

*2012 National Metal and Nonmetal  
Mine Rescue Contest*

**JUDGE'S PACKET  
Day #1**



*July 31, 2012  
Reno, Nevada*



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## **Introduction**

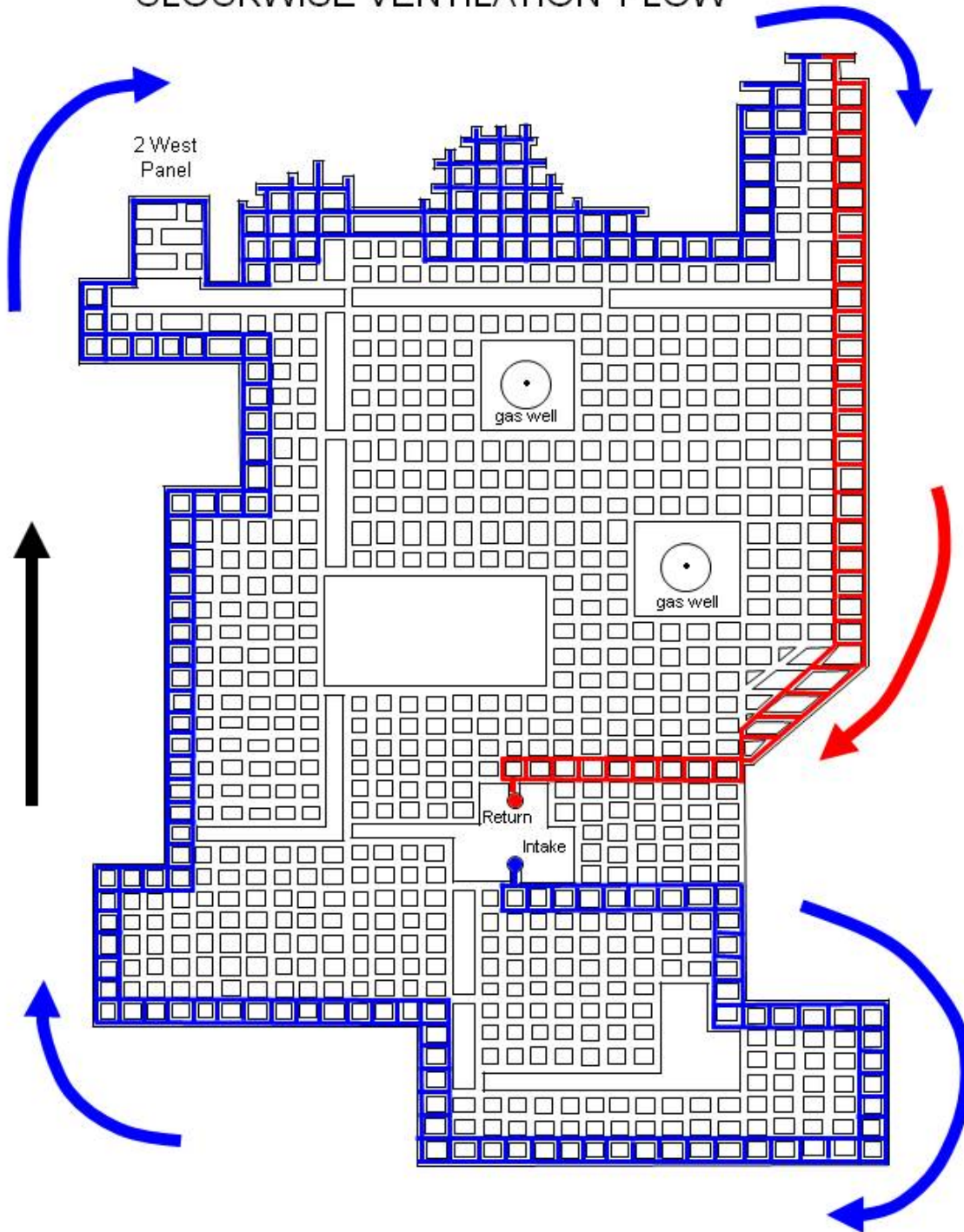
Welcome to the 2012 National Metal and Nonmetal Mine Rescue Contest. Before we begin, we want to commend each of you for the countless hours that you have volunteered, and your selfless dedication and willingness to participate as a mine rescue team member. We would also like to recognize each team for the hard work spent during this past year while training and preparing to help your fellow miners during a mine emergency.

We have a very challenging problem for you this year. It will make you think and exercise all of your mine rescue skills. Hopefully, each of you will go away feeling that you are better prepared for an actual emergency based on what you have learned.

Even though there can only be a handful of contest winners, the real winners are the miners and their families, the communities, and the companies you represent. It is for all of them that we are here today.

Now, let us continue with the briefing for this year's mine rescue problem.

# CLOCKWISE VENTILATION FLOW



**Doors installed in all entries where they pass through barrier pillars to separate intake and return ventilation**

## **Mine Information Sheet**

### **Reno Mining Company - Reno Mine No. 1**

#### **Mining & Equipment:**

The 1,000-foot deep single-level shaft mine uses a conventional room and pillar method to extract ore from the bedded deposit. The Intake Shaft is downcast (intake air) and is used to transport people and to convey supplies. The mine is ventilated by two main fans located underground near this shaft. The Return Shaft is upcast (return air) and is equipped with the production skips, as well as an escape compartment which can be used to hoist 8 persons to the surface.

The mine currently operates four production panels, three 8-hour shifts per day, and 6 days per week. A separate maintenance shift has recently been added to the evening schedule for equipment maintenance and general upkeep. The ore is drilled, blasted, and loaded from the faces using diesel-powered load-haul-dumps (LHD's). The ore is then transported from the feeder breaker on each panel via a series of conveyor belts to the bunker located near the Return Shaft. The ore is then hoisted to the surface via the production skips.

#### **Ventilation:**

Air enters the mine through the Intake Shaft and exhausts from the Return Shaft. The Intake Shaft is downcast and is designated as the primary escape way for the mine. The main fans are located underground near this shaft and are not reversible. The two fans operate in parallel to induce fresh air into the mine. The Return Shaft is upcast and is used as the secondary escape way. Air is directed to the faces using permanent (concrete block) and temporary (brattice cloth) ventilation controls.

The main fans push approximately 300,000 cfm of intake air into the mine. The fans are currently operating in a stable portion of their performance curve.

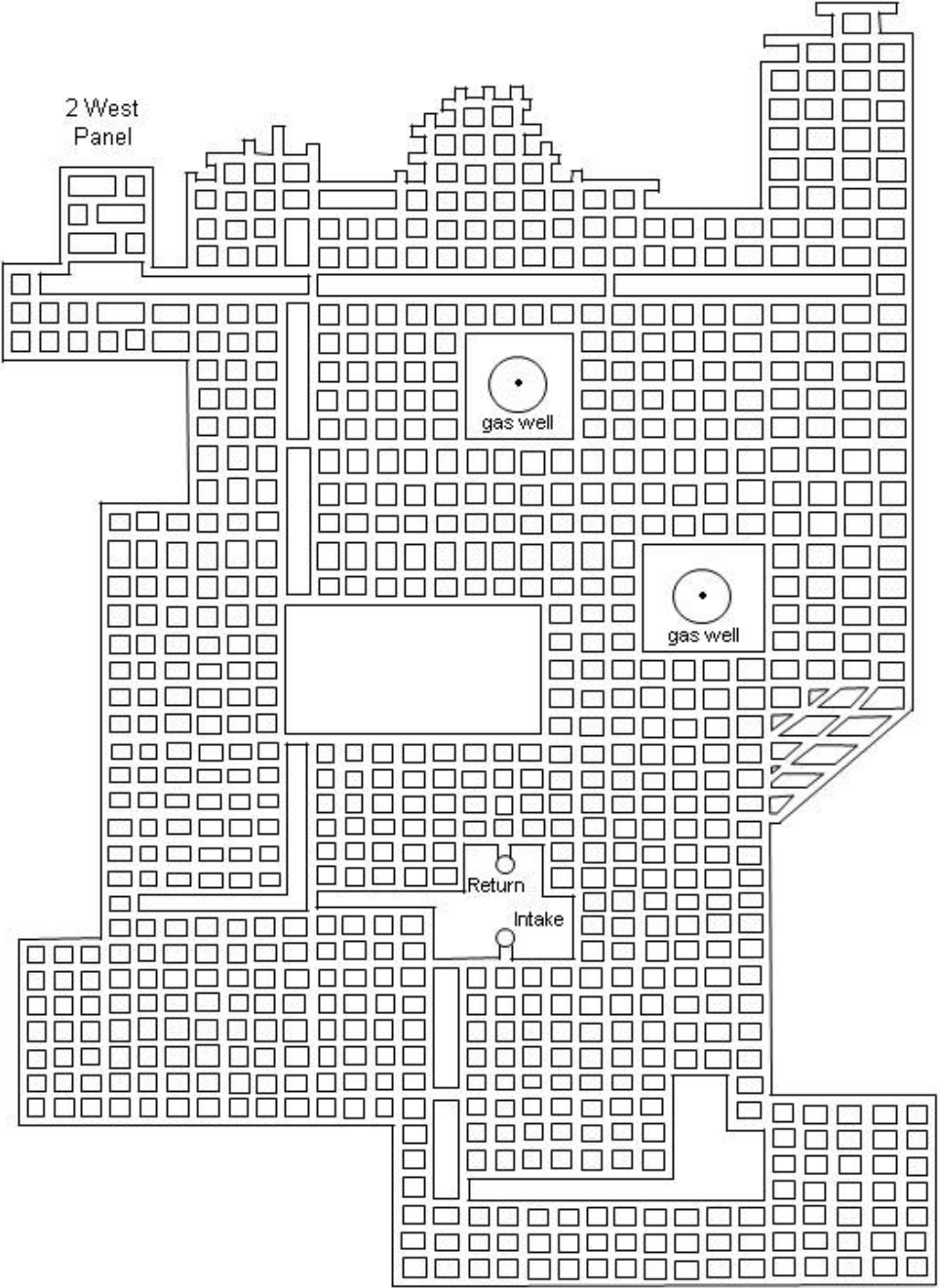
A third ventilation shaft has been drilled to the 2 West Panel near the contractor's office. This shaft will eventually become the main exhaust for the mine, and will include an 800 hp exhaust fan on surface. However, the fan has not yet been installed. At the present time, it is just a shaft, extending from the surface to the mining level.

#### **Gas:**

In accordance with Title 30 CFR 57.22003, the mine is classified as Category VI. That is, the presence of methane has not been established in this mine, and there is no history of methane gas in any other mine in the area.



# OVERALL MINE LAYOUT





## **Mine Information Sheet (cont.)**

### **Reno Mining Company - Reno Mine No. 1**

#### **Ground/Rib and Roof Control:**

The immediate roof or back is supported by 6-foot long roof bolts, installed on 4-foot centers. Additional roof jacks, posts, and crib blocks are used in problem areas.

#### **Water, Pumps, and Waterlines:**

The mine produces water at an approximate rate of 200 gallons per minute. The water has never caused significant production problems. The ore body dips toward the northeast. Culverts are used to divert water from the active areas. Submersible pumps and waterlines have been installed to minimize water levels in the travel ways. The sump for the 2 West Panel is located in the face area of Drift D. The sump pump controls are located in the foreman's office.

Each shaft is equipped with a ten-foot deep sump. The main water pumps, located on the surface, can easily handle the volume of water produced in the mine and the shafts. The main water pumps have been activated along with the power to the shafts.

#### **Electric Power:**

A 4,160-volt power feeder cable supplies power to the main substation located in the first crosscut off of the Intake Shaft. The power is then distributed to power centers located on each panel. The face drills and roof bolters are supplied with 440-480 volt power from the power centers.

The electrical power to the shafts, the fans, and the main sump pumps is on; however, all other underground power has been de-energized, locked out, and guarded.

#### **Mine Map:**

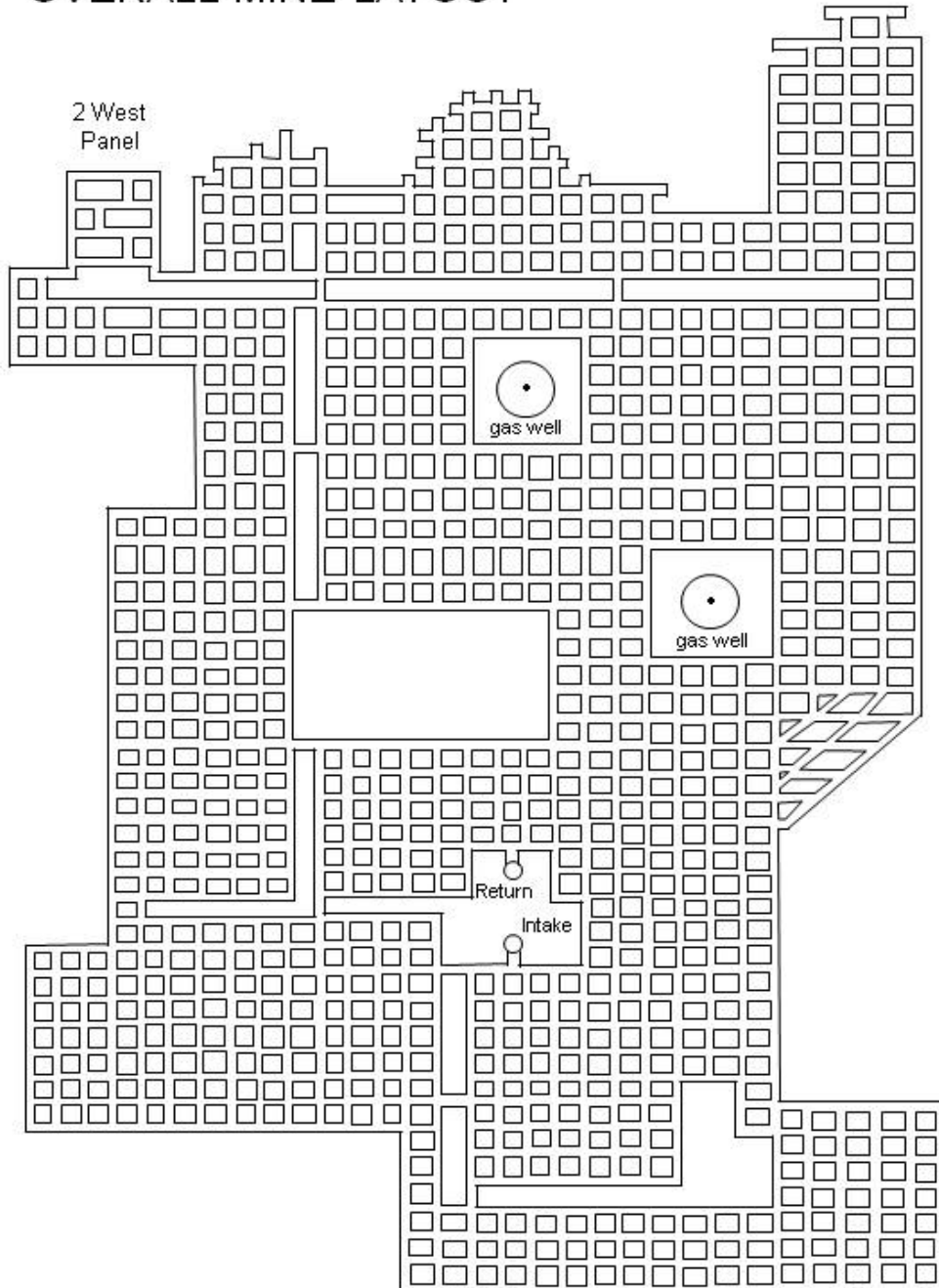
The mine map was updated two weeks ago.

#### **Other Mines:**

There are several active mines in the area. However, this mine does not connect to any of the mines.



# OVERALL MINE LAYOUT



## **Mine Information Sheet (cont.)**

### **Reno Mining Company - Reno Mine No. 1**

#### **Explosives:**

Explosives are available and used during the mining cycle. Blasting is conducted at the end of each production shift. Only enough explosives for a day's use are stored in the day boxes on the blasters' trucks.

#### **Refuge Chambers:**

The mine does not have any refuge chambers. In the event of an emergency, the underground offices provide the crews working on the production panels a safe refuge. That is, each office meets the regulatory requirements for a refuge chamber listed in 30 CFR 57.11052.

#### **Communications:**

Pager phones are available in the mine and normally have contact with the surface. The phones are located at the shaft stations, the panel lunch rooms, the conveyor belt drives and transfer points, the shop, and offices. At this time, we do not know the status of the communication system in the 2 West panel because there has been no contact with the three missing miners.

#### **Materials:**

Most available equipment and materials to work the problem are located in the mine and are identified with placards. The materials are stored in several areas underground and can be readily located if needed. If there is something else deemed necessary by the team, upon request, it can be delivered in a reasonable amount of time. This includes: timbers, crib blocks, hydraulic jacks, tools, brattice materials, and gas sampling instrumentation.

# Problem Map

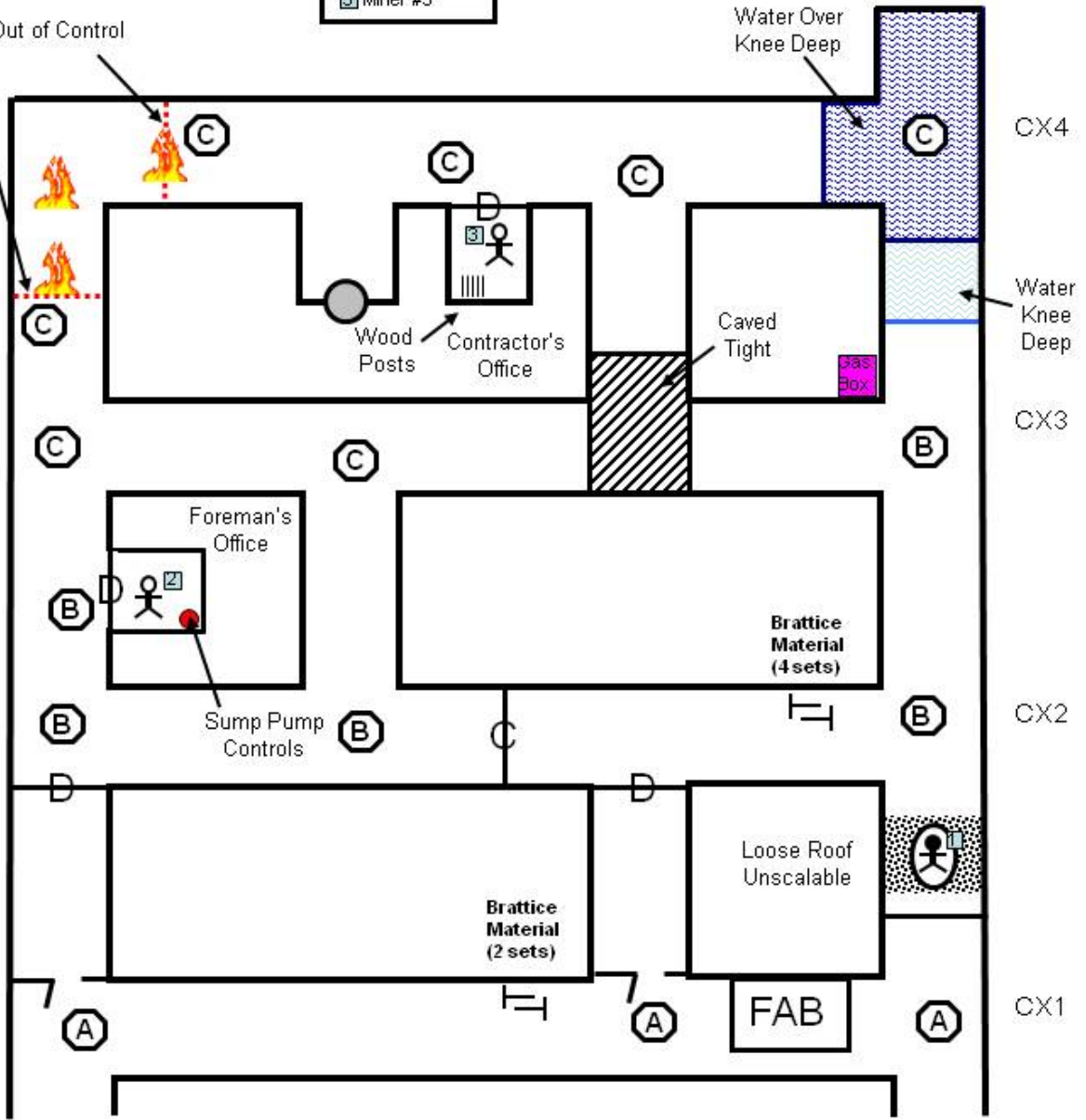


**Missing Miners:**

- 1 Miner #1
- 2 Miner #2
- 3 Miner #3

Fire Out of Control

Water Over Knee Deep



Drift A

Drift B

Drift C

Drift D

**Gas Placards:**

<span style="border: 1px solid black; border-radius: 50%; padding: 2px;">A</span>	<span style="border: 1px solid black; border-radius: 50%; padding: 2px;">B</span>	<span style="border: 1px solid black; border-radius: 50%; padding: 2px;">C</span>
Clear Air	Light Smoke CO = 1,900 ppm O <sub>2</sub> = 15.5 %	Heavy Smoke CO = 5,000 ppm O <sub>2</sub> = 14.0 %

## Team Briefing Statement

You are located at the underground fresh air base that has been established in the 2 West Panel of the Reno Mining Company's Reno Mine No. 1. The mine is a single-level underground development with three shafts (Intake, Return, and Ventilation Shaft). Air enters the mine through the Intake Shaft and exhausts from the Return Shaft. The two main blowing fans produce 300,000 cfm, and they are located underground near the Intake Shaft. Air is directed toward the working panels and the face areas using concrete block stoppings and temporary brattice cloth curtains.

At this time, the four development panels are all located in the northern end of the mine. The ore is drilled, blasted, and loaded from the faces using diesel-powered load-haul-dumps (LHD's). The ore is then transported from the feeder breaker on each panel via a series of conveyor belts to the bunker located near the Return Shaft. The ore is then hoisted to the surface via the production skips.

The immediate roof or back is supported by 6-foot long roof bolts, installed on 4-foot centers. Additional roof jacks, posts, and crib blocks are used in problem areas. The mine has no history of methane gas in the active workings. The sumps installed in the panels and the shafts have minimized water problems in the mine.

The 2 West Panel is currently idle and contract employees are on site to set up an underground crushing facility and to install production hoists in the Ventilation Shaft. This shaft will eventually become the main exhaust shaft for the mine. At the present time, it is just an open shaft extending from the surface to the mine level.

About two hours ago, an unidentified miner had called the surface from the 2 West Panel to report heavy smoke underground, and that he was seeking refuge in the foreman's office. He stated that the office was completely sealed, with the only way in or out through the doorway in Drift A. At that point, the phone went dead. Afterward, a contractor employee had called out to the surface to report smoke in the mine, and that he was seeking refuge in the contractor's office. He stated that the office was completely sealed, with the only way in or out through the doorway in Crosscut 4. At that point, his phone also went dead.

At that time, the superintendent ordered the mine to be evacuated. The Company's mine rescue teams entered the mine and explored the entire mine to the 2 West Panel. One team traveled into the 2 West Panel and established a Fresh Air Base. The location has been marked on the Day 1 - Team and Fresh Air Base Maps.

