2016 Northern Regional Mine Rescue Contest

JUDGES' PACKET
Field Competition

June 15, 2016
Clymer, New York

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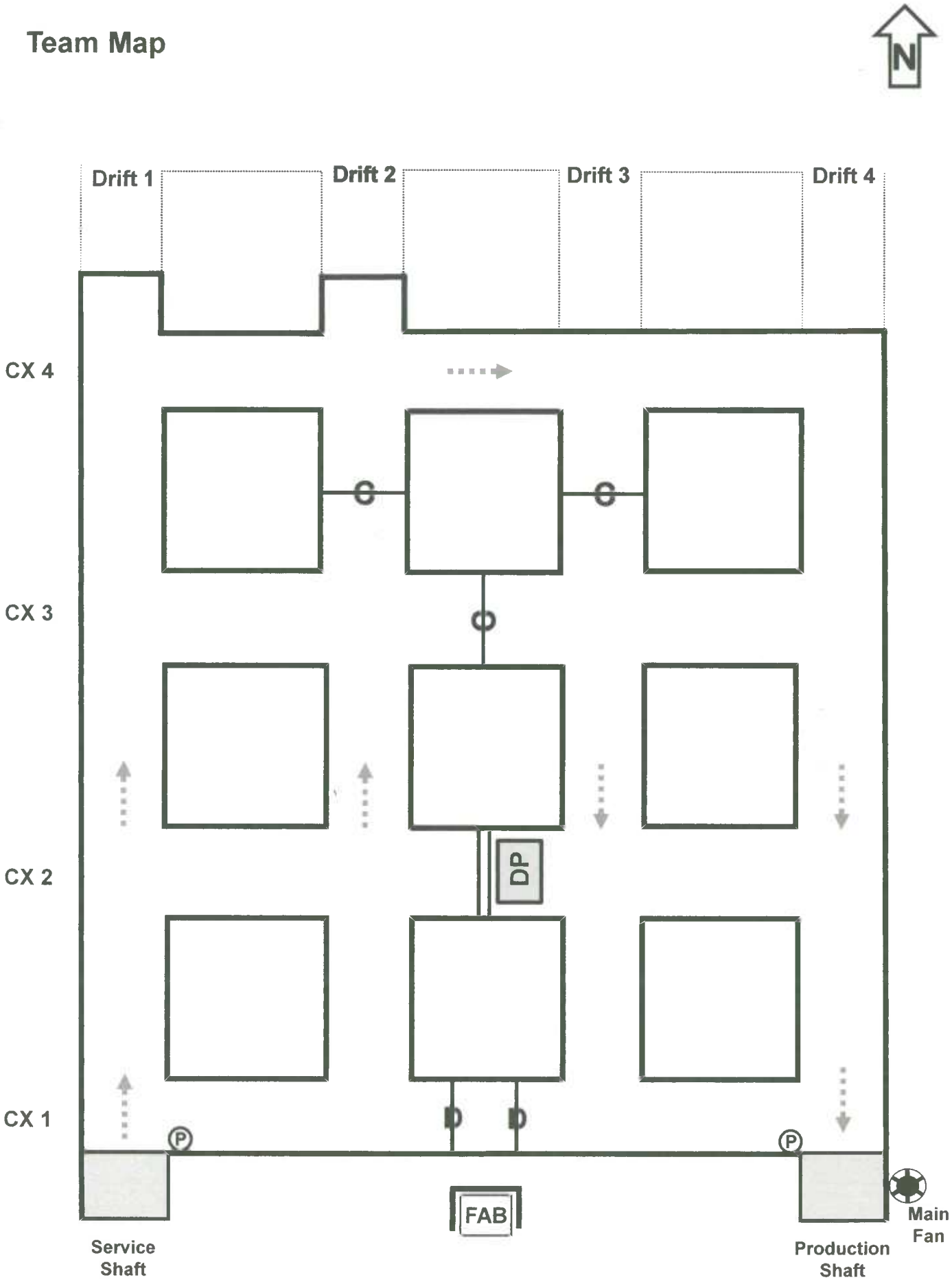
Team Map


N
Drift 1
Drift 2
Drift 3
Drift 4
CX 4
CX 3
CX 2
CX 1
DP
FAB
Service Shaft
Production Shaft
Main Fan

Mine Information Sheet
PNP Mining Co. – Segway Mine No. 2

Mining & Equipment:
The newly opened single-level, shaft mine uses a conventional room and pillar method to extract ore. The broken ore is loaded into haul trucks using face loaders and then transported to the shaft dump pocket located in CX 2 between Drift 2 and Drift 3. The ore is then hoisted to the surface via skips in the Production Shaft. The development entries are driven 8-feet high and 10-feet wide. Typical pillar dimensions are 15-feet by 15-feet (W x L). All underground mobile equipment (including the loaders, haul trucks, face drills, roof bolting machines, and transport jeeps) is diesel-powered.

