

## TECHNOLOGY: COVERT TUNNELS

### When a tunnel is just a cover

Boston Area-based geotechnical and tunnelling consultant, Peter J. Tarkoy looks at current methodologies to detect covert tunnels.

Covert tunnels are growing in number and their sophistication is increasingly astonishing. The boldness of their location, the volume and character of goods transported through them, allied with the increasingly sophisticated booby trap protection, have all become a serious threat to security.

However, the origin of covert tunnels is unknown. Howard Hughes Sr. (co-founder of Hughes Tool) was the first to propose using small diameter tunnel boring machines for penetrating trenches during WWI. The call for the detection of covert tunnels goes back to the Korean War under the Demilitarised Zone (DMZ) (**Figure 1**) and the Vietnam War (**Figure 2**) throughout the battle areas.

Currently, covert tunnels have achieved notoriety in Gaza, around Israeli borders, and the US-Mexican and Canadian borders (Figure 3).



**Figure 1. Tunnel under Korean DMZ.**



**Figure 2. Tunnel in from Mexico**

We have received inquiries for underground construction equipment to excavate covert tunnels nearby enemy buildings in places as far flung as Kashmir, as well as various unidentified and mysterious projects.

Various geophysical methods have been proposed and investigated. Some have had minimal success because:

1. Variable geological conditions
2. Depth below the surface, and
3. Water table conditions.

### Sources of inquiry

Various entities, from the military (during the Korean War) to security agencies (more currently) have sought development of technologies to detect covert tunnels in and around battle zones, under borders, and in areas of ongoing conflict, such as in the Middle East..

Some of the case histories include:

1. Penetration under the Korean DMZ,

2. Tunnel networks in Vietnam used by the Viet Cong for staging surprise attacks.
3. Various smuggling tunnels in the Middle East, originally for smuggling goods, then weapons; tunnels used to set off explosives in a tunnel under an Israeli military encampment; and more recently, for humanitarian supplies to Gaza.
4. Under-border penetrations between the USA and Mexico and between the USA and Canada for smuggling illegal aliens, drugs, and more recently, possible terrorist activity.

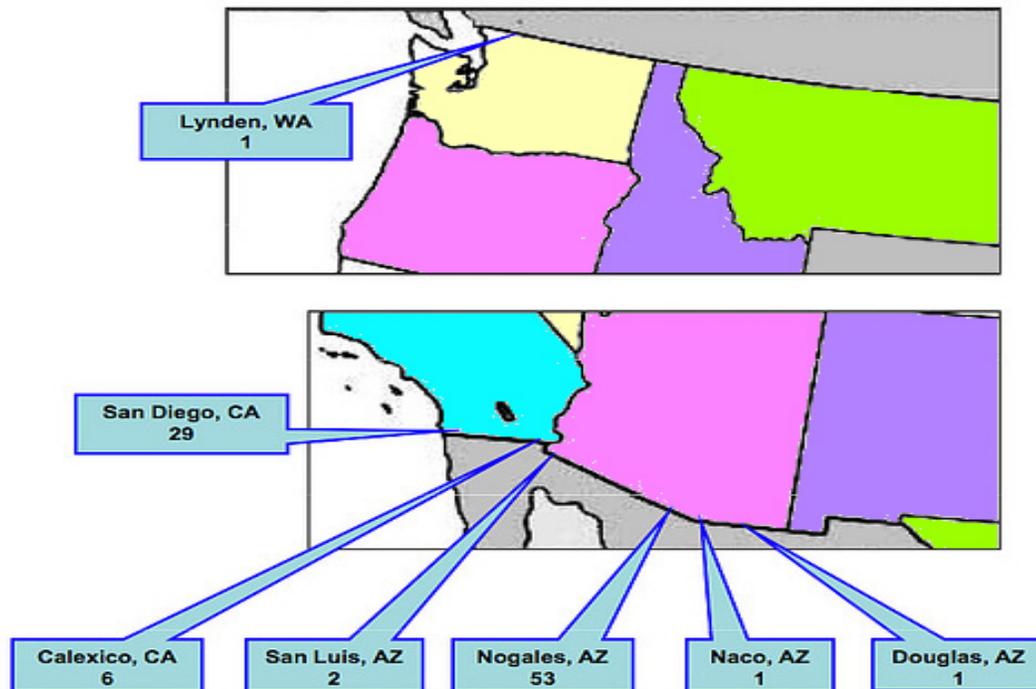
For example, between 1990 and November 2008, 93 cross-border tunnels were discovered, 35 of which were in California, 57 in Arizona, and 1 in Washington State (**Figure 3**).

As a result of security concerns, various entities and agencies have sought methods to locate illicit tunnels. Proposals have almost always been based on a variety of geophysical methods.

### Potential Technologies

Nearly all known methods for detection proposed are based on geophysical technology and they have had either little or no consistent or reliable success as a result of various limitations. The main detection technologies are:

1. Ground penetrating radar  
Ground penetrating radar (GPR) does not work well in moist mediums like clay or below the water table, and rarely penetrates deeper than 12m. False alarms even at shallow depths are not uncommon.



**Figure 3. Location of Covert US Border Tunnels**

2. Seismic waves,  
Seismic waves require real-time detectors and more powerful imaging software – to filter out the waves' reactions to natural and man-made 'noises', such as wind and highway traffic.

3. Electrical resistivity,  
Electrical resistivity would require a wide-ranging network and would have to be permanently installed, at great expense. Furthermore, it would have to be hidden to avoid tampering.

4. Microgravity, and  
Microgravity would require very high precision. The gravity differential for smuggling tunnels can be as slight as 10 microgals, measured against the Earth's field of 100 million microgals.

5. Cosmic rays.

Cosmic Rays would require a large number of costly detectors, buried beneath the probable paths of illicit tunnels, (Small detectors find few muons and therefore have low resolutions.)

### Solution

The San Diego Union Tribune headline (July 11, 2004) claimed that 'Border tunnels [are] often uncovered by luck'. We disagree, they are found because tunnelling is difficult to perform covertly. Tunnelling operations require considerable work that is difficult to do covertly. These telltale signs are easily detectable by discerning observation and normal observational methods. More sophisticated operations can also be exposed when systematic observations are focused on selective targets.

To minimize the length of border to be observed, be it Mexican or Canadian, we need to identify those sections of border that are ideal and prone to penetration by tunnelling.

Thereby, observations, by direct, instrumentation, or remote sensors, may be concentrated on those sections of border that are most prone to tunnelling.

These sections can be systematically observed by existing in-place technology, modified and processed for detecting likely covert tunnelling operations.

Do you have a covert tunnel to tell us about?

Further information is available from [www.geoconsol.com](http://www.geoconsol.com)