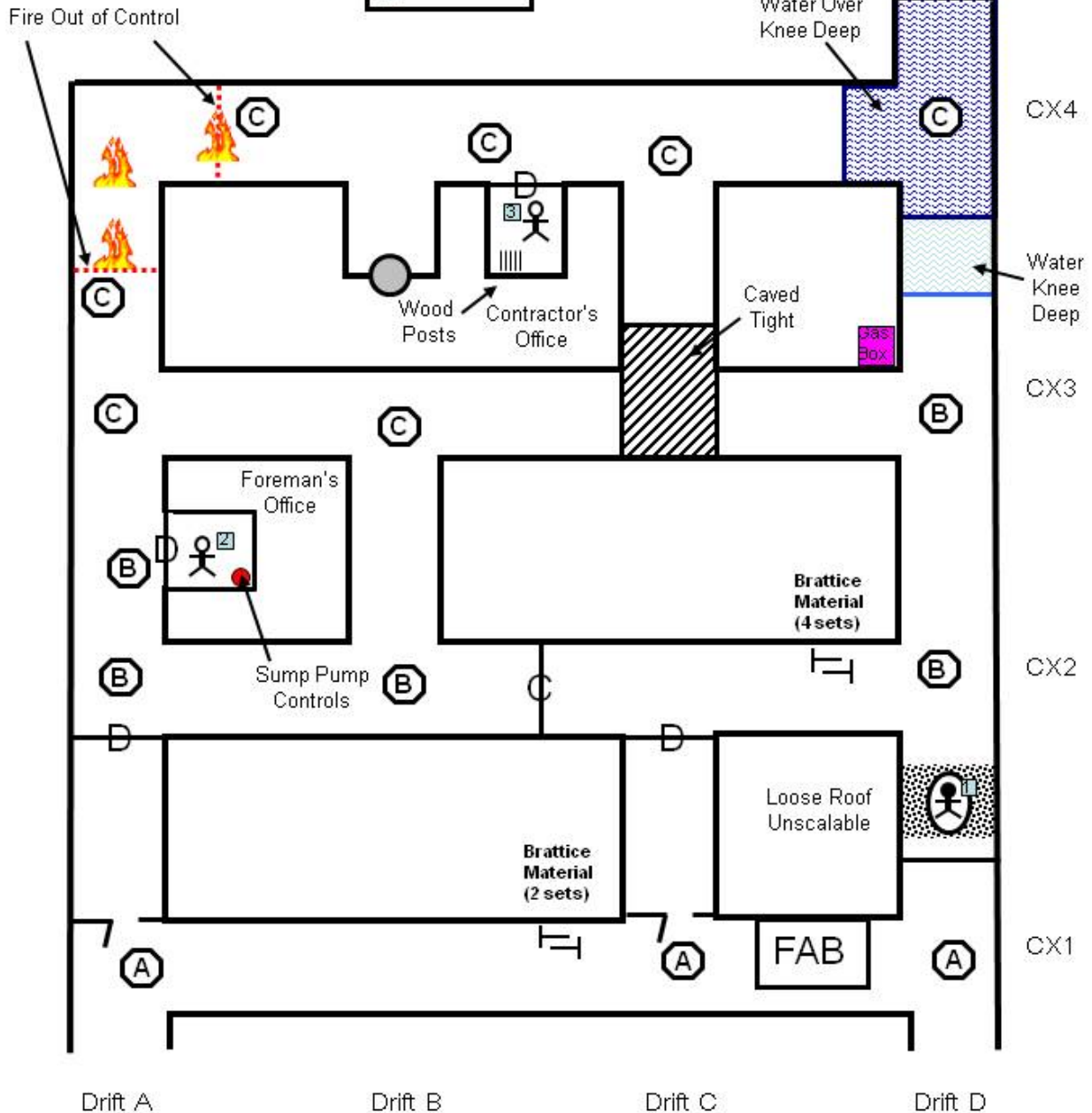
The previous mine rescue team installed the air locks in Drifts A and C, and the temporary stopping in Drift D between Crosscuts 1 and 2 (shown as CX1 and CX2 on the Team and Fresh Air Base maps).

# Problem Map



**Missing Miners:**

- 1 Miner #1
- 2 Miner #2
- 3 Miner #3



**Gas Placards:**

<b>(A)</b>	<b>(B)</b>	<b>(C)</b>
Clear Air	Light Smoke CO = 1,900 ppm O <sub>2</sub> = 15.5 %	Heavy Smoke CO = 5,000 ppm O <sub>2</sub> = 14.0 %

All power to the underground has been de-energized, locked out, and guarded. The underground main fans are operating, but can be turned off at any time. Both hoists are operational. Continuous gas monitoring at the Return Shaft shows “very light smoke and 30 ppm carbon monoxide (CO).”

We have called all of the government agencies for help. Guards have been posted at the shafts and at the Main Fans. There is a fully equipped mine rescue team located at the Fresh Air Base and they are ready to serve as your team’s backup. Another team will be sent into the mine to replace you after 90 minutes.

If your team is willing to help, we would like you to account for all missing miners; bring any live miners to the surface; extinguish or seal any fires; and explore and map all accessible areas of the mine. Most available equipment and materials to work the problem are located in the mine and are identified with placards. The materials are stored in several areas underground and can be readily located if needed. If there is something else deemed necessary by the team, upon request, it can be delivered in a reasonable amount of time.

When you reach the mine rescue course, the Mine Manager will introduce you to the judges. Once the Team Captain has started the timer, the Mine Manager will provide you with any changes to the briefing information that you have received. The Mine Manager will not answer any additional questions concerning the team briefing statement. However, if you do not understand a term, it will be defined. The Manager will only respond to questions allowed by the rules while you are working the problem.

The fresh air base attendant and alternate will be assigned a location where they can study the team briefing information, mine information, and map. Only one attendant or alternate will be allowed to assist at the fresh air base. This fresh air base attendant can assist the team and communicate with them while they advance past the fresh air base using the wire communication system. He must maintain an accurate map indicating all initial information that the team relays to him. He may also assist the team by relaying information to the mine manager when required by the problem. He may also assist the team when they retreat to the fresh air base.

The fresh air base attendant and mine rescue team alternate are not allowed to speak to anyone during the working of the problem except their team members and the mine manager.

**GOOD LUCK!**

## **Team Instructions**

- Extinguish or seal any fires
- Account for the three (3) missing miners
- Bring any live miners to the surface
- Explore and map all accessible areas of the mine

## **Fresh Air Base Instructions**

- The fresh air base attendant and alternate will be assigned a location where they can study the team briefing information, mine information, and map.
- Only one attendant or alternate will be allowed to assist at the fresh air base. This person can assist the team and answer any questions the team may ask. However, this person cannot physically assist the team beyond the fresh air base unless that person becomes an active team member in the event that someone drops out.
- The fresh air base attendant and mine rescue team alternate are not allowed to speak to anyone during the working of the problem except their team members and the mine manager.



## Problem Orientation

Introduce yourself to the team as the “Mine Manager.” Then, introduce the #1, and #2 Judges to the team. **Note: The team has been briefed on the problem and the mine information, and been provided with the mine maps in isolation.**

Read the following instructions to the team:

**At this time, I have no new information to report to you. I cannot answer any questions concerning the team briefing statement. I can, however, define any term that the team did not understand. During the working of the problem, I will answer any question that you may have; however, by problem design, my response may be limited in scope.**

**The fresh air base attendant or mine rescue team alternate will be required to locate at a designated area where he/she can study the map and team briefing information. He/she can assist the team and answer any questions that the team may ask. Only one attendant or alternate will be allowed to assist at the fresh air base. He/she cannot physically go beyond the fresh air base to assist the team unless he/she becomes a team member when someone drops out.**

**CAUTION** - the fresh air base attendant or mine rescue team alternate is not allowed to communicate with anyone except the team members, the mine manager, or the judging officials.

**At the end of the problem, both the team map and the fresh air base attendant’s map will be collected and scored. All map editing must take place prior to stopping the clock.**

Ask if they understand these instructions?

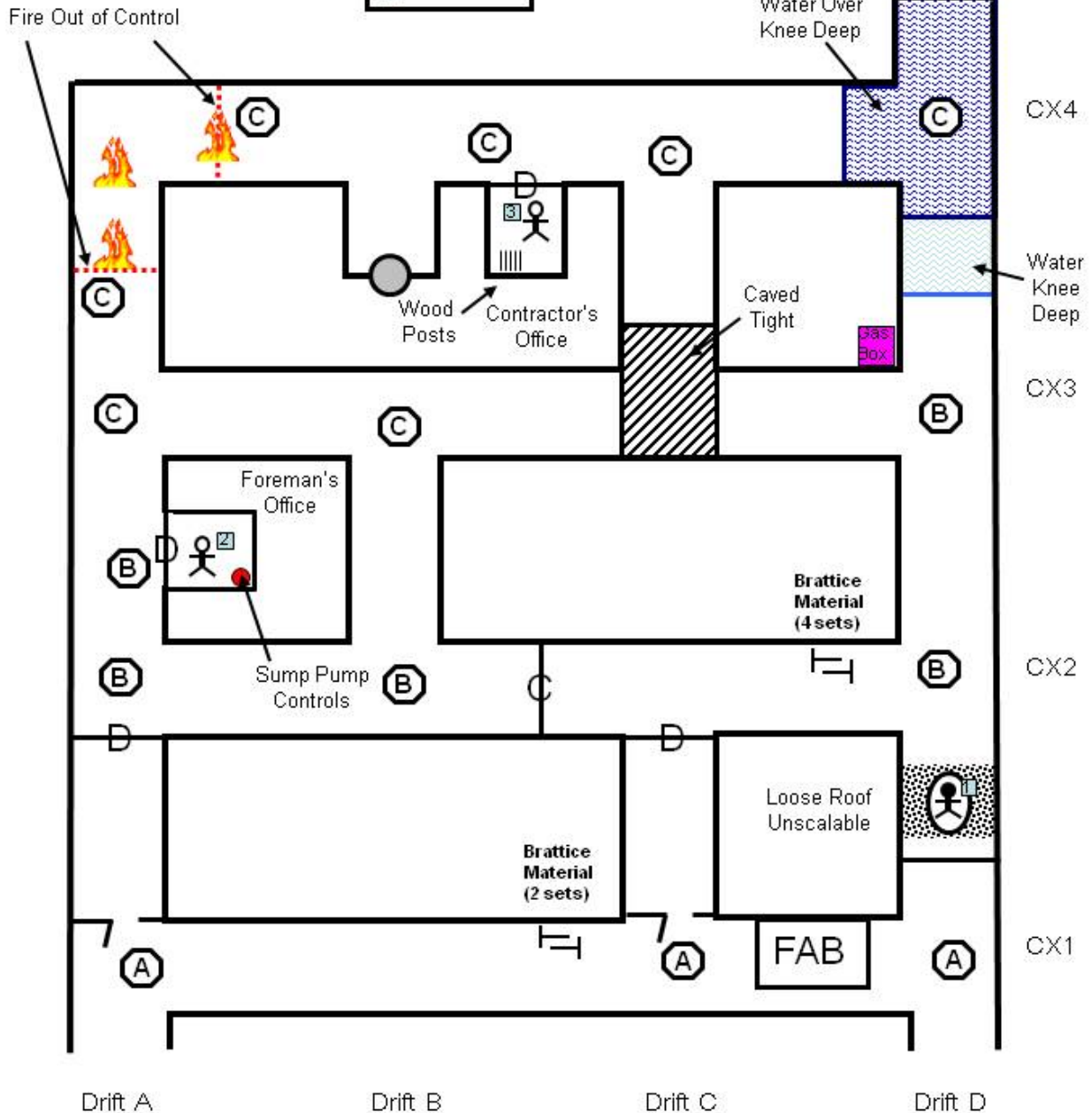
**When they verify understanding the instructions, have the Team Captain start the clock and hand the team the Team Briefing Information, the Mine Information Sheets, and the Mine Maps. Remember to add: “Good Luck!”**

# Problem Map



**Missing Miners:**

- 1 Miner #1
- 2 Miner #2
- 3 Miner #3



**Gas Placards:**

<b>(A)</b>	<b>(B)</b>	<b>(C)</b>
Clear Air	Light Smoke CO = 1,900 ppm O <sub>2</sub> = 15.5 %	Heavy Smoke CO = 5,000 ppm O <sub>2</sub> = 14.0 %

## Problem Solution

### **DISCLAIMER:**

**There are many ways to successfully solve this problem. The following outlines one possible way for use during MSHA field judges' training.**

Each team will receive a briefing prior to arriving at the fresh air base, including an identical videotaped version for all teams; and the team briefing statement, mine information sheet, mine maps, and instructions for rescue teams and fresh air base attendants.

Upon arrival at the fresh air base, the team will meet the Mine Manager and will be introduced to the judges. The Mine Manager will read the Problem Orientation and update the team with any information obtained since their briefing. Questions will be answered only as required by the rules or to explain the meaning of a term.

When the team verifies that they understand the instructions, the captain immediately starts the official clock. He writes the month, day, year, and the team position number on the sign-in board.

After receiving the information from the Mine Manager, the team may discuss the conditions presented by the problem and the map. The team is not required to check their equipment again. These equipment checks were conducted prior to reporting to the field, and the team is fully equipped, physically fit, and ready to go. However, deficiencies with the team's equipment, identified by the judges during the working of the problem, should be discounted appropriately. Since the mine is a Category VI and methane hasn't been encountered in the mine, the team does not need to use non-sparking tools to work the problem. However, if the team does not have non-sparking tools and requests them from the official in charge, the tools that they brought with them will be deemed non-sparking.

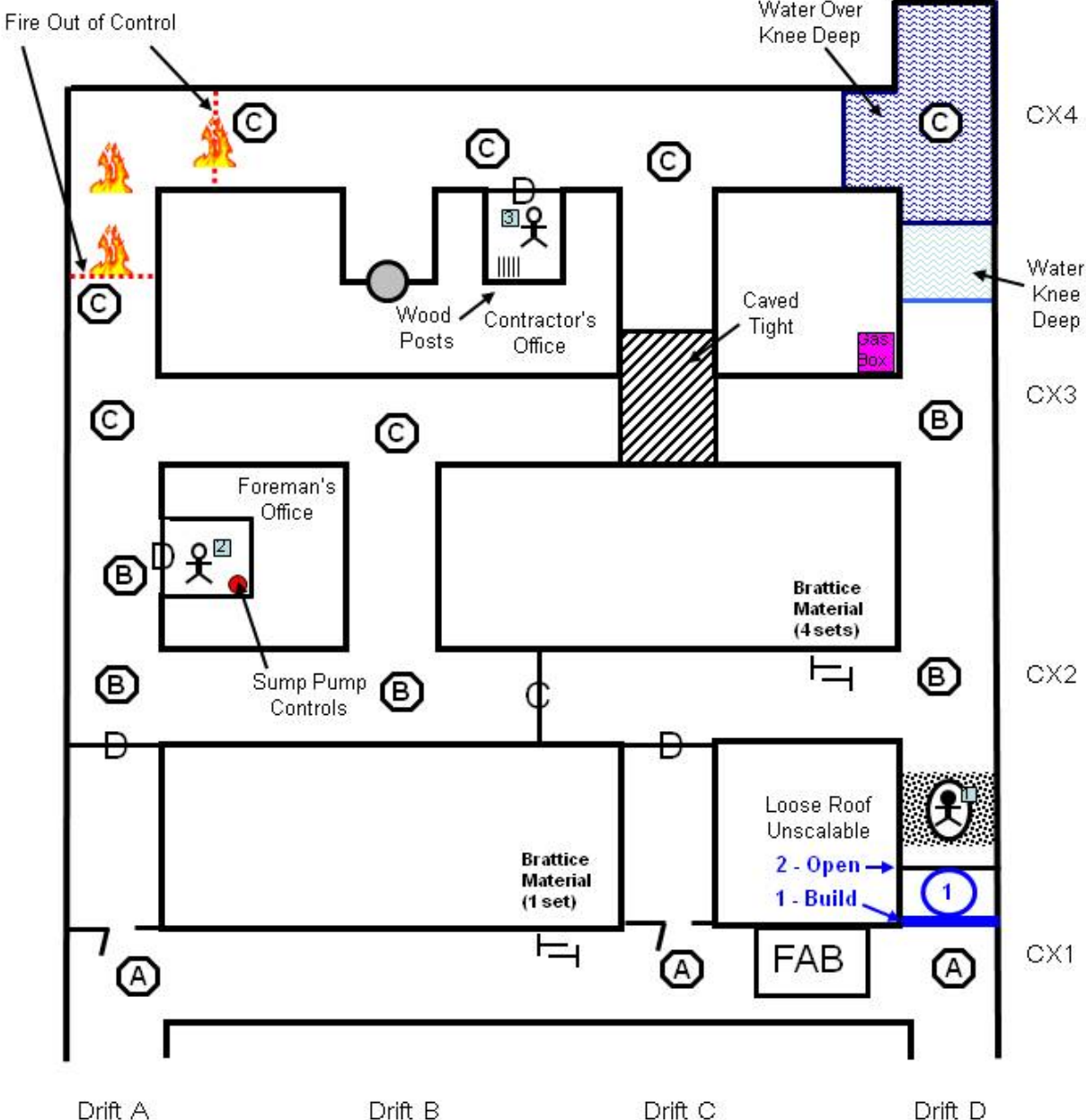
When ready, the team must examine all openings along the prior mine rescue team's furthest point of advance.

**Note:** Entrances to all mine openings shall be examined while under oxygen. In air clear of smoke, these checks may be made without a lifeline, provided the entire team does not go into the entrance. This examination should not cover more than twenty-five (25) feet.

**Drift A checks reveal:** A placard at the drift shows Clear Air. The southern airlock door is open and the northern airlock door is closed.

**Drift C checks reveal:** A placard at the drift shows Clear Air. The southern airlock door is open and the northern airlock door is closed.

# Solution Map - 1



**1** = Team Stop

**Drift D checks reveal:** A placard at the drift shows Clear Air. The drift to the North is blocked by a temporary stopping which had been erected by the previous mine rescue team.

**Note:** After advancing not more than fifty (50) feet from the fresh air base, the captain must give a signal for the team to stop. At this team stop, all team members and their apparatus must be checked. After the first 50 feet apparatus check, the team is required to conduct apparatus examinations not exceeding 20-minute intervals while working the problem. Additionally, apparatus removed in order to enter a confined area or apparatus that has sustained possible damage from impact must be checked before continuing.

**Note: Team Stop No. 1 (see SOLUTION MAP - 1)**

### **TEAM STOP NO. 1**

The team elects to proceed northward in Drift D. After erecting a temporary stopping outby the one built by the previous mine rescue team to form an airlock, they can tear down the existing stopping. They will find that they cannot proceed to the north due to loose unscalable back stretching rib-to-rib. The captain must warn the team members to avoid the hazard. Underneath the loose back, the team will see the first missing miner (Miner #1). From his location under dangerous back, there is no way for the team to rescue him or assess his condition.

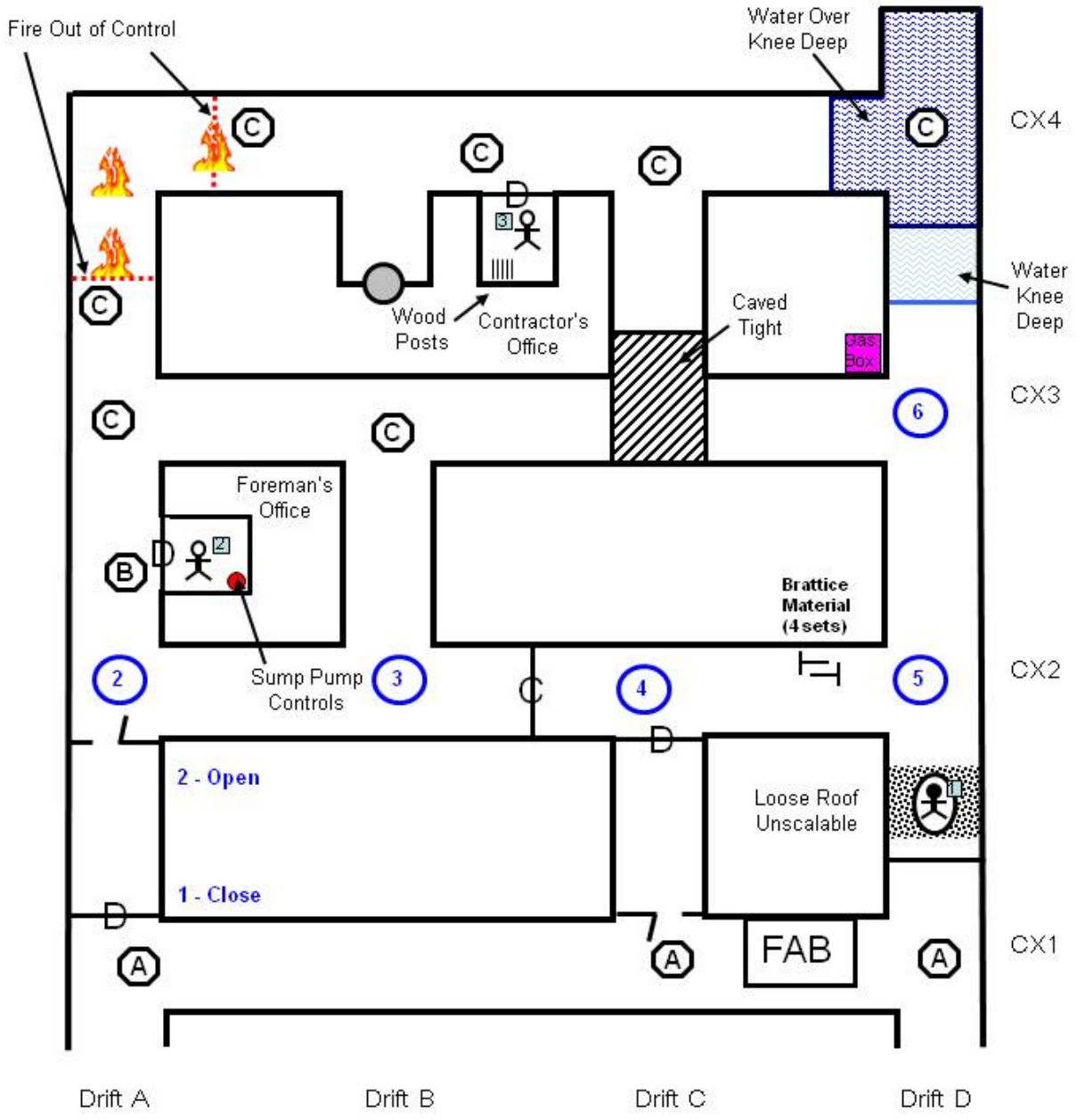
At this point in the problem, they have not found any posts to support the area. If the team requests posts from the mine manager, they will be told that all needed materials are located in the mine; however, there is an additional supply shipment on the way which should arrive at the mine in about two hours.

The team must rebuild the original temporary stopping to keep from making a ventilation change as they retreat to Crosscut 1 (designated as CX1 on the Team and Fresh Air Base maps).

**Note:** During the remainder of the rescue mission, the team must remember to protect this miner from further harm. That is, during any ventilation change, no additional concentrations of toxic gases can be directed through the area of loose back.

**Note:** No physical comparison of the fresh air base map and team map will be allowed after the initial entry into the mine. No changes can be made to either map while the team is at the fresh air base or out of the mine.

# Solution Map - 2



1 = Team Stop

**Note: Team Stop Nos. 2 - 6 (see SOLUTION MAP - 2)**

### **TEAM STOP NO. 2**

The team can now advance northward in Drift A. To proceed to CX2, the team must travel through the airlock erected by the previous mine rescue team. In order to prevent an air change, they must first close the southernmost door before opening the northern door. At the intersection with CX2, the captain performs roof or back checks, and the team will conduct necessary gas checks. They will find 15.5 percent (%) oxygen (O<sub>2</sub>), 1,900 ppm carbon monoxide (CO), and light smoke. Both the drift to the north and the crosscut to the east are open.