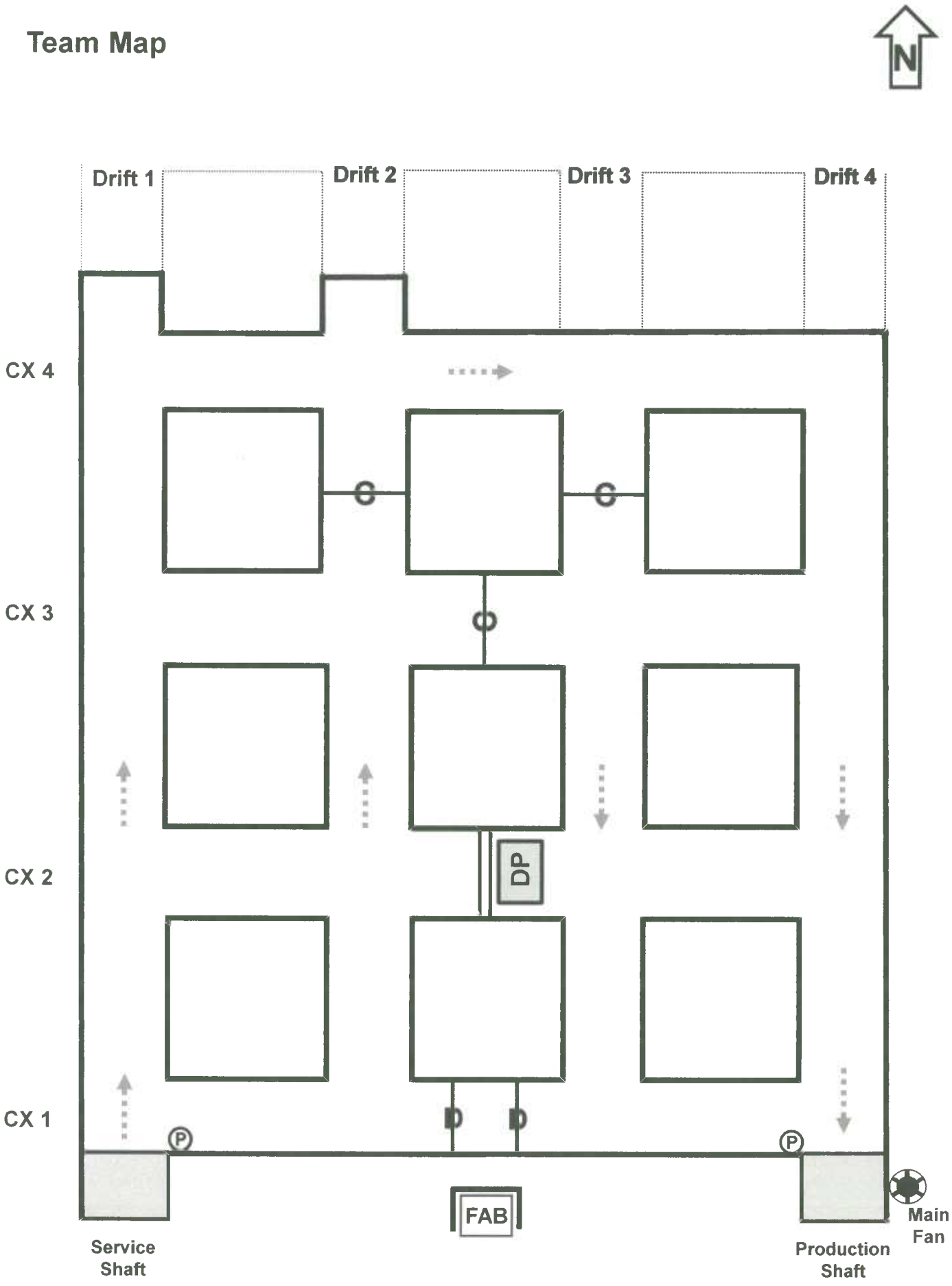
Mine Classification:
In accordance with Title 30 CFR § 57.22003, the mine was classified as a Category VI mine. That is, the presence of methane has not been established in this mine and there is no history of methane gas in any other mine in the area. Historical hygiene data from the mine, both MSHA and Company's samples, have indicated no presence of methane.

Mine Openings:
The mine is opened by two 18-foot diameter shafts approximately 1,750 feet deep. The Service Shaft is equipped with a hoist used to transport people and to convey supplies. The shaft also serves as the primary escapeway from the mine. The Production Shaft is equipped with two ore skips and a separate compartment containing an escape hoist which can be used to bring a maximum of eight persons to the surface.

Ventilation:
A 6-ft. diameter exhausting Main Fan is located on the surface near the Production Shaft. The Main Fan is <u>not</u> reversible. The fan produces approximately 100,000 cfm and operates in the stable portion of its performance curve. Airlock doors have been installed in CX 1 to allow passage between the intake and the return drifts without disrupting the established airflow to the faces. The electrical power to the fan is on and the fan is operating. The air enters the mine through the Service Shaft and exhausts from the Production Shaft. Air is directed to the faces using permanent (concrete block) and temporary (brattice cloth) ventilation controls. The typical airflow direction is marked on the Team and Fresh Air Base Maps.

Water and Pumps:
The mine has no history of water problems in the active workings. 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.

