

Man in the Mud

FDNY Rescues Sandhog from Bull's Liver at Second Avenue Subway Excavation Site

by Assistant Chief Ronald R. Spadafora and Deputy Chief Daniel Donoghue

Whosoever saves a single life saves an entire universe.—taken from the Talmudic Tractate Sanhedrin 4:5, as referenced/verified by Rabbi Joseph Potasnik, FDNY Chaplain.

Initial response

On Tuesday, March 19, 2013, at 2033 hours, units were assigned to respond to Manhattan Box 1233 (a medical emergency; male buried in mud at a construction site) at the corner of Second Avenue and East 95th Street in Manhattan. Subsequent information revealed that a worker 75 feet below street level at the Second Avenue Subway excavation (see sidebar below) site at 96th Street was engulfed in slurry (Bull's liver; see sidebar on opposite page). More than 60 FDNY units, plus 160 Firefighters, responded to this incident, which

escalated to a third alarm and lasted more than eight hours (four and a half hours of which were required for rescue of the trapped victim). In this instance, it wasn't the number of victims that was at issue, but the type of material that was entrapping the lone victim.

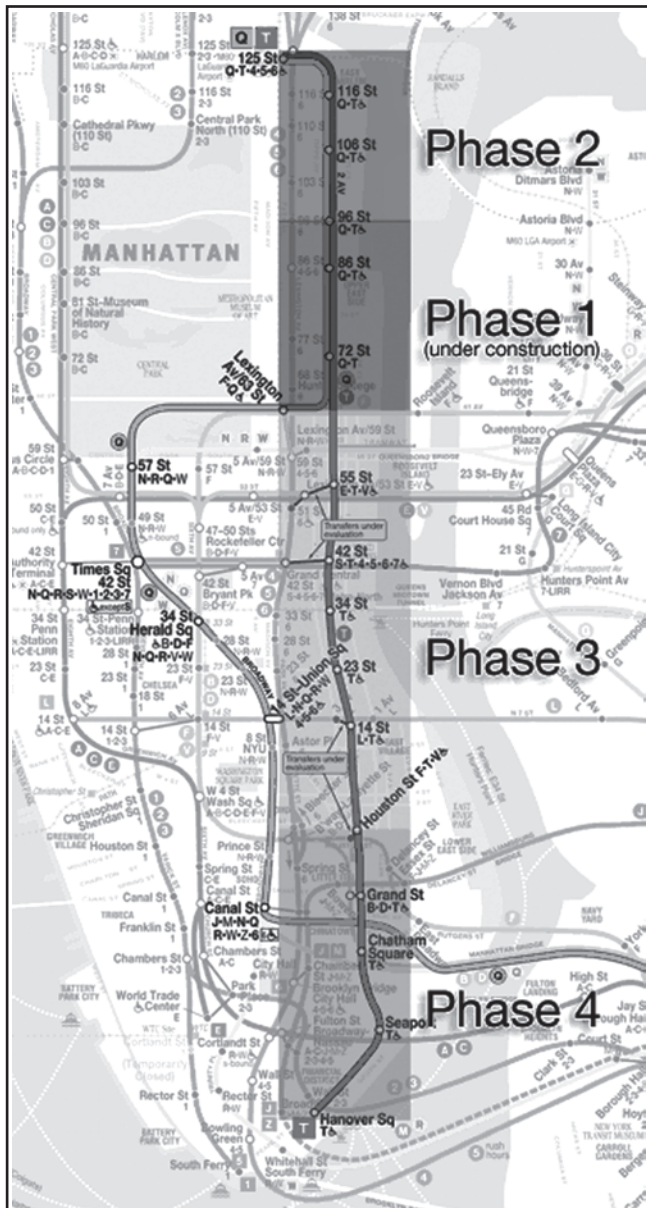
The excavation's north/south length went from 99th to 95th Street, while measuring nearly the full width of Second Avenue. Victim level access was via two separate and distinct points of ingress: one, a full return-type scaffold stair located south of 95th Street, which was the main access for workers at the site and the second, a vertical, ladder-type entryway, just north of the incident and closer to the victim. Initially, there was uncertainty regarding the victim's exact location. This contributed to confusion over the best ingress point to use.

First-arriving units entered the return-type scaffold stairway to descend to the reported location. Reaching the excavation floor, members walked 125 feet north to the victim. The second access point also was used. Engine 22, led by Lieutenant Daniel Sambrato, and Ladder 26, under the command of Captain Charles Roberto, made initial victim contact. Upon confirmation of a trapped construction worker below-grade, Rescue 1 and 3 and Squad 41 and 18 were assigned.

The victim, a sandhog, had accidentally slipped or fell off a crane mat—used to support heavy equipment at the floor level of the excavation into the Bull's liver—and was unable to free himself. He was up to his chest in the soil at an angle whereby he looked as if he was sliding into home plate. Prior to FDNY arrival, fellow workers applied a harness to him and secured it to a shoring strut high point in hopes of preventing the victim from dropping deeper into the soil. After more than 30 minutes of futility, trying to free the sandhog, his co-workers dialed 911 for assistance.

Note: In the days prior to the incident, heavy rains—in conjunction with backhoe digging—resulted in a large and deep depression where Bull's liver had formed into a sizeable pool. In some areas of the excavation, the depth of the Bull's liver may have reached 10 feet. This was in the general vicinity of the victim.

