



SMUGGLI TUNNELS

The Need for a Transnational Analysis

BY TERRANCE G. LICHTENWALD AND FRANK S. PERRI

Abstract

Tunnels present significant national security concerns to the United States of America because of the devastating consequences inherent in terrorist organizations using tunnels as conduits to bypass Department of Homeland Security measures. This paper outlines sources and methods used by Canada, Israel, and South Korea to combat smuggling tunnel excavation, communication methods, and security operations. Integrating Canadian, Israeli, and South Korean sources and methods into U.S. homeland security is considered. The research design for transnational analysis of smuggling tunnels with ongoing data collection for U.S. intelligence and law enforcement is proposed.

NC US

Photo Credit: U.S. Immigration and Customs Enforcement

An agent crawls out of a tunnel discovered in November 2010 at Otay Mesa, California. More than 20 tons of marijuana were found in this tunnel connecting warehouses in San Diego and the Tijuana area—the second time a sophisticated tunnel was found in the same location—thus supporting the doctrine that geography affects national security.

This article is approved by the following for continuing education credit: The American Board for Certification in Homeland Security, CHS® provides this continuing education opportunity for those individuals Certified in Homeland Security, who are required to obtain 30 Certification Maintenance Unit's (CMU) per 3-year recertification cycle.

AFTER STUDYING THIS ARTICLE, PARTICIPANTS SHOULD BE BETTER ABLE TO DO THE FOLLOWING:

1. Describe the transnational tunnel analysis research design.
2. Identify sectors on the U.S. border where human intelligence and law enforcement practices identify the most tunnels.
3. Recognize the multiple intelligence and criminal investigative leads generated by transnational tunnel analysis.
4. Describe the global implications of tunnel analysis as it relates to terrorist activity.

KEYWORDS: Smuggling, tunnels, Department of Homeland Security, Secure Border Initiative

TARGET AUDIENCE: Intelligence analysts and law enforcement officers and agents who work with national security and law enforcement issues on the U.S. borders.

PROGRAM LEVEL: Basic

DISCLOSURE: The authors have no relationships or conflicts.

PREREQUISITES: None

Introduction



The Secure Border Initiative (SBI) is a multi-year, multibillion-dollar program that began in 2005 intended to secure U.S. borders and end illegal immigration (“The secure border,” 2009). Two years after the SBI was approved, the Tactical Infrastructure/Border Fence project, under the control of the Facilities Management and Engineering Office of the U.S. Border Patrol, completed the pedestrian and vehicle fence projects along the southwest border of the United States (“Tactical infrastructure,” n.d.). Security threats addressed in this paper, none of which are addressed by pedestrian or vehicle fences, are the growing number of tunnels found on the U.S. border and the similarity between smuggling tunnels found in the U.S.—one tunnel was large enough to drive a jeep through—and those found in the Middle East and the demilitarized zones of South and North Korea.

The Homeland Security Advanced Research Projects Agency has begun to research the science and technology of tunnel detection in urban settings through the Science and Technology Directorate, which is the primary research and development arm of the Department of Homeland Security (“Tunnel vision,” 2009). The authors note that as of yet the Human Factors Behavioral Sciences Division has not addressed the social and behavioral sciences aspect of smuggling tunnels or the crime-terror nexus point of each (“High priority technology,” 2009). Likewise, the U.S. military’s Joint Task Force North, which conducted nine tactical

missions last year to find underground tunnels using some of the technologies noted above, did not include the social and behavioral aspects presented in this paper during its tactical missions (Hettena, 2009). In this paper, the authors propose and outline a transnational tunnel analysis model that includes in-tandem assessment of hard-science tunnel construction and the social and behavioral aspects of the crime-terror nexus point.

Between 1990 and 2008, there had been at least 75 tunnels discovered along America’s border with Mexico, 63 of these since the terrorist attacks of September 11, 2001 (Elsworth, 2008). Another calculation surmised that between 1990 and fall 2009, the United States Border Patrol found a minimum of 109 tunnels along the California and Arizona sections of the United States-Mexico border (Medrano, 2009). In fiscal year 2009, U.S. Customs and Border Patrol agents stationed along the United States-Mexico border discovered 26 illegal tunnels—a 60% increase over the 16 tunnels authorities discovered in 2008 (Mora, 2010). Between 2006 and 2010, at least 51 tunnels—more than one per month—were found between two border cities: Sonora and Nogales, Arizona. Lacey (2010) states, “Some Nogales tunnels are short, narrow passageways that require those navigating them to slither. Others are long, sophisticated underground thoroughfares strung with electric cables and ventilation hoses.”

A recent report by the Border Patrol appears to be contrary to the progressive increase in the discovery of tunnels and thus raised public discussion about whether the number of tunnels is increasing or decreasing. In a press release, the Border Patrol reported that from October 1, 2009, to July 31, 2010, five tunnels were identified within the Tucson Sector and that during the same period in the previous year, 20 tunnels were discovered (Holub, 2010). In November 2010, over 20 tons of marijuana were found in a tunnel connecting warehouses in San Diego and Tijuana—the second time a sophisticated tunnel was found in the same location—thus supporting the doctrine that geographical variables can

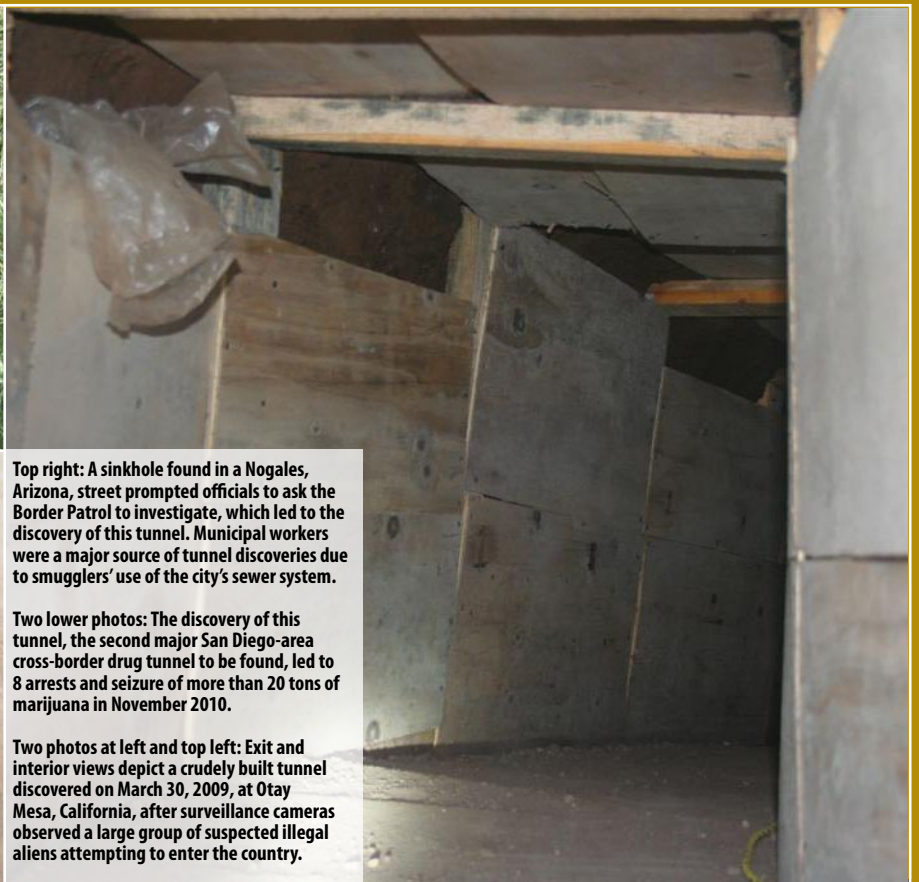
Tunnels Discovered Within Arizona HIDTA-Region Fiscal Year 2005-2009*

PLACE OF ENTRANCE	FISCAL YEAR				
	2005	2006	2007	2008	2009*
DOUGLAS	0	0	0	0	0
NOGALES	3	4	10	14	9
SAN LUIS	0	0	1	0	1
TOTAL SEIZED IN ARIZONA	3	4	11	14	10

Source: Department of Homeland Security
• Data as of December 31, 2008 (data referenced are the latest available).

have an effect on national security. The 2009 U.S. government figures are provided below (Marosi, 2010; Winter 2010) (Department of Homeland Security, 2009).

Within the context of of several factors—the progressive increase in the number of tunnels discovered on the U.S.-Mexico border, the decrease in number of tunnels within specific sectors,



Top right: A sinkhole found in a Nogales, Arizona, street prompted officials to ask the Border Patrol to investigate, which led to the discovery of this tunnel. Municipal workers were a major source of tunnel discoveries due to smugglers' use of the city's sewer system.

Two lower photos: The discovery of this tunnel, the second major San Diego-area cross-border drug tunnel to be found, led to 8 arrests and seizure of more than 20 tons of marijuana in November 2010.

Two photos at left and top left: Exit and interior views depict a crudely built tunnel discovered on March 30, 2009, at Otay Mesa, California, after surveillance cameras observed a large group of suspected illegal aliens attempting to enter the country.



Photo Credit: U.S. Immigration and Customs Enforcement, U.S. Customs and Border Protection

the subsequent debate as to whether the decrease in tunnels is related to how tunnels are discovered, and the debate as to whether tunnels are or could be used to support terrorism—the authors believe it is time for transnational analysis of smuggling tunnels. Transnational analysis includes an assessment that incorporates geopolitical dynamics of different drug organizations at war with each other as well as with different governments in different hemispheres. This analysis includes incidents when drug organizations use terror tactics or are aligned by any number of means and purposes with terrorist organizations and are engaged in smuggling using tunnels.

Previous intelligence estimates that drug organizations would not use United States-Mexico tunnels for terrorist purposes were based on geopolitical dynamics that supported the belief that use

of tunnels for terrorist purposes was bad for business (Lichtenwald, 2003, 2004; Williams, 2007). Geopolitical dynamics have drastically changed since those estimates, and presently Mexico is in the grip of a drug war that has killed more than 30,000 people since December 2006, when President Felipe Calderon launched a crackdown on powerful drug gangs (“U.S. border cops,” 2010). The Mexican presidential elections will be held in 2012, and the 2010 campaigning for Mexican gubernatorial elections was marked by drug-gang intimidation as suspected cartel assassins murdered two candidates and threatened others. Mexico’s weak economy, drug gang violence, and President Calderon’s declining popularity are indications that yet again significant changes in geopolitical dynamics affecting U.S. border security are occurring (Rosenberg & Gutierrez, 2010).