Team Map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Mine Information Sheet (continued)
PNP Mining Co. – Segway Mine No. 2

Ground/Rib and Roof Control:
The immediate roof, or back, is supported by six-foot rock bolts. The back is fairly competent, but problem areas are supported by wooden posts or stacked crib blocks.

Explosives:
Explosives are available and stored on the surface. They are used during the mining cycle and blasting is conducted at the end of each shift while all persons are out of the mine. Only enough explosives for a day's use are stored in day boxes on the blaster's truck.

Electric Power:
The electrical power to the shafts, the surface pumping station, and the Main Fan has been restored; however, all power to the underground has been de-energized, locked out, and guarded.

Mine Map:
The onsite Engineering Department updated the mine map on June 1, 2016.

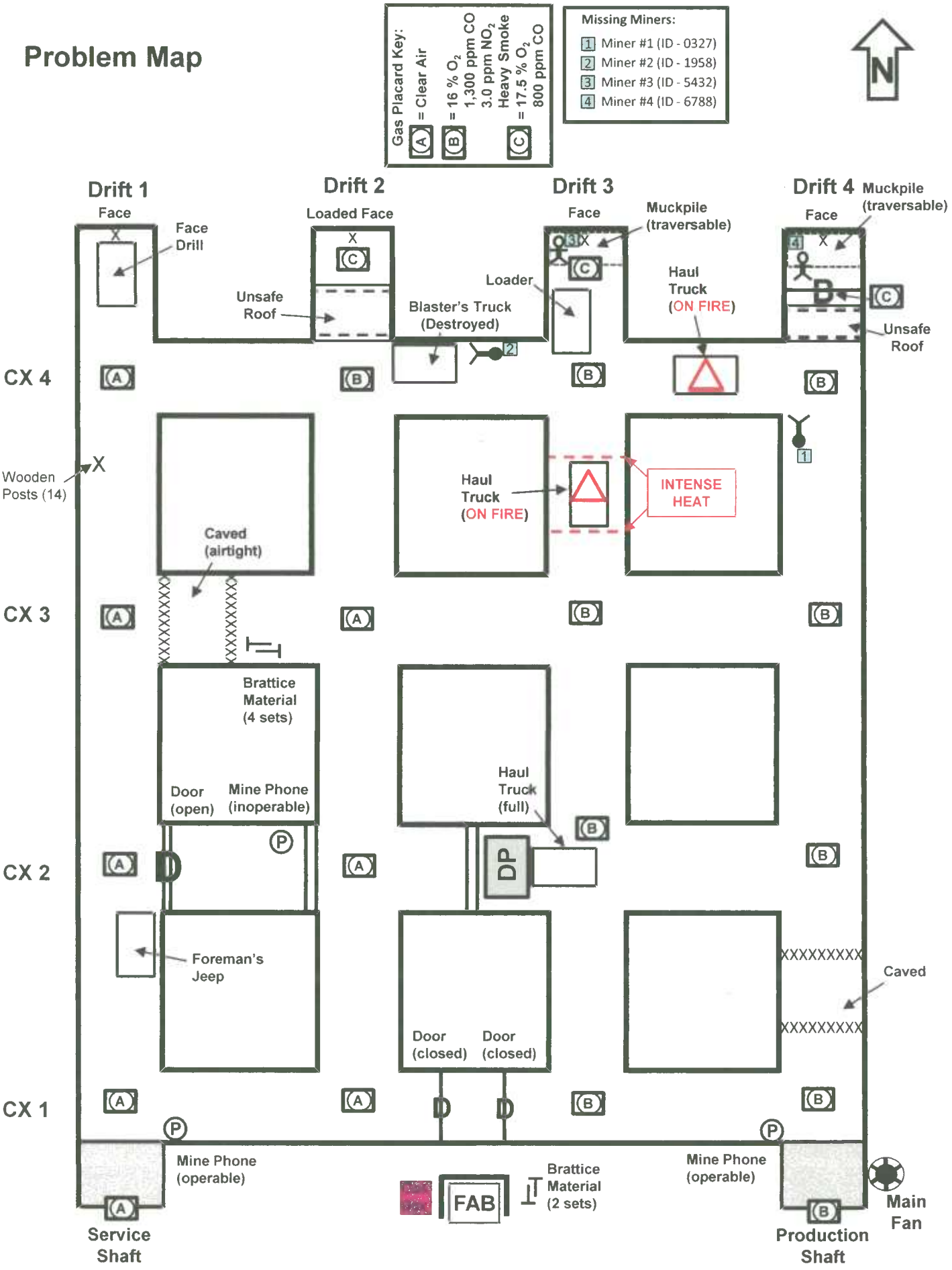
Other Mines:
There are several known mines, active and abandoned, in Clymer, New York. At this time, the Segway Mine No. 2 is not connected to any of these mines.

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.

> **Note: The brattice material available for use by the team is relatively lightweight and compact (10-foot strips of brattice cloth with a clip on each end). For the sake of realism, the team will only be allowed to carry two sets of material at any one given time.**

Communications:
Three mine phones are available in the mine for contact with the surface. The current phone locations are marked on the mine map. At this time, we do not know the status of the communication system, because there has been no contact with the missing miners.