Battalion Chief James Manning, Battalion 10, arrived on-scene at 2039 hours and took on the role of Incident Commander (IC). Chief Manning responded to the location designated by White Hat



Second Avenue Subway

The Second Avenue Subway project encompasses a two-track line along Second Avenue, from 125th Street to the Financial District in Lower Manhattan. It will include a connection from Second Avenue through the 63rd Street tunnel, to existing tracks for transportation of passengers to West Midtown and Brooklyn. Sixteen new subway stations will be constructed. The project will be built in four phases.

Phase One, initiated in April 2007, includes tunnels from 105th Street and Second Avenue, to 63rd Street and Third Avenue, with new stations along Second Avenue at 96th, 86th and 72nd Streets. Each of the stations under construction is a separate contract being overseen by MTA Capital Construction. A White Hat protocol identifying a location for contractor representatives to meet with FDNY personnel (similar to the FDNY/Con Edison White Hat program) has been established for each station.



MTA White Hat location, situated north of the excavation.

photo by Assistant Chief Ronald R. Spadafora

Source: http://www.vanshnookenraggen.com/_index/2010/03/the-futureofsubway-second-avenue-subway-history/

Bull's Liver

Bull's liver actually is not mud. It is a fine-grained mixture of inorganic silt or clay soil and water. It has low permeability and low plasticity. Bull's liver will not drain water easily. Dewatering, therefore, is very difficult when using standard dewatering methods. When allowed to accumulate at construction sites, it has proved to be extremely dangerous, acting similarly to quicksand. Bull's liver is a very heavy and thick slurry material that will not allow anything to be easily removed from its grip.

Operating units were at a loss regarding how to free the victim without seriously injuring or killing him in the process. Bull's liver has historically demonstrated high instability when saturated and subjected to construction-induced disturbance. This was the case after 9/11 during recovery and construction activities at the Cortlandt Street Station, which serves the R subway line in Lower Manhattan, located immediately adjacent to the World Trade Center site. Soils in this area were known locally in the construction trades as Bull's liver.



Bull's liver in its non-aqueous form. It is a mixture of soil, clay and silt.

photo by Assistant Chief Ronald R. Spadafora



Large-diameter steel pipes, acting as lateral shoring struts for the excavation walls, were used as high points.

photo by CTU

protocol, but was unable to make contact with Tully-Cruz Construction contractor representatives. His primary objective was to both verify the location of the victim and determine the best route to that location.