**Note:** The team must perform an apparatus and personnel check before entering smoke at this location.

### **TEAM STOP NO. 3**

The team can now advance eastward in CX2 toward Drift B. At the intersection, the captain performs roof or back checks, and the team will conduct necessary gas checks. They will find the gas concentrations have not changed from their previous location. Both the drift to the north and the crosscut to the east are open.

### **TEAM STOP NO. 4**

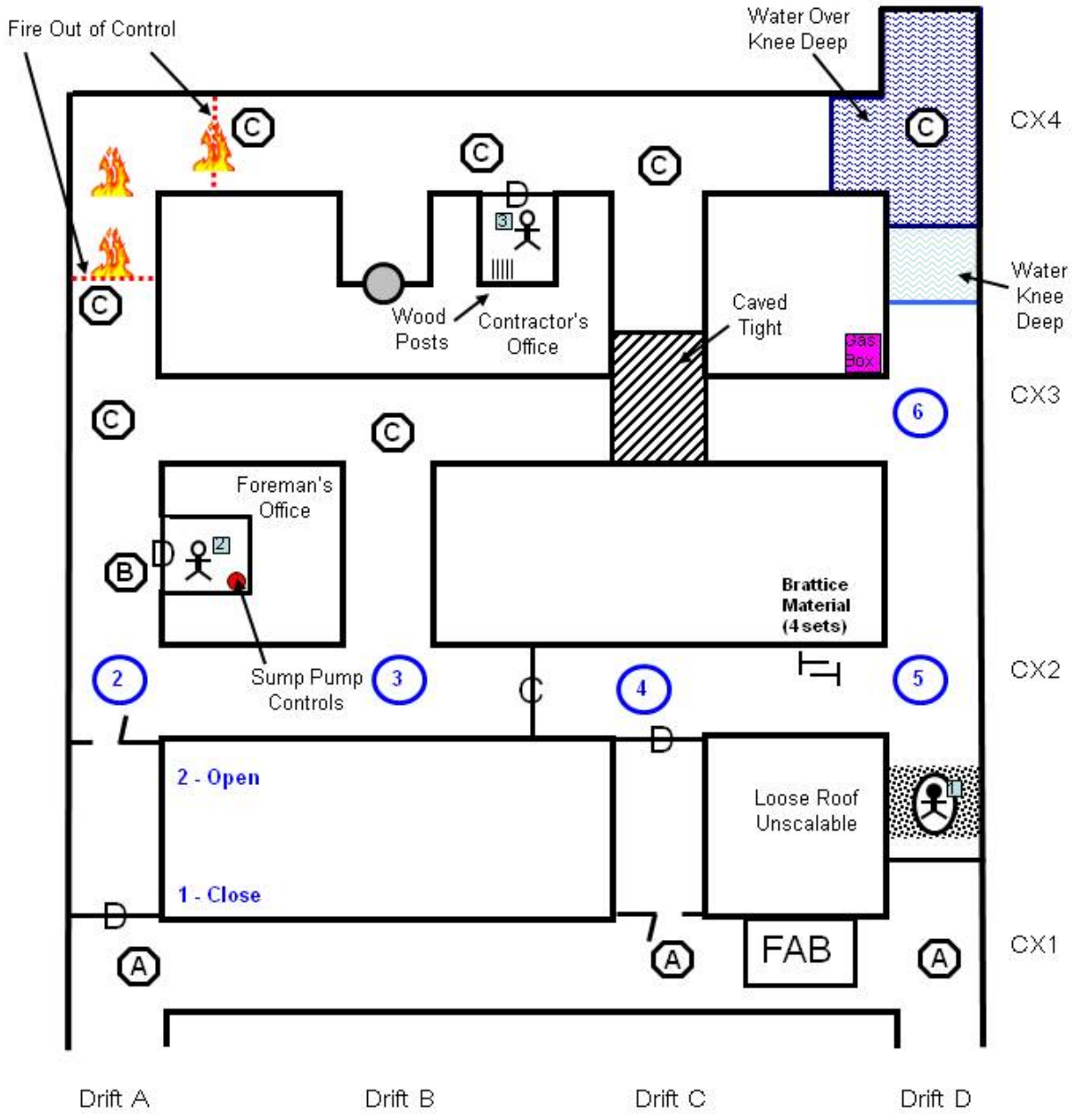
The team can continue to advance eastward in CX2 through the existing check curtain toward Drift C. At the intersection, the captain performs roof or back checks, and the team will conduct necessary gas checks. Again, gas concentrations have not changed from their previous location (CO = 1,900 ppm and O<sub>2</sub> = 15.5% with light smoke). The airlock door to the south is intact, and the captain must D&I it as their furthest point of advance in this direction.

### **TEAM STOP NO. 5**

The team can now advance eastward in CX2 toward Drift D. As they travel, they will find four sets of brattice material along the northern rib in the crosscut. The team may elect to carry some of the materials with them for future use. At the intersection, the captain performs roof or back checks, and the team will conduct necessary gas checks. They will find the gas concentrations have not changed from their previous location.

In order to tie-in, the team can stretch southward in the drift. About 5 feet from the intersection, the team will find the northern most extent of the loose unscalable back stretching rib-to-rib. The captain must warn the other team members to avoid the hazard. Again, they will see Miner #1. Since posts are not available, the area and the miner must be left behind. The captain must D&I the area of loose back as their furthest

# Solution Map - 2



1 = Team Stop



point of advance in this direction.

### **TEAM STOP NO. 6**

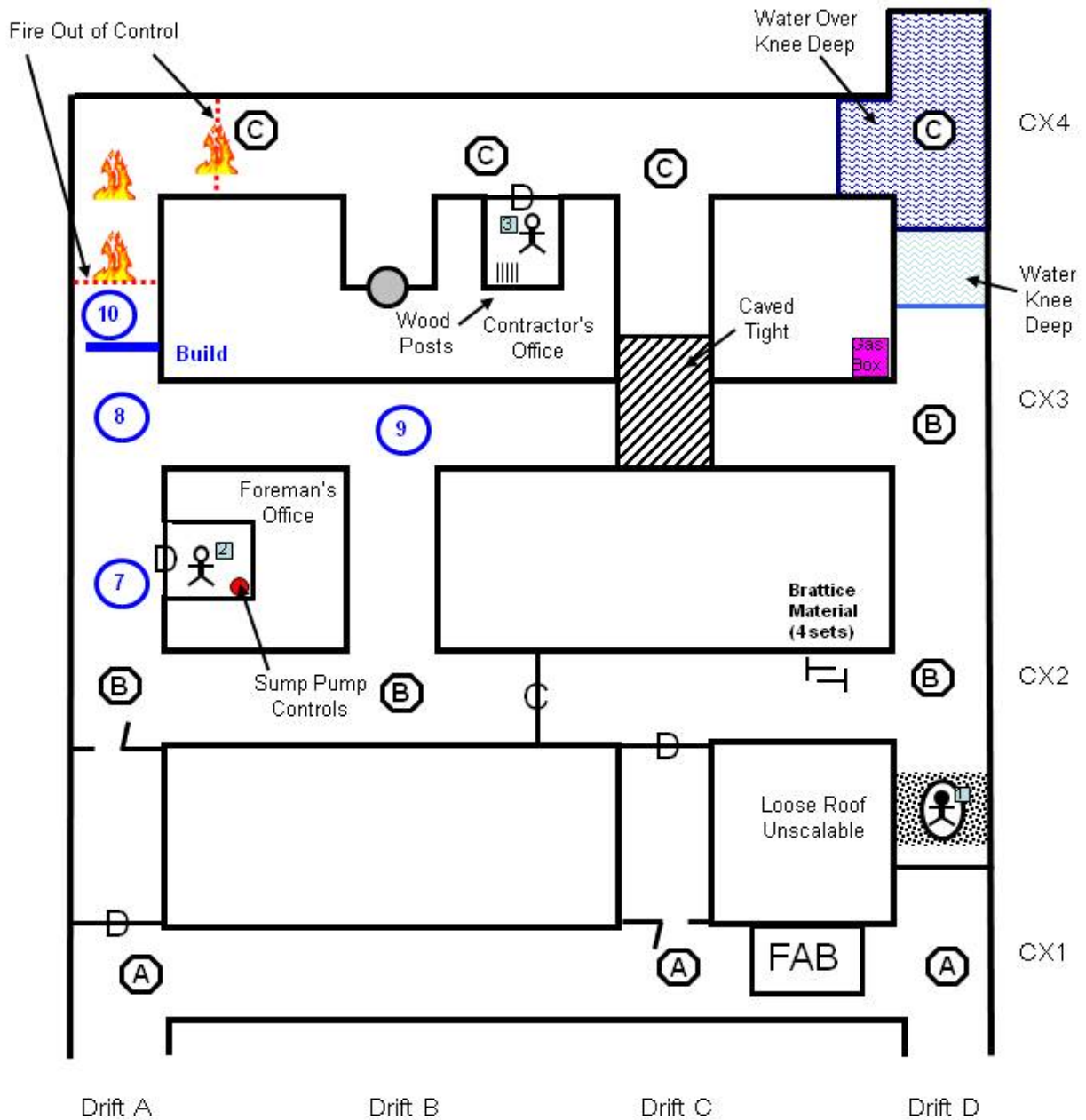
After retreating to CX2, the team can advance northward in the drift toward CX3. At the intersection, the captain performs roof or back checks, and the team will conduct necessary gas checks. Again, gas concentrations have not changed from their previous location (CO = 1,900 ppm and O<sub>2</sub> = 15.5% with light smoke).

**The team will find the gas testing box on the southeast corner of the pillar near CX3 and Drift D. A team member must use the team's multi-gas instrument to determine the gas concentrations in the unknown mixture. Judge No. 2 will assess the team's measurements and, if warranted, apply appropriate discounts (Judge 2 – UG Rule #4).**

Afterward, as the team attempts to travel westward in CX3, they will find an airtight cave (caved tight rib-to-rib) blocking access to the intersection with Drift B. After making roof or back checks and taking gas tests, the captain must D&I this furthest point of advance (at the cave).

As the team attempts to travel northward in Drift D, they will travel through an area of water knee deep. However, about 3 feet from the intersection with CX4, they will find a placard indicating that the water level has changed to "over knee deep." Since this new depth extends rib-to-rib, the team cannot travel further in the drift and must retreat from the area. The captain must D&I this area as their furthest point of advance in this direction.

# Solution Map - 3



1 = Team Stop

**Note: Team Stop Nos. 7 - 10 (see SOLUTION MAP - 3)**

### **TEAM STOP NO. 7**

Now that the team has explored Drift D as far as possible, they must continue to explore systematically and tie-in the other drifts and crosscuts. In order to do this, they can retreat to the intersection of Drift A and CX2. Once there, they can advance northward in the drift. Along the eastern rib, they will find the foreman's office with its door closed.

The team must examine the roof, test for gases, and D&I the door. Gas tests in the area show that there is light smoke with 1,900 ppm CO and 15.5% O<sub>2</sub>.

There is a response from inside. The team can converse with the second missing miner (Miner #2). He is alone and feeling a bit light headed. The air inside the office is O.K., ground conditions are good, and there are no openings to any other entry or crosscut.

**The team cannot open the door because of the dangerous gas concentrations in the vicinity.** The team will instruct Miner #2 to stay inside the office and wait. They will return and get him out as soon as possible.

### **TEAM STOP NO. 8**

The team must advance northward in Drift A to CX3. At the intersection, the captain performs roof or back checks, and the team will conduct necessary gas checks. They will find heavy smoke with 5,000 ppm CO and 14.0% O<sub>2</sub>. The drift to the north and the crosscut to the east are open.

### **TEAM STOP NO. 9**

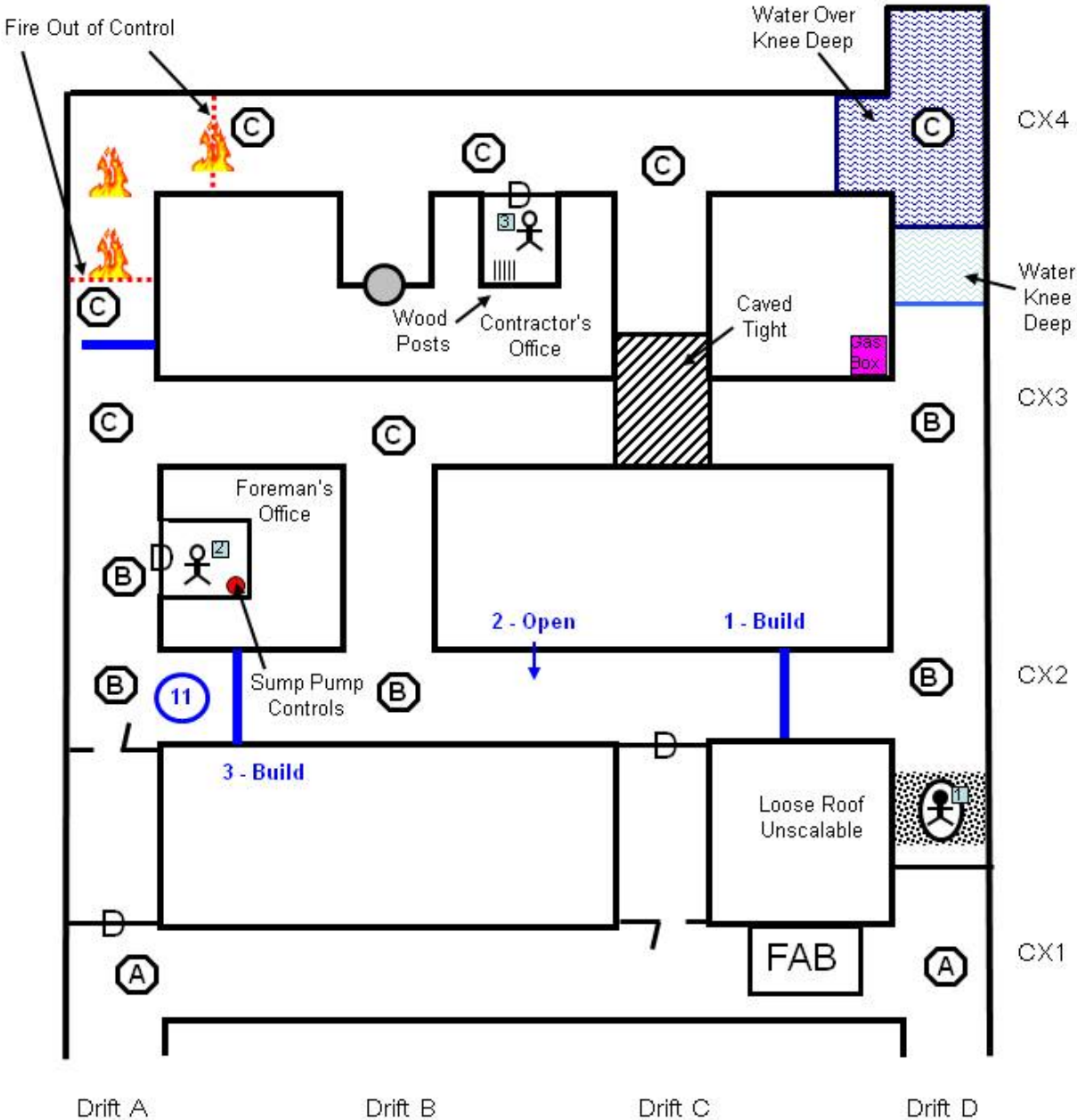
The team will then advance eastward in CX3 to the intersection with Drift B. The captain performs roof or back checks, and the team will conduct necessary gas checks. Gas concentrations have not changed from their previous location.

To tie-in, the team will stretch southward in Drift B to CX2. They will not find anything in this drift. Then, the team will stretch eastward in CX3 toward Drift C. They will find the western extent of the airtight cave (caved tight rib-to-rib) blocking access to the intersection with Drift C. After making roof or back checks and taking gas tests, the captain must D&I this furthest point of advance (at the cave).

### **TEAM STOP NO. 10**

Retreating to the intersection of Drift A and CX3, the team can now advance northward in the drift. About 10 feet in by the intersection, the team will encounter a "fire out of control." By definition, the fire cannot be extinguished. The captain must D&I the location of the "fire". As the captain performs roof or back checks, the team will conduct necessary gas checks. They will find 14.0 % O<sub>2</sub>, 5,000 ppm CO, and heavy smoke.

# Solution Map - 4



The team must erect a fire seal leaving an opening for a regulator to restrict the air flow to the fire and prevent its further advance. (**Note:** Regulating airflow to control a fire is not considered a ventilation change.) **Now, without undue delay, the team must find all other approaches to the fire.**

**Note: Team Stop No. 11 (see SOLUTION MAP - 4)**

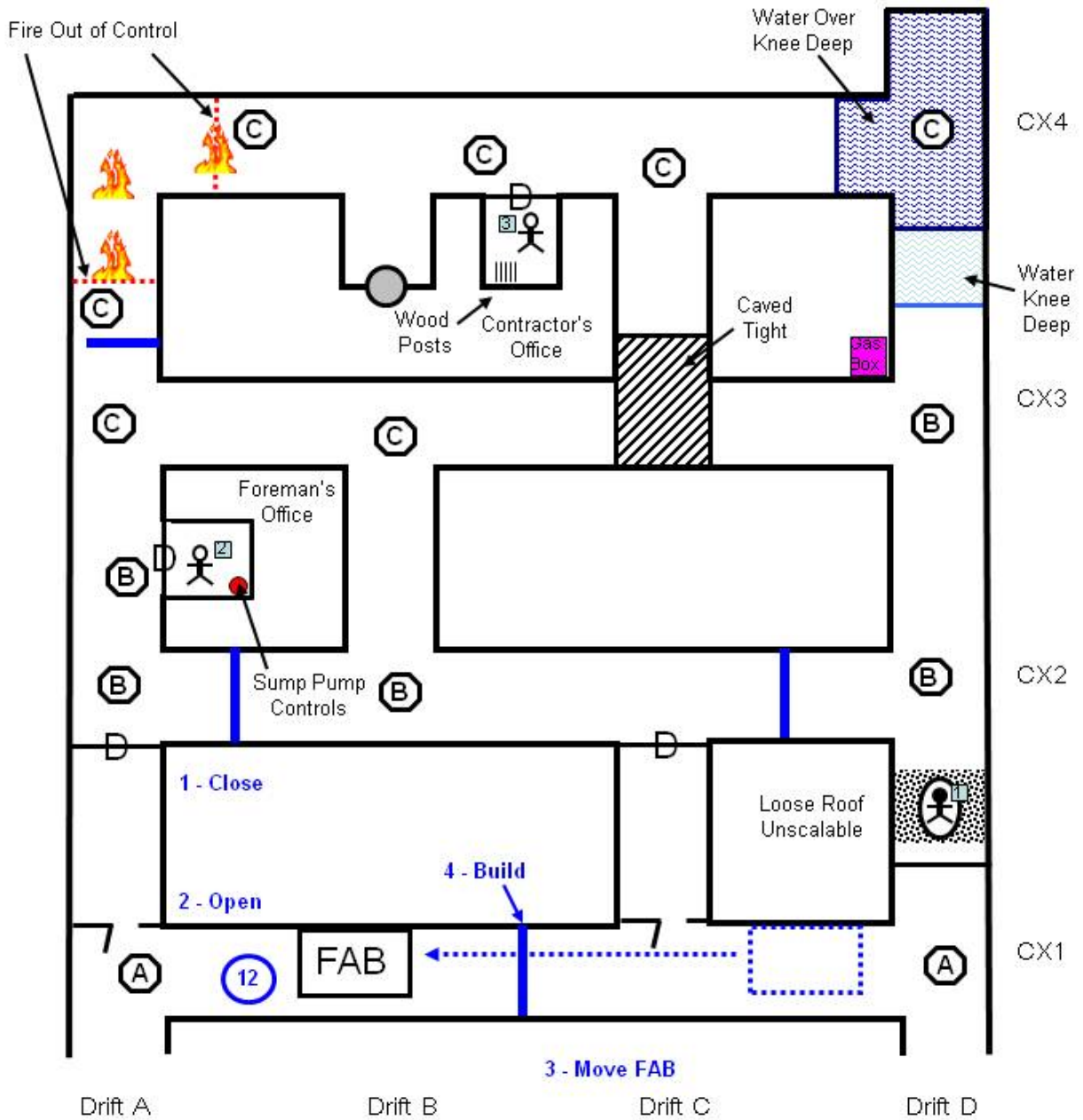
### **TEAM STOP NO. 11**

At this point, the team has explored all areas that could be accessed safely. The only way to explore CX4 in its entirety is to pump the water from Drift D. In order to do this, a ventilation change must be made to move the high concentrations of CO from the mine, including the area directly in front of the foreman's office. Now, the team must propose to ventilate the mine with fresh air to remove toxic gas concentrations, so that this area can be safely entered and the sump pump controls can be accessed. The team must confer with the mine manager through their fresh air base coordinator by using the communication line, or by returning to the surface. In either case, they must explain the necessary ventilation changes prior to implementing them. They outline the following changes to the mine manager:

- 1) Construct a stopping in CX2 between Drifts C and D;
- 2) Open the check curtain in CX2 between Drifts B and C; and
- 3) Construct a stopping in CX2 between Drifts A and B.

Once these changes are made, additional measures will need to be taken before fresh air is introduced to the panel inby CX1. These are addressed in the following team stop.

# Solution Map - 5



**1** = Team Stop

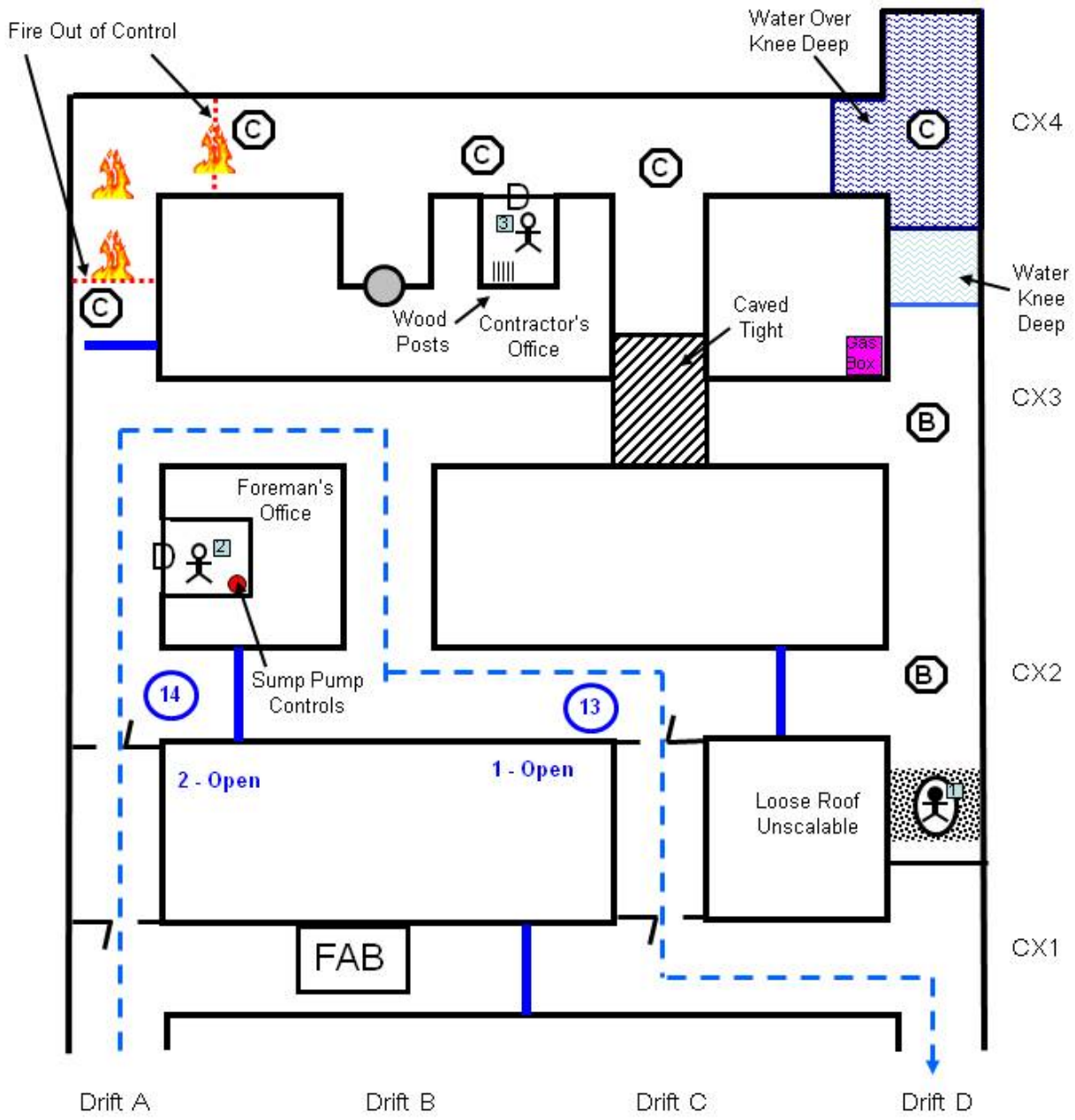
**Note: Team Stop No. 12 (see SOLUTION MAP - 5)**

**TEAM STOP NO. 12**

Now that the preparatory changes in CX2 have been made, the team must return to CX1 and make these additional changes to isolate the fresh air base from possible contamination.