Problem Map


Gas Placard Key:
(A) = Clear Air
(B) = 16 % O_2
1,300 ppm CO
3.0 ppm NO_2
Heavy Smoke
(C) = 17.5 % O_2
800 ppm CO
Missing Miners:
1 Miner #1 (ID - 0327)
2 Miner #2 (ID - 1958)
3 Miner #3 (ID - 5432)
4 Miner #4 (ID - 6788)
N
Drift 1
Drift 2
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Drift 4
Face
Face Drill
Loaded Face
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Blaster's Truck (Destroyed)
Loader
Muckpile (traversable)
Haul Truck (ON FIRE)
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Wooden Posts (14)
Caved (airtight)
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INTENSE HEAT
Brattice Material (4 sets)
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Haul Truck (full)
DP
Foreman's Jeep
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Door (closed)
Caved
Mine Phone (operable)
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Main Fan
Service Shaft
Production Shaft

Team Briefing Statement

You are located at the surface of the PNP Mining Company's Segway Mine No. 2. The newly opened single-level, shaft mine uses a conventional room and pillar method to extract ore. The mine is opened by two shafts approximately 1,750 feet deep. Air enters the mine through the Service Shaft which is equipped with a hoist used to transport people and to convey supplies. This shaft serves as the primary escapeway from the mine. Air exhausts from the Production Shaft which is equipped with skips, as well as an escape compartment which can be used to hoist a maximum of seven persons to the surface. This shaft serves as the secondary escapeway from the mine. The mine is ventilated by a surface-mounted Main Fan located near the Production Shaft. The Main Fan exhausts 100,000 cfm from the mine and cannot be reversed.

Ore is mined by the traditional room and pillar method. The entries are initially driven 8-feet high and 10-feet wide. Typical pillars dimensions are 15-feet by 15-feet (W x L). The immediate roof, or back, is supported by six-foot rock bolts. The back is fairly competent, but problem areas are supported by wooden posts or stacked crib blocks. The mine has no history of water problems in the active workings.

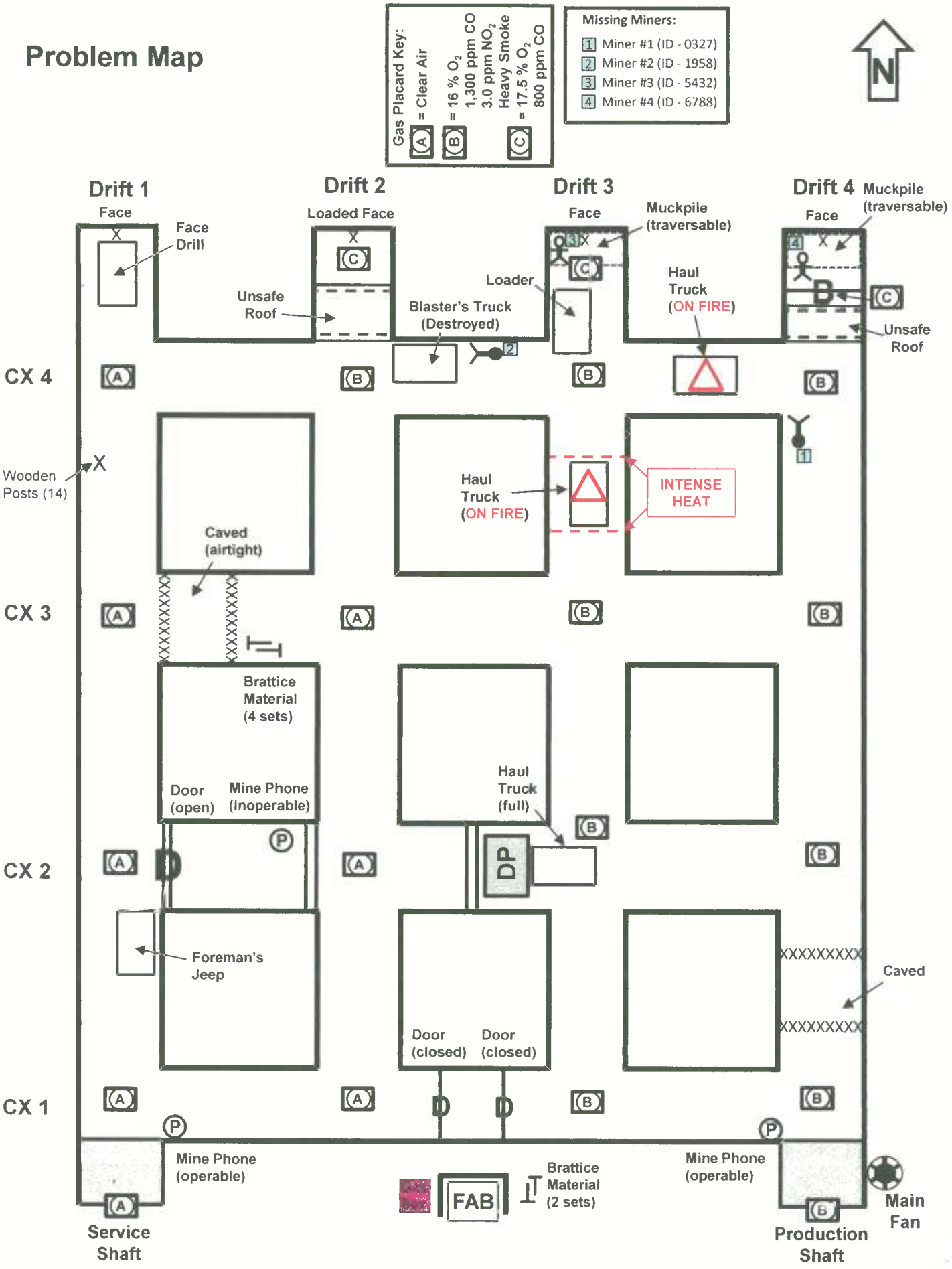
This morning at 5:00 a.m., a foreman and his five-person crew went underground to start the day shift. At about 6:15 a.m., the foreman called out from the underground office and informed the hoist engineer that there was an apparent explosion near the faces and dark black smoke was filling the mine. At that time, communication was lost. The hoist engineer called the superintendent who immediately gave the order to activate the warning system to evacuate the mine. A short time later, two miners called out from the Service Shaft station and asked to be hoisted out of the mine. They reported that they had difficulty traveling in Drift 4 due to heavy smoke. Once they found their way, they headed through the airlock doors toward the Service Shaft. They had no specific information as to what had happened nor were they aware of the condition or location of the rest of their crew. Since that time, no one has entered or exited the mine. We do not know the status of the mine's communication system since there has been no further contact with the missing miners.