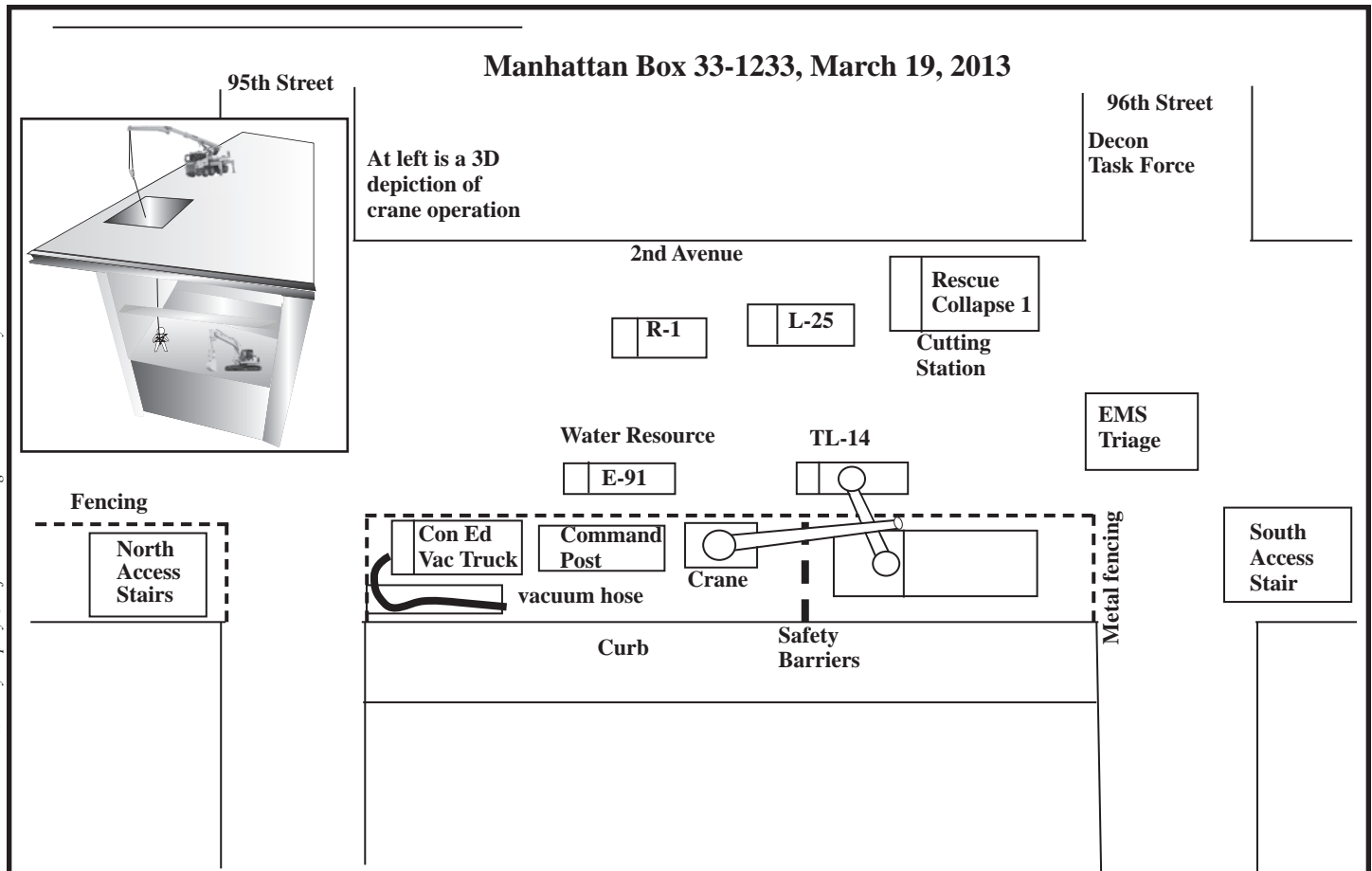
Preliminary information

Preliminary information from unit Officers included the following:

- Sandhog buried to chest level in a clay-mud slurry mixture (Bull's liver). The victim was slowly sinking, despite initial rescue efforts

by the on-site construction crew.

- The path to the victim was treacherous. Numerous areas of the construction floor were covered by the cold and slippery Bull's liver. Several Firefighters became stuck momentarily while proceeding to the victim. The depth of the Bull's liver varied from several inches to several feet.
- The area surrounding the victim would require a platform in order for members to operate safely. Numerous specialized hand tools and equipment, lifesaving ropes and devices, dewatering pumps, plywood and portable light stanchions would be needed.



Victim Removal

by Battalion Chief Donald F. Hayde

On arrival, Chief Hayde observed a construction worker trapped up to his chest in a clay and water slurry solution. Ladder 43 personnel had secured him with a life-saving rope that was draped over a steel shoring strut. Members from Rescue 1 and Squad 41 were attempting to free him by digging around his lower body. Simultaneously, another rope was thrown over the tunnel support and secured to the victim. An attempt was made to pull the victim up with this ad hoc pulley system. Due to the tremendous amount of suction caused by the Bull's liver, this operation proved unsuccessful.

Members continued to try to free the victim by digging, but the Bull's liver in which the victim was trapped continued to back fill into the area. A 4:1 mechanical advantage system was set up and used unsuccessfully to extricate the worker. During this time, it was discovered that four pieces of plywood were also covering the worker's right leg. This fact, coupled with the suction created by the Bull's liver, was making removal next to impossible. The victim's left leg, which was unencumbered by the plywood, eventually was freed.

The entire area in which FDNY members were operating was covered in Bull's liver that varied in depth from a few inches to many feet deep. This made maneuvering in the area extremely difficult and hazardous. Members were continually getting stuck or finding themselves sinking into the material. Ground pads, in the form of plywood sheets, were used in the immediate work area and many more were needed. These extra sheets of plywood and dimensional lumber (2 x 4s and 4 x 4s) were lowered by rope by units working at street level 75 feet above. Additional equipment, such as ropes, battery-operated reciprocating tools, griphoists and buckets, were called for and lowered down. Subsequently, a man basket also was used to deliver needed tools and materials. During the rescue effort, the water level around the victim fluctuated, rising and falling. Several types of FDNY dewatering pumps were used, but none of them had any success due to the viscosity of the material.

Numerous FDNY medical professionals were on-scene, providing intravenous medications and monitoring the victim's condition. After numerous and prolonged attempts to free the construction worker, several different actions performed simultaneously brought success. While unable to free the worker, these actions did remove some Bull's liver, preventing it from rising above the victim's chest. An on-site mechanical excavating machine was brought to the vicinity of the victim by a construction worker. Using the reach of its boom, the backhoe was used to dig a trough adjacent to where the victim was trapped. This acted as a drainage trench and facilitated the flow of some of the Bull's liver away from the victim. This operation was closely monitored and done in small increments, with the excavator operator taking his signals from Lieutenant Vincent Pickford, Squad 288.

The removal of plywood covering the victim's right leg involved the use of a griphoist with a chain and "J" hook attached. The "J" hook was secured around the plywood and used to rip and shred it. The "J" hook operation was done numerous times because the device had to be reset each time it went through the plywood. During this entire time, members from Rescue 1 continued to manually dig with shovels around the victim and manipulate his right leg up from the Bull's liver.

During this time, the suction hose from the Con Edison vacuum trucks were stretched onto the floor level of the excavation site and utilized with positive results. The level of Bull's liver began to recede. With all these operations taking place simultaneously, gradual slow movement of the victim's leg occurred until he was finally freed. The man basket was called for and lowered via crane. The victim was evaluated for transport readiness, packaged and removed to street level, with an EMS Paramedic accompanying him.

This was a prolonged, four-hour-plus rescue operation, with many obstacles that FDNY members had to overcome. It demanded a major logistics commitment and featured difficult site access, underground conditions and a worker trapped in deteriorating, quicksand-like soil. While everyone operating felt a sense of frustration, it never detracted from the focus of victim removal. Training, teamwork and thinking outside the box all came together to attain a successful outcome and the saving of a life.