- 1) Close the northernmost air lock door in Drift A;
- 2) Open the southern air lock door in Drift A;
- 3) Move the fresh air base from CX1 between Drifts C and D to CX1 between Drifts A and B; and
- 4) Build a stopping in CX1 between Drifts B and C.

# Solution Map – 6 (Ventilation Change)



1 = Team Stop



**Note: Team Stops No. 13 and 14 (see SOLUTION MAP – 6 (Ventilation Change))**

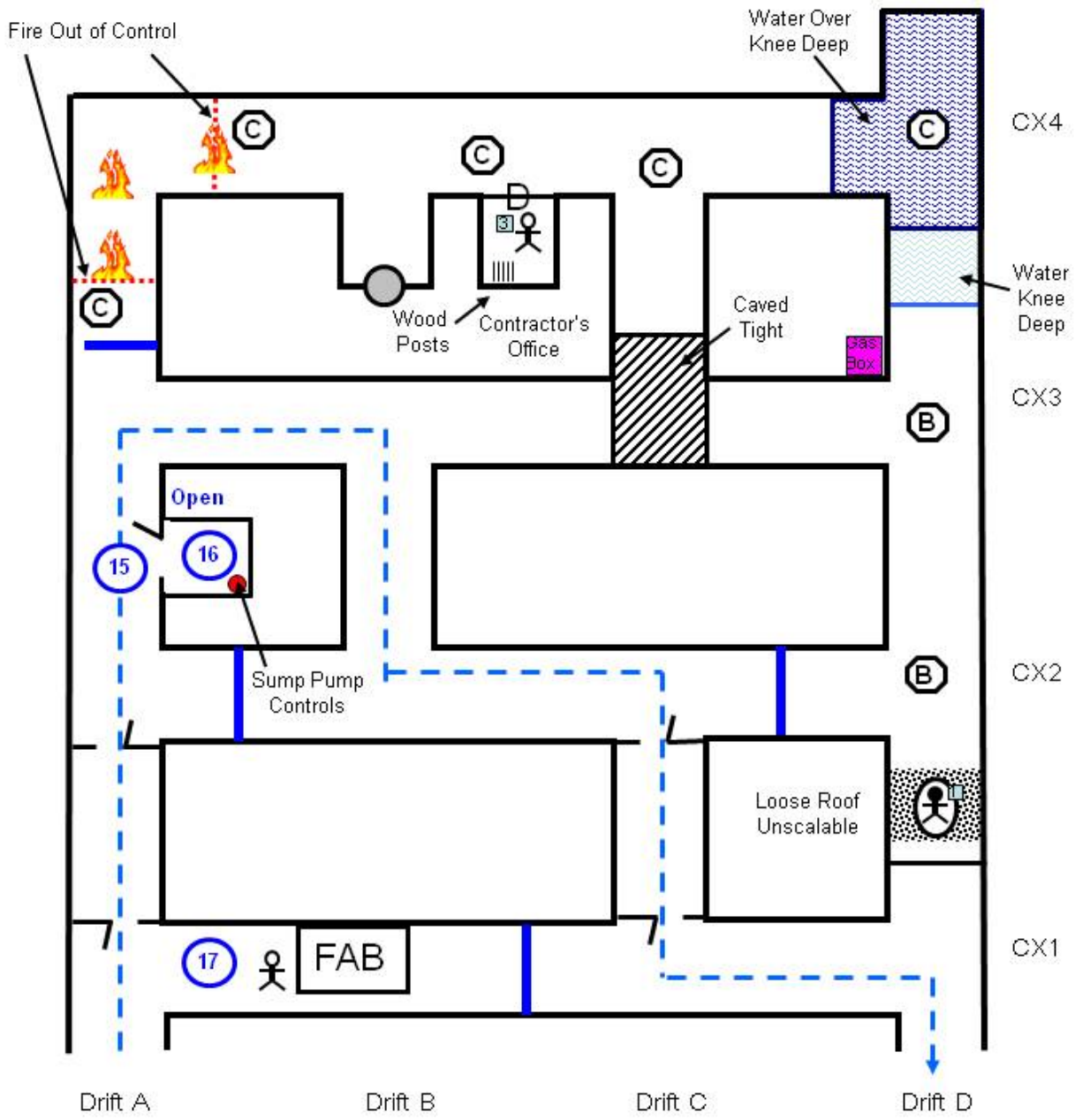
**TEAM STOP NO. 13**

To start the flow of fresh air, the team must open the northern most air lock door in Drift C and then travel inby to the intersection of CX2 and Drift A.

**TEAM STOP NO. 14**

Once at the intersection, the team can open the northern most air lock door in Drift A. At that time, fresh air will begin to flow: northward in Drift A to CX3; eastward in CX3 to Drift B; southward in Drift B to CX2; eastward in CX2 toward Drift C; southward in Drift C to CX1; eastward in CX1 toward Drift D; and southward in Drift D toward the mouth of the panel. The gas concentrations along this route will quickly dissipate and the placards will revert to Clear Air.

# Solution Map - 7



1 = Team Stop

**Note: Team Stops No. 15 - 17 (see SOLUTION MAP - 7)**

**TEAM STOP NO. 15**

As the gas concentrations are swept from the mine, the team can return to the foreman's office. A recheck of the gases in the vicinity of the office will show "clear air." Afterward, the team can open the door.

**TEAM STOP NO. 16**

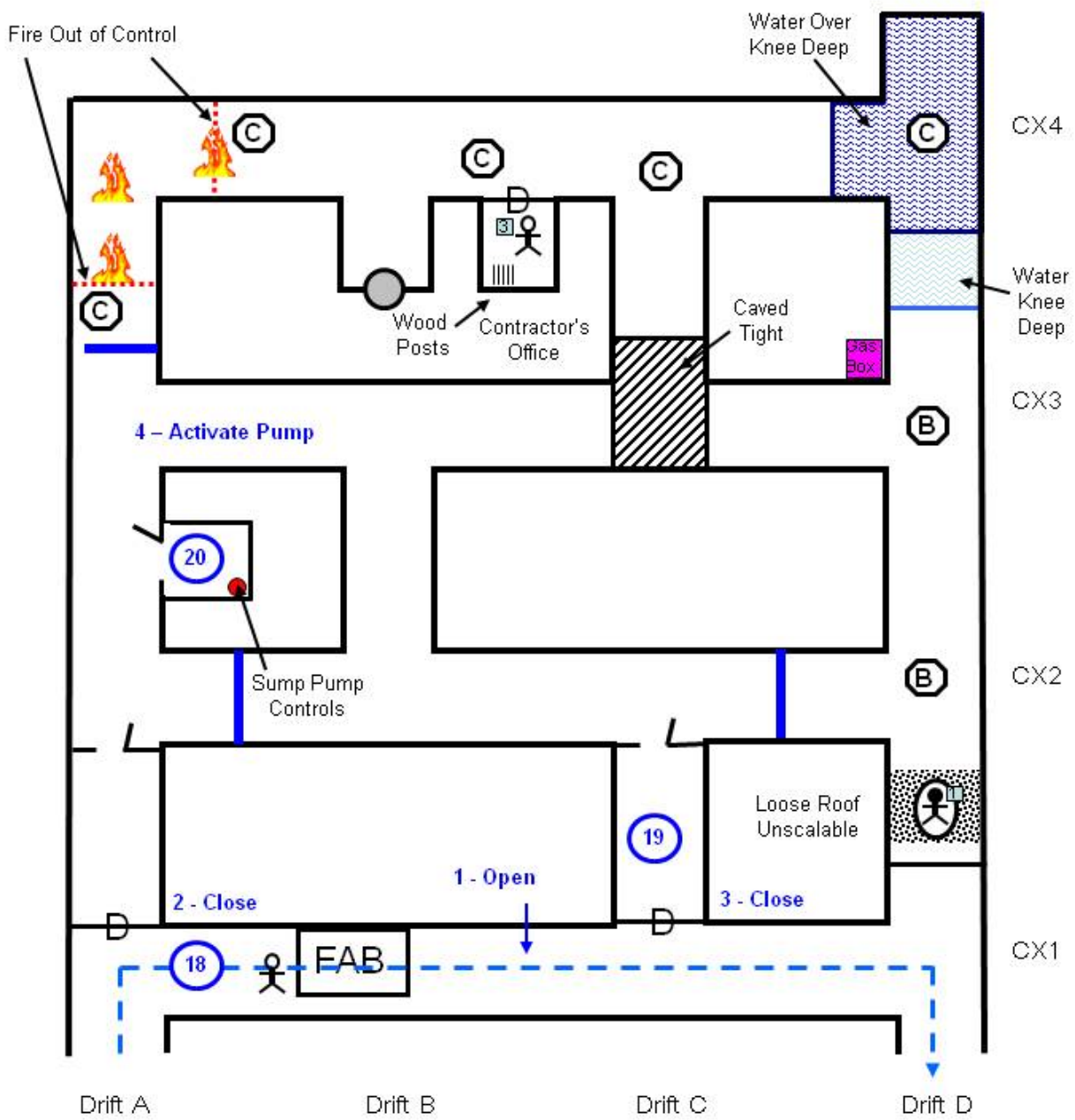
Inside the foreman's office, the team will find Miner #2. Team members can assess his condition and find that he is not injured and able to walk out with the team. Before leaving the area, gas tests must be taken inside the office, and the captain must D&I the face.

**TEAM STOP NO. 17**

The team will escort Miner #2 to the fresh air base. Once there, the team can arrange for any follow-up medical treatment.

**Note:** All areas that have been cleared of smoke or toxic or dangerous gases that the team elects to travel through must be gas tested at all openings along the route that they travel.

# Solution Map - 8



**Note: Team Stops No. 18 - 20 (see SOLUTION MAP - 8)**

### **TEAM STOP NO. 18**

Now that the foreman's office has been explored and the sump controls have been located, the team can take measures to start the pump and lower the water level in the northeast corner of the panel. In order to do this, the team must first short-circuit the airflow away from the panel. The following changes must be made:

- 1) Open the temporary stopping in CX1 between Drifts B and C;
- 2) Close the southernmost air lock door in Drift A; and
- 3) Enter the air lock in Drift C and close the southernmost air lock door.

By making these changes, the air will flow in CX1 from Drift A to Drift D and toward the mouth of the panel.

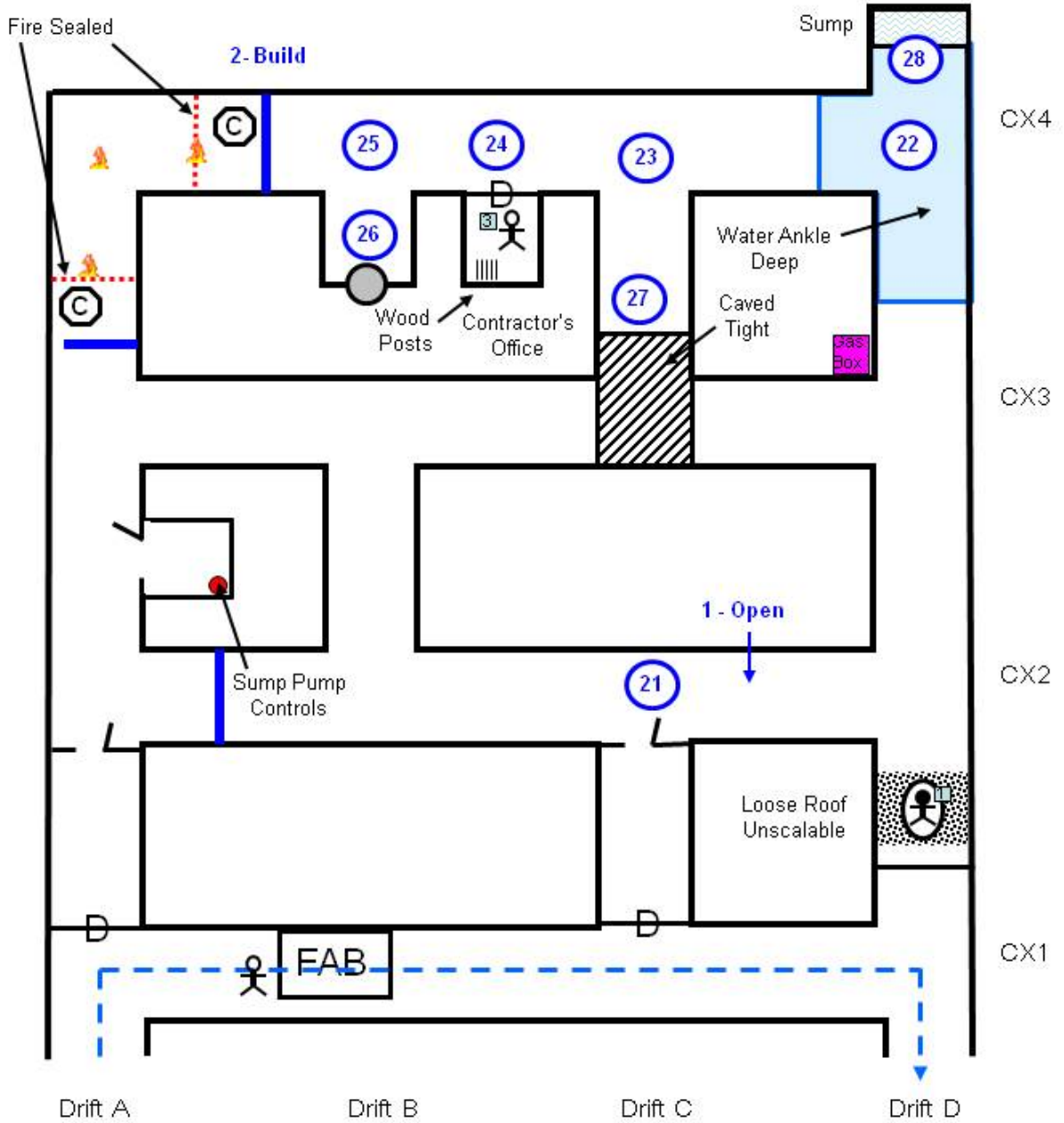
### **TEAM STOP NO. 19**

From the air lock, the team can advance inby to the foreman's office.

### **TEAM STOP NO. 20**

Once in the foreman's office, the team can activate the sump pump controls. Within minutes, the water level placards in Drift D and CX4 will revert to "water ankle deep." The team can now continue systematic exploration of the panel inby CX3. **Without undue delay, the team must find all other approaches to the fire.**

# Solution Map - 9



1 = Team Stop

**Note: Team Stops No. 21 - 28 (see SOLUTION MAP - 9)**

### **TEAM STOP NO. 21**

In order to return to Drift D and continue northward, the team must open the temporary stopping that they had erected earlier.

### **TEAM STOP NO. 22**

The team can now advance to the intersection of Drift D and CX3. Once there, the team can advance northward toward CX4. Along the way, they will find that the water levels have dropped and the placards now indicate “water ankle deep.” So, the team can continue advancing. At the intersection of Drift D and CX4, the captain performs roof or back checks and the team will conduct necessary gas checks. They will find heavy smoke with 5,000 ppm CO and 14.0% O<sub>2</sub>. The drift to the north and the crosscut to the west are open. **At this time, the team cannot advance or stretch northward in the face area of Drift D or it will be considered undue delay in trying to find all approaches to the fire.**

### **TEAM STOP NO. 23**

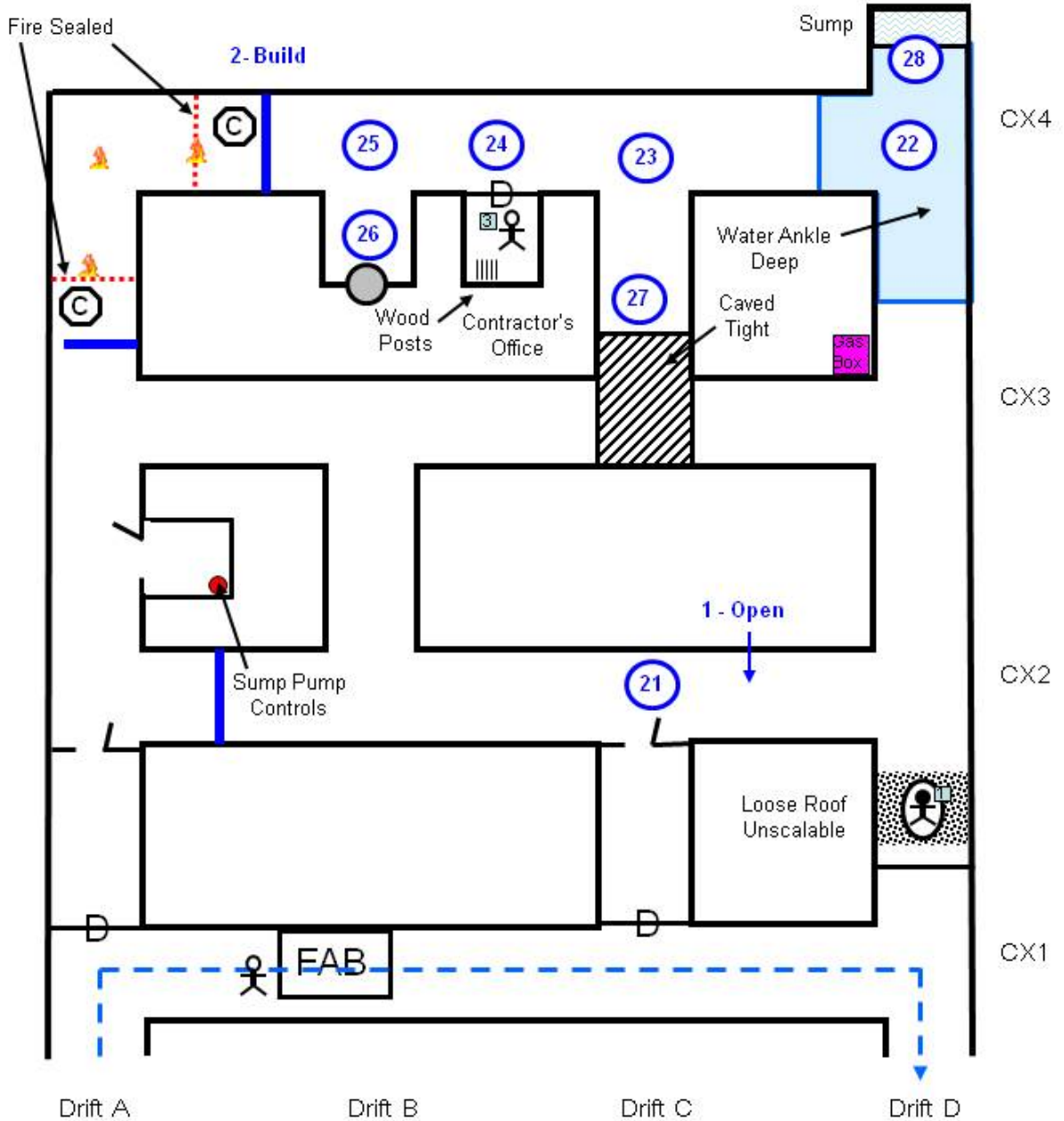
The team will advance westward in CX4 to Drift C. At the intersection, the captain will perform roof or back checks, and the team will conduct necessary gas checks. They will find that the gas concentrations have not changed from their last location. **At this time, the team cannot advance or stretch southward in Drift C, or it will be considered undue delay in trying to find all approaches to the fire.**

### **TEAM STOP NO. 24**

The team can travel westward in CX4 toward Drift B. Along the southern rib, they will find the contractor’s office with its door closed. The team must examine the roof, test for gases, and D&I the door. Gas tests in the area show that there is heavy smoke with 5,000 ppm CO and 14.0% O<sub>2</sub>.

There is a response from inside. The team can converse with the third missing miner (Miner #3). He is alone and feeling a bit light headed. The air inside the office is O.K., ground conditions are good, and there are no openings to any other entry or crosscut. **The team cannot open the door because of the dangerous gas concentrations in the vicinity.** The team will instruct Miner #3 to stay inside the office and wait. They will return and get him out as soon as possible.

# Solution Map - 9



1 = Team Stop



## **TEAM STOP NO. 25**

At the intersection of CX4 and Drift B, the captain will perform roof or back checks, and the team will conduct necessary gas checks. They will find that the gas concentrations have not changed from their last location. **At this time, the team cannot advance or stretch southward in Drift B, or it will be considered undue delay in trying to find all approaches to the fire.**

The team can continue westward and find the last approach to the “fire out of control.” The captain must D&I the location of the “fire”. As the captain performs roof or back checks, the team will conduct necessary gas checks. They will find 14.0 % O<sub>2</sub>, 5,000 ppm CO, and heavy smoke. The team must erect a fire seal. **At this point, all approaches to the fire have been found, and the fire is contained to the northwest corner of the panel.**

## **TEAM STOP NO. 26**

Now that the fire has been contained, the team can complete systematic exploration of the mine. At the intersection of CX4 and Drift B, the team can stretch southward toward the Ventilation Shaft to tie-in. The team captain should warn the team members to stay clear of this opening to avoid any falling object hazards from the levels above. The team must examine the roof, test for gases, and the captain must D&I the Shaft as their furthest point of advance in this direction.

