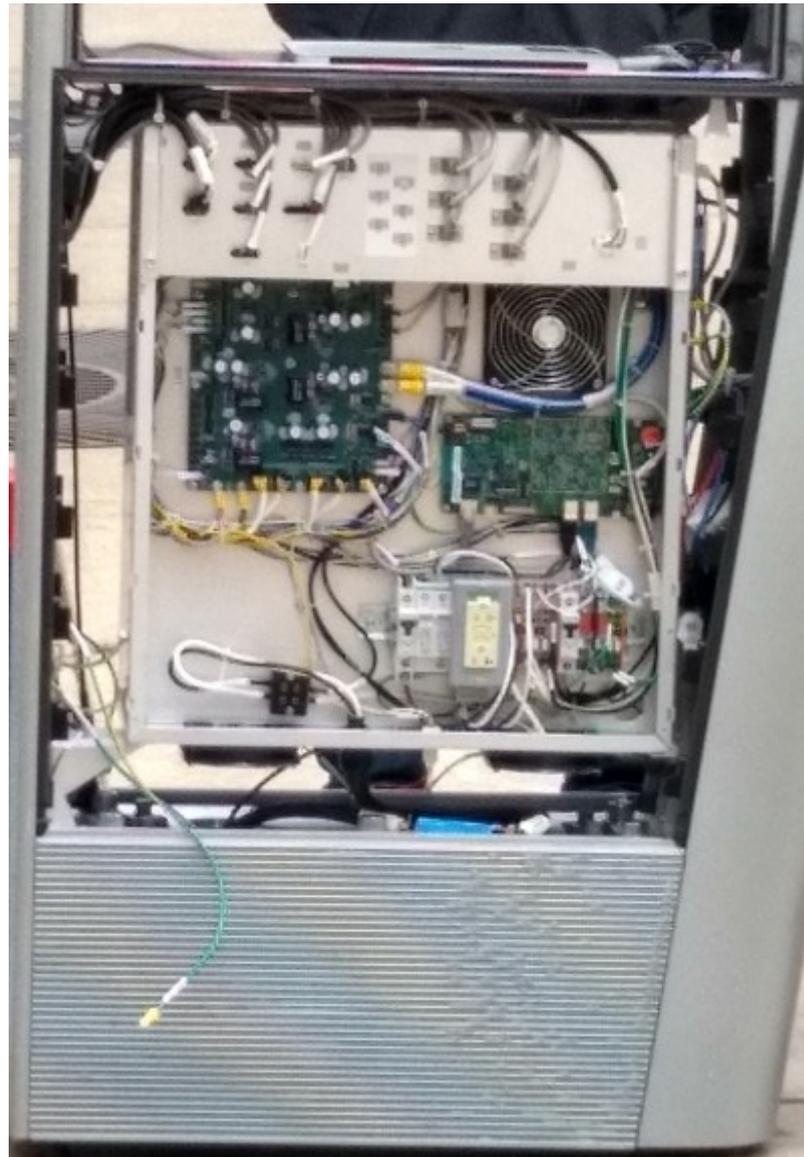
- Provide free WiFi access, mobile device charging, phone calls, access to municipal/emergency services, maps, directions.
- Each LinkPHL kiosk has three cameras, and microphones, among other sensors.
- Created by **Intersection** (formerly **Titan**), with investment from **Alphabet**.