About the Author...

Battalion Chief Donald F. Hayde is a 36-year veteran of the FDNY. He is assigned to the Rescue Battalion of the Special Operations Command. He holds a BA degree in Fire Protection Management from Queens College. This is his fourth article for WNYF.



Plywood was used to provide a work and walking platform atop the Bull's liver.

photo by CTU



Tower Ladder 14's bucket was positioned over the large street opening and used as a high point. Also note the crane operator and crane that had a man basket attached to it, located just south of the bucket.

photo by CTU

- A lifesaving rope, construction harness and personal rescue webbing were secured to the victim. Members of Ladder 43, directed by Captain Raymond Farrell, quickly completed these tasks in an attempt to stop/slow the victim from sinking deeper into the Bull's liver.

All Hands operations

Deputy Chief Dan Donoghue, Division 3, arrived on-scene at 2048 hours, conferred with Chief Manning and ordered him to supervise and coordinate ongoing operations at street level. Chief Donoghue assumed overall command. Chief Donoghue determined that the more substantial return-type stairway was the better of the two routes for ongoing operations, even though it was situated farther from the victim.

An Incident Command Post (ICP) was established on Second Avenue, north of 95th Street. This gave members at the ICP a good view of the primary access stair, as well as the two excavation openings situated in the street. These openings were used throughout the incident to facilitate resource delivery to FDNY members below.

Additionally, Tower Ladder (TL) 14, under the command of Lieutenant Frederick Simms, was ordered to position the bucket of his apparatus over the 18- by 30-foot north access opening to serve as an above-ground high point. Chief Donoghue transmitted the *All Hands* at 2057 hours and requested the response of a second tower ladder to span the smaller south opening should the need arise. TL-13 was dispatched to cover this assignment although their apparatus was not required as an additional high point.

Initial FDNY rescue operations were unsuccessful. Simply reaching out to the sandhog and grabbing him or trying to tie ropes around him and pulling were both ineffective and unsafe. Many Firefighters engaged in transporting tools, equipment, supplies and plywood (used to create a safe working platform) were getting stuck themselves. The Bull's liver was so treacherous that members formed a human chain, passing resources where required, using a hand-to-hand method. Many sheets of plywood were laid out on the excavation floor. This effort was ineffective, however, as one by one, the plywood sunk into the Bull's liver, causing its level to rise, further endangering the entrapped victim.

On arrival, Battalion Chief Donald Hayde, Rescue Battalion, was ordered to command rescue efforts at the floor of the excavation (Victim Removal Sector). Battalion Chief Mike O'Kelly, Haz-Mat Battalion, was ordered to use Haz-Mat 1 and their resources to conduct preliminary atmospheric tests within the excavation.

SOC Support Ladder (SSL) Company 25 with the Collapse Rescue 1 vehicle, under the command of Lieutenant James McCarthy, arrived on-site and erected a wood-cutting station near the street openings. They also initiated the labor-intensive task of supplying sheets of plywood and lumber to the excavation floor level. They were assisted in these assignments by SSLs TL-14 and TL-7.

Second alarm

Although initial reconnaissance indicated the victim removal would not be a prolonged event, subsequent reports were less encouraging. A second alarm was proactively transmitted by Chief Donoghue at 2103 hours. Actual and anticipated conditions included the following:

- Victim Removal Sector was heavily engaged. All members were

working in cold, damp and difficult conditions. Little to no progress was being made in the rescue effort. The victim continued to slowly submerge and apparently was entangled in plywood and debris below the Bull's liver surface.

- The Bull's liver was rapidly clogging dewatering pumps and it was extremely difficult to shovel. Members operating on plywood platforms near the victim were unintentionally shifting Bull's liver toward the victim.
- Large quantities of plywood, lumber, shovels, buckets, dewatering pumps and other tools/equipment were needed.
- Captain Frank Pellegrino, commanding Engine 91, were designated Water Resource Officer and Water Resource Unit, respectively. The Captain was ordered to coordinate the efforts of second-alarm engines to provide a hose-line at the excavation floor level, as well as

Comfort and Support

by the Reverend Stephen Harding, BCC, STM

By prior arrangement, on the evening of March 19, 2013, I was at Fire Department Headquarters. The initial call for a construction worker trapped in the Second Avenue subway tunnel came in at approximately 2030 hours. While monitoring the incident on the Department radio, a second alarm was transmitted for the same incident a half-hour later. As I was in the company of Assistant Chief Ronald Spadafora and his Aide, FF Michael Daly, Engine 52, I responded with them in their vehicle to Manhattan.

At the Incident Command Post (ICP), I did what I usually do as FDNY Chaplain to support our members: move around the scene, talk to anyone who isn't actively engaged in operations, visit EMS and make my way back to the ICP to monitor the situation and position myself where I might be needed next.

That night, I spent some time at the ICP, listening to the handie-talkie traffic. After a while, I made my way to the street access point where plywood and other materials were being lowered to the tunnel floor and stayed there, maintaining a presence and providing support. After being present on the scene for three hours, listening to the reports provided from members with the trapped worker, I understood that the rescue operation was complex and taking longer because of the conditions in the tunnel and that the worker had been partially submerged in a mud/slurry/water mixture since the first-responding companies and ambulances arrived.