A U.S. Immigration and Customs Enforcement agent comes out on the U.S. side of a cross-border tunnel in a warehouse in this Jan. 30, 2006 file photo in San Diego. Federal law enforcement agents arrested Mexican drug lord Francisco Javier Arellano-Felix, a leader of a major violent gang responsible for digging these elaborate tunnels to smuggle drugs under the U.S. border.

Photo credit: AP Photo/Denis Poroy

The contention that drug organizations will not challenge U.S. security is not supported by recent cross-border smuggling operations by criminal groups that dominate border sectors with military precision, employing military-grade weapons and tactics. Analysis of tunnels must take into account militarization of drug organizations, their willingness to take control of Mexican territory and hold the territory, in addition to the organizations' will and capability to take and temporarily hold United States-Mexico border sectors. One theory holds that the degrading of Mexican-based drug organizations such as Los Zetas, through the death of their Special Forces-trained members, has reduced the organization to an uncontrolled group of reactionary gunslingers, with the resulting dynamic of increased use of terrorist tactics and expanded ties with the terrorists in Mexico and Central America. Terrorist groups such as Hezbollah securing a presence in Latin America has been reported for several years, with specific operations identified in Argentina, Brazil, and Paraguay (Sale, 2009; "Columbia smashes drug ring with Hezbollah ties," 2008; Mauro 2005). Additional concerns are that geopolitical pressure on drug

organizations will create a dynamic in which using tunnels for terrorist activities appears an option. Additional concerns are unknown "wild card scenarios." The September 30 murder of American tourist David Hartley serves as a case in point. He was killed by newly recruited non-Special Forces-trained Los Zetas security due to the recruits' misperception that Hartley was involved in an intelligence-collection operation against their smuggling corridor in Mexican territory including the United States-Mexico border ("The Falcon Lake murder," 2010). Given the current state of affairs, it is no longer "business as usual" for drug organizations, law enforcement, and intelligence analysts working the U.S.-Mexico border—nor is it, as evident in the murder last March of Arizona rancher Robert Krentz, business as usual for American citizens who live within striking distance of the border.

One of the first problems a transnational analysis would address is the question of whether there is an increase or decrease in the total number of tunnels found along the entire U.S.-Mexico border and totals found along specific sectors of the border. The ultimate question is whether a decrease in tunnel construction or use of city's water and sewer tunnels for smuggling is related to a decrease in the discovery of tunnels.

The Border Patrol 2010 press release is compared against reports in newspapers that question whether there is a decrease in tunnels in the city of Nogales, Arizona. The significant twist on the Nogales tunnel theory (Holub, 2010) is based on the belief that decreases in tunnels found do not reflect a decrease in number of tunnels excavated. The Nogales theory contends that several confounding factors, one of which is how tunnels are discovered, mask the false association between the numbers of tunnels reported and tunnels in existence. This theory contains several hypotheses. First, most tunnels are found by workers with the City of Nogales Public Works Department digging trenches for water and sewer infrastructure or doing road work. Use of Nogales water and sewers as part of an underground smuggling system is known by authorities who report that many criminals have come to Nogales, where they can tap into an underground sewer and flood-control network shared by the city of Nogales and its larger Mexican neighbor. "That's why this is probably such a unique situation," says another Border Patrol spokesman, Mark Qualia (Mora, 2010). Transnational comparison of the uniqueness of using sewer and flood control networks provided the 2006 case of smuggling from Hong Kong to Shenzhen, China, where the smugglers confessed they had smuggled using the sewage passage but found another method due to the sewers' unbearable odor ("Smuggling Tunnel to Hong Kong," 2006).

The second most likely group to discover tunnels is Nogales landlords who become suspicious of their tenants. While inspect-

ing rental units, landlords often find a room full of dirt and a hole in the floor of a closet. Next, tunnels are found by accident when a street or sidewalk caves in. The least likely group to find tunnels is law enforcement or security personnel. The Nogales tunnel theory is based on a belief that the only reason fewer tunnels have been recently discovered in Nogales is because the Nogales Public Works Department, the group that found most of the tunnels, is not digging as many water and sewer line trenches (Holub, 2010).

Transnational tunnel analysis answers this hypothesis by collecting and analyzing the frequency and methods by which tunnels are discovered, and creating a pattern analysis of tunnel construction, methods used to identify tunnels, and types of contraband smuggled (people and drugs going north and money and guns going south). Results would be compared to tunnel construction in different hemispheres, including incidents where flood-control networks were part of a smuggling network. Transnational analysis allows for a scientific approach to assessing criminal and terrorist tunnel construction. This approach tests specific hypotheses, such as: Tunnel construction by terrorist and/or crime groups in different hemispheres have identifiable similarities and/or differences to those found along U.S. borders.

Knowing which organization invested and lost enormous amounts of money in the tunnel, and as a result, must use alternative smuggling routes prior to the takedown of the tunnel, presents intelligence and law enforcement opportunities. Currently, both intelligence and law enforcement personnel have offered a variety of theories about tunnels in the United States. One theory applicable to Nogales is that city workers and citizens on the U.S. side are reporting tunnels—in contrast to the Mexican side, where tunnels are seldom reported. A transnational analysis examines data for significant differences among diverse groups that report locations of tunnels.

Another theory is that the progressive increase in discovery of tunnels on the United States-Mexico border is due to increased border security, such as patrols by drones, leading to an increase in tunnel construction. In essence, the improved security created by combining air and land surveillance has driven smuggling underground. A slight modification of this theory includes that science and technology of tunnel detection has improved, in concert with the ability to gather human intelligence, including American citizens reporting tunnels. These factors complement local, state, and federal law enforcement as well as parts of the Mexican government working together. Information that appears to support the theory that more tunnels are being constructed can be found in several press releases, such as the statement, “We’ve increased our enforcement on the ground, so they have to compensate for it and that’s why they’re developing tunnels,” from Border Patrol spokesman Michael Scioli (Mora, 2010).

A third theory considers which geographical sectors of the United States-Mexico border are conducive to covert tunnel construction. It concludes it is inevitable that tunnels are located in that sector because smugglers are running out of land to exca-

vate that provides suitable hiding spots. Information that appears to support this theory that tunnels are located in a defined geographic area comes from the fact that most of the subterranean routes were discovered in Arizona, with 20 found in the “Tucson Sector”—a 262-mile long sector of the border from the New Mexico state line to Yuma County, Arizona (“20 found in the ‘Tucson Sector,’ ” 2010).

Method and Sources

Regardless of which theories are advanced to account for discovery of the tunnels, an immediate national security concern is determining the probability that smuggling tunnels originating from either Canada or Mexico will serve as the conduit by which terrorists or their weapons of mass destruction will bypass post-9/11 security procedures. At the core of the national security concern is that it is difficult to separate criminal and terrorist groups who may use the same tunnel, as well as separating tunnels built and used only by criminals from tunnels built and used only by terrorists.

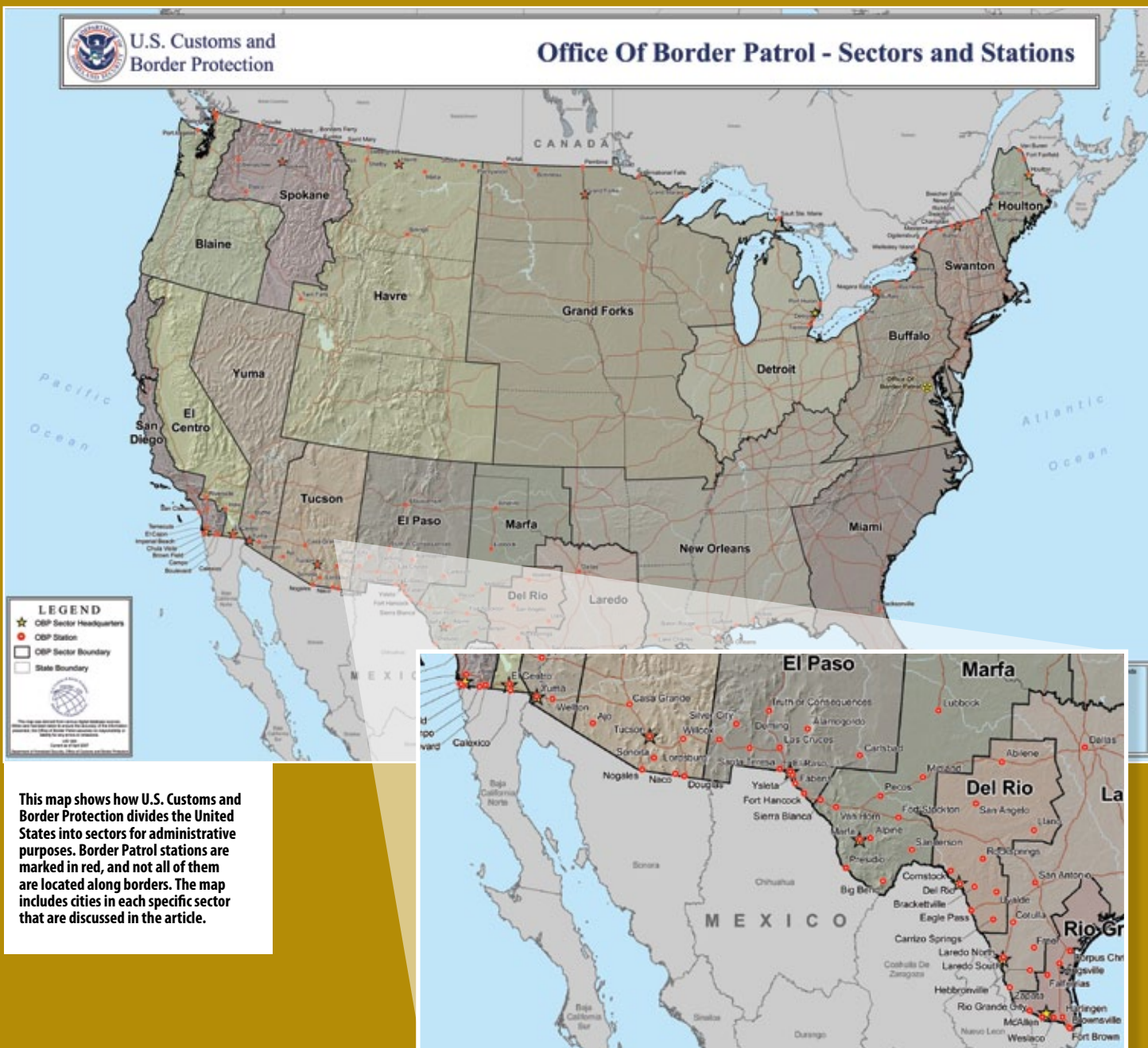
The authors clarify and advance the discussion regarding national security threats posed to the United States by smuggling tunnels controlled by terrorist organizations or cells under the organization’s control or influence by reviewing open-source literature regarding smuggling tunnels found in the Middle East. In