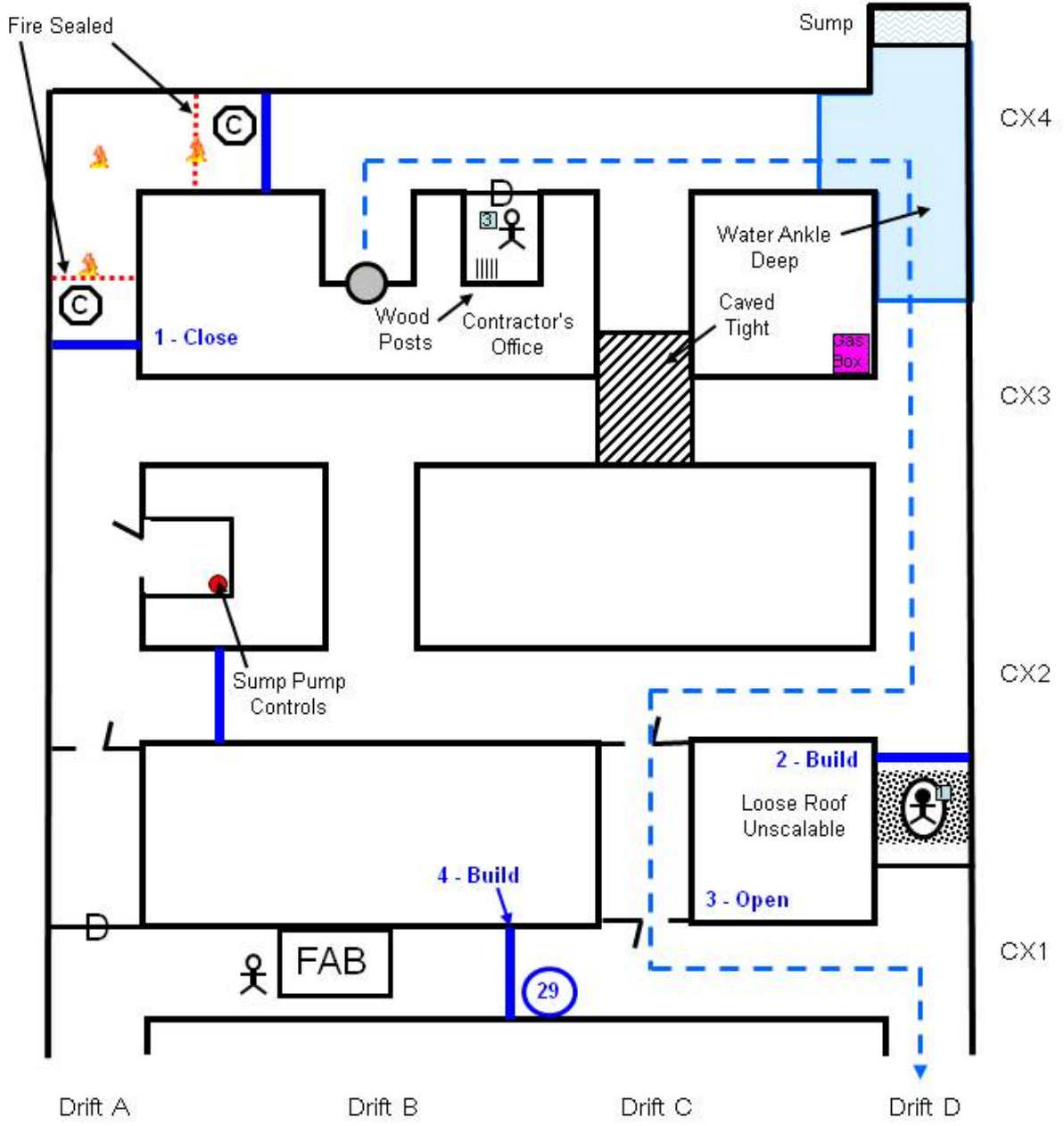
## **TEAM STOP NO. 27**

At the intersection of CX4 and Drift C, the team can stretch southward to tie-in. They will find the northern extent of the airtight cave (caved tight rib-to-rib) blocking access to the intersection with CX3. After making roof or back checks and taking gas tests, the captain must D&I this furthest point of advance (at the cave).

## **TEAM STOP NO. 28**

At the intersection of CX4 and Drift D, the team can stretch northward into the face area of Drift D to tie-in. They will find the sump stretching rib-to-rib and blocking access to the face. The captain should warn the others to stay clear of this hazard. After making roof or back checks and taking gas tests, the captain must D&I this furthest point of advance (at the sump).

# Solution Map – 10 (Ventilation Change)



1 = Team Stop

**Note: Team Stop No. 29 (see SOLUTION MAP – 10 (Ventilation Change))**

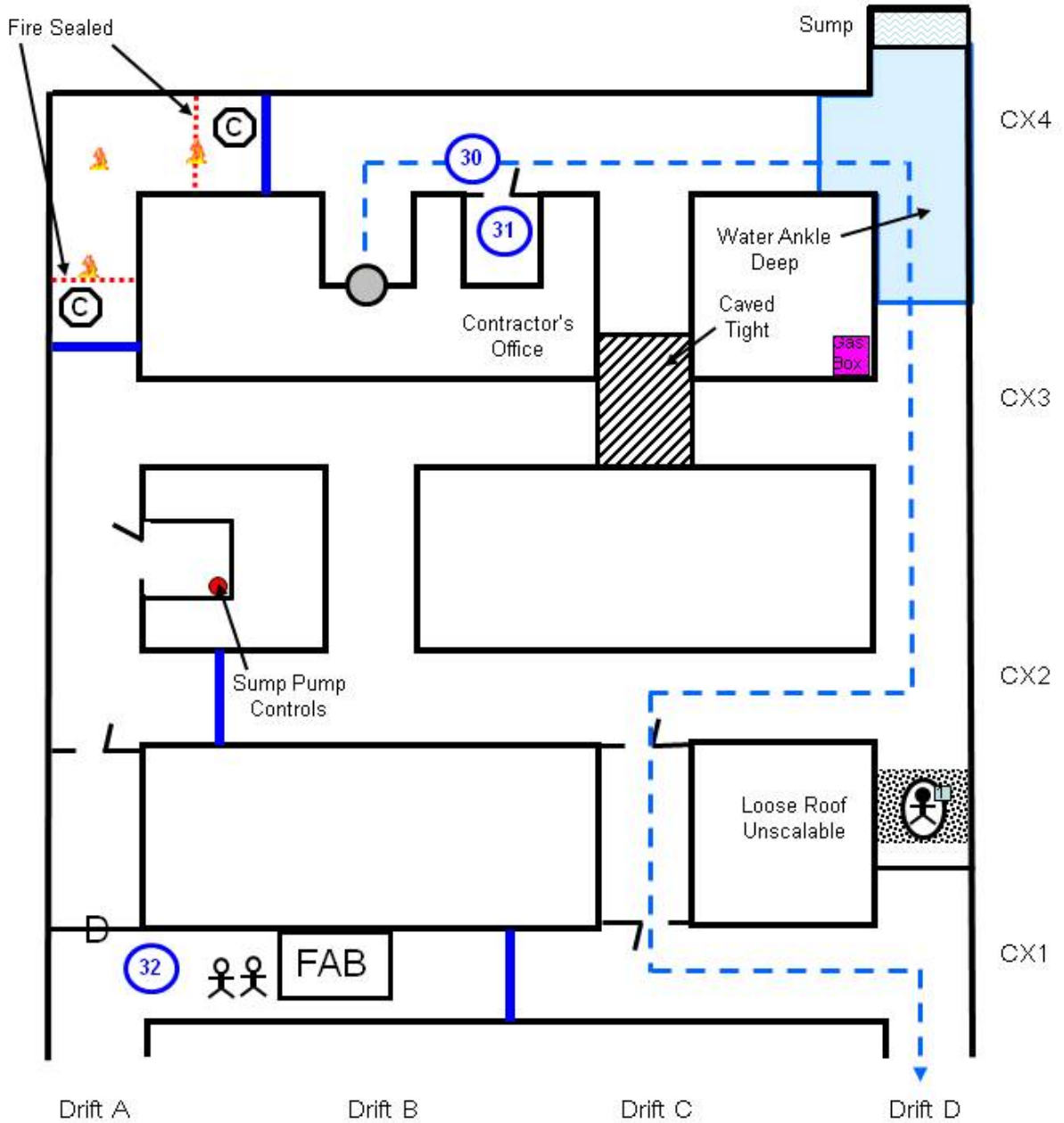
**TEAM STOP NO. 29**

Now all accessible areas of the mine have been explored. In order to rescue Miner #3 from the contractor's office, a second ventilation change is necessary to move the high concentrations of CO from the mine, including the area directly in front of the contractor's office. Now, the team must propose to ventilate the mine with fresh air to remove toxic gas concentrations, so that this area can be safely entered. The team must again confer with the mine manager through their fresh air base coordinator by using the communication line, or by returning to the surface. In either case, they must explain the necessary ventilation changes prior to implementing them. They outline the following changes to the mine manager:

- 1) Close the regulator in the southernmost fire seal;
- 2) Build a temporary stopping in Drift D just south of the intersection with CX2 (in order to protect miner laying under loose unscalable back);
- 3) Open southernmost air lock door in Drift C; and
- 4) Build temporary stopping in CX1 in between Drifts B and C.

Fresh air will travel: down the Ventilation Shaft; eastward in CX4 toward Drift D; southward in Drift D toward CX2; westward in CX2 to Drift C; through the open air lock toward CX1; eastward in CX1 toward Drift D; and southward in Drift D toward the mouth of the 2 West Panel. The gas concentrations along this route will quickly dissipate and the placards will revert to Clear Air.

# Solution Map - 11



1 = Team Stop

**Note: Team Stop Nos. 30 - 32 (see SOLUTION MAP – 11)**

**TEAM STOP NO. 30**

As the gas concentrations are swept from the mine, the team can return to the contractor's office. Afterward, they can open the door.

**TEAM STOP NO. 31**

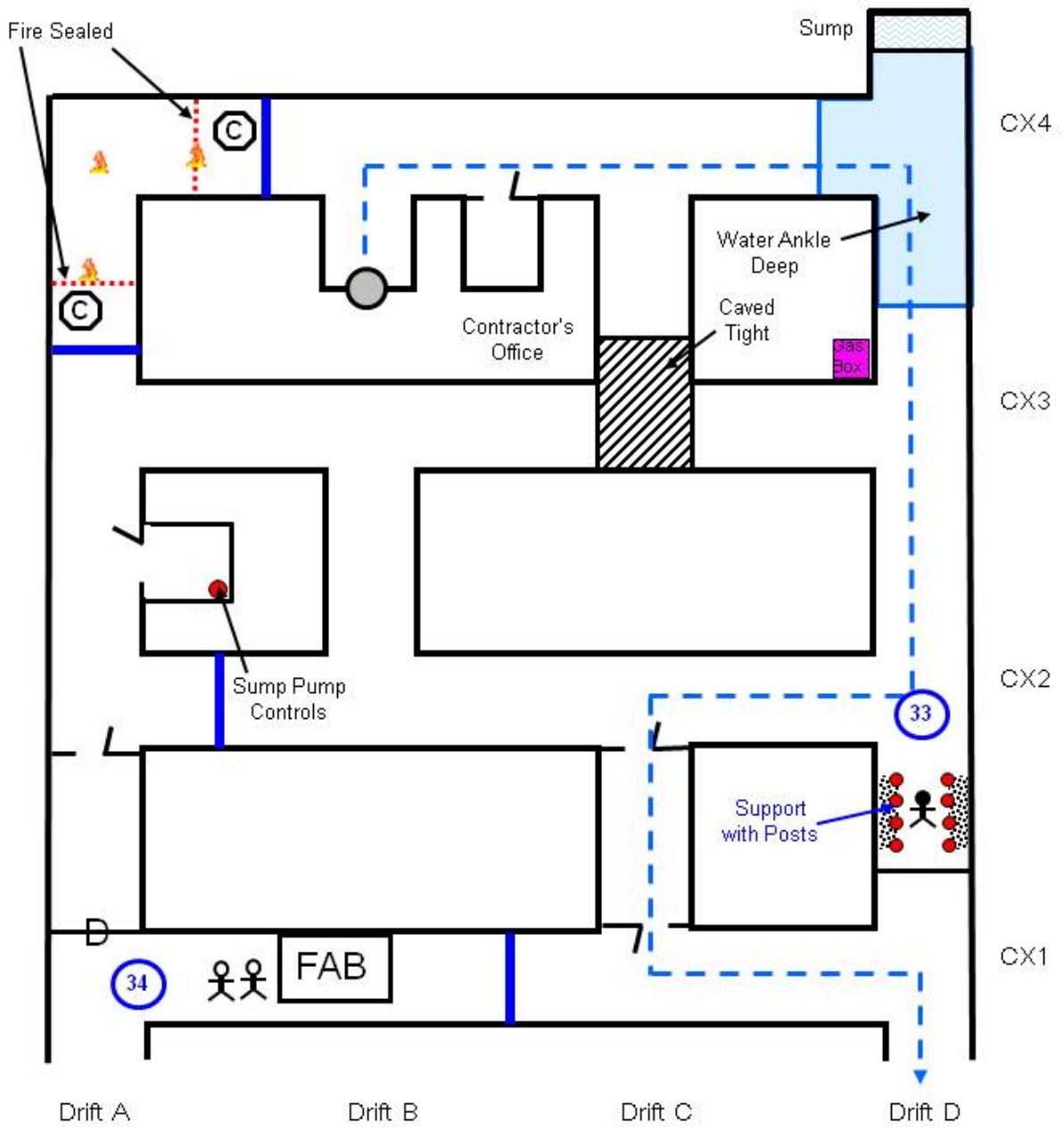
Inside they will find Miner #3. Team members can assess his condition and find that he is not injured and able to walk out with the team. Before leaving the area, gas tests must be taken inside the office and the captain must D&I the face. The team will also find ten wooden posts. They may take the posts with them for future use.

**TEAM STOP NO. 32**

The team will escort Miner #3 to the fresh air base. Once there, the team can arrange for any follow-up medical treatment.

**Note:** All areas that have been cleared of smoke or toxic or dangerous gases that the team elects to travel through must be gas tested at all openings along the route that they travel.

# Solution Map - 12



1 = Team Stop

**Note: Team Stop Nos. 33 - 34 (see SOLUTION MAP – 12)**

### **TEAM STOP NO. 33**

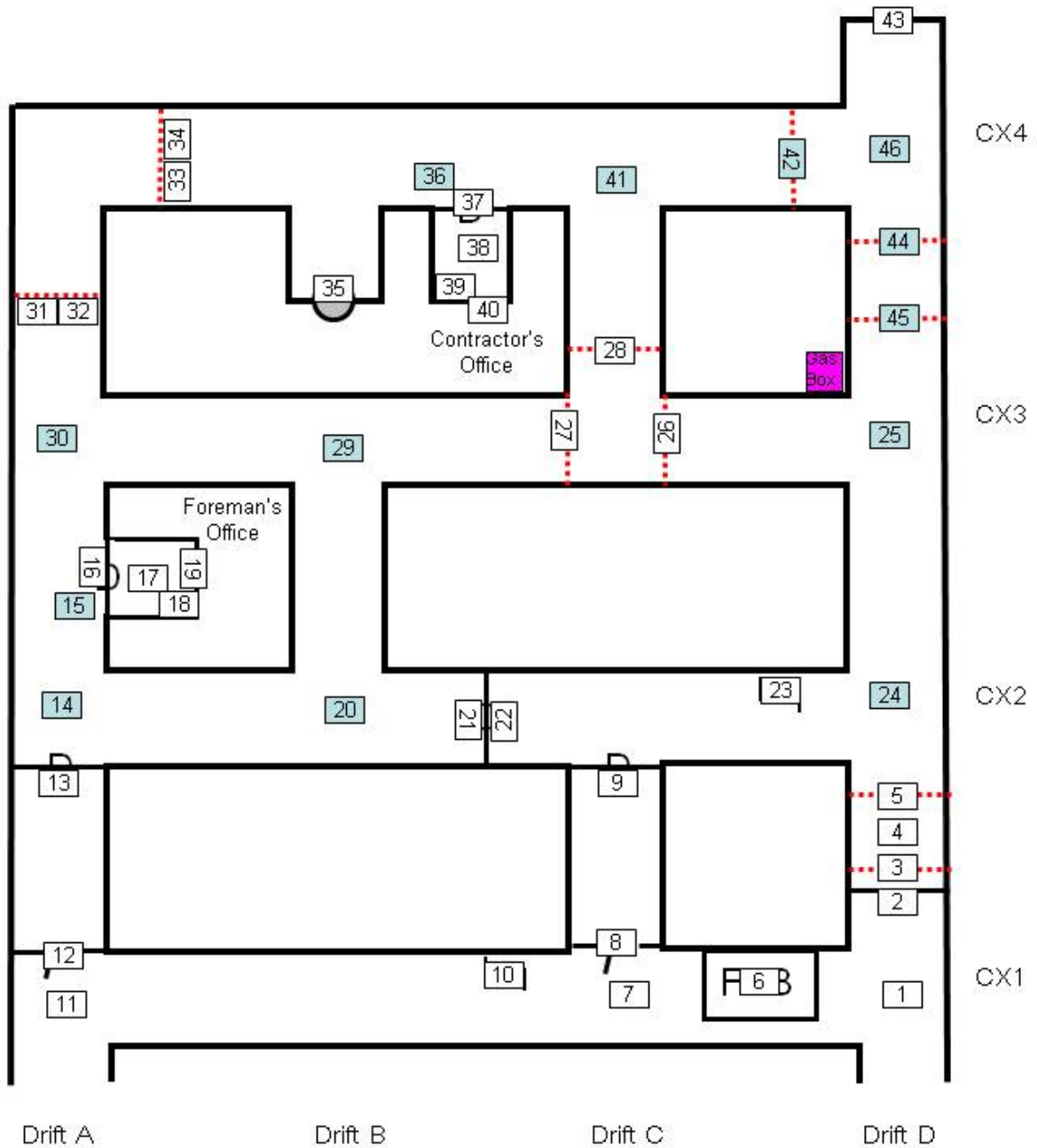
Now that the team has finally found wooden posts, they can support the area in Drift D between CX1 and CX2. Once the loose back is supported, the team can assess the condition of Miner #1 who is unresponsive. The team captain must perform necessary roof or back checks over the miner. After a primary assessment, the #1 Judge will hand the team member a placard which reads: “**The miner exhibits no vital signs. The miner is dead.**” The captain must D&I the location of the body.

### **TEAM STOP NO. 34**

The team can return to the fresh air base. Afterward, the captain can state that the team has completed their mission. That is, they have explored all accessible areas of the mine, sealed the fires, re-ventilated the mine, and located the three missing miners and brought two of them out alive.

**\*\*\* THE END \*\*\***

# Day 1 - Placard Map



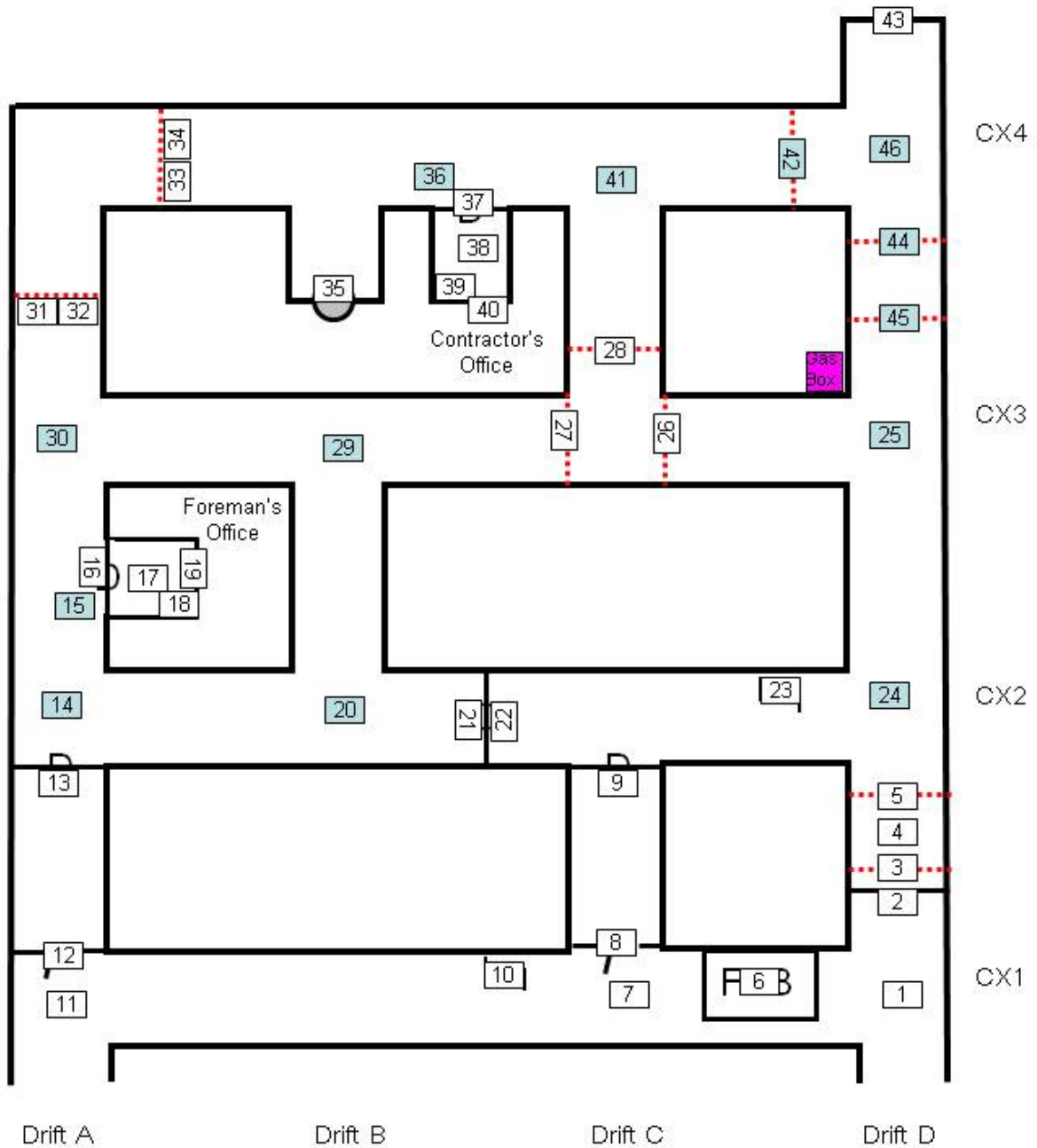
20 = Double-sided Placard



## Placard Key

- |  |   |
|--|---|
| 1. CLEAR AIR   | 19. FACE  |
| 2. TEMPORARY STOPPING  | 20. LIGHT SMOKE<br>CO = 1,900 ppm<br>O <sub>2</sub> = 15.5 %    |
| 3. LOOSE BACK (UNSCALABLE)                                   | 21. CHECK CURTAIN   |
| 4. MINER #1  | 22. CHECK CURTAIN   |
| 5. LOOSE BACK (UNSCALABLE)                                   | 23. BRATTICE MATERIAL (4 sets)                                  |
| 6. FRESH AIR BASE  | 24. LIGHT SMOKE<br>CO = 1,900 ppm<br>O <sub>2</sub> = 15.5 %    |
| 7. CLEAR AIR   | 25. LIGHT SMOKE<br>CO = 1,900 ppm CO<br>O <sub>2</sub> = 15.5 % |
| 8. AIR LOCK DOOR (Open)                                      | 26. CAVED TIGHT   |
| 9. AIR LOCK DOOR (Closed)                                    | 27. CAVED TIGHT   |
| 10. BRATTICE MATERIAL (1 set)                                | 28. CAVED TIGHT   |
| 11. CLEAR AIR  | 29. HEAVY SMOKE<br>CO = 5,000 ppm<br>O <sub>2</sub> = 14.0 %    |
| 12. AIR LOCK DOOR (Open)                                     | 30. HEAVY SMOKE<br>CO = 5,000 ppm<br>O <sub>2</sub> = 14.0 %    |
| 13. AIR LOCK DOOR (Closed)                                   | 31. FIRE OUT OF CONTROL   |
| 14. LIGHT SMOKE<br>CO = 1,900 ppm<br>O <sub>2</sub> = 15.5 % | 32. HEAVY SMOKE<br>CO = 5,000 ppm<br>O <sub>2</sub> = 14.0 %    |
| 15. LIGHT SMOKE<br>CO = 1,900 ppm<br>O <sub>2</sub> = 15.5 % | 33. FIRE OUT OF CONTROL   |
| 16. FOREMAN'S OFFICE DOOR<br>(Closed)                        |   |
| 17. MINER #2   |   |
| 18. SUMP PUMP CONTROLS (Off)                                 |   |