At that point, I approached Chief Spadafora to express my concern that the worker must be cold and that everyone in the tunnel probably had a specific task or function to accomplish. I suggested that I provide comfort and support to the victim. I concluded by asking his permission to go down to the worker. As Chaplain, my function was to focus on the worker's well-being and provide him with encouragement.

The Chief agreed and directed the Officer and Firefighters of Engine 23 to escort me. FF Daly, seeing that I had responded to the incident without my bunker gear or helmet, lent me his gear, for which I am still grateful. Engine 23 members led me into and down a maze of narrow stairs, vertical ladders and catwalks onto the floor level of the excavation. The surface initially was firm, but quickly gave way to mud as we approached the members operating around the trapped worker.

FDNY members were standing closely together on the plywood that had been lowered. The mud on the plywood was thick enough that it required an effort to pick my feet up if I didn't move them regularly and was even worse off the plywood. I worked my way to the worker and made my presence known to EMS Lieutenant Rafael Goyenechea and the Rescue Paramedics, who told me, "His name is Joe and he's doing okay." I introduced myself to the Firefighter standing closest to Joe and then introduced myself to the trapped worker: "Hi, Joe, my name's Stephen. I'm one of the FDNY Chaplains and I came down to see how you are doing." He said he was doing okay. I asked if I could hold his hand for a bit. He agreed and I held his hand, which was freezing. I tried to warm it up as best I could and kept him company, saying my own internal prayers for Joe, for his safety, his family and for all who were working so hard to get him out safely. After a while, I became aware that one of the Rescue Paramedics was trying to gain access to Joe, so I moved back. I stayed near Joe, however, who was still in the water and now had a heating blanket on his chest.

As I continued my internal prayers, I took in all the resources and personnel who were operating in the tunnel. I stayed on the plywood until it became clear that my weight was hindering the operation. Realizing that this part of my involvement in the operation was over and that my presence in the tunnel was not essential, I started to make my way back up to the street. When I was at the base of the last ladder, I heard a cheer from below and realized that the members had gotten Joe out.

Back on the street, I went to the access point where Joe would be brought up in the man basket by the crane. I watched as he was transferred from the basket to a stretcher, decontaminated and then moved to an ambulance. I thought briefly about going back to him, but realized that he was extremely cold and that any intervention by me at that point would delay his medical care.

Once he had been taken to the hospital, I looked for Lieutenant Goyenechea and the Rescue Paramedics to congratulate them on the job they had done in an extremely difficult situation. I talked briefly with Chief Donald Hayde about his part in the operation and we both expressed thanks that Joe was safe. I made my way back to the ICP and gave a full report to Chief Spadafora. I returned FF Daly's helmet--he insisted that I keep wearing his bunker coat--and then moved around the site, talking with various FDNY members. At some point, I went to the decon station to get the mud off my boots and made my way back to the ICP.

I was included as one of the speakers in the press conference afterward. When it was my turn to talk, I explained why I had asked to go down and provide support to Joe. One of the reporters asked if I had gone down to give him last rites. It had never occurred to me that the members wouldn't get him out until that moment.

The incident ended with me accompanying Chief Spadafora to the hospital to check on three Firefighters injured while operating at the incident. All were in good spirits, if in some degree of pain: two had strained their muscles attempting to extricate themselves from the mud; the third had broken his wrist in a fall. All were discharged the next day.

In conclusion, it was a genuine privilege to be able to go into the tunnel and witness the members operating together with the common goal of getting Joe out of the mud. There were a lot of members in the tunnel and it was moving to see everyone supporting each other in this situation. I am very glad that Joe was rescued by the Department and even happier that he was restored to his family. I am indebted to Chief Spadafora for including me in the operation, grateful to FF Daly for lending me his gear, grateful to Engine 23 for escorting me and very appreciative of our members for their participation and the excellent job they did in getting Joe out.

Lessons learned

- The Chaplain should have his bunker gear with him at all times. I could have moved more quickly and been more immediately identifiable to the members operating in the tunnel if I had my own gear. Having my handie-talkie with me would have given me more direct and timely communication with Command and the other members throughout the operation.
- Know when to intervene. After three hours, it was time for the Chaplain to approach the partially submerged worker and offer comfort. There may be an appropriate time at other incidents to activate the Chaplain as a resource to support the victims, their families or FDNY members.
- Know when the moment for Chaplain intervention(s) is over. Anytime the Chaplain's intervention interferes with medical treatment or the rescue operation, it's time for the Chaplain to step back.
- The Chaplain is part of the overall response effort and reports as a resource for the Chief Officer in charge of the operation. While the Chaplain made the request to provide support to the trapped worker, it was the IC's decision whether to permit it. The Chaplain's safety is an issue that must be considered.

About the Author...

The Reverend Stephen Harding is one of seven FDNY Chaplains. This is his first contribution for WNYF.





Con Ed vacuum truck shown with suction boom and eight-inch aluminum extensions. Two of these trucks were used on March 19, 2013, at Manhattan Box 1233 to facilitate removal of the victim trapped in the Bull's liver.

photo courtesy of Con Edison

hose-lines at street level for decontamination purposes.