Terrorist groups such as Hezbollah securing a presence in Latin America have been reported for several years, with specific operations identified in Argentina, Brazil, and Paraguay

that area in the world, literally hundreds of individuals engage in smuggling for their own economic survival, in addition to or in concert with individuals with criminal and terrorist intent, among a citizenship that has either supported or become indifferent to tunnel construction. At its core, transnational analysis would be a national intelligence program that follows the post-9/11 model by seeking to fuse foreign intelligence analysis of the threat that tunnels pose to other democratic governments with the criminal data, criminal intelligence, and criminal investigative analysis regarding tunnels on U.S. borders.

Smuggling Tunnels in the Middle East: A Touchstone for Comparisons

The Palestinians’ view is that tunnels in the Middle East are the result of the Gaza Strip blockade, and that tunnels are an economic necessity because they are frequently the only link in a supply chain for commercial goods. An alternative theory considers dynamics of failed states, terrorism, and smuggling (Perri, Lichtenwald, & MacKenzie, 2009). Specifically, states that have a history similar to the Gaza Strip have a history of serious mismanagement and corruption scandals (e.g., during the leadership of Yasser Arafat) and are controlled by criminal and/or terrorist groups (e.g., Hamas).



This map shows how U.S. Customs and Border Protection divides the United States into sectors for administrative purposes. Border Patrol stations are marked in red, and not all of them are located along borders. The map includes cities in each specific sector that are discussed in the article.

A comparison of United States-Mexico, Israel-Gaza Strip and Egypt-Gaza Strip tunnels would include considering geography and geology from a military perspective. It has been said that “be it natural caves, simple hand-dug tunnels, or very sophisticated hard and deeply buried Under Ground Fortress, it now appears that the underground terrain may very well be the pivotal battlefield of the not so distant future” (Caldwell, Ehlen, & Harmon, 2004). The prediction of Caldwell et al. (2004) has been confirmed in recent reports from the war in Afghanistan in which Taliban use tunnels to maintain command and control elements as well as to run operations (“Afghan, coalition forces,” 2010) and have used tunnels to move between a fortress and an escape route (“Al-Qaeda suspects,” 2004). When soldiers of the 101st Airborne’s 3rd Battalion, 3rd Brigade searched one of Saddam Hussein’s underground fortress-and-tunnel systems, they found a 12-room complex inside a cave with white marble floors, 10-foot ceilings and fluorescent lighting (“U.S. forces venture,” 2003).

In keeping with the work of Caldwell et al. (2004), all of Tucson, Arizona, and the Gaza Strip have a defined sector. For purposes of transnational analysis, it is understood that the Gaza Strip borders Egypt on the southwest and Israel on the south, east, and north. The terrain is flat to rolling, sand- and dune-covered coastal plain. Geopolitical factors of the Gaza Strip included the Israeli-imposed crossing closures, which became more restrictive after Hamas violently took over the territory in June 2007, and fighting between Hamas and Israel during December 2008 and January 2009, which resulted in the near-collapse of most of the private sector, extremely high unemployment, and high poverty rates. Shortages of many goods are met through the Hamas-controlled black market tunnel trade that flourishes under the Gaza Strip’s border with Egypt (“Gaza Strip-Middle East,” 2010).

Transnational tunnel analysis includes consideration of developments in Egypt earlier this year: Egyptian President Hosni Mubarak’s resignation on February 11; the nation’s subsequent

return to the 1952 model of ruling the state via a council of army officers; and whether the military stays true to its commitment to hold elections on schedule in September. This analysis also includes Jordan's Muslim Brotherhood describing the resignation of Mubarak as a historic victory wherein the United States and Israel are the main losers balanced against the Egyptian military reporting that Cairo's peace treaty with Israel remains in force, saying that Egypt is committed to all national and international agreements ("Egypt: Temporary government remains in place," 2011). Also incorporated in the analysis is Israel's statement that it will not intervene in Egypt's internal affairs, and according to a ministry statement, its only concern is the stability of the region and the honoring of the peace treaty ("Israel: Foreign ministry assessing Egyptian situation," 2011). The analysis considers if Egypt continues to work with contractors on construction projects that impede smuggling tunnels.

Given economic and political dynamics of the Gaza Strip, it is common for some individuals involved in smuggling activities to engage in criminal acts. In one moment, they engage in terrorist acts and then shift back to criminal acts in the next moment, with such speed that the nexus point from criminal to terrorist and terrorist to criminal blurs. Shifting of smuggling tunnel activities from criminal to terrorist and terrorist to criminal is exactly the type of phenomenon transnational analysis of tunnels would be designed to analyze. With respect to the United States, the analysis would focus on tunnels in the context of drug organizations increasing their use of terrorist tactics in their own right, as well as aligning with or losing control to terrorist organizations. The contention is that nexus points where criminal and terrorist intent and actions blur are where hybrid smuggling tunnels (used by both criminals and terrorists) exist. For purposes of discussion

The Canadian border (excluding Alaska) is approximately 3,987 miles long while the length of the United States-Mexico border is approximately 1,933 miles long.

in this paper, failed government states are defined as those states where the rule of law has been subverted and/or states that sponsor terrorism. Failed states serve as a nursery for hybrid smuggling tunnels. Thus, tunnels of the Middle East must be part of the U.S. transnational research design (Perri et al., 2009).

One natural strength of U.S. security is that there are only two possible borders by which tunnels can subvert transportation security checkpoints. However, the corresponding security weakness is that the Canadian border (excluding Alaska) is approximately 3,987 miles long, while the length of the United States-Mexico border is approximately 1,933 miles long—both of which present significant distances to protect. The border with Mexico has more in common with geopolitical dynamics of the Gaza Strip than with the border with Canada. Nevertheless, it was at the United States-Canada border that a tunnel constructed by foreign nationals to both Canada and the United States was discovered in 2005,

a year prior to the discovery of the first highly sophisticated tunnel between Tijuana, Mexico, and Otay Mesa, California.

2005 United States-Canada Tunnel

A similarity between individuals who constructed the United States-Canada tunnel in 2005 and individuals involved in the Middle East tunnels in 2006 is that the individuals in both hemispheres of the world were bound by specific ethnic groups within the larger population. Specifically, individuals in the United States-Canada tunnel came from the ethnic classification Fijian East Indian ("Federal agents shut down," 2005). The importance of identifying, classifying, and understanding ethnicity of individuals who construct tunnels is critical. Understanding individuals' ethnicity, family connections, and national alliance, if any, leads to an understanding of the individuals' worldviews, especially views related to U.S. national security (Navarro, 2005, 2006). For example, it has been reported that many of the tunnels found in the Gaza Strip are run by the Abu Samhadana and Abu Rish families, both of Bedouin origin. A tie with terrorist organizations, again through family connections, is evident in that some sources have reported financial links to the Arafat family. Some of the tunnels were allegedly controlled by one of the Palestinian Authority security services under the command of Moussa Arafat, cousin of Yasser Arafat. Thus, a preliminary analysis of tunnels from different hemispheres suggests that national, ethnic, and family ties among those involved in the specific tunnel should be considered in the threat analysis of any specific tunnel (Sharp, 2009; " Hamas burns recreational drugs," 2010).

The tunnel connecting the United States and Canada had obvious similarities to the tunnels in the Middle East: the type of real estate purchased, the use of buildings to mask the tunnel, the cover story for the construction materials, and techniques for disposing of dirt that did not match the type of cover story for the tunnel construction involved. However, notable differences are apparent between how individuals who constructed the U.S.-Canada tunnel ran their business and how tunnel businesses are run in the Middle East. Individuals who constructed the United States-Canada tunnel failed to compartmentalize different components of the operation, including who knew about the tunnel. Due to this failure, there was a communication intercept, and further evidence revealed to law enforcement that a U.S.-Canada tunnel was under construction but the tunnel's location was unknown. The communication intercept presents a "key lesson" for thoughtful discourse regarding tunnels and the importance of human intelligence collection. Although the United States has had citizens report tunnel construction in the past, human intelligence collected during the U.S.-Canada tunnel allowed for a joint multinational ongoing intelligence collecting law enforcement-centered investigation and essentially an ongoing applied behavior analysis at both individual and group levels while the tunnel was under construction. Of special interest to U.S. security and law enforcement is that analysis of behaviors during tunnel construction provided data that can be compared with the behaviors of individuals and criminal, terrorist, and hybrid groups captured on the United States-Mexico border

and then against information collected from interviews and interrogations of individuals captured in the Middle East. Behavioral analysis of individuals and groups involved in tunnel construction leading to the clarification and classification of individual and group loyalty to the construction, maintenance, security and profitability of the tunnel is a necessary step in understanding the smuggling process (Lichtenwald, 2003, 2004). Detailed coding of each type of contraband (i.e., drugs, people, weapons, exotic animals and plants etc.) smuggled through the tunnel must be included for a valid and reliable transnational analysis (Lichtenwald, Perri, & McKenzie, 2009).