All power to the underground has been de-energized, locked out, and guarded. Both hoists are operational and the Main Vent Fan is operating. Continuous gas monitoring has been established at both shafts. The latest readings show "clear air" at the Service Shaft and 16 % oxygen (O_2), 1,300 ppm carbon monoxide (CO), and 3.0 ppm nitrogen dioxide (NO_2) with heavy smoke at the Production Shaft.

We have called all of the government agencies for help. Guards have been posted at the shafts and at the main power supply for the mine. There is a fully equipped mine rescue team located on the surface and they are ready to serve as your team's backup.

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

Problem Map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accessible areas of the mine. **Another team will be sent into the mine to replace you after 90 minutes.**

All 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, the mine manager, and the judging officials.

GOOD LUCK!

Team Instructions

- Explore and map all conditions found in the mine (problem field) and any changes made by the team;
- Extinguish or seal any fires;
- Account for the four missing miners;
- If necessary, re-ventilate the mine; and
- Bring any live miners to the surface.

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.
- 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, mine manager, and the judging officials.

Problem Orientation

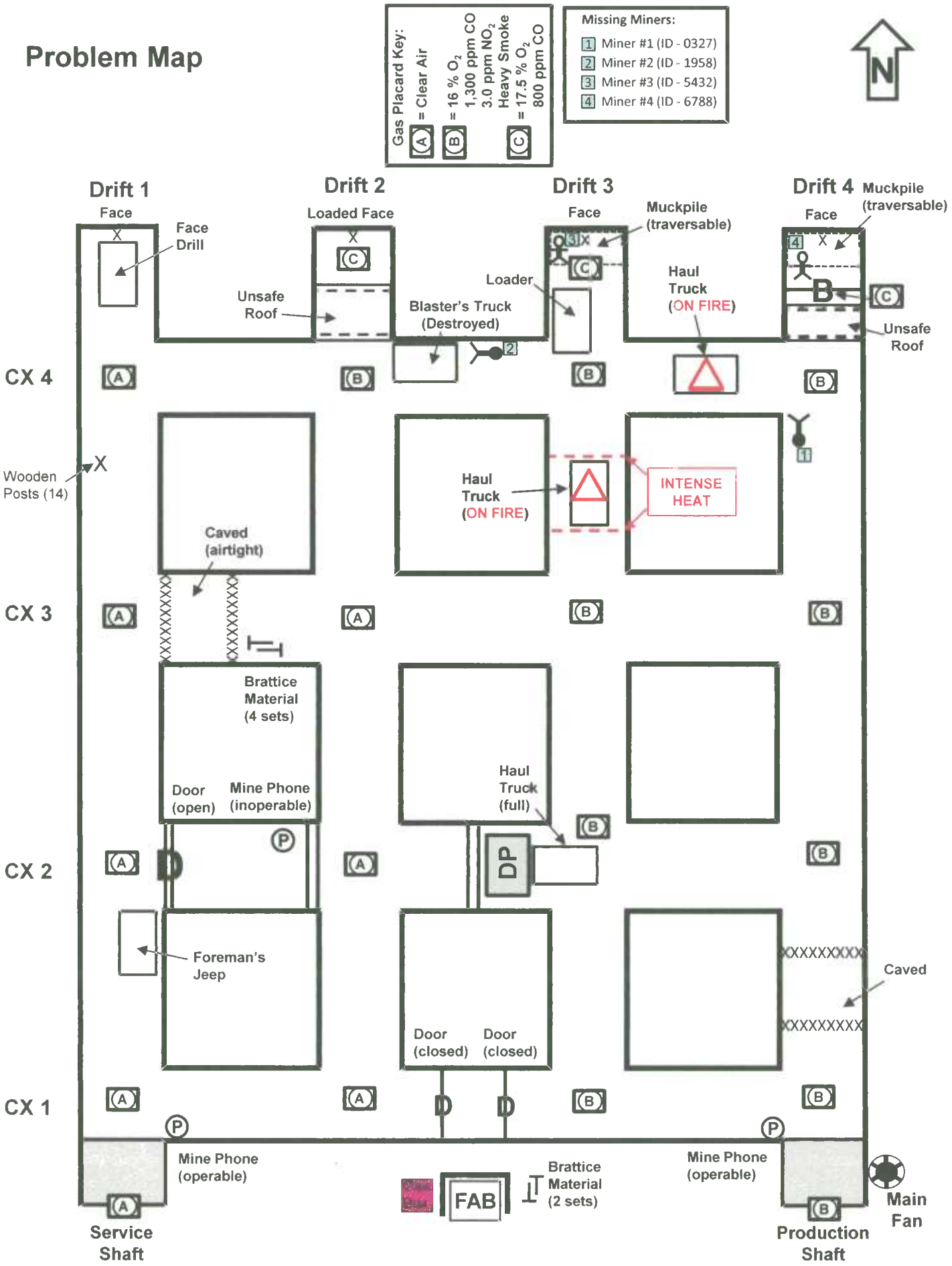
Introduce yourself to the team as the "Mine Manager." Then, introduce the #1, and #2 Judges. The team has been briefed on the problem and the mine information, and been provided with the mine maps in isolation. Read the following instructions to the team:

> **At this time, I have no new information for your team. 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 and mine rescue team alternate must remain at the surface fresh air base. Only the fresh air base attendant can speak with the team via the communication system to discuss the rescue activities performed or proposed. If the team returns to the fresh air base, only the attendant or alternate will be allowed to assist them. However, neither the attendant nor the alternate can physically go beyond the fresh air base to assist the team unless he/she becomes a team member when someone drops out.**
>
> **After the team has completed its 50 foot check, they will not be allowed to physically compare the team map with the fresh air base attendant's map or the team alternate's map. No side by side comparison will be allowed and no changes (edits) can be made to any map while the team is at the surface fresh air base.**
>
> **The fresh air base attendant or team alternate is not allowed to speak with anyone except the team members, the mine manager, or the judges.**
>
> **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. The alternate's map will also be collected at this time but it will not be scored.**
>
> **Do you understand these instructions?**

When they verify understanding the instructions, have the Team Captain start the clock and hand the team their copies of the Team Briefing Information, the Mine Information Sheets, and the three mine maps.

Remember to add: **"Good Luck!"**

Problem Map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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 in isolation. At that time, the teams will be allowed to review the team briefing statement, mine information sheet, mine maps, and instructions for rescue teams and fresh air base attendants. However, copies of these documents and maps will be collected at the conclusion of the briefing session.

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.

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 (or sheet). The captain's failure to perform any of these tasks will result in discounts (4 x each infraction) per Judge 1 – Surf Rule #8.

After receiving the information from the Mine Manager (i.e., team briefing statement, mine information sheet, instructions for rescue teams and fresh air base attendants, and the mine maps), 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.