- Battalion Chief John Pellegrinelli, Battalion 11, was the designated Safety Officer. He was directed to oversee operations at the excavation floor level.
- EMS Deputy Chief John Wieland was the Medical Branch Director and provided patient updates at the Command Post.
- Emergency Response Physicians and Rescue Medics treated the victim. The sandhog remained stable, but was suffering from hypothermia and was at risk for total submersion under the Bull's liver.
- Battalion Chief Kevin Blaine, Safety Battalion, initially was directed to supervise operations at the street access openings. Members were using these unprotected areas to lower tools, equipment and lumber 75 feet to the construction floor. Subsequently, he was ordered down to the excavation floor level to evaluate safety conditions during the extrication.
- The Con Edison vacuum truck arrived and was positioned near the return-type stair. Battalion Chief John Corcoran, Battalion 8, was directed to coordinate joint effort operations. Each Con Ed vacuum truck comes equipped with 30 feet of suction hose and two trucks were used at this incident. Special Operations Command units have additional suction hose and equipment. With the assistance of Ladder 16 and TL-13, as well as Engine 44, enough



Trapped sandhog up to his chest in Bull's liver (shown slightly below and to the left of center) secured to rope and harness assembly. Firefighters worked tirelessly for more than four hours trying to free him. *photo by CTU*

hose was stretched (approximately 75 feet vertically and 35 feet horizontally) to reach the victim.

- Numerous sheets of plywood were being used and more were necessary to maintain a work platform for members. Plywood was continually sinking into the Bull's liver and had to be replaced regularly throughout the operation.

Assistant Chief Ron Spadafora, Command Chief for the tour, arrived on the scene at 2124 hours and met with Chief Donoghue at the ICP. After receiving a comprehensive overview of the incident, Chief Spadafora assumed command. He designated Chief Donoghue as the Operations Section Chief and established and implemented a Command channel. The Command channel facilitated coordination and control of the incident from the ICP with the Sector Chiefs.

Frank McCarton, Office of Emergency Management (OEM) Deputy Commissioner for Operations, was at the Command Post. He was helpful in expediting a second Con Edison vacuum truck response and locating a commercial lumber vendor to provide additional plywood needed for the rescue effort, as well as contacting and summoning Metropolitan Transportation Authority (MTA) representatives to the ICP. On-site dewatering pumps were confirmed to be in operation by these officials, although their effect on the success of the rescue was minimal.

Chief Spadafora used an on-site International Union of Operating Engineers Local 15 worker to operate a crane situated just south of the street openings. The crane was fitted with a man basket and then deployed over the boom of TL-14 and down into the excavation. Basket utilization provided Firefighters below with needed tools, equipment, lumber and plywood. Subsequently, the man basket also was employed to raise the victim out of the excavation, once he was freed from the Bull's liver.

For the next 90 minutes, several rescue tactics were contemplated or employed. A plywood box (cofferdam) was constructed at street level and lowered. The idea was to position it over the victim and seal off the Bull's liver from him. The remaining slurry then would be removed from inside the box. This plan was not carried out since in order to place the cofferdam around the victim, the ropes securing him would have to be detached. There was a real danger that the victim could sink entirely into the Bull's liver in the interim.

Additionally, a four- by eight-foot sheet of plywood (placed on the excavation floor by contractors prior to FDNY arrival) was discovered atop the victim's right leg. This sheet could not be readily removed due to the suction action created by the Bull's liver. When pulled by an anchored griphoist, the plywood shredded apart into small pieces.

A 4:1 mechanical advantage system was tried in an attempt to free the victim, but it was feared that he would lose his limbs before the Bull's liver would release its hold. Water from a hose-line was applied to the Bull's liver in an attempt to thin out its consistency, making it more fluid. It was thought that this might loosen the grip on the victim. The water stream, however, only added to the volume of Bull's liver to the point where the victim was in danger of drowning. Hose-lines eventually were ordered shut down.

Shovels to remove the Bull's liver also were ineffective. The slurry would simply flow back into the area where the shovels were being used by Firefighters. A backhoe, at excavation floor level, was carefully employed in an attempt to dig out a trench reservoir for the slurry near the location of the victim. Lastly, portable dewatering pumps designed to remove the slurry clogged within minutes, putting them out of service.

Third alarm

At 2256 hours and still no substantial progress in the rescue effort, Chief Spadafora transmitted a third alarm, with an additional Rescue and two Squad companies requested. A total of five Squads, three Rescues and three Collapse Rescue vehicles responded to this

incident. The large amount of Bull's liver the victim was in, combined with hampered rescuer maneuverability, made this operation labor-intensive.

Firefighters directly engaged at excavation floor level were in need of relief, yet providing it was difficult. When Assistant Chief William Seelig, Special Operations Command, arrived at the ICP, he was given a briefing of rescue operations already performed, as well as those ongoing. He was directed to enter the excavation and take over command of the Victim Removal Sector. Chief Seelig provided vital oversight and coordination for the rescue effort.

Hearing the request for the amputation kit by Emergency Response Physicians, Chief Spadafora knew time was not on the side of the victim. He looked over to the FDNY Chaplain, the Reverend Stephen Harding, standing at the ICP and, as if he was reading the Chief's mind, the Reverend asked if he could be escorted down to the victim to provide spiritual support. His request was gratefully accepted. Reverend Harding reached the sandhog in short order and was able to bolster his resolve to live during the final hour of the ordeal.