The U.S.-Canada tunnel provided a second key lesson for policy makers, intelligence, and law enforcement personnel. Although it initially appeared that the science and technology used to detect the tunnel had failed, further analysis of the U.S.-Canada tunnel found that its location technology was working but that excavation had not yet reached a sector where the tunnel could be detected. This subtle but significant point has enormous relevance to Mexico-United States evaluation of tunnel detection methods because tunnels must reach an excavated phase far enough along that search by electronic means can detect the tunnel. Again, transnational data analysis regarding the amount of time it typically takes to construct a tunnel, accounting for specific factors such as rocks, sand, weather, and number of crew members, would assist in determining the method and frequency with which specific sectors of land should be monitored for new tunnel construction.

Tunnel detection includes many different sciences and technologies. Synchronized electromagnetic wave gradiometers is one type of detection technology (“Sensors, command, control,” 2005). A second technology uses semi-autonomous robots that can navigate and map tunnels and provide chemical readings and video (Madrigal, 2009). Another published technology used to detect both tunnels and human beings inside the tunnel uses analysis of surface seismic waves generated by movement of persons, existence of human electromagnetic emissions in the EL band, and measurements of changes in the geomagnetic field (Chechak, 2007). Finally, Klar and Linker (2009) proposed results from their research on electro-optic technology that can be used as part of a border wall to locate tunnels. Each technology, including positive and false error rates,

Scientists and agents both realize that most of the existing tunnels are concentrated in large urban centers where they are difficult to spot with satellite images.

would be included in the transnational analysis. However, reliance on hard science and technology is not enough. For example, the Department of Homeland Security reported that they initially explored the possibility of an unmanned aircraft equipped with radar technology that would fly along the border searching for tunnels. However, the scientists and agents both realize that most of the existing tunnels are concentrated in large urban centers where they

are difficult to spot with satellite images. In addition, the airborne radar’s radio frequency signals could potentially pose privacy concerns if they cross into someone’s home (“Tunnel vision,” 2009). Thus, in urban areas such as San Diego, where tunnel detection technology is less effective, the need for tunnel detection protocols derived from applied behavior analysis is essential.

The authors remain open to the possibility that in addition to tunnels constructed solely for movement of narcotics, a hybrid smuggling tunnel could be detected on the United States-Canada border. The documents presented in this paper suggest that the United States-Mexico border demonstrates the greatest number of factors similar to the geopolitical dynamics of the Gaza Strip—thus the number of factors conducive to construction of terrorist or hybrid tunnels.

Israel-Egypt

For decades the Israel Defense Force (IDF) has been evaluating tunnels dug and maintained by tribes, criminals, and terrorists. Different tunnels in the same geographic area are reportedly used to smuggle goods of no threat to Israel’s national security, whereas others are used to smuggle goods that pose a high threat to Israeli national security; and tunnels used for smuggling goods of no threat to Israel are also used to smuggle goods of threat to Israel. (“Egypt finds 13 Gaza tunnels,” 2010).

Threat assessments must consider the possibility that tunnels on the United States-Mexico border could be used in a fashion similar to tunnels in Rafah—low-threat tunnels under the control of a terrorist organization such as Hamas and Islamic Jihad—which could immediately become a high threat. Specific examples of terrorist tunnels used as profit centers are detailed in the IDF’s report on tunnels in the Middle East. The report found that in addition to weapons and operatives, terrorists have been charging money to move a wide variety of contraband. Abu Nisreen stated that the tunnels are operated by a small group of smugglers who plan, dig, and maintain the passages, transporting goods for whoever pays. The exit shafts are usually dug in private homes, inhabited or abandoned. The owners of the houses receive a portion of the profits from the smuggling as well as compensation if the tunnel is discovered and the house is destroyed. Tunnels are run as businesses, mainly by big tribes and families, often of Bedouin origin (Martin, 2008; “Secret tunneling,” 2010).

People in the town of Rafah maintain that not every tunnel is used for smuggling weapons and that tunnels that are used to smuggle weapons are usually owned by or shared among militant groups, mainly Hamas and Islamic Jihad (Rafah, 2005). Analysis of the type of weapons used in Mexico’s three wars—the war between the various drug cartels, the war between the government and the cartels, and the war being waged against citizens and businesses by criminals (guns legally available in Mexico, guns legally available in the U.S. but not in Mexico, and guns not available for civilian purchase in Mexico or the U.S.)—debunks the myth that 90% of the weapons used by the Mexican drug cartels come from the United States (“Mexico’s gun supply and the 90 percent myth,” 2011). Transnational tunnel analysis—with correct coding of weap-



Photo Credit: U.S. Immigration and Customs Enforcement

Photo Credit: U.S. Immigration and Customs Enforcement



The haul of drugs from the November 2010 tunnel discovery is stored in a warehouse. The tunnel, which reached an estimated depth of 90 feet, emerged in Tijuana, Mexico, inside a stucco residence outfitted with a garage large enough to accommodate deliveries by tractor trailer trucks, according to a U.S. Immigration and Customs Enforcement report.

ons and explosives smuggled and used, in which of the three wars, with the principal interest in criminals compared with drug cartels and terrorist groups—assists in identifying the intent of the group that constructed or used the tunnel. The transnational analysis from the Middle East suggests that when United States border checkpoints choke off the weapons supply on the above-ground routes, these tunnels, not unlike tunnels in the Gaza Strip, could become a reasonable smuggling method for weapons. The movement of weapons south through United States-Mexico tunnels would constitute a significant shift in threat assessment and management with respect to national security for both the United States and Mexico.

A clear indication of the need for a transnational analysis of tunnels arises from the most recent geopolitical fluctuation of Los Zetas gaining control of sectors of the United States-Mexico border, along with the similarities between Israel and the Gaza Strip and the criminal terrorist groups Hamas and Islamic Jihad, which also encourage small groups of individuals to excavate and run their own smuggling.

How Middle East Hybrid Tunnels Operate

“The method employed by terrorist organizations to hollow out underground passages is relatively simple: They select a spot underneath a plot of land that is populated or used to raise livestock or for agricultural purposes to begin their dig. They then begin excavations by digging 30-45 feet into the ground in order to conceal the tunnel’s existence and then begin burrowing horizontally until they reach the desired span of the underground passage” (“The Rafah terror tunnels,” 2003).

The telltale signs of the hybrid tunnels are that they are used to smuggle weapons, cigarettes, drugs, and people (primarily prostitutes) from Egypt into Gaza. Hybrid tunnels are often elaborate and may contain wood paneling, electrical infrastructure, communications equipment, and elevators. They are typically dug inside residential homes and are concealed under bathrooms, living rooms and bedrooms (“The terror tunnels,” 2010).

In an August 10, 2002, interview, an individual named “Honey” identified himself as an active “expert” in the excavation of clandestine subterranean passages in Rafah, located in the Southern Gaza Strip area. He described how he and his friends dug tunnels

through which Palestinian terrorist organizations smuggled arms. In the following summary of Honey's account, the astute reader will note that each step allows for the opportunity to detect those who are constructing the tunnel or the actual tunnel construction ("The terror tunnels," 2003).

According to Honey's report, engineers are used to survey the ground. It is generally believed that the further the point of origin is from the border, the less chance of being caught. The pit is dug one meter wide and between 12 to 14 meters deep. Supports are placed on the side of the pit. It is believed by those digging the tunnel that tunnel detection science and technology cannot detect the tunnel if it is at least 12 meters deep. The tunnel is dug horizontally so that it has dimensions of 40 by 40 centimeters. Every three meters, wooden planks are placed on four sides of the tunnel. Various mechanical devices are used to overcome natural obstacles like rock. Machines remove sand via suction, and electric cable is hung to provide lighting.

Work must be conducted clandestinely, generally by a crew of five. Removal of the sand is a problem. In the Middle East, sand is placed in flour bags and transported to a remote location. Lookouts are posted at the entrance to the tunnel. Completion of one tunnel takes three months or more at the rate of about

6 to 12 meters dug every day. Workers who build the tunnel receive a percentage of the profit generated from smuggling weapons. At either end of the tunnel is a work manager. Two work managers maintain contact by code, usually via phone. The tunnel is constructed so that the exit on the side where the tunnel is dug is a straight vertical shaft, while it is a gradual incline on the other side. Documents indicate that the grade of the tunnel can be dictated by groundwater flow and that construction may account for the flow of water out of the tunnel ("The terror tunnels," 2003).

The smuggling operation is conducted in code. For example, if someone is interested in smuggling a weapon, he makes a coded request, and the workers schedule the date for the smuggling operation. Codes and passwords are transferred via "land-line and cellular phones." Physical transfer of items from one side to the other takes 5 to 10 minutes and is carried out using an engine that pulls a rope. On November 4, 2009, Egyptian authorities uncovered 13 smuggling tunnels leading from the Sinai into Hamas-run Gaza. Police managed to capture one suspected smuggler carrying an automatic weapon when raiding one of the tunnels, although all the other smugglers believed to be in the area at the time managed to escape arrest. Police found cement,

Tunnels Discovered in the El Centro and San Diego Sectors 2005-2007*

NAME	DATE OF DISCOVERY	LOCATION & SECTOR	DISCOVERY METHOD	COMPLETE / INCOMPLETE
TECATE NO.1	12/3/07	Tecate -San Diego	U.S. agent	C
OTAY MESA NO. 13	6/21/07	Otay Mesa-San Diego	Mexican officer	I
OTAY MESA NO. 11	3/28/07	Otay Mesa-San Diego	Police debriefed criminal	I
OTAY MESA NO. 12	3/28/07	Otay Mesa-San Diego	Mexican authorities	I
SAN YSIDRO NO. 12	10/23/06	San Ysidro-San Diego	Mexican & U.S. agents	I
OTAY MESA NO. 10	10/10/06	Otay Mesa-San Diego	U.S. task force	I
SAN YSIDRO NO. 11	9/26/06	San Ysidro-San Diego	Not known	C
CALEXICO NO. 4	9/15/06	Calexico-El Centro	Task force & police follow up	C
SAN YSIDRO NO. 10	5/25/06	San Ysidro-San Diego	Police & humanitarian organization	I
SAN YSIDRO NO. 9	5/16/06	San Ysidro-San Diego	U.S. agents	I
SAN YSIDRO NO. 8	5/15/06	San Ysidro-San Diego	Not known	C
SAN YSIDRO NO. 6	2/9/06	San Ysidro-San Diego	Mexican authorities	I
SAN YSIDRO NO. 7	2/9/06	San Ysidro-San Diego	Mexican authorities	I
OTAY MESA NO. 8	1/31/06	Otay Mesa-San Diego	Humanitarian organization	I
OTAY MESA NO. 9	1/31/06	Otay Mesa-San Diego	Not known	C
SAN YSIDRO NO. 5	1/25/06	San Ysidro-San Diego	U.S. agent	I
OTAY MESA NO. 7	1/24/06	Otay Mesa-San Diego	Mexican authorities	C
OTAY MESA NO. 6	1/20/06	Otay Mesa-San Diego	Not known	I
SAN YSIDRO NO. 4	1/9/06	San Ysidro-San Diego	Not known	C
OTAY MESA NO. 5	11/16/05	Otay Mesa-San Diego	Not known	C
CALEXICO NO. 3	2/25/05	Calexico-El Centro	Electronic	C