LinkPHL



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Police Cameras

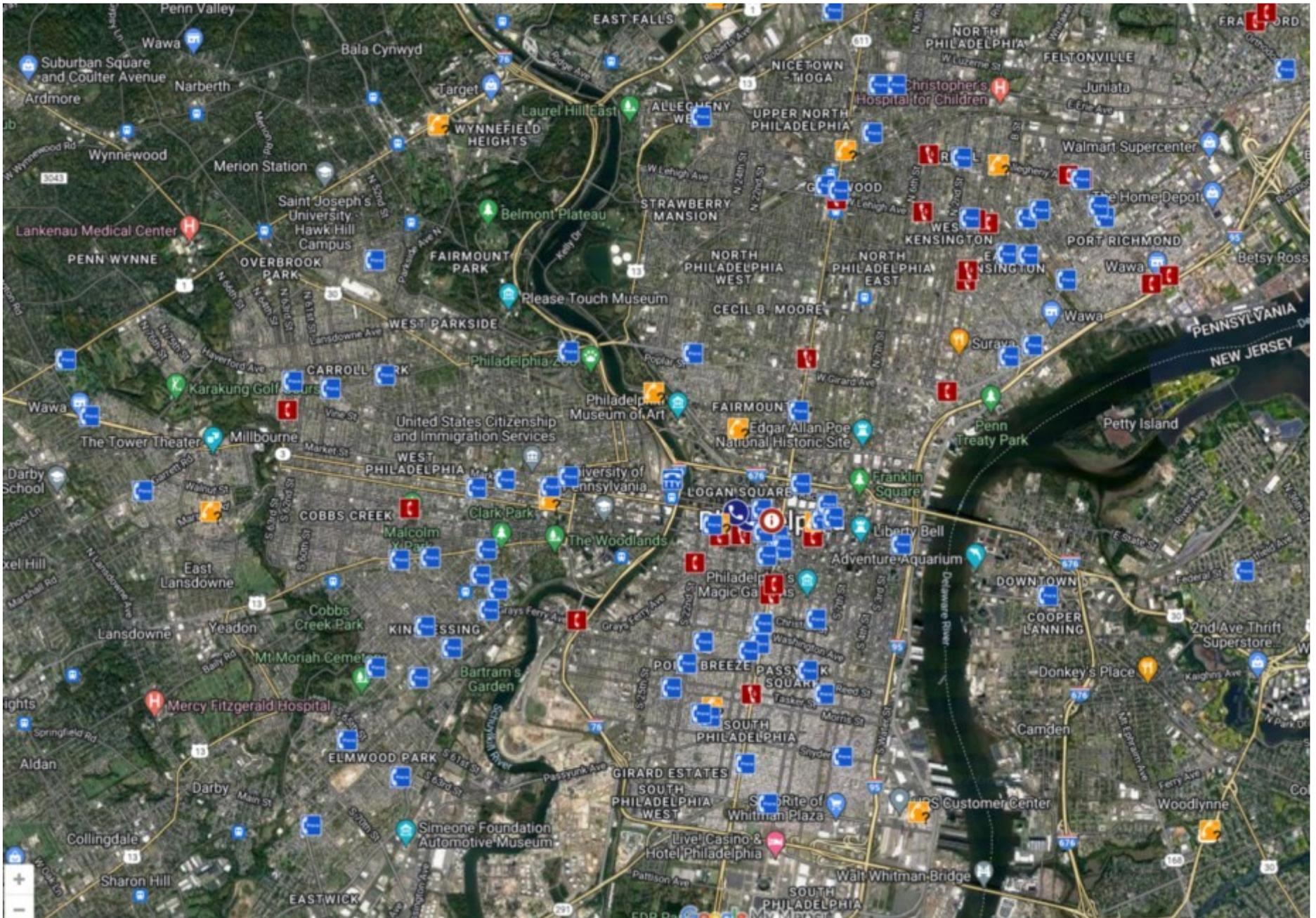
- Have been in the city since 2009, many are thought to be broken and in disrepair.
- Cameras automatically follow movement. Anyone watching?



Payphones

- Pacific Telemangement Services (PTS) based out of California.
- NewTel based out of The Bronx, NYC bought remaining Verizon payphones in 2012.
- Please dial the MCI ANAC -> 1-800-444-4444





Not Yet Covered

- Parking Kiosks
- Transit Kiosks
- Shotspotters
- Ricochet (anything left?)
- More?



Sight Seeing



401 N Broad

- **Terminal Commerce Building**, this 14-story concrete building was built between 1929 and 1931 by the Reading Company.
- Largest carrier hotel within Philadelphia with over 80 carriers as of 2015.