During third-alarm operations, rescuers were slowly, but steadily, freeing the sandhog from his entrapment. With the arrival of a second Con Edison vacuum truck, enough suction hose now

was on-site to reach the area where the victim was located. A coordinated effort from several units managed to stretch it both horizontally and vertically from street level, down the return-type stairs and onto the excavation floor. Con Edison vacuum suction hose proved vital in its ability to remove a substantial amount (more than four cubic yards) of Bull's liver. Additionally, the backhoe, in proximity to the victim, was able to successfully create a depression whereby the Bull's liver could be deposited and secured away from the victim. The level of slurry in the area around the sandhog began to diminish. This development, in conjunction with the gradual removal of plywood from the victim's right leg, led to the complete and safe removal of the sandhog from the Bull's liver.

Packaging of the victim into a Stokes basket for removal out of the excavation via man basket was readily accomplished. Accompanied by EMS Lieutenant Thomas Schulz, the victim was hoisted out to street level, delivered topside to EMS personnel and transported to a nearby hospital emergency room.

Lessons learned

- The Second Avenue subway construction site has an area designated as a "White Hat" meeting place. It is similar in function to

Rescue Medical Care

by EMS Haz Tac Lieutenant Rafael Goyenechea

I was the second EMS Officer to arrive (after EMS Lieutenant Fred Desarno) at the incident at approximately 2040 hours. Lieutenant Desarno, acting as the initial Medical Branch Director, instructed me to proceed to the south excavation entrance where on-scene workers were clamoring for assistance. I would operate as the Rescue Medic Task Force (RMTF) Officer in contact with the victim/patient. Subsequently, initial Rescue Medic units would join me, linked to street level via handie-talkie communications.

Going into the excavation, I had to climb down multiple stairs, ladders and catwalks. At the bottom of the excavation, there was an immense amount of extremely thick mud (Bull's liver). Walking through this was a challenge, as your legs would become trapped. I proceeded along the excavation floor, which was approximately one City block, to where the victim was located.

I was able to make patient contact after approximately five minutes. The patient was located near East 96th Street and Second Avenue. Arriving, I found a 51-year-old male, alert and oriented. His right leg was buried in the mud from mid-thigh down. He was complaining of pain to that leg, but I was unable to ascertain if he had any other injuries at that time because the leg was buried and non-visible. His left leg was already completely freed and his torso was under muddy water up to his mid-chest. Since only one leg was freed, it forced his body to remain supine above the waist. This made it difficult to keep his airway clear from the rising mud and water.

My preliminary findings did not reveal any immediate life threats and he was in very good spirits. When Rescue Medic Unit 01R3 arrived, I directed one of the Paramedics to establish an area that was dry, safe and as close as possible to the victim. We used this as a logistical site for our medical needs. I further directed the Paramedics to prepare intravenous (IV), intraosseous (bone injection) and endotracheal (windpipe) intubation kits. This enabled us to address any immediate life threats should they arise unexpectedly. Since the area was unstable and we had limited access to the victim, we would be prepared to treat the victim as quickly as possible if his condition warranted. One Paramedic stayed with me at the side of the victim in order to continually monitor his condition. The second Paramedic was directed to ferry medical supplies and equipment, as needed, from street level. Additionally, a patient decontamination area was requested to be established at street level and staffed by an EMS Haz Tac unit.

Doctors Douglas Isaacs and David Ben-Eli arrived shortly thereafter and I provided them with a patient update. It was decided to gain IV access to provide fentanyl (an opioid analgesic) to the patient. He was complaining of increased leg pain and right-sided flank pain caused by pressure from shifting plywood atop him. Gaining IV access, the patient was administered the first dose of fentanyl with some positive response. The patient started to exhibit signs and symptoms of hypothermia approximately one hour after my arrival.

During the operation, rescuers were getting stuck in the quicksand-like Bull's liver. Wood planks and plywood were laid down around the patient to prevent sinking in the mud. Numerous times, rescuers fell into the Bull's liver because the backhoe inadvertently would hit the wood and cause the improvised floor to shift.

Additional rope systems were set up to pull FDNY members free from the mud. Rescuers took turns holding up the victim/patient by his harness to prevent him from drowning. A Firefighter next to me became trapped to the point where he needed to be extricated via a 4:1 mechanical rope system. I evaluated him before he was placed into a Stokes basket and removed from the excavation with a right leg injury.

Throughout patient monitoring and delivery of IV medications, the victim/patient's face and mouth had to be cleared of mud that was continually accumulating. Additional fentanyl doses were given to the patient via IV and intranasal route as needed. When the victim's torso had been cleared of Bull's liver, I was able to wrap his body with heating and regular blankets. This action decreased his shivering slightly.

After treating the patient for approximately three hours, EMS Haz Tac Lieutenant Thomas Schulz arrived and assisted me. We took turns pulling each other out from the mud and continued medication administration and close monitoring of the patient's mental status and airway. Due to the difficult location and surroundings, all equipment used had to be held up above the Bull's liver. Almost all of our communications inside the excavation had to be performed directly (face to face) or by hand signals, due to the extremely loud noise coming from the Con Edison dewatering pumps, power tools and backhoe. Approximately three hours into the incident, Dr. Isaacs requested the amputation kit. It was brought down to the rescue site, just in case all other efforts to extricate the victim should fail.