Source: Department of Homeland Security, Master List of Border Tunnels, 19 December 2007

Analysis of Discovery Method and Tunnel Completion Status Tunnels Discovered in the El-Centro and San Diego Sectors 2005-2007

DISCOVERY METHOD		TUNNEL COMPLETION	
		Completion	Incomplete
NOT KNOWN	6	5	1
MEXICAN AUTHORITIES	5	1	4
U.S. AGENT ALONE	3	1	2
POLICE DEBRIEFED CRIMINAL	1	1	0
MEXICAN & U.S. AGENTS	1	0	1
U.S. TASK FORCE	1	0	1
U.S. CITIZENS	0	0	0
U.S. TASK FORCE & POLICE FOLLOW UP	1	1	0
POLICE & HUMANITARIAN ORGANIZATION	1	0	1
HUMANITARIAN ORGANIZATION	1	0	1
ELECTRONIC	1	1	0

steel reinforcing rods, and food products inside or near the smuggling tunnels (“Egypt finds 13 smuggling tunnels,” 2010).

United States-Mexico

Above and on the facing page are two tables that summarize open-source information about tunnels on the El Centro and San Diego sector and the United States-Mexico border in Arizona. (“Cross-border tunnels,” 2008). For each tunnel, the discovery method reported was coded by the authors based on available information. A number of tunnels for which a discovery method was not listed in the documents were coded “Not Known (NK).”

For each of the Tunnels Discovered tables, the authors completed an Analysis of Discovery Method and Tunnel Completion Status Table that broke down the different types and frequency of discovery methods and whether the discovery method identified complete or incomplete tunnels.

The dates of discovery indicate that January is the month with the most tunnels reported in 2006. However, that pattern did not occur in the other months of 2005 and 2007. Therefore, it is not clear if weather patterns, such as the rainy season, made it easier or more difficult to construct or detect tunnels.

The numbers in the Tunnels Discovered Table above indicate that “Not known” was the discovery method leading to the most tunnels and the method by which the most completed tunnels were found. The numbers indicate that Mexican authorities followed by U.S. agents alone are the next two most successful methods for discovery of tunnels. Mexican authorities found four incomplete tunnels and one complete tunnel, and U.S. agents alone found four incomplete and one complete tunnel. This information gives the appearance that Mexican authorities are playing a leading role in finding tunnels in general and tunnels prior to completion in particular.

Dates of discovery indicate that March was the month with the highest tunnel detection frequency with four tunnels, and that January, September, October and December were next with three tunnels found each month. Thus, it is not clear if weather patterns such as the rainy season have been making it easier or more difficult to construct or detect tunnels in the Nogales Arizona sector.

The data above indicate that Mexican authorities, U.S. agents and U.S. citizens/repair crews discovered the most tunnels. There was no apparent difference between which groups did or did not find completed or incomplete tunnels. In some respects, the information in the tables lends some support for the Nogales hypothesis in that the information provided by Homeland Security does not provide enough data to determine who is finding the most tunnels, and the available documents do not indicate that the tunnels are found by citizens or road crews more so than any other group.

Although the original documents were not available for statistical analysis, the available information did allow for an illustration of how a transnational tunnel database would be structured and the information generated. Once the United States’ tunnels are entered into a transnational database, the comparison to terrorist tunnels in other hemispheres can be completed.

South-North Korea

Another area in the world where tunneling is posing a threat to the security of a democratic government can be found within the demilitarized zone between South Korea and North Korea. Remarkable similarities appear between the frequency of gunshots and most recently artillery fired from North Korea into South Korea and, along the United States-Mexico border, the shootings and border crossings using military vehicles in contested areas. Intelligence analysts have speculated that North Korea may be attempting to push South Korea away from the border, and comparisons can be drawn between this activity and recent drug-terrorist organizations’ border incursions along the United States-Mexico border (Nanto, 2003; “Is North Korea moving another ‘Red Line,’” 2010)

Of interest in the use of tunnels for terrorist activities is North Korea’s history of abducting foreign as well as South Korean citizens in South Korea and that the transnational analysis of tunnels indicated similar acts occurring in the Middle East (“Background Note: North Korea,” 2010).

The tunnels between North Korea and South Korea are part of the transnational tunnel analysis because the United States, although in a much less aggressive fashion, is attempting to develop demilitarized zones in some locations along the Mexican border. The border between North Korea and South Korea is a 2.5-by-151-mile demilitarized zone (DMZ). The DMZ is also dotted with land mines and bunkers and crisscrossed by barbed

Tunnels Discovered Along the U.S. Mexico Border in Arizona 2005 January 8, 2008*

NAME	DATE OF DISCOVERY	LOCATION & SECTOR	DISCOVERY METHOD	COMPLETE / INCOMPLETE
NOGALES NO. 17	3/1/05	Nogales, AZ	U.S. agent	I
NOGALES NO. 18	3/15/05	Nogales, AZ	U.S. repair crew	I
NOGALES NO. 19	8/1/05	Nogales, Sonora	Mexican authorities	C
NOGALES NO. 20	10/29/05	Nogales, AZ	U.S. agents	I
NOGALES NO. 21	10/31/05	Nogales, AZ	U.S. agents	C
NOGALES N. 22	3/2/06	Nogales, AZ	U.S. agents	I
NOGALES NO. 23	3/4/06	Nogales, AZ	Mexican authorities	I
NOGALES NO. 24	1/6/07	Nogales, AZ	U.S. citizen	NK
NOGALES N. 25	1/10/07	Nogales, AZ	U.S. agents	NK
NOGALES NO. 27	4/19/07	Nogales, AZ	U.S. agents	NK
NOGALES NO. 28	6/28/07	Nogales, AZ	U.S. agents & Mexican authorities	C
NOGALES NO. 29	6/29/07	Nogales, AZ	U.S. agents, canine unit, local U.S. police	C
NOGALES NO. 30	7/11/07	Nogales, AZ	U.S. agents	C
NOGALES NO. 31	7/29/07	Nogales, AZ	U.S. agents	C
NOGALES NO. 32	9/7/07	Nogales, AZ	U.S. agents & Mexican authorities	I
SAN LUIS NO. 1	9/17/07	Nogales, AZ	U.S. citizen & U.S. agents	I
NOGALES NO. 33	9/23/07	Nogales, AZ	POE inspectors & U.S. agents	NK
NOGALES NO. 34	10/3/07	Nogales, AZ	U.S. agents	C
NOGALES NO. 35	12/2/07	Nogales, AZ	U.S. agents	C
NOGALES NO. 36	12/11/07	Nogales, AZ	U.S. National Guard & U.S. agents	C
NOGALES NO. 37	12/18/07	Nogales, AZ	Santa Cruz Metro Task Force	C
NOGALES NO. 38	1/16/08	Nogales, AZ	UK	UK

Source: Department of Homeland Security, Master List of Border Tunnels, as 31, 2008

wire. In the 1970s, defectors told South Korea that President Kim II Sung of North Korea ordered the 10th Army Division at the border to build two tunnels, each to prepare for an invasion. The first three tunnels were found in 1974, 1975, and 1978 (big enough to drive a jeep through). American and South Korean officials estimate that 15 to 20 tunnels in the DMZ have not yet been discovered. A South Korean military intelligence officer said he believed that tunnel construction had continued through the mid-1980s, even after the first three tunnels were discovered, but ended when North Korea completed enough tunnels to start an invasion and decided not to risk further tunnel construction (“Seoul uncovers a border tunnel,” 1999).

Likewise, comparing and contrasting tunnels in the Rafah system offers possible insights into the tunnels’ intent. However, during the course of either intelligence analysis or criminal prosecution, it is likely that Tupman’s (2002a; 2002b; 2006) assertion regarding how the profits are spent and the terms under which they will smuggle the cargo—with no questions asked or as part of a working agreement with a terrorist organization (a hybrid)—will determine if terrorist intent was present and if

a conviction can be won in court. The investigation into the backgrounds of the individuals who dug the tunnel, such as confirmed membership in a terrorist organization, also will likely assist in determining if terrorist intent (weapons or money) existed (Narvarro, 2005, 2006).

Transnational Analysis of Tunnel Construction

Open-source documents collected during the study of criminal and terrorist smuggling tunnels have provided several representative tunnels that lend themselves to comparisons between criminal and terrorist tunnels. For example, the picture and infographic on the facing page include illustrations of a tunnel system in the Middle East and a second located on the border of the United States and Mexico.

The map and tunnel diagram illustrate the complexity of the tunnels built and maintained by Hezbollah, an Iran-backed group based in Lebanon, and the tunnels dug by Mexican smugglers seeking a profit.