# Day 1 - Placard Map



20 = Double-sided Placard

- 34. HEAVY SMOKE  
CO = 5,000 ppm  
O<sub>2</sub> = 14.0 %
- 35. VENTILATION SHAFT
- 36. HEAVY SMOKE  
CO = 5,000 ppm  
O<sub>2</sub> = 14.0 %
- 37. CONTRACTOR'S OFFICE DOOR  
(Closed)
- 38. MINER #3
- 39. WOODEN POSTS (10)
- 40. FACE
- 41. HEAVY SMOKE  
CO = 5,000 ppm  
O<sub>2</sub> = 14.0 %
- 42. WATER OVER KNEE DEEP
- 43. FACE
- 44. WATER OVER KNEE DEEP
- 45. WATER KNEE DEEP
- 46. HEAVY SMOKE  
CO = 5,000 ppm  
O<sub>2</sub> = 14.0 %

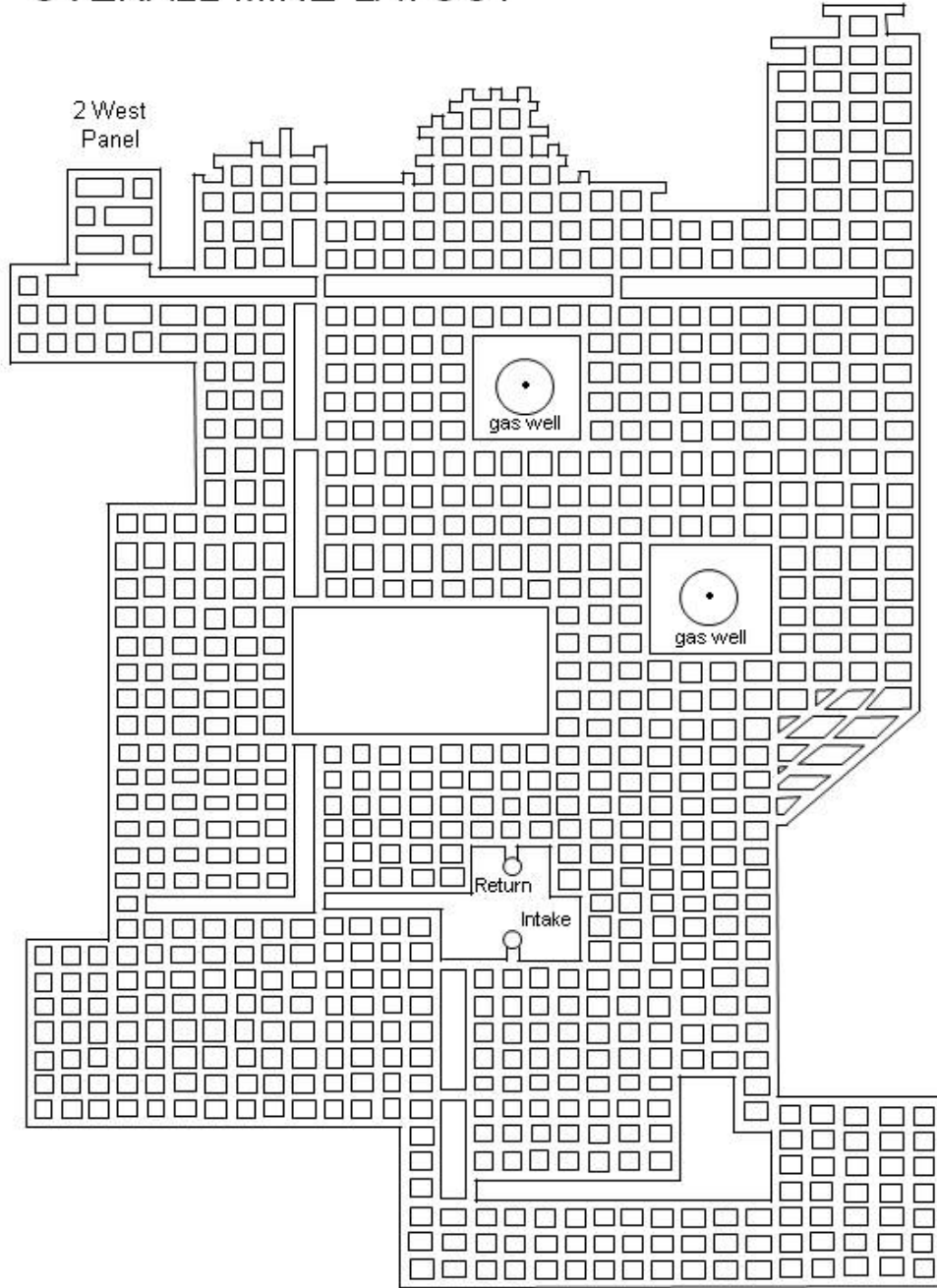
**Note:**

Ten gas placards (14, 15, 20, 24, 25, 29, 30, 36, 41, and 46) are double-sided. The backside will indicate "Clear Air" when changes have been made by the team to successfully ventilate these areas.

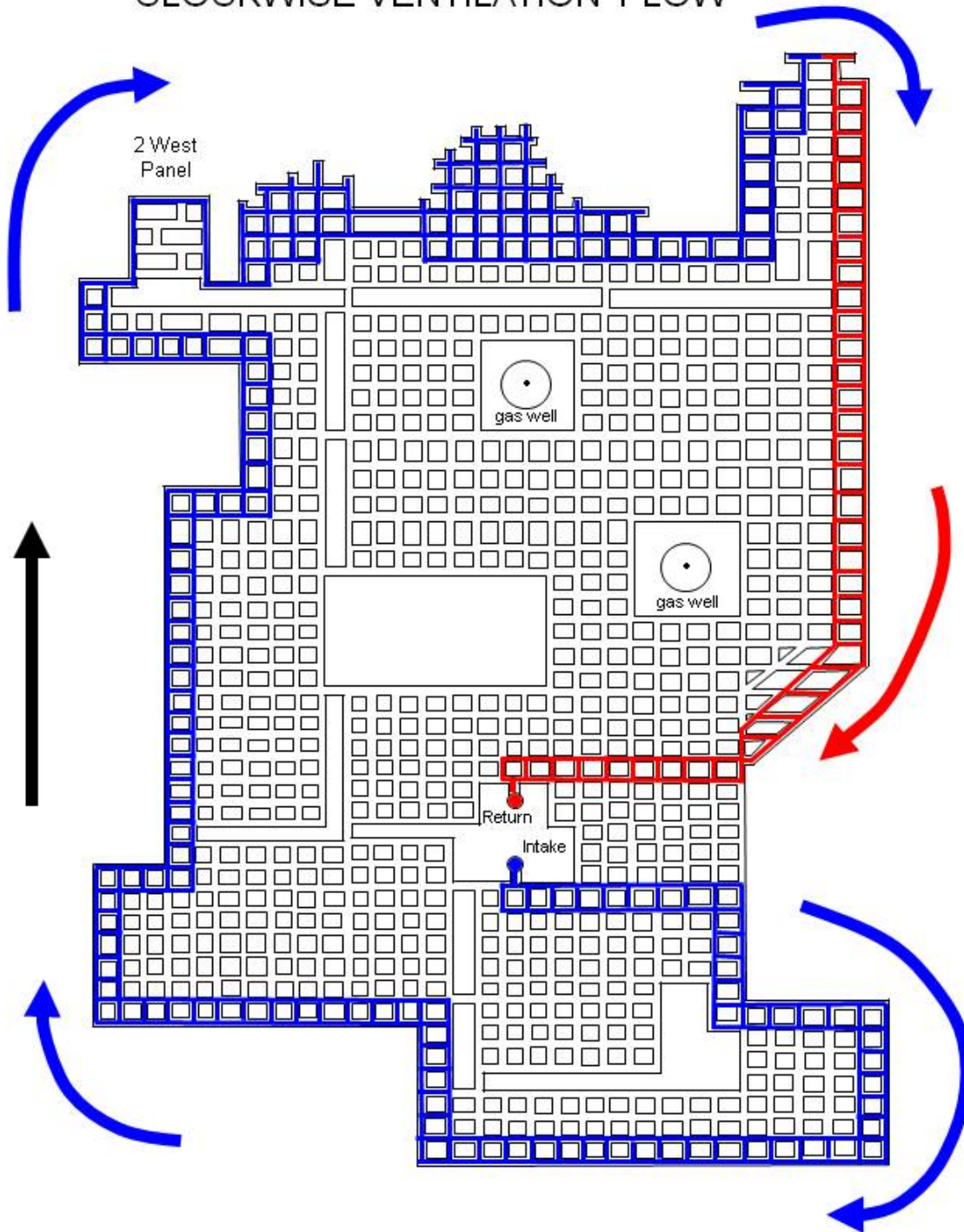
Three additional placards (42, 44, and 45) are double sided. The backside will indicate "Water Ankle Deep" when the team pumps the standing water in the northeast corner of the 2 West Panel.



# OVERALL MINE LAYOUT




# CLOCKWISE VENTILATION FLOW



**Doors installed in all entries where they pass through barrier pillars to separate intake and return ventilation**

Reno Mining Company  
Reno Mine No. 1  
I.D. No. 26-02012  
Reno, Nevada

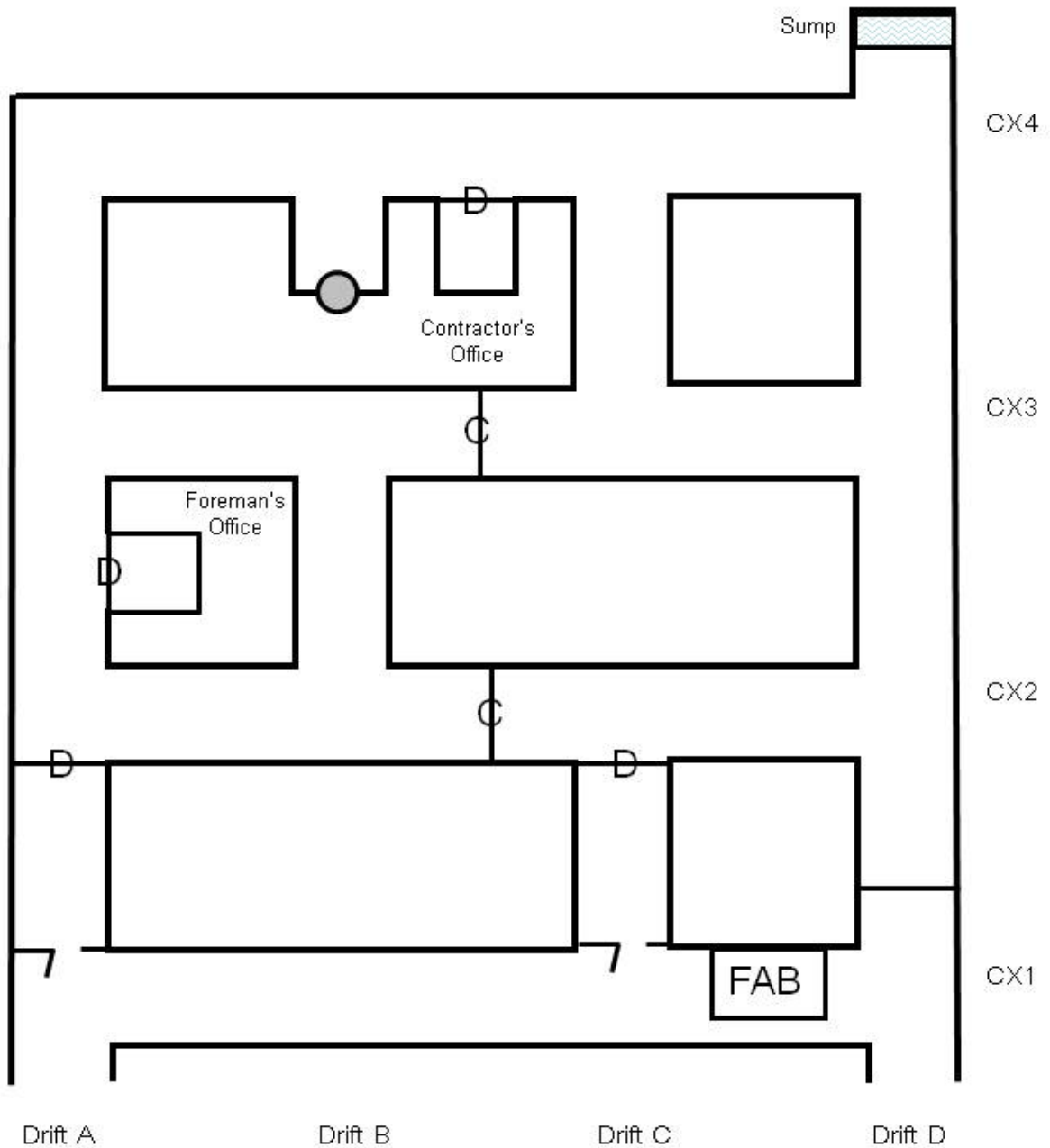
Map Legend:

-  Power Center
-  Pager Phone
-  Check Curtain
-  Permanent Stopping
-  Stopping with Door
-  Airlock
-  Airflow & Direction
-  Air Shaft

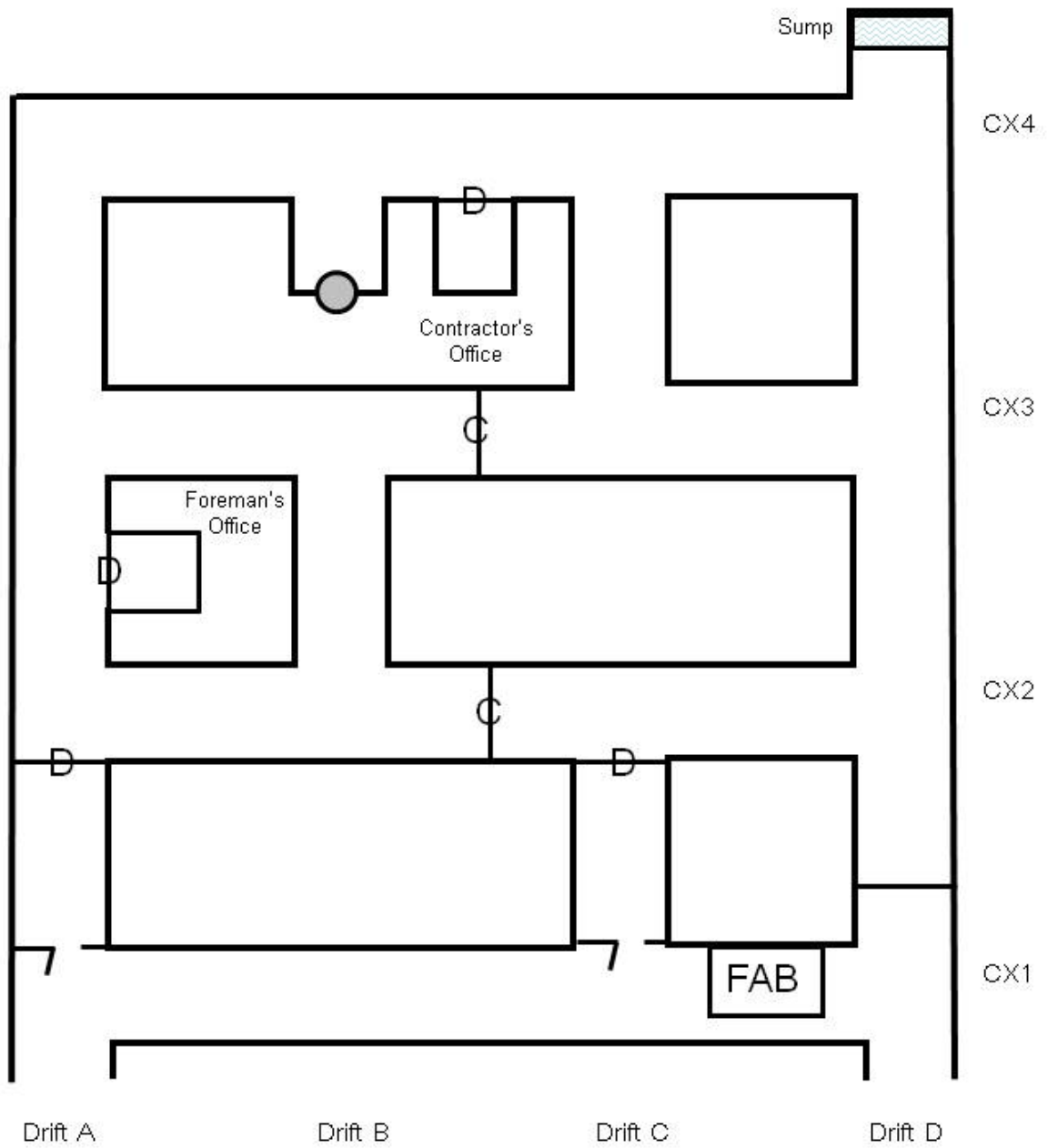
Updated July 17, 2012  
Approx. Scale 1 in . = 10 ft.