After approximately four hours into the incident, the patient was finally completely freed. A head-to-toe examination was performed, revealing no obvious signs or symptoms of trauma. The patient was complaining only of being cold. Additional heating blankets and dry sheets were placed on the patient after the safety harness was removed. The patient was secured to the Stokes basket for removal from the excavation.

Lieutenant Schulz was positioned inside the man basket. He continued monitoring the patient as the crane lifted the man basket to street surface. He provided an update on the patient's condition and treatment to the ambulance crew and relinquished care to them. Dr. Isaacs had made his way to street level and provided additional patient care information to the transporting EMS crew.

In conclusion, the victim was located in a very austere environment, requiring extreme caution and improvisation by rescuers. EMS personnel were able to overcome and contribute greatly to the successful rescue of this patient.

About the Author...

EMS Lieutenant Rafael Goyenechea was appointed to EMS as an Emergency Medical Technician 26 years ago. He is assigned to a Haz Tac unit. This is his first contribution to WNYF.





FDNY members positioning and securing the freed sandhog into the man basket for removal from the excavation.

photo by CTU

Con Edison locations. Ideally, during a fire or emergency, a supervisor will meet the FDNY at this site, regardless of the actual emergency location, to provide valuable information. At this incident, however, no construction supervisors responded. This led to initial confusion regarding the best and safest route to the victim. Moreover, highly knowledgeable construction engineers responded directly to where the victim was located and did not report to the Command Post. Their expertise regarding the operational status of on-site dewatering pumps could have proved beneficial. Both of these issues were addressed in a post-incident meeting with the construction companies.

- Bull's liver proved to be a difficult adversary for our units. Although located at other construction sites around the City, FDNY members do not have extensive experience with it. Special Operations obtained a large container of the material from the Second Avenue construction site. Tests and evaluations will be conducted using varied strategies, tactics, specialized tools and equipment. Additionally, personnel safety measures are being addressed by the construction companies' safety teams.
- Several members involved in the rescue effort became stuck themselves in the Bull's liver. They had to be extricated and removed by fellow firefighters. This situation complicated rescue efforts, dictating additional manpower and resources. In such circum-

stances, a high level of supervision is needed to control both operations and safety.

- Con Edison vacuum trucks were invaluable for their ability to remove Bull's liver over great depths and long distances. FDNY dewatering pumps were ineffective. Special Operations Command units have additional suction hose and equipment and have been trained to work with Con Ed personnel. The IC must ensure such units are assigned during these kinds of operations.
- A Decontamination Task Force was special-called to decon the victim, FDNY members and recovered tools and equipment. The Task Force played a vital role in removing and neutralizing contaminants.
- Some FDNY hand tools sank in the Bull's liver and were never found. Additionally, tools and equipment were left at the scene due to safety concerns. An agreement was reached with Tully-Cruz Construction to retrieve our resources within 24 to 48 hours once the excavation floor dried out. During this time, units were instructed to generate lost property reports. A master list of lost/missing tools and equipment, however, was not compiled and acted on until days later. This delay hindered the recovery effort.

Conclusion

FDNY members operated for a prolonged period of time under extreme conditions with limited opportunities for relief. Ultimately, Firefighters, emergency response physicians, Rescue Medics and a Chaplain improvised a solution to a problem none of them had ever encountered. When the sandhog finally was freed around 0030 hours on Wednesday, he was suffering from hypothermia and a wide assortment of other less serious injuries. He was taken to New York Presbyterian/Weill Cornell Hospital in Manhattan where he made a full recovery. Although the time required to remove the victim was greater than originally expected, team work and sheer determination overcame all obstacles faced and ended in a successful rescue.



About the Authors...

Assistant Chief Ronald R. Spadafora (top) has served the FDNY since 1978. He is the Chief of Logistics. He holds a Masters degree in Criminal Justice from LIU-C.W. Post Center, a BS degree in Fire Science from CUNY-John Jay College and a BA degree in Health Education from CUNY-Queens College. He is an Editorial Advisor and regular contributor to WNYF.



Deputy Chief Daniel Donoghue (bottom) is a 28-year veteran of the FDNY. He is assigned to the 3rd Division. He holds an Associate degree in Nursing from Suffolk Community College, a BA degree in Fire and Emergency Service from CUNY-John Jay College of Criminal Justice and is a graduate of the FDNY Officers Management Institute (FOMI). He writes frequently for WNYF.



photo by Craig Wurga, New York Daily News

Reunited at the quarters of Engine 53/Ladder 43, sandhog Joe Barone (center) poses with FDNY members who rescued him from the Second Avenue Subway excavation site. Reality TV "Cake Boss" Buddy Valastro (far right), baked the cake Mr. Barone presented to the *Bravest*.

Members are urged to review the following references:

- *Firefighting Procedures, Collapse Operations, Addendum 4, Con Edison Vacuum Truck Response, December 19, 2007.*
- "Special Tools Used at Trench Operations," by Battalion Chief Joseph R. Downey, in the 1st/2005 issue of WNYF.