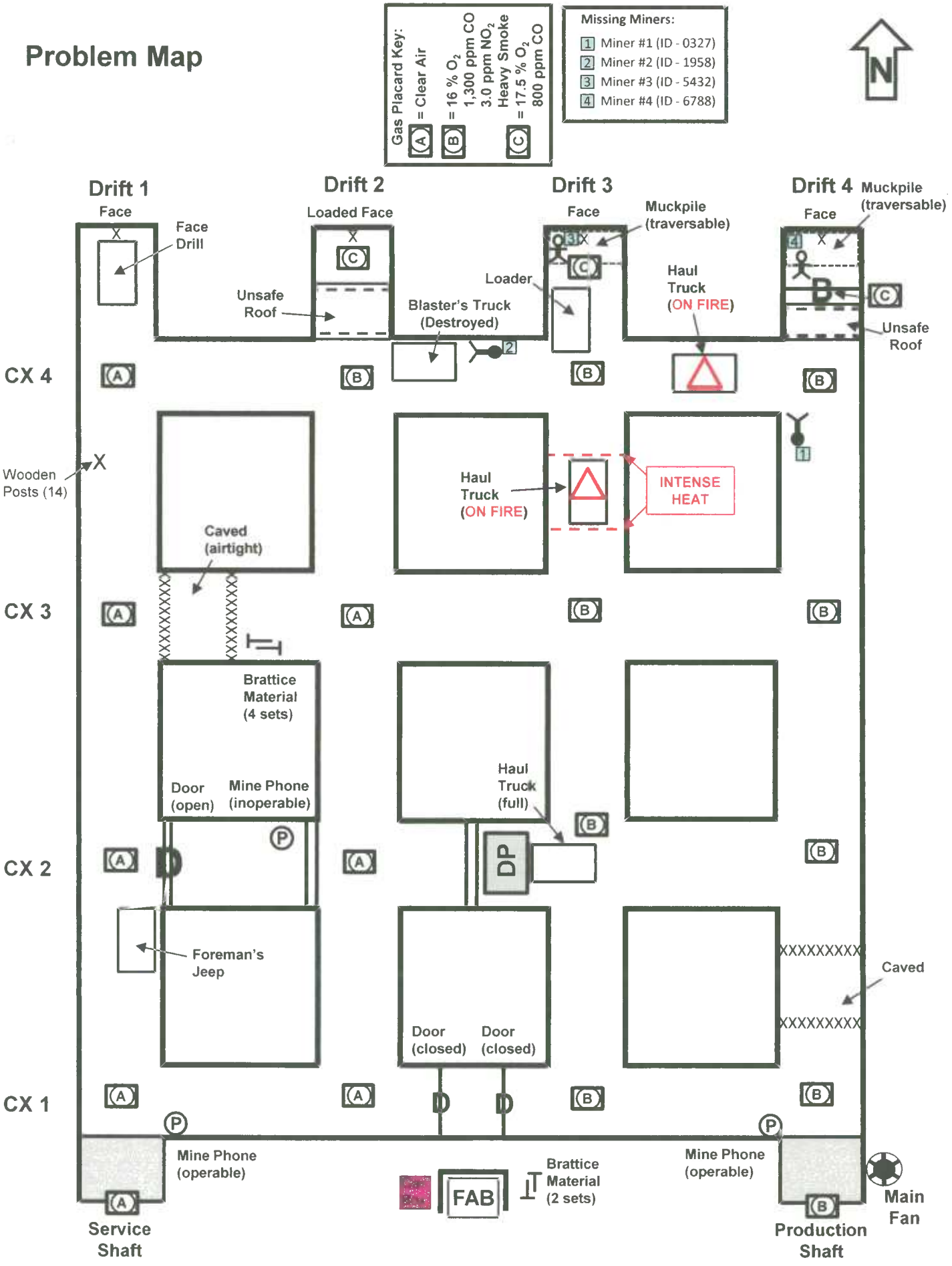
Since the mine is a Category VI, the team does not need to use non-sparking tools to work the problem. However, if the team does not have non-sparking tools and requests them from the official in charge, the tools that they brought with them will be deemed non-sparking.

The team will find that there are two sets of brattice material at the fresh air base to be used as needed during the working of the problem. The team may elect to take these along with them during exploration of the mine.

Note: The brattice material available for use by the team is relatively lightweight and compact (10-foot strips of brattice cloth with clips on each end). Therefore, for the sake of realism, the team will only be allowed to carry two sets of material at any one given time. This information was provided to the team on the Mine Information Sheet.

When ready, the team must examine the mine openings. Both shafts must 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.

Problem Map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The team's failure to wear apparatus while checking the mine openings will result in individual endangerment discounts (15 x each person) per Judge 1 – UG Rule #10(a)(6).

Note: These checks must be made to assure the conditions are safe to proceed. The team's failure to take necessary gas tests where required (each gas and each infraction) assess discounts (1x each omission) per Judge 2 - UG - Rule #1.

Service Shaft checks reveal:
A placard at the shaft shows "Clear Air." The conveyance will be at the top of the shaft and the team will place combustible material on the cage and send it down, using the posted Nevada hoisting signal codes. The team must then signal the cage to return to the surface. When the material is checked, it will be intact and dry. The team's failure to check both shafts for damage will result in a team endangerment (75 discounts) per Judge 1 – UG Rule #10(b)(1).