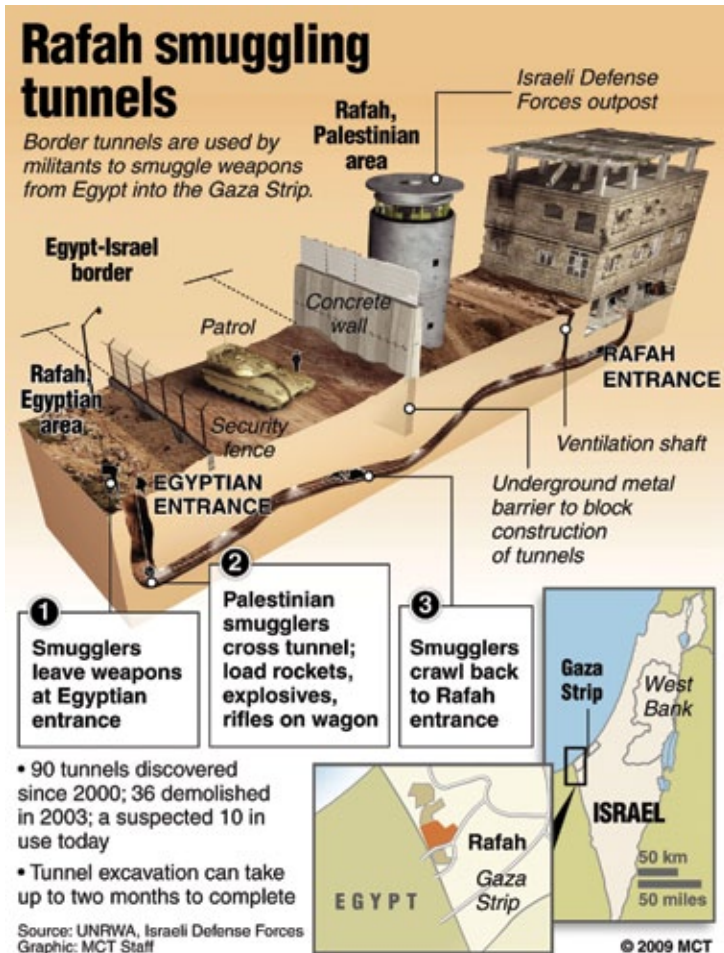
The authors observe that with few modifications, the info-

**Analysis of Discovery Method and Tunnel Completion Status
Tunnels Discovered in the U.S. Mexico Border in Arizona 2005
January 8, 2008**

DISCOVERY METHOD		TUNNEL COMPLETION	
		Completion	Incomplete
NOT KNOWN	1	0	0
MEXICAN AUTHORITIES	2	1	1
U.S. AGENT ALONE	10	5	3 & NK
POLICE DEBRIEFED CRIMINAL	0	0	0
MEXICAN & U.S. AGENTS	2	1	1
U.S. TASK FORCE	1	1	1
U.S. CITIZENS / REPAIR CREW	2	1 & NK	1 & NK
U.S. TASK FORCE & POLICE FOLLOW UP	0	0	0
U.S. TASK FORCE	1	1	0
POLICE & HUMANITARIAN ORGANIZATION	0	0	0
HUMANITARIAN ORGANIZATION	0	0	0
ELECTRONIC	0	0	0

graphic (below left) and the picture (below right) reflect the current tunnel systems dug and used by smuggling organizations between the United States and Mexico. The authors note that when Egyptian forces locate a tunnel, they place explosives in the opening of the tunnel and seal it off. The U.S. Army Corps of Engineers is working with two Egyptian companies to construct a steel barrier that will extend 59 feet below the ground and stretch about six miles and is outfitted with sensors that will pinpoint where the barrier has been breached (“Egypt, Palestinian territories,” 2009).

Of particular interest to the United States is Israel’s detection of what are classified as “tunnel bombs”—tunnels that are used as part of a specific terrorist attack. To create a tunnel bomb, the tunnel is dug under a sensitive site, such as a settlement in a contested area or military post, and then large explosives are placed in the tunnel. The explosives are then detonated. A second kind of terrorist-specific tunnel is one that is constructed and then used during a terrorist operation to kidnap a member of the



government the terrorists wish to attack. For example, in June 2006 an Israeli soldier, Gilad Shalit, was abducted by Gaza-based terrorists who had constructed a tunnel burrowing into Israel. The terrorists killed two members of Shalit’s tank crew and brought him back to Gaza to be held as a bargaining chip. Both the tunnel bomb and the tunnels used as part of a “snatch and grab” operation are two methods that, as of yet, have not been reported to have occurred on United States territory (“Egypt, Palestinian territories,” 2009).

Based on the open-source documents available for this study, the proposed transnational analysis is based on the following research design. Open-source documents indicated that at present there are three states, Arizona, California, and Washington, which can be divided by city into seven U.S. border sectors where tunnels have been identified. Four cities are in Arizona, two in California, and one in Washington state. The specific cities are: Lynden, Washington; San Diego and Calexico in California; and the Arizona cities of San Luis, Nogales, Naco, and Douglas. The number of tunnels in a city ranges from one in Lynden to over 53 in Nogales. A transnational analysis would include the analysis of factors specific to tunnel construction, smuggling methods, and geopolitical dynamics as well as the social and behavioral aspects of the crime-terror nexus point for each tunnel in each city. The next step in the analysis is the comparison of each city to every other city in that sector—a type of within-subjects research design. The third step is a comparison by state, California, Arizona, and Washington. The fourth step is the comparison of U.S. tunnels with the tunnels in different hemispheres. A method for testing for the presence of hybrid tunnels on the U.S. border would consist of the data from U.S. tunnels—at the city, state, and sector levels—statistically measured against the information from criminal and terrorist smuggling tunnels in different hemispheres of the world.

Also, social network analysis as part of a tunnel analysis indicates that once one member associated with the tunnel is identified, other members in the network become more evident. In its simplest form, a social network is a map of specified relationship ties, and this approach has turned out to be useful for explaining many real-world phenomena, including transnational organized crime and terrorism. Furthermore, dynamic analysis of social networks leads to political affiliations of members and thus plausibly enhances the tunnel's usage intent. It is the match between the type of tunnel and the type of people who built, financed, and maintain the tunnel that assists the direction that the investigation might take. For example, how does transnational tunnel analysis that incorporates historical data dating back to the Korean War (1950-1953) assist in understanding tunnels found on the U.S.-Mexican border today? Underground structures were built on the Korean peninsula during the Korean War. During this period, North Korea's ally, the Chinese, taught North Korea the benefits of constructing tunnels to avoid heavy casualties. In certain areas, entire underground cities were developed that served to supply aid to the front and to evacuate the wounded. In turn, a decade later, North Korea helped the North Vietnamese fight the Americans by helping them to build reliable underground tunnels to deliver aid from the former Soviet Republic and other allies.

Currently, the tunnel system in Gaza is strikingly similar to the Viet Cong's Cu Chi tunnels during the Vietnam War in that weapons and supplies move through their tunnels and Hamas, like the Viet Cong, hid its top leaders in them as well. Moreover, according to Swedish journalist Bertil Lintner, North Korean technologies became available to Hezbollah in Lebanon: "In southern Lebanon following the 2006 war, Israel's Defense Forces and the United Nations found several of the underground complexes, which by then had been abandoned by Hezbollah militants. By coincidence or not, these tunnels and underground rooms ... are

strikingly similar to those the South Koreans have unearthed under the Demilitarized Zone that separates South from North Korea" (Lintner, 2010). Transnational analysis facilitates comparing and contrasting tunnels by the data collected to determine potential usage intent, the logistics to construct and maintain a tunnel, and to examine (through social networking analysis) affiliations linked to the tunnel. It is no longer just a tunnel that is discovered, but more importantly, tunnels are classified to allow better analysis. Although it is understandable why tunnels are destroyed—to prevent usage—the authors would recommend that evidence (i.e. data) be collected prior to their destruction, as with a crime scene.

Transnational analysis can also be applied to the tunnels found on the United States-Mexico border, which can be compared against the hundreds of tunnels found in the Middle East and other hemispheres, providing behavioral and financial patterns of interest to intelligence agencies and policy makers seeking a more objective method to evaluate pattern analysis to help hone human intelligence watch points. Specifically, a tunnel under investigation is compared and contrasted against not only recent tunnel construction from the Middle East but from current and past tunnels constructed by North Korea and Vietnam. Shifting of smuggling tunnel activities from criminal to terrorist and terrorist to criminal is exactly the type of phenomena transnational tunnel analysis is designed to study and analyze with respect to the U.S. tunnels in the context of drug organizations increasing their use of terrorist tactics in maintaining control of their territory.

Furthermore, just as there may be specific types of tribes and families that control tunnels in Gaza, perhaps this type of analogy can be applied to the different types of cartels that control certain tunnels in different areas of Northern Mexico. Just as different families in Gaza may be more apt to use tunnels for terrorist purposes, are there cartels that would be more apt to use tunnels for similar purposes? The number of comparisons and contrasts that have been broached in this article is small compared to what actual transnational analysis would look like, but the authors believe that the benefits of collecting data are tangible.

Summary

The number of tunnels on the United States-Mexico border discovered since 9/11 has steadily increased, while at the same time the Mexican government is fighting numerous criminal organizations that are also locked in a war among themselves. The outcome of this conflict will decide who or which coalition will govern Mexico. At present the Mexican cartel structures that control many local law enforcement and political systems, as well as private business, are mirror images of criminal infiltration that led the United States to pass the Racketeer Influenced and Corrupt Organizations Act to deal with the influence of organized crime on a larger scale. Inherent in transnational tunnel analysis research design is the accommodation of law enforcement and intelligence analysis of Mexican cartels that remain fixed in their structures and battles or cartels that mutate into an organized crime structure with a national crime syndicate and family territories (similar to the Cosa Nostra/Mafia in the United States), or cartels that mutate into a model similar to the former Soviet Republic and current Afghan government—a hybrid of criminal and political

corruption (Perri, Lichtenwald, & MacKenzie, 2009). In essence, the political and the criminal structures become one in the same, reflective of an emerging failed state.