**DAY 1 – Map Legend**

# DAY 1 – Team Map (2 West Panel)



# DAY 1 – Fresh Air Base Map (2 West Panel)





# Problem Map

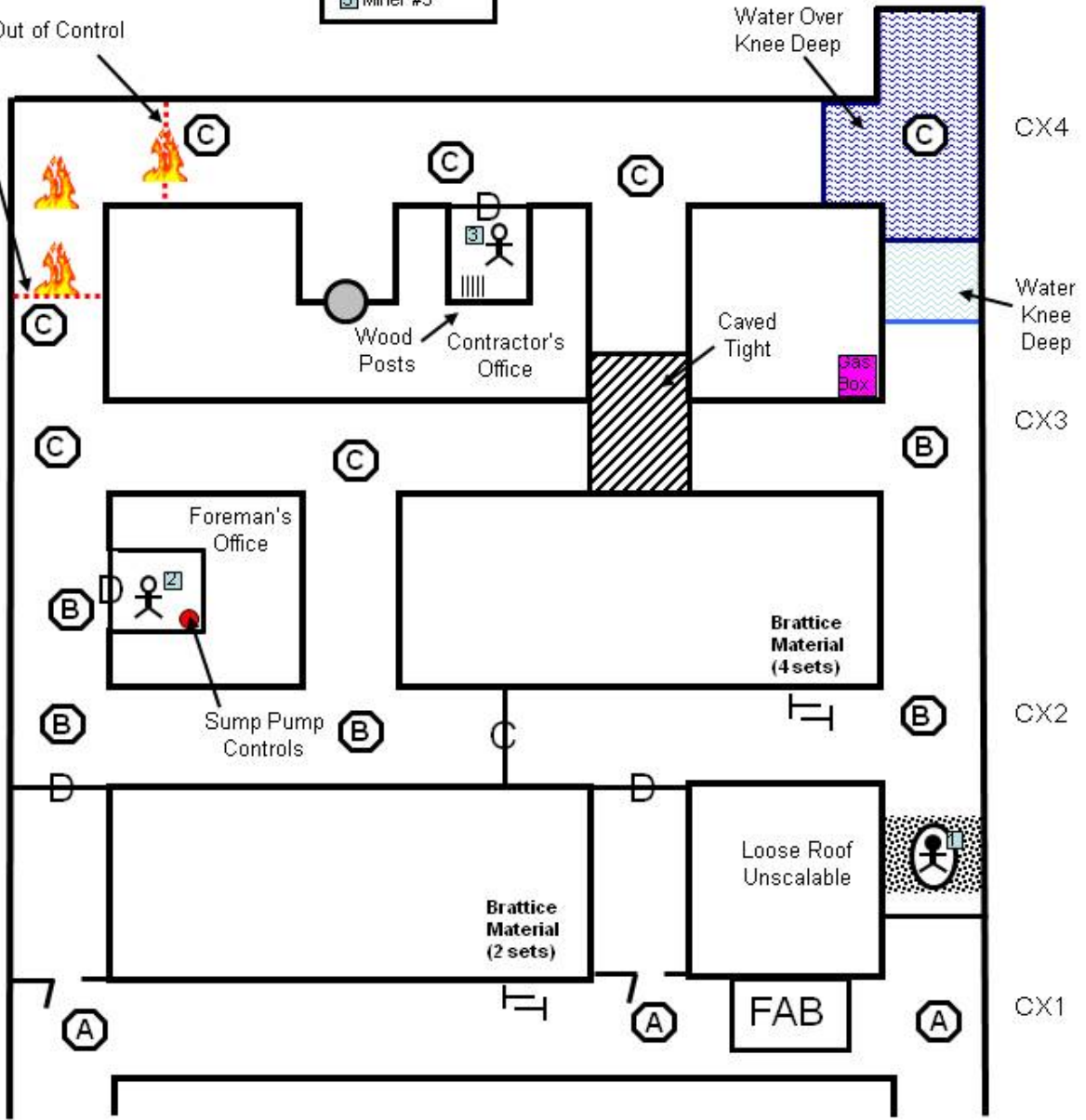


**Missing Miners:**

- 1 Miner #1
- 2 Miner #2
- 3 Miner #3

Fire Out of Control

Water Over Knee Deep



Drift A

Drift B

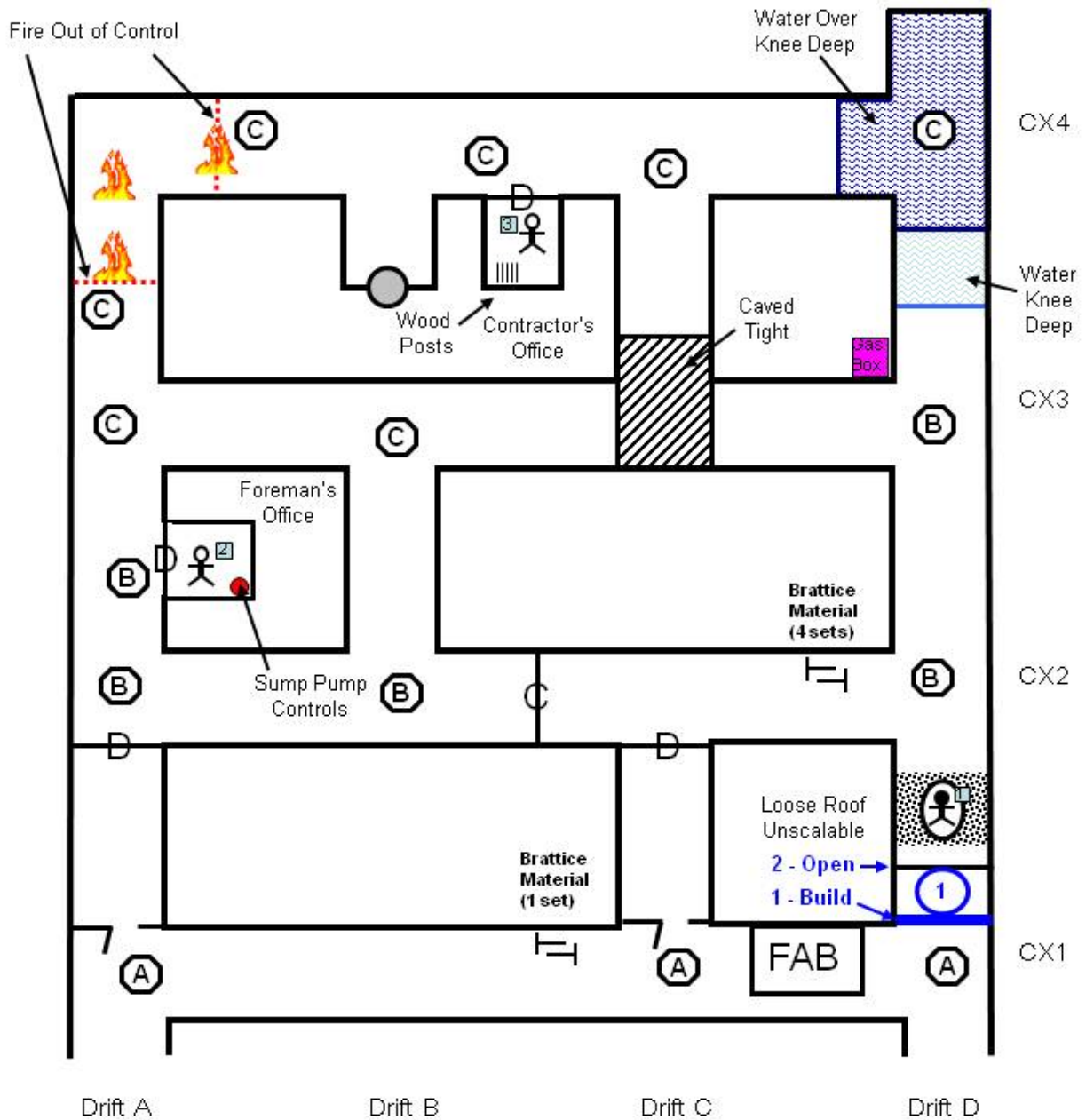
Drift C

Drift D

**Gas Placards:**

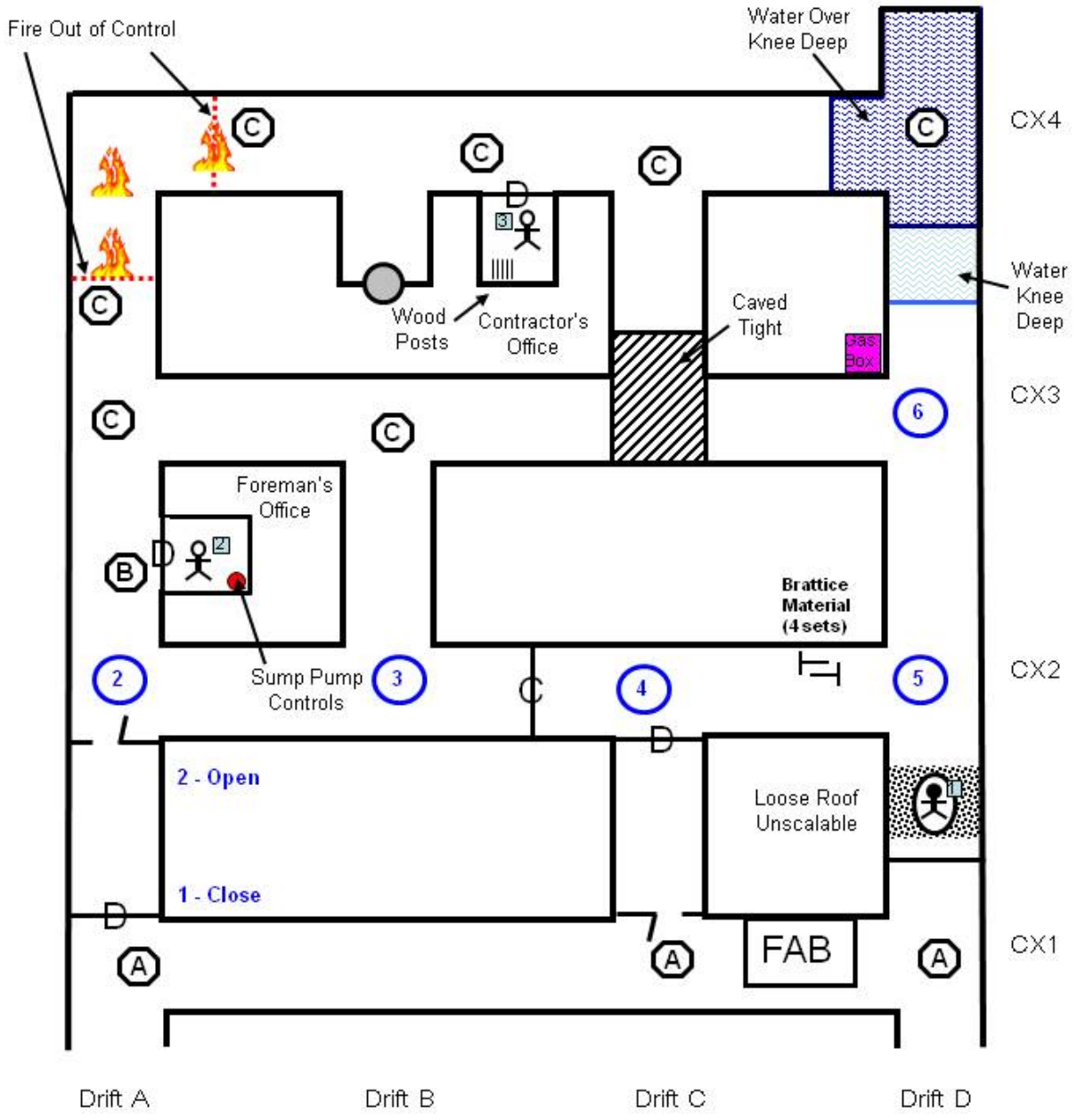
<span style="border: 1px solid black; border-radius: 50%; padding: 2px;">A</span>	<span style="border: 1px solid black; border-radius: 50%; padding: 2px;">B</span>	<span style="border: 1px solid black; border-radius: 50%; padding: 2px;">C</span>
Clear Air	Light Smoke CO = 1,900 ppm O <sub>2</sub> = 15.5 %	Heavy Smoke CO = 5,000 ppm O <sub>2</sub> = 14.0 %