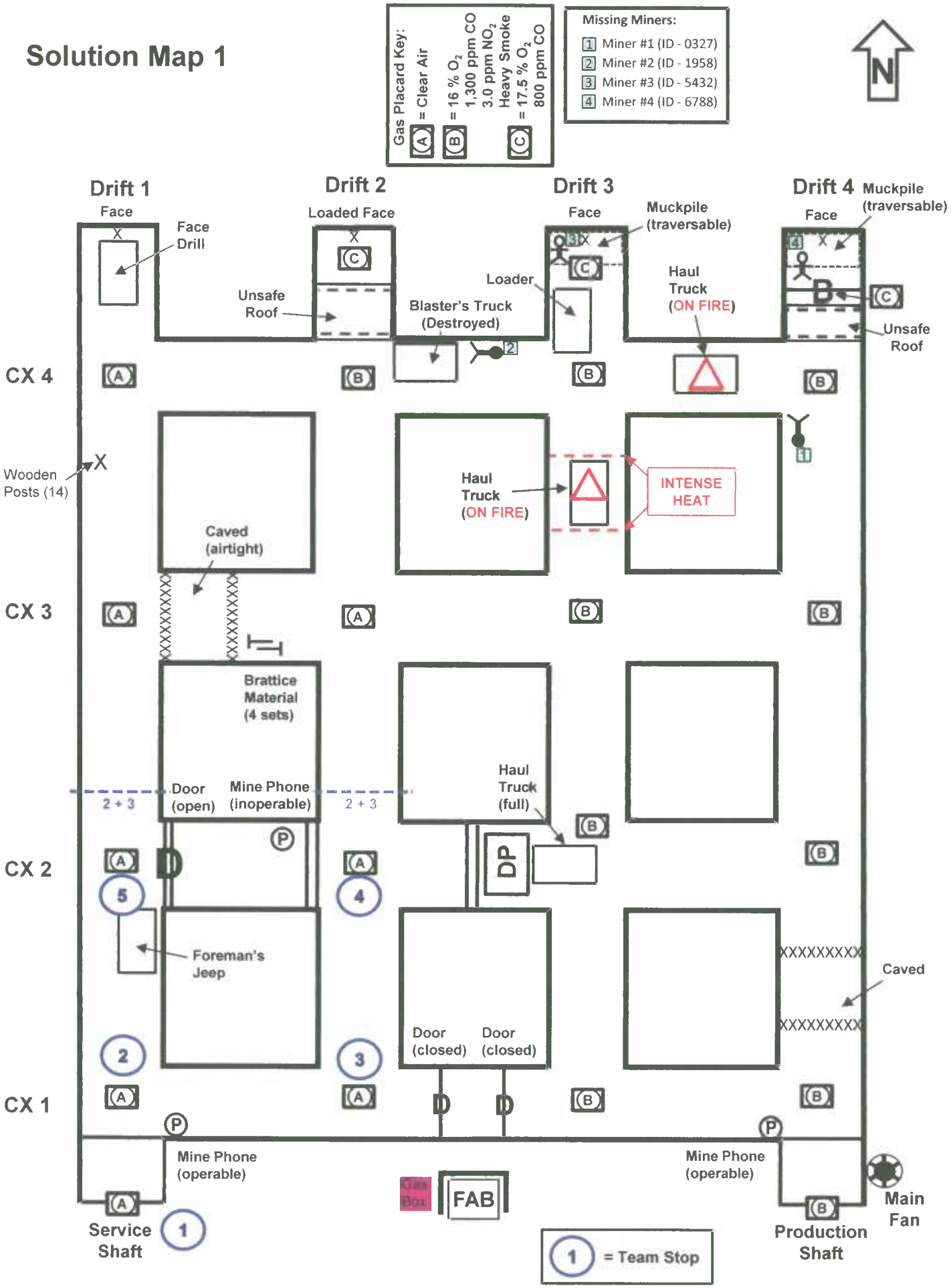
Note: At each shaft, Judge No. 1 will allow 10 seconds for the conveyance to travel in each direction.

Production Shaft checks reveal:
A placard at the shaft shows 16 % oxygen (O_2), 1,300 ppm carbon monoxide (CO), and 3.0 ppm nitrogen dioxide (NO_2) with heavy smoke. The conveyance will be at the top of the shaft and the team will place combustible material on the cage and send it down, using the posted Nevada hoisting signal codes. The team must then signal the cage to return to the surface. When the material is checked, it will be intact and dry.

Note: Gas concentrations found at this shaft was provided to the team during their briefing. Therefore, the team must perform an apparatus and personnel check before entering smoke at this location. They must also be attached to their lifeline. The team's failure to conduct a team check before entering smoke will result in discounts (5 x each infraction) per Judge 1 – UG Rule #12. Additionally, a team member's failure to be attached to or have hold of the lifeline when in smoke will result in discounts (2 x each infraction) per Judge 2 – UG Rule #9.

Gas Box Testing Station:
The team will also find the gas box testing station located at the fresh air base. A team member must use the team's multi-gas instrument to determine the gas concentrations in the unknown mixture. The team must provide its own calibration cup to report: O_2, CH_4, CO, and NO_2. **This will be the only gas box on the mine rescue field.** Judge No. 2 will assess the team's measurements and, if warranted, apply appropriate discounts (15 x each incorrect gas measurement) per Judge 2 – UG Rule #4.

Solution Map 1



Note: Team Stop Nos. 1 - 5 (see Solution Map 1)

Team Stop No. 1
The team can travel to the Service Shaft. They must count off before entering the cage (first time they go underground). Then, they must close the shaft gate and signal the hoist engineer. Afterward, the team will descend to the Service Shaft station in Crosscut 1 (designated as CX 1 on the team and fresh air base maps).

Team Stop No. 2
Before exiting the cage the captain must check for loose roof in front of the cage. A gas check will show "clear air." After exiting the cage, the team will close the shaft gate. At the shaft station, the team will find a working mine phone. They will also find that Drift 1 to the north and CX 1 to the east are open.

The team's failure to "count off" upon first entry into and final exit from the mine will result in discounts (2 x each infraction) per Judge 1 – Surf Rule #10.

The team's failure to close the shaft gate will result in discounts (5 x each infraction) per Judge 1 – UG Rule #7.

The team's failure to use the posted hoisting signals will result in discounts (1 x each infraction) per Judge 1 – UG Rule #6.