Three Logan Square

- Formerly the **Bell Atlantic Tower**, this 55-story office building was erected in 1991.
- After Bell split up, the Philadelphia-based Baby Bell **Bell Atlantic** headquartered within the building until 1996 when it purchased New York City-based **NYNEX** and moved operations to New York.
- Still houses **Verizon Communications of Pennsylvania HQ**.



NYNEX



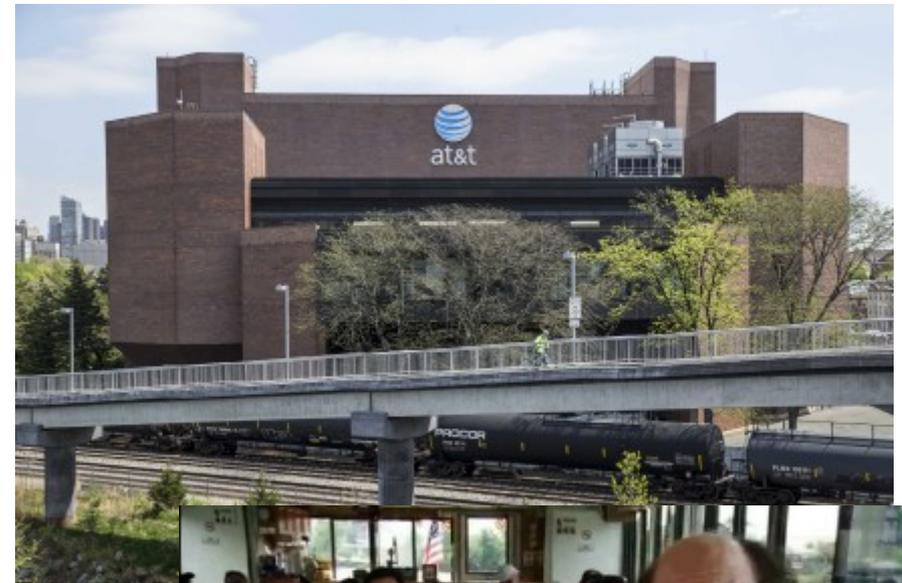
Comcast Center & CTC

- **Comcast** started as **American Cable Systems** in 1963.
- **Comcast Center** is a 58-story building built between 2005 and 2008, and is **Comcast's HQ**.
- **Comcast Technology Center** is a 60-story building built between 2014 and 2017.



500 South 27th

- **AT&T** building presumably used for continued **AT&T** service and collocation for other telephone companies.
- Built 1967 by **Bell Telephone** to replace an older exchange at 17th and the Parkway.
- Situated near railroad lines by the Schuylkill.



Right To Know

- Created **Right To Know** requests that will be submitted to various organizations within the Philadelphia government in an attempt to gain information on surveillance equipment deployed throughout the city.
- inspired by the *Aaron Swartz Day Police Surveillance Project* #ASDPSP and information brought to light via "The Wiretap Room" by Ryan Gallagher and Henrik Moltke in *The Intercept*.
- Requests filed through **MuckRock**, <https://www.muckrock.com/project/philadelphia-police-surveillance-project-305/>

MUCKROCK



Right to Know Request List

- GUNSHOT DETECTION MICROPHONES (SHOTSPOTTER/SENTRI)
- IMSI-CATCHER EQUIPMENT
- SOCIAL MEDIA MONITORING SOFTWARE
- PREDICTIVE SOFTWARE
- FEDERAL MOUs
- AUTOMATED LICENSE PLATE READERS
- FLIR THERMAL CAMERAS
- FACIAL RECOGNITION SOFTWARE
- UNMANNED AERIAL VEHICLES (DRONES)
- BODY WORN CAMERAS
- EYE IN THE SKY

What's Next

- More walking around and looking at things.
- Ask for help to identify things I can't identify, <https://github.com/networksofphilly/unidentified-infrastructure-objects>
- Walking tours?





Questions?

- Networks of New York, Ingrid Burrington
- Underground Philadelphia, Harry Kyriakodis & Joel Spivak
- The Anatomy of a City, Kate Ascher
- The Victorian Internet, Tom Standage
- Tubes, Andrew Blum
- The Undersea Network, Nicole Starosielski
- <https://hiddencityphila.org>