In addition, according to one enforcement agent, "It shouldn't be a surprise to anyone that terrorist organizations would utilize the border to enter the U.S. ... We can't ignore any threat or detail when it comes to al Qaeda and other terrorist organizations bent on attacking the U.S." (The Washington Times, 2009). In June 2009, U.S. counterterrorism officials authenticated a video by an al Qaeda recruiter threatening to smuggle a biological weapon into the United States via tunnels under the Mexican border. The video shows Kuwaiti dissident Abdullah al-Nafisi telling a room full of supporters in Bahrain that al Qaeda is casing the U.S. border with Mexico to assess how to send terrorists and weapons into the United States. Al-Nafisi states, "Four pounds of anthrax carried by a fighter through tunnels from Mexico into the U.S. are guaranteed to kill 330,000 Americans within a single hour if it is properly spread in population centers there. What a horrifying idea; 9/11 will be small change in comparison. Am I right? There is no need for airplanes, conspiracies, timings and so on. One person, with the courage to carry four pounds of anthrax, will go to the White House lawn, and will spread this 'confetti' all over them, and then we'll do these cries of joy. It will turn into a real celebration." In addition, Hezbollah is using routes that Mexican drug lords control to smuggle contraband and people into the United States to finance operations. According to one counter-terrorism official, while Hezbollah appears to view the U.S. primarily as a venue to finance its operations elsewhere, "it should not be viewed lightly, as the money raised can be used against the U.S. or assets in future operations."

In addition, a former Mexican national security adviser and ambassador to the United Nations, Adolfo Aguilar Zinser, stated that in Northern Mexico, "Islamic terrorist groups are using Mexico as a refuge...In light of this situation, there are continuing investigations aimed at dismantling these groups so that they may not cause problems." Mexican law enforcement has acknowledged that the drug cartels are setting up training camps near the border for recruits similar to those in Afghanistan created by al Qaeda. This shows that the drug cartels are willing to challenge the Mexican police and are even advertising for recruits. Authorities say these camps have Afghan and other Middle Eastern instructors who teach the latest military fighting tactics that are utilized in Iraq and Afghanistan by the Islamic radicals. New cartel recruits take intensive six-week training courses in weapons, tactics, and intelligence gathering.

Moreover, although technology is an asset in the detection of tunnels and its improvement has greatly increased the interdiction of tunnels, what is interesting is that many of the tunnels are also located with the assistance of private citizens who tip off law enforcement as to their existence, in addition to informants that decide to work against those that construct and use the tunnels. For example, the 1990 discovery of a drug tunnel running between Douglas, Arizona, and Agua Prieta, Mexico, triggered one of the most robust investigations ever linked to a cross-border tunnel: Operation Catacomb. The investigation began in early 1990 with an architectural draftsman who had provided the Guzman cartel with possible locations for a drug tunnel bisecting the

Mexico-Arizona border, plus initial designs. He sent his brother to collect the promised fee of \$400,000. When the cartel murdered his brother and did not pay his requested fee, the draftsman contacted a U.S. federal agent running a Border Protection office in Phoenix, Arizona. The draftsman, now turned informant, wanted protection in trade for information. Federal agents recruited engineers with sonar and high-tech surveying equipment to verify the tunnel location provided by additional informants.

Agents set up land-based and aerial surveillance, identified a private airport outside of Agua Prieta where traffickers off-loaded Colombian cocaine, cultivated more informants, and culled intelligence from sources on both sides of the border. In the United States, the tunnel ended underneath a building supply warehouse, and in Mexico, under a luxury residence belonging to a major Mexican drug lord. Agents located a tunnel the length of a football field with compartments big enough to store 5 tons of cocaine. On the Mexican side, the tunnel led to a small chamber equipped with a hydraulic lift that raised the ceiling and allowed traffickers to enter the recreation room of the luxury home. This cartel recreation room, equipped with an expensive pool table and other amenities, displayed photos of U.S. and Mexican law enforcement and military officials. As a result of human intelligence, U.S. authorities arrested the architect of the Douglas-Agua Prieta tunnel, Felipe de Jesus Corona. In addition to these arrests, U.S. agents seized more than 13 tons of cocaine and \$10 million in cash. A Mexican informant, promised asylum in the U.S., led agents to a separate cash house near Agua Prieta, and a group of private citizens discovered the bodies of tunnel diggers in a well near the Arizona border. The factory turned out to be both a holding area for drugs and an execution site for uncooperative cartel associates or tunnel workers who knew too much.

This preliminary analysis of smuggling tunnels indicates that Mexican authorities are one of the leading sources for discovering incomplete tunnels entering the United States. Transnational analysis indicates that Nogales is not the only city where city storm and sewer networks provide resources for smuggling. When addressing the question as to whether terrorists will use tunnels to generate profit as well as carry out terrorist operations, transnational analysis presented in this paper indicates that the answer is yes on both accounts. Data derived from the preliminary transnational analysis presented in this paper indicated that human intelligence collection, including a notable level of cooperation from citizens, is a key factor in the discovery of tunnels. Programs may prove beneficial if a reward system could be implemented at both the federal and local levels for the identification of tunnels or smugglers who use tunnels. Such programs would be similar to those conducted by the Internal Revenue Service, which rewards citizens who report tax fraud, or, at a local level, Crime Stoppers, which rewards citizens who disclose the location of wanted criminals to police.

To gain a strategic and tactical advantage in fighting the United States tunnel problem, the authors propose a multi-step research project designed to analyze information about smuggling tunnels in the Middle East, North Korea and South Korea, Canada, Mexico, and the United States. The first step in the research would be to create specific variables for the coding of the information about each of the tunnels found in each hemisphere of the world. The

second step is the statistical analysis of hundreds of variables that yielded descriptive analysis describing dates, times, and locations of where the tunnels were discovered, as well as witnesses, perpetrators (including families, small groups of individuals, or organized crime groups building and maintaining the tunnels) and types of contraband smuggled. The analysis of tunnels found on the United States-Mexico border, compared with the hundreds of tunnels found in the Middle East and other hemispheres, provides behavioral and financial patterns of interest to law enforcement, intelligence agencies, and policy makers. Pattern analysis may help to hone human intelligence watch points, science, and technology procedures.

In conclusion, tunnels present significant national security concerns because of the devastating consequences inherent in criminal and terrorist organizations using them to bypass security measures. No longer are tunnels to be viewed as a nuisance to contend with. Tunnels, according to military experts, are considered “a transnational threat” (Welch, 2006). This threat must prompt the need for a transnational analysis that would assist in formulating security policy in a more objective manner and avoid situations where politics trumps sound national security policy.

Acknowledgements

The authors would like to acknowledge Terry Gardini, Psy.D., and Dale Collura, for content review of the manuscript; and Steven J. Erickson, Ph.D., and Scott Tenney Jr. for both statistical analysis and content review.

ABOUT THE AUTHORS



TERRANCE G. LICHTENWALD, Ph.D., earned his doctorate in clinical psychology from an American Psychological Association (APA) approved program and completed an APA-approved internship. He has a master’s degree in clinical psychology and a second master’s in school psychology. He earned his bachelor’s degree in broad field social studies and psychology. Dr. Lichtenwald has spent 20 years completing forensic, behavioral, and security evaluations, as well as threat assessments. Scholarship interests include fraud detection homicide, the crime-terror nexus, and the application of the developmental smuggling model. You may contact Dr. Lichtenwald via e-mail at tgl3155@aol.com



FRANK S. PERRI, JD, MBA, CPA, has worked in the criminal law field for over 15 years. Areas of concentration include violent and white-collar crimes. He received his Juris Doctor from the University of Illinois, Master’s in Business Administration from Case Western Reserve University, and Bachelor of Arts from Union College. In addition, Mr. Perri is a licensed Certified Public Accountant. Scholarship interest includes fraud-detection homicide, the fraud-terror nexus, and application of the developmental smuggling model. You may contact Mr. Perri via e-mail at frankperri@hotmail.com

References

- 20 found in the “Tucson Sector” – a 262-mile long sectors of the border from the New Mexico state line to Yuma County, Arizona. (February 2010). *U.S. Department of Justice National Drug Intelligence Center National Drug Threat Assessment 2010*.
- Afghan, coalition forces destroy tunnels in Helmand, ISFAF Joint Command. (26 November 2010). Retrieved from News ID 60931, www.dvidshub.net
- Al-Qaeda suspects may have escaped in tunnel, (22 March 2004). *USA Today World Section Online*.
- Background Note: North Korea. (29 September 2010). Bureau of East Asian and Pacific Affairs, United States Department of State. Retrieved from on November 23, 2010 <http://www.state.gov/r/pa/ei/bgn/2792.htm#>
- Caldwell, D.R., Ehlen, J., & Harmon, R.S. (2004). *Studies in Military Geography and Geology*. New York: Kluwer Academic Publishers.
- Cechak, J. (2007). Detection of the under-soil intruder activity. University of Defense, Faculty of the Military Technology, *Koumnicova*, 65, 612.
- Columbia smashes drug ring with Hezbollah ties. (22 October 2008). *Reuters Africa [On-line]* Retrieved on 10/22/2008. <http://africa.reuters.com/world.news/usnTRE49LOGQ.html>
- Cross-border tunnels discovered in California and Arizona, 2005-2008. (31 January 2008). Department of Homeland Security. Retrieved November 16, 2010 from www.fas.org/spp/othergov/dhs/tunnels.html
- Department of Homeland Security. (2009 March). Tunnels discovered within the Arizona HIDTA region, fiscal year 2005-2009 [Table 7]. In National Drug Intelligence Center, Arizona High Intensity Drug Trafficking Area Drug Market Analysis 2009, Document ID: 2009-R0813-002. Retrieved on November 20, 2010 from <http://www.justice.gov/ndic/pubs32/32762/index.htm>
- Egypt finds 13 Gaza tunnels used by smugglers (04 November 2010). Retrieved on November 7, 2010 from <http://www.google.com/hostednews/afp/article>
- Egypt, Palestinian Territories: A New Wall and the Spurning of Hamas. (22 December 2009). Stratfor Intelligence.
- Egypt: Temporary government remains in place – military. (12 February 2011) In Stratfor Security Weekly. Retrieved on 2/12/2011 from <http://www.stratfor.com>
- Elsworth, C. (03 September 2008). *The Telegraph*, Retrieved from <http://www.telegraph.co.uk/news/worldnews-conditioned-drugs-smuggling-tunnel-discovered-on-US-Mexico-border.html>
- Federal agents shut down a drug-smuggling tunnel on the US-Canada border and arrest three men. (20 July 2005). Washington State Department of Archeology and Historic Preservation. Retrieved from <http://www.historylink.org/>
- Gaza Strip. (27 October 2010). *CIA—The World Factbook—Gaza Strip*” *Middle East* Retrieved from <https://www.cia.gov/library/publications/the-world-factbook>
- Hamas burns recreational drugs, taxes cigarettes Gaza rulers burn nearly 2 million painkillers many residents of Strip take in search of relief from territory’s hardship. (20 April 2010). Retrieved on November 05, 2010 from www.ynetnews.com/Ext/Comp/11/24/2007
- Hettena, S. (3 December 2009). Detecting border tunnels. Retrieved on November 28, 2010 from <http://www.sethhettena.com/2009/detecting-border-tunnels>
- High intensity drug trafficking area drug market analysis 2009. (March 2009). National Drug Intelligence Center Arizona.
- High priority technology needs, (May 2009). *Department of Homeland Security*. Retrieved from http://www.dhs.gov/xlibrary/assets/st_high_priority_technology_needs.pdf
- Holub, H. (31 August 2010). Are there fewer drug tunnels in Nogales? Tucson Citizen.com Retrieved from <http://tucsoncitizen.com/view-from-baja-arizona/2010/08/31/are-there-fewer-drug-tunnels-in-nogales>
- Is North Korea moving another ‘Red Line’? (23 November 2010). Stratfor Intelligence Retrieved from http://www.stratfor.com/analysis/20101123_north_korea_moving_another_red_line/?utm_source=Snapshot&utm_campaign=none&utm_medium=email&fn=397182787
- Israel: Foreign ministry assessing Egyptian situation. (12 February 2011)