# Solution Map - 1



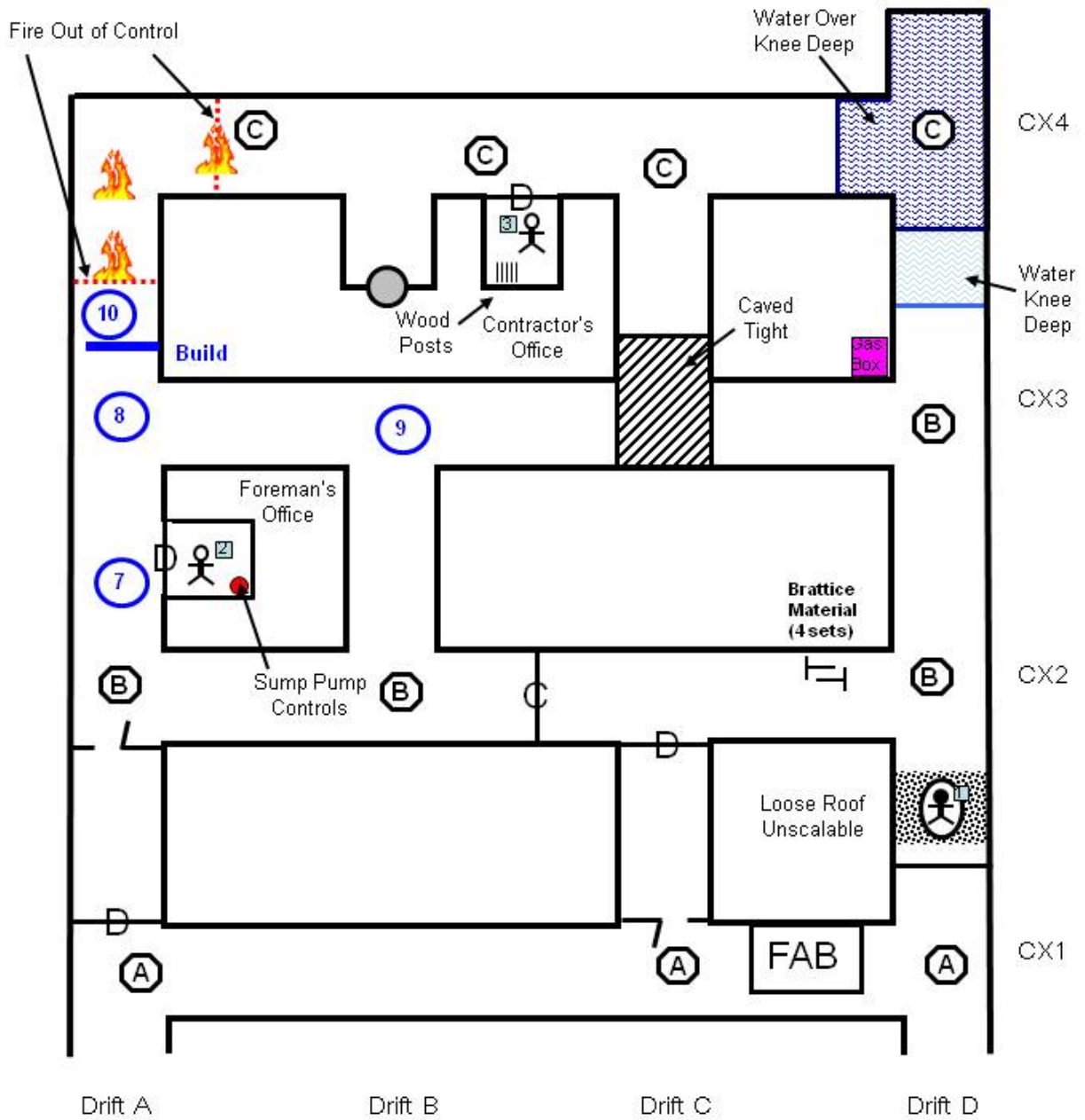
1 = Team Stop

# Solution Map - 2

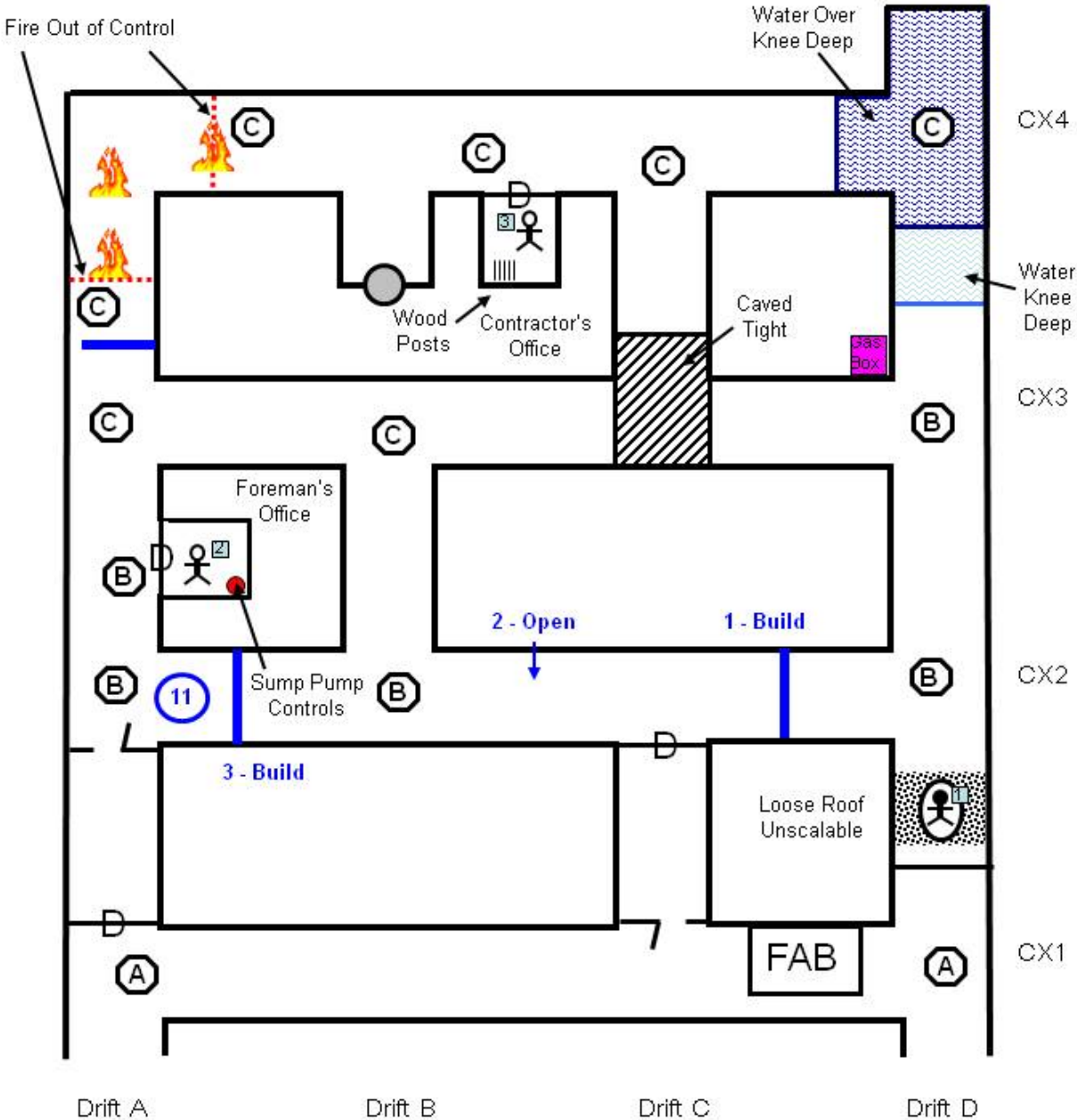


1 = Team Stop

# Solution Map - 3

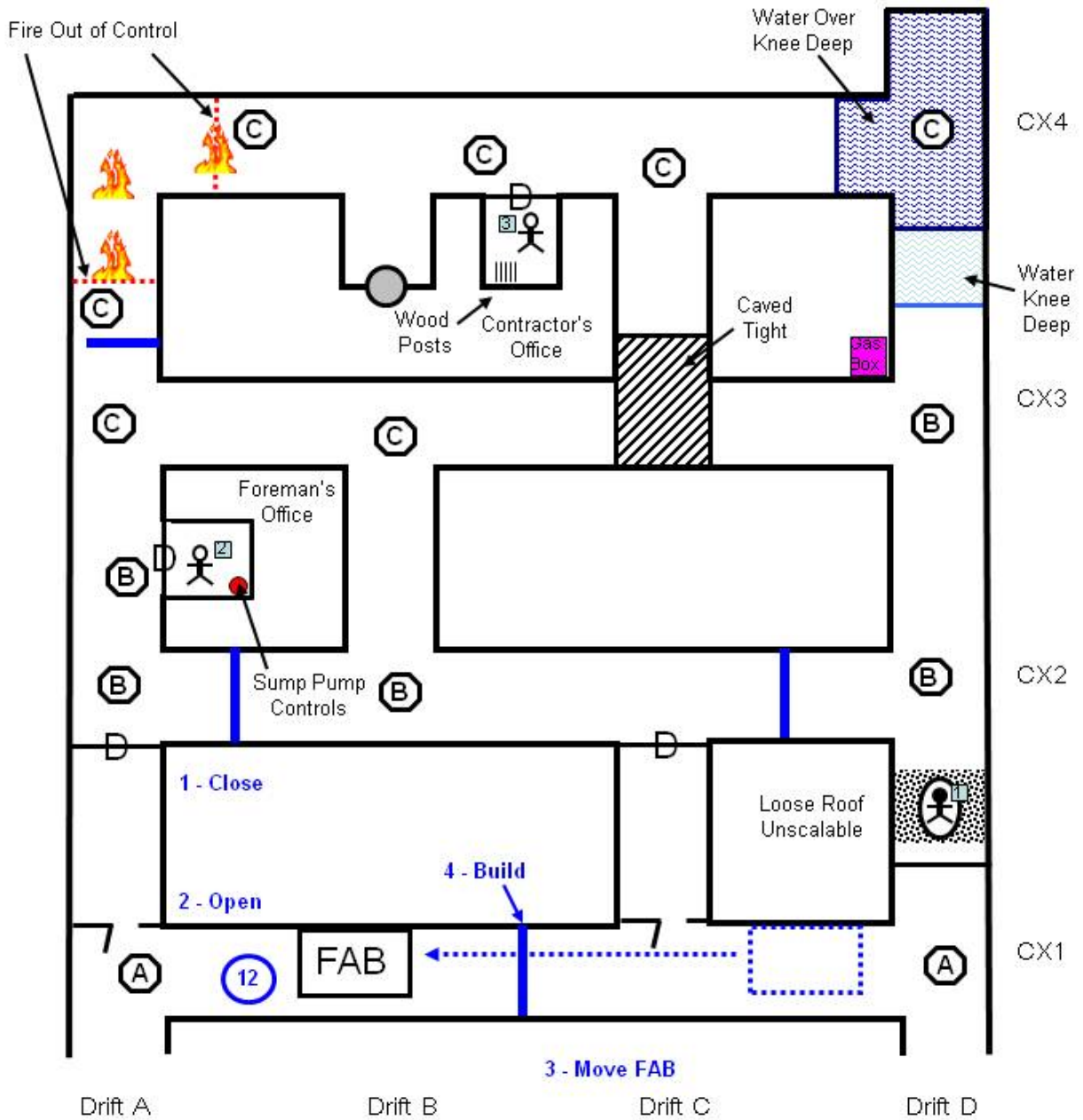


# Solution Map - 4



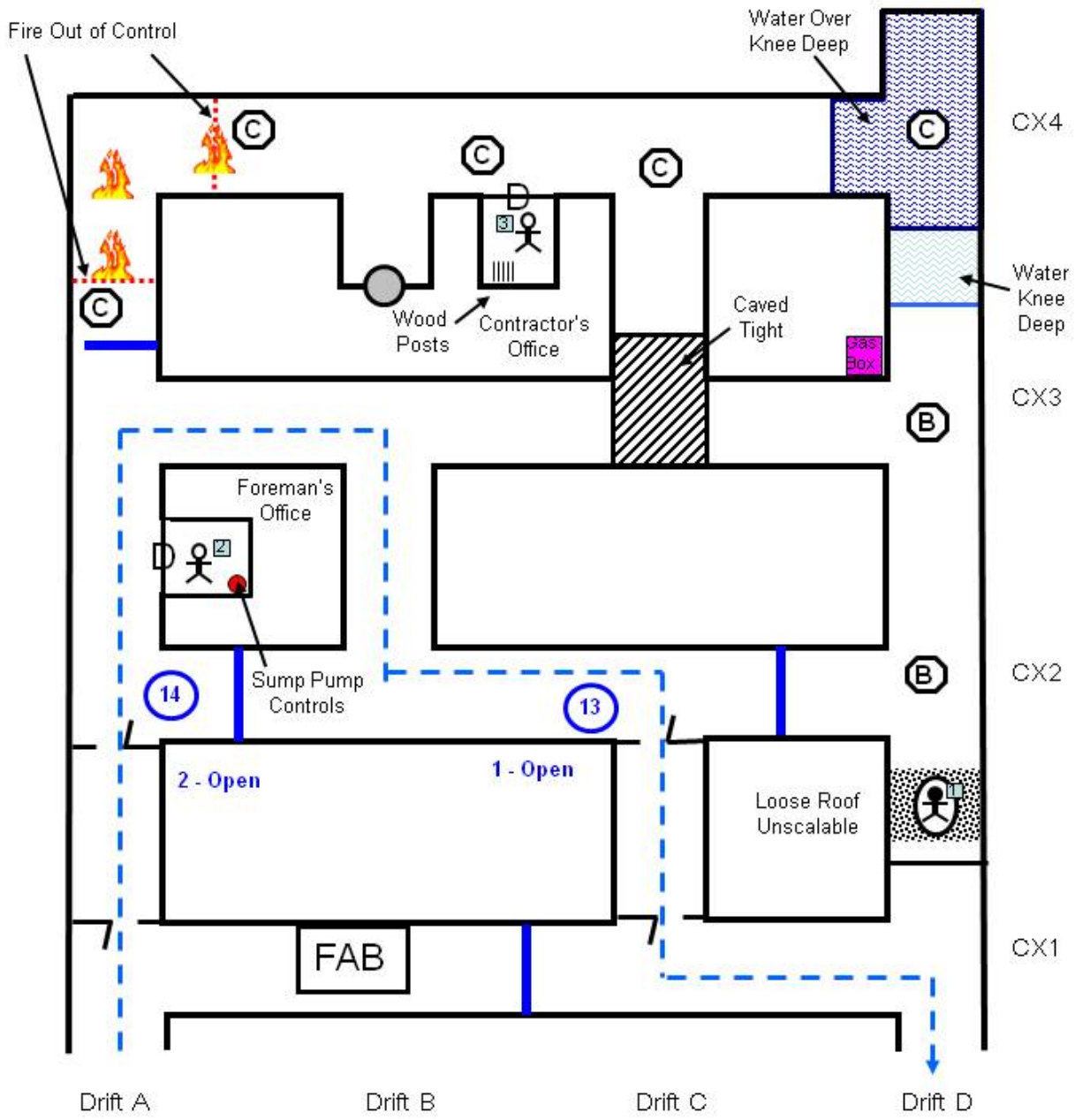
1 = Team Stop

# Solution Map - 5



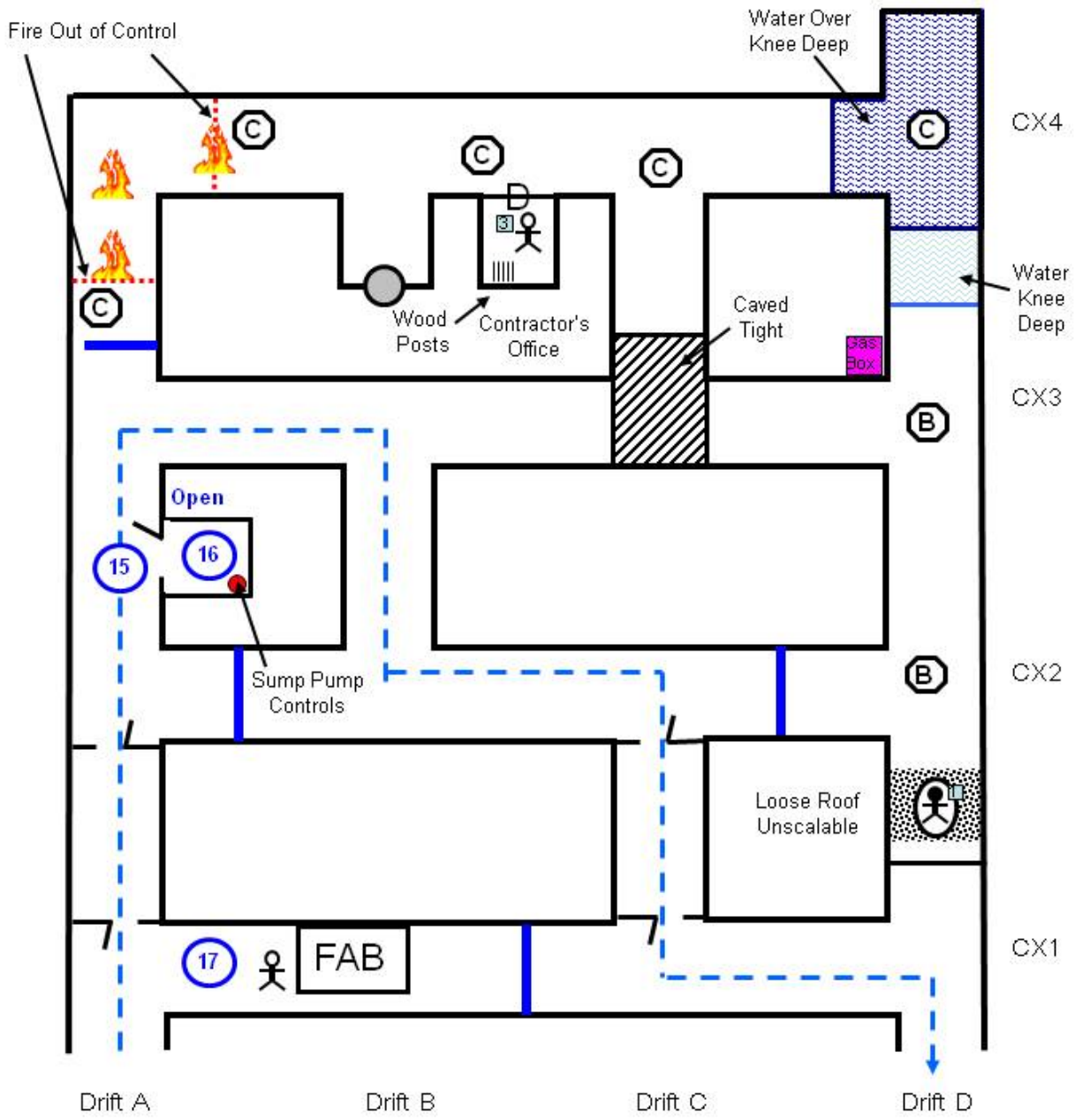
1 = Team Stop

# Solution Map – 6 (Ventilation Change)



1 = Team Stop

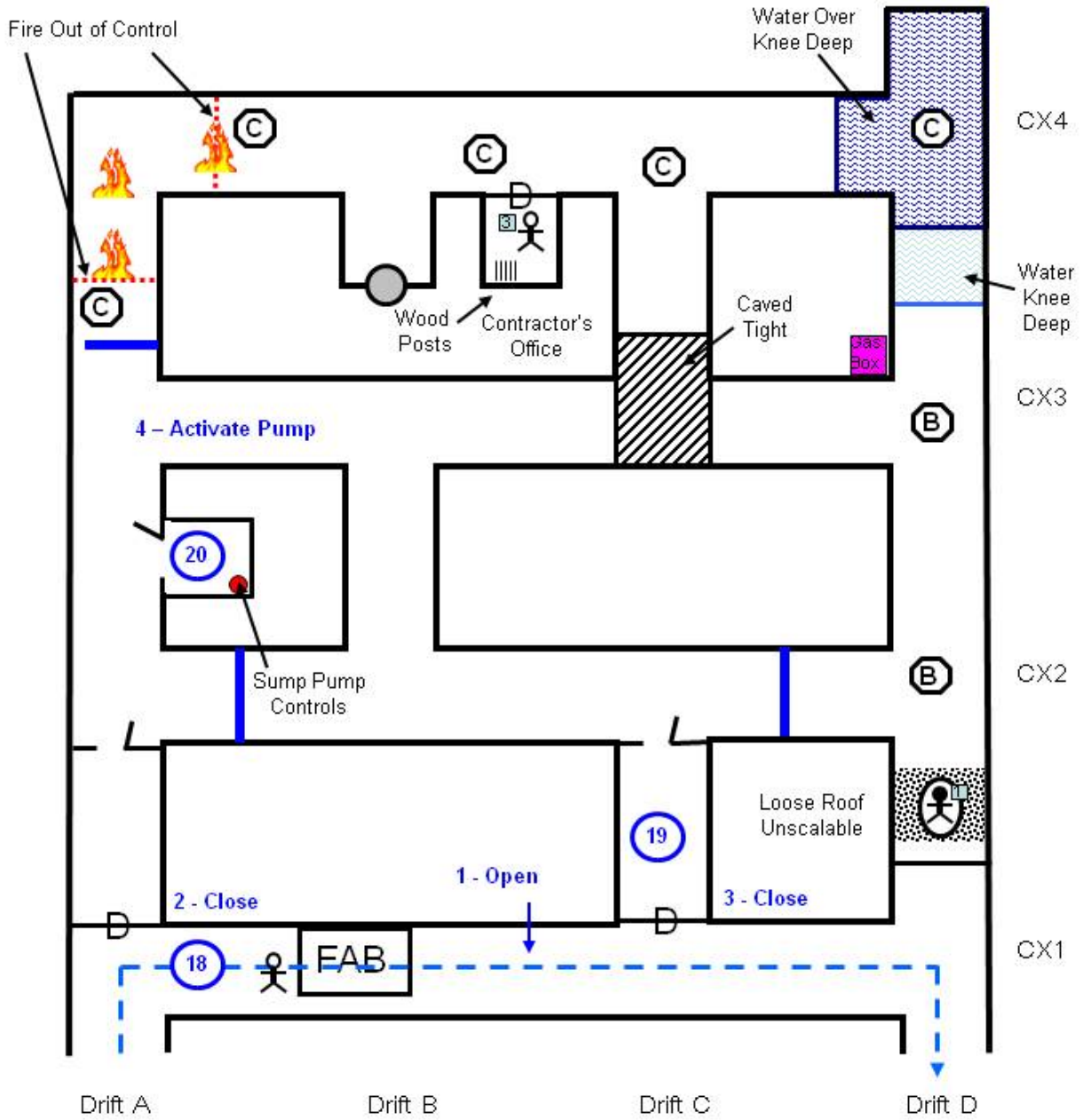
# Solution Map - 7



1 = Team Stop

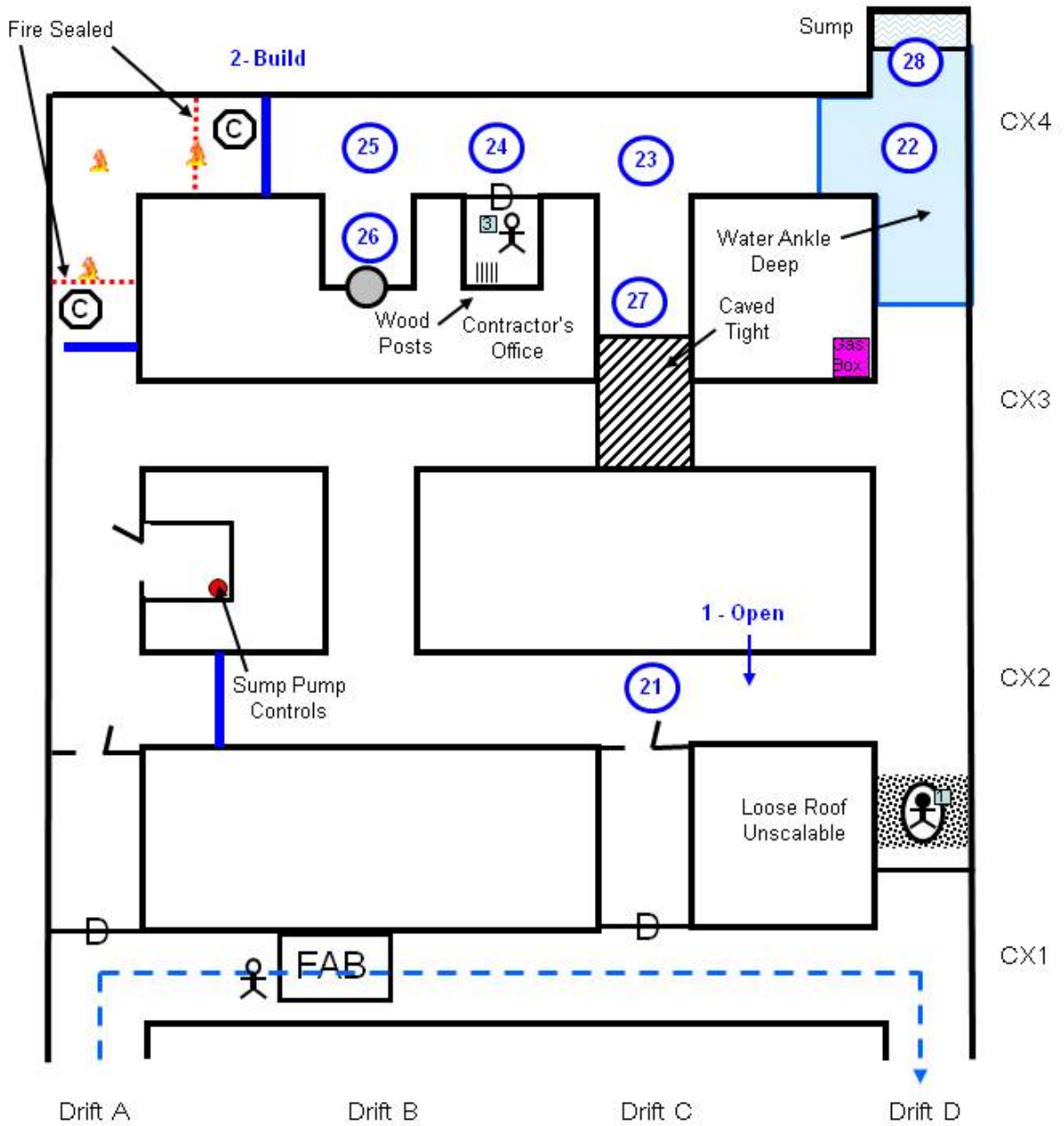


# Solution Map - 8



**1** = Team Stop

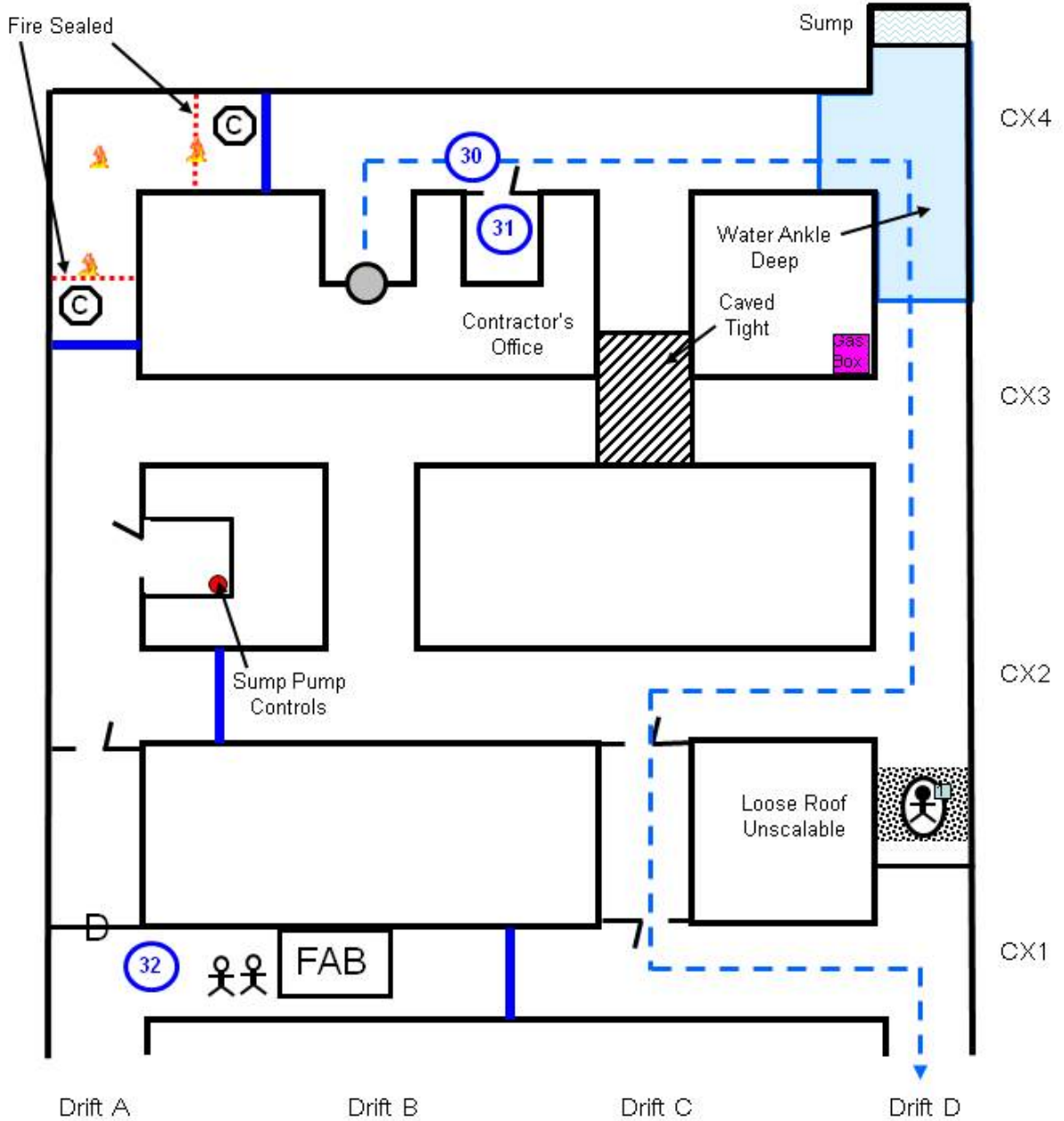
# Solution Map - 9



1 = Team Stop

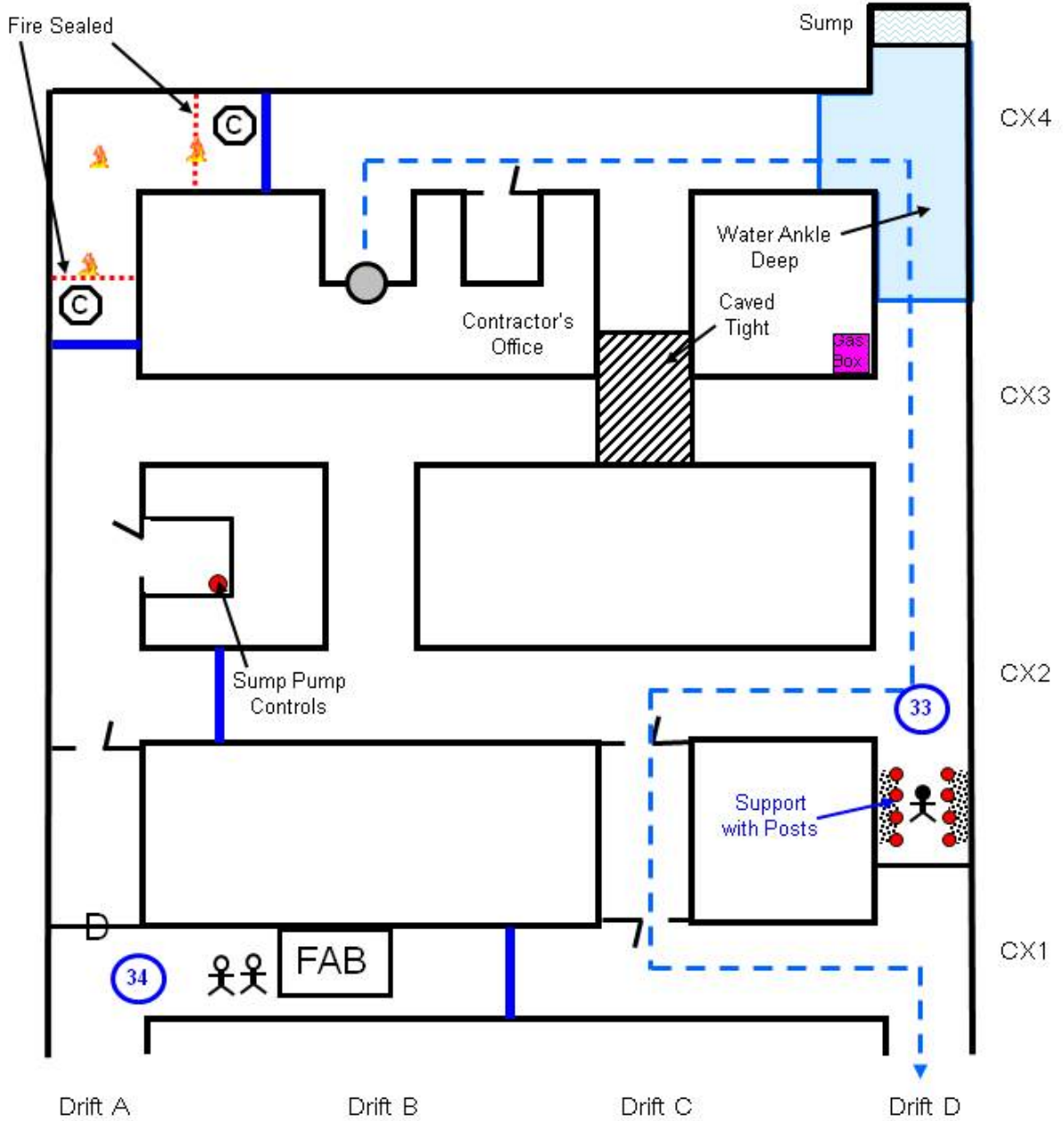


# Solution Map - 11



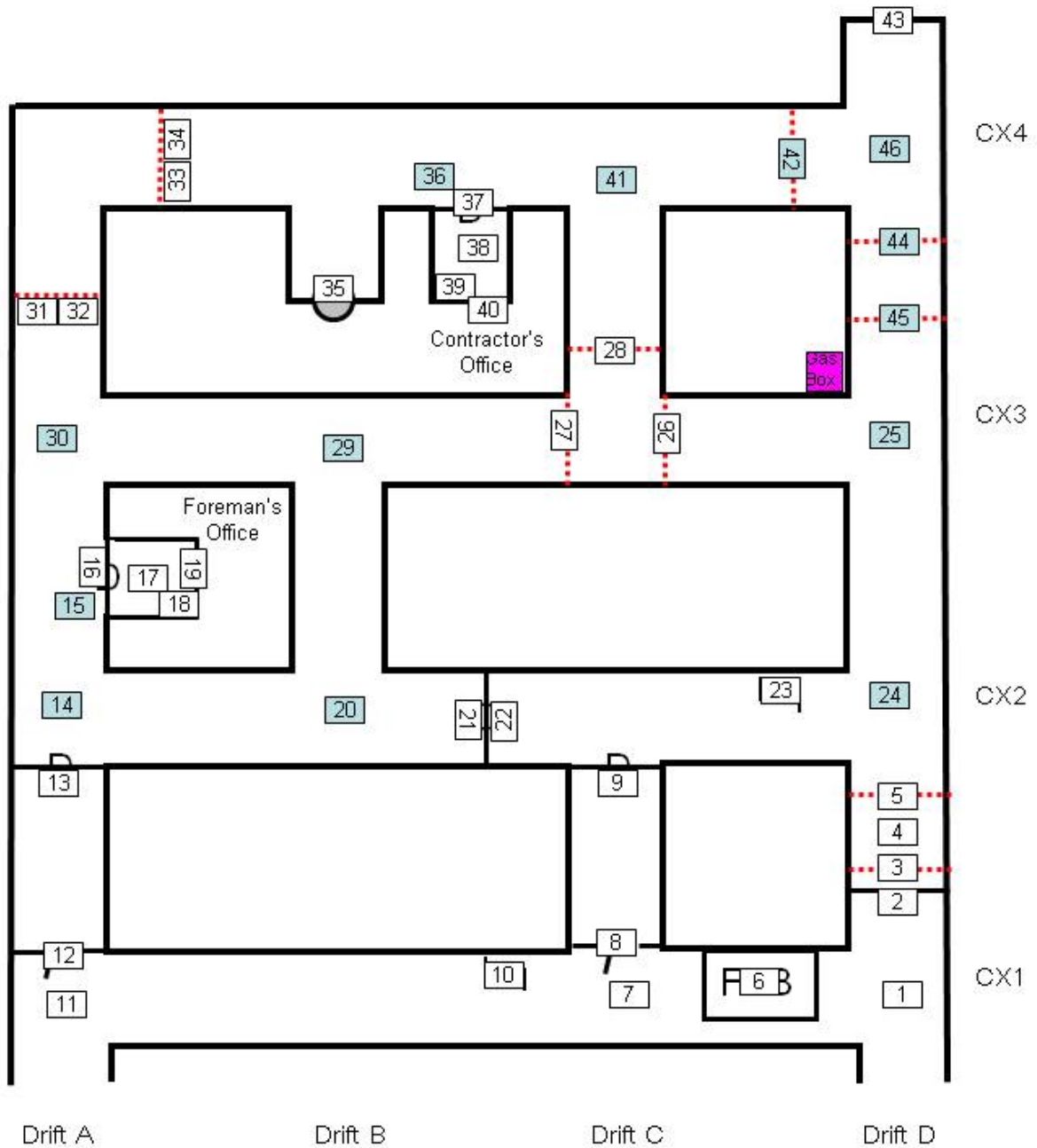
1 = Team Stop

# Solution Map - 12



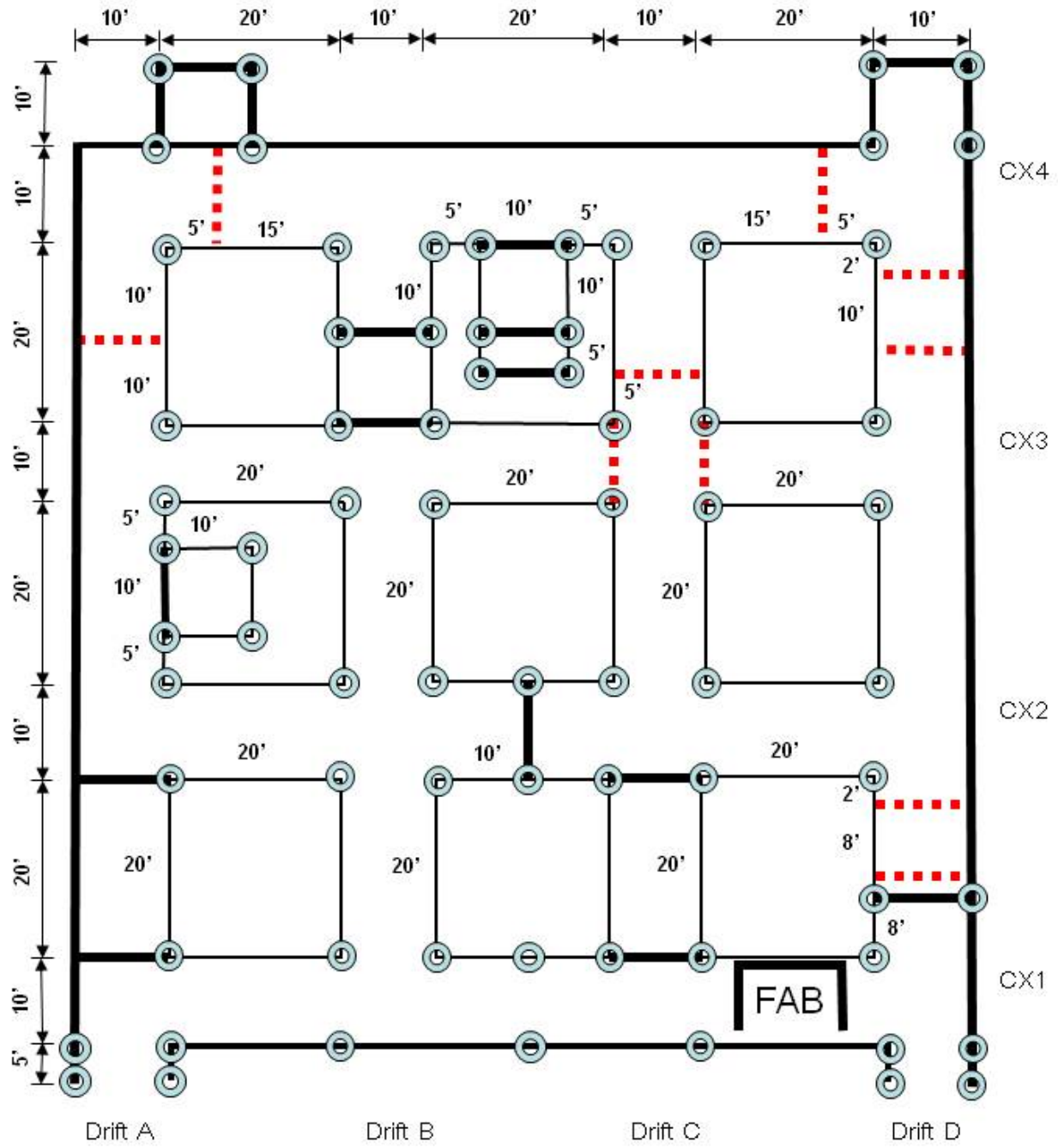
1 = Team Stop

# Day 1 - Placard Map



20 = Double-sided Placard

# Day 1 - Construction Map



115' x 100'

