



Q&A

NEW YORK



Q1: Did you know that without a surveyor, cities wouldn't be built? Can you spot all the surveyors in New York?

A: Altogether, there are **thirteen** surveyors in this scene, all busily working away. You can spot surveyors by their fetching hi-vis vests, which help keep them safe and seen while they're on site, as well as the wide variety of technology they use: scanners on tripods, radar and sonar devices fitted to boats, and imaging drones being piloted across the city!

A city like New York depends on surveyors for so many things. They work on everything from the biggest buildings to the smallest signpost. You'll find them underground in the subway, on the sidewalk in the street, in the waterways, and even in the sky! They work on all aspects of construction, maintenance, communication, energy, and building safety... in other words, a city like New York just wouldn't work without surveyors!

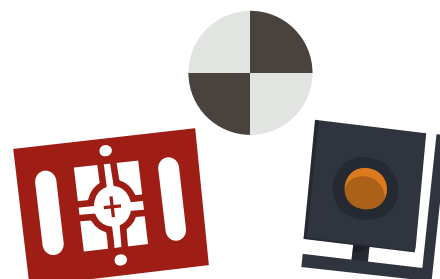
Q2: There are 3 different types of survey targets around the city. What do you think they are used for and can you find them all?

A: These are tricky to find! If you managed to locate all three target types, find a mirror and give yourself a (gentle) high-five! There's one on the underground platform - the black and white circle just above the end of the red pipe. There's a red and white target to the left of the crashed alien ship, and another one at the base of the Statue of Liberty. The third type of target is a black square with a red circle in the middle, and you can find one of these on the side of the Brooklyn Bridge, and another at the top of the skyscraper behind the NSPS flag.

These targets work with LiDAR - Light Detection And Ranging technology. Scanning devices send out precise beams of light, which bounce off the target and back to the device, allowing an accurate measurement to be made.

There is also a fourth, very old survey marker being inspected by the police officer and Bengal Cat in the foreground of the scene. It dates back to the early 1800s, when a land surveyor called John Randel Jr., whose job it was to plan out the street grid on Manhattan Island, used metal pegs to mark proposed street intersections. Many residents weren't happy about the street plans, and they

chased poor John with dogs, threw vegetables at him, and even ripped his pegs out of the ground! This one in Central Park, however, has lasted over 200 years... and you can still find it today!



Q3: Something has happened to Lady Liberty's torch? It is now a GNSS unit and collects data from dozens of satellites in space. Can you spot the other surveyors using GNSS equipment?

A: If you follow Lady Liberty's torch straight down, you'll find Alison: she's wearing a white hard hat and holding a GNSS unit. There's one on top of the small boat, and another unit is being operated by Tim and Trish, who are standing outside the Guggenheim Museum (look for the alien running across the roof above - I'm not sure he'll be allowed into the museum, especially without a ticket!). All these GNSS units can communicate with satellites

in space, which send an exact location back to the device. This allows surveyors to know their precise whereabouts on Earth.

Maybe the men in black could ask the GeoSquad for help with their alien absconder - they're hanging out nearby! Can you spot Miles, Setsuko, Kwame, and Maddison on her skateboard?



Q4: Surveyors use laser scanners to make 3D models of buildings. Can you spot the surveyor using a laser scanner to survey an old church?

A: The surveyor standing at the foot of the NSPS flagpole is collecting scan data for St. Patrick's Cathedral, a building that dates back all the way to 1878. The laser scanner he is using records the reflection of thousands of light beams per second. These recordings, called 'datapoints', can be combined to make a 3D computer model of the scanned object.

Scans like this are particularly important for historical **conservation** - preserving something precious from the past. In 2019, over in Paris, France, the Notre Dame Cathedral caught fire and a large portion of the building was badly damaged. However, thanks to the work of surveyors, detailed scan data is now being used to help in the restoration of the church.



Q5: Hydrographic surveyors use GNSS, sonar and LiDAR technology in their work to locate features above and below water. Can you find the TWO teams performing hydrographic surveys?

A: There are two boats motoring down the New York waterway. The one to the right of the hot dog stand is using a LiDAR scanner attached to the cabin to scan the banks of the river. This data is important in helping ensure the safety of the waterway, and to check that no potentially dangerous changes are occurring on the riverbanks.

The smaller boat to the left of the hot dog stand has a sonar scanner attached, with its sensors sitting below the surface of the water. This device makes measurements using

sound waves; it records the bounce-back time of radio waves and uses them to create

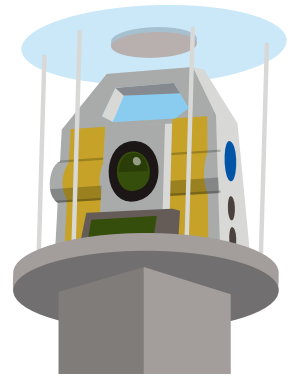
a digital picture of what's happening below the surface of the water. It is important to understand what's happening on the waterways in New York - especially as millions of people travel over, across and underneath them each day!



Q6: Did you know surveyors use high-tech equipment to keep an eye on buildings in cities so that they don't collapse? This is called Monitoring. Can you spot the equipment used for it? (Clue: Look on the top of the buildings)

A: If you can find the crane that's carrying the metal beam, upon which some very brave workers are having their lunch, then you can spot the monitoring equipment on the skyscraper behind them. The device is called a 'total station'. It's housed inside a special cage (to deter any would-be thieves!), and it works around the clock, all

day, every day, gathering data on the surrounding buildings, roads and other structures. Surveyors check this data regularly to see if there are any movements, cracks or potential hazards appearing in the scanned environment. This way, we can keep a close eye on our cities, and keep their residents and buildings safe.



Q7: Did you know surveying is one of the few professions that allow you to fly Drones in the city? Can you spot the different ones in New York City?

A: There are three drones: the LiDAR USA drone, which has a laser scanner attached to it collecting data for a 3D model of the city; the white Monsen Engineering drone soaring towards the scaly mega monster, and another grey drone which seems to be in a spot of trouble! Hopefully the flying dog will make a pawsome rescue!

Some drones have cameras mounted on their bellies, and are used for **photogrammetry** - the process of taking measurements from photographs. Drone pilots control their vehicles via remote - particularly useful when surveyors want to explore an area which is hard to access, maybe because it is densely populated and busy - like New

York - or perhaps because it could be dangerous - like mountains and volcanoes, glaciers and deserts, or anywhere else where a normal person might not want to venture!