In Stratford Security Weekly. Retrieved on 2/12/2011 from <http://www.stratfor.com>

Klar, A. & Linker, R. (1 April 2009). Fiber optic sensing optical fibers detect tunnel-digging. Retrieved from <http://www.optoic.com/index/photonic-technologies-applications/lfwdisplay/lfw-article-display/358140/articles/laser-focus-world/volume-45/issue-4/worldnews/fiber-optic-sensing-optical-fibers-detect-tunnel-digging.html>

Lacey, M. (02 October 2010). Smugglers of drugs burrow on border. *The New York Times*.

Lichtenwald, T. G. (2003). Drug smuggling behavior: A developmental smuggling model-Part 1. *Forensic Examiner*, 12, 15-22. Available at National Criminal Justice Reference Service #NCJ209084.

Lichtenwald, T.G. (2004). Drug smuggling behavior: A developmental smuggling model-Part 2. *Forensic Examiner*, 13, 14-23. Available at National Criminal Justice Reference Service #NCJ209085

Lichtenwald, T.G., Perri, F.S., & MacKenzie, P.M. (2009). Smuggling multi-consignment contraband: Isolated incidence or a new trend? *Inside Homeland Security*, 7, (2). Available at National Criminal Justice Reference Service NCJ # 227306.

Lintner, B. (June, 9, 2009) 'Tunnels, Guns and Kimchi: North Korea's Quest for Dollars - Part I', Yale Global, <http://yaleglobal.yale.edu/content/NK-quest-for-dollars-part1> (accessed December 19, 2010).

Madrigal, A. (16 May 2009). Bots vs. smugglers: Drug tunnel smackdown. Retrieved from www.wired.com/wiredscience/2009/05/tunnelbots

Marosi, R. (04 November 2010) San Diego-to-Tijuana drug tunnel uncovered: 25 tons of pot seized. *Los Angeles Times*.

Martin, P. (28 June 2008). In the tunnels of Gaza, smugglers risk death for weapons and profit. *Rafah, The Sunday times*. Retrieved November 04, 2010 from http://www.timesonline.co.uk/tol/news/world/middle_east/article4228420.ece

Mauro, R. (17 August 2005). Terrorism's triple-border sanctuary: Islamist world terror from Argentina, Brazil & Paraguay. Retrieved from http://www.worldthreats.com/latin_america/Terrorism's%20TripleBorder%20Sanctuary

Medrano, L. (09 August 2009). Drug war's hidden front: Nogales's tunnels. *Christian Science Monitor*.

Mexico's gun supply and the 90 percent myth. (10 February 2011) In Stratford Security Weekly, retrieved on 2/11/2011 from <http://www.stratfor.com>

Mora, E. (20 April 2010). Justice Department reports 60 percent increase in number of drug smuggling tunnels at U.S.-Mexican border. Retrieved from CNSNews.com

National Drug Threat Assessment. (2010 February). *U.S. Department of Justice National Drug Intelligence Center*.

Nanto, D.K. (18 March 2003). North Korea chronology of provocations, 1950 - 2003. Congressional Research Service: The Library of Congress. Retrieved November 22, 2010 from <http://www.fas.org/man/crs/RL30004.pdf>

Navarro, J. (2005). Hunting terrorists: A look at the psychopathology of terror. Springfield, IL: Charles C. Thomas.

Navarro, J. (2006) Specialized Services Training Seminar. Chicago, Illinois.

Perri, F.S., Lichtenwald, T.G., & MacKenzie, P.M. (2009). The evil twins: The crime terror nexus. *Forensic Examiner*, 18(4), 16-29.

Rafah, S.A.R. (18 April 2005). Tunnels, the illegal breadwinner for Gaza. *Israel-News Today On-line*. Retrieved February 27, 2009 from <http://www.unitedjersalem.com/index2.asp?id=579541&Date=4/18/2005>

Rosenberg, M. & Gutierrez, M.A. (5 July 2010). Mexico state votes signal tough 2012 election race. Retrieved on November 28, 2010 from <http://www.reuters.com/article/idUSTRE6643PF20100705>

Sale R. (06 February 2009). U.S. officials: Hezbollah gaining in Latin America. *Middle East Times On-line*. Retrieved from www.metimes.com/Politics/2009/02/06/us_officials_hexzbollah_gaining_in_latam_america/56857

Secret tunneling | underground leisure and smuggle for survival (10 August 2010). Retrieved from an entry on dpr-barcelona.com.

Sensors, and command, control, communications, and intelligence: Proceedings of SPIE - Part 2 (C31) (01 April 2005). *Technologies for Homeland Security and Homeland Defense IV*, 5778(28).

Seoul uncovers a border tunnel. (4 March 1999). *The New York Times On-*

line. Retrieved February, 22, 2009 from www.nytimes.com/gst/fullpage.html?res=9c0ce6d71331f937a35730ca966958260&sec

Sharp, H. (31 December 2009). Smuggling fuels Gaza's stalled economy. *BBC News, Gaza* Retrieved from http://news.bbc.co.uk/2/hi/middle_east/8435066.stm

Smuggling tunnel to Hong Kong uncovered. (15 September 2006). Retrieved from http://www.spacedaily.com/reports/Smuggling_Tunnel_To_Hong_Kong_Uncovered_99.

Tactical Infrastructure/Border Fence U.S. Customs and Border Protection-Border Security. (n.d.). Retrieved from www.cbp.gov

The Falcon Lake murder and Mexico's drug wars. (21 October 2010). Retrieved from www.stratfor.com

The Rafah Terror Tunnels: An underground city of weaponry: Israel's war against terror. (02 November 2003). Retrieved from http://www.israel-wat.com/tunnels_eng.htm

The Secure Border Initiative (SBI), (23 July 2009). *Department of Homeland Security* Retrieved on November 29, 2010 from www.dhs.gov/files/programs/editorial_0868.shtm

The terror tunnels: An underground city of weaponry -Israel's war against terror. (05 November 2010). Retrieved from www.israel-wat.com/tunnels

The Washington Times, (2009, June 3), Al Qaeda eyes bio attack from Mexico, <http://www.washingtontimes.com/news/2009/jun/03/al-qaeda-eyes-bio-attack-via-mexico-border/> 9 (accessed on December 15, 2010). Treaster, J. (03 June 1993). Huge drug tunnel from Mexico into U.S. is found. *The New York Times*. Retrieved on November 04, 2010 from <http://www.nytimes.com/1993/06/03/world/huge-drug-tunnel-from-mexico-into-us-is-found>

Tunnel vision. S & T snapshots -border & maritime. (26 June 2009), *Homeland Security*. Retrieved on November 29, 2010 from www.dhs.gov/files/programs

Tupman, W.A. (2002a). The business of terrorism. *Intersec - The Journal of International Security*, 12, 6-8.

Tupman, W.A. (2002b). The business of terrorism - Part 2. *Intersec - The Journal of International Security*, 12, 186-8.

Tupman, W.A. (2006). The business of terrorism. Manuscript submitted for publication by Centre for Strategic and Global Studies, Moscow.

Tunnels. (26 August 2010). Border patrol community informational report.

U.S. border cops find massive Mexico drug tunnel. (03 November 2010). Retrieved from <http://www.newsdaily.com/stories/tre6a27b1-us-usa-security-border>

U.S. forces venture into Saddam's vast tunnels. (09 April 2003). Associated Press.

Welch, W. (2006, March 1). In age of terror, US fears tunnels pose bigger threat, Retrieved from http://www.usatoday.com/news/nation/2006-03-01-tunnel-terror_x.htm (accessed on December 15, 2010).

Williams, P. (2007 August). Terrorism, organized crime, and WMD smuggling: Challenge and response. *Strategic Insights*, 6(5). Retrieved on November 21, 2010 from <http://www.nsp.edu/Academics/centers/ccc/publications/OnlineJournal/2007/Aug/williamsAug07.html>

Winter, M. (03 November 2010). Major drug-smuggling tunnel found between San Diego, Tijuana. Retrieved from <http://content.usatoday.com>

Additional Resources

Perri, F.S., Lichtenwald, T.G., & MacKenzie, P.M. (2009). The evil twins: The crime terror nexus. *The Forensic Examiner*, 18(4), 16-29.

Shelley, L. (n.d.). The nexus of organized international criminals and terrorism. Retrieved from <http://pagesperso-orange.fr/societe.internationale.de.criminologie/pdf/Intervention%20Shelley.pdf>

Shelley, L., & Melzer, S. (2008). The nexus of organized crime and terrorism: Two case studies in cigarette smuggling. *International Journal of Comparative and Applied Criminal Justice*, 32(1), 43-63.

Shelley, L.L., Picarelli, J.T., Irby, A., et al. (2005). Methods and motives: Exploring links between transnational organized crime and international terrorism. Retrieved from <http://www.ncjrs.gov/pdffiles1/nij/grants/211207.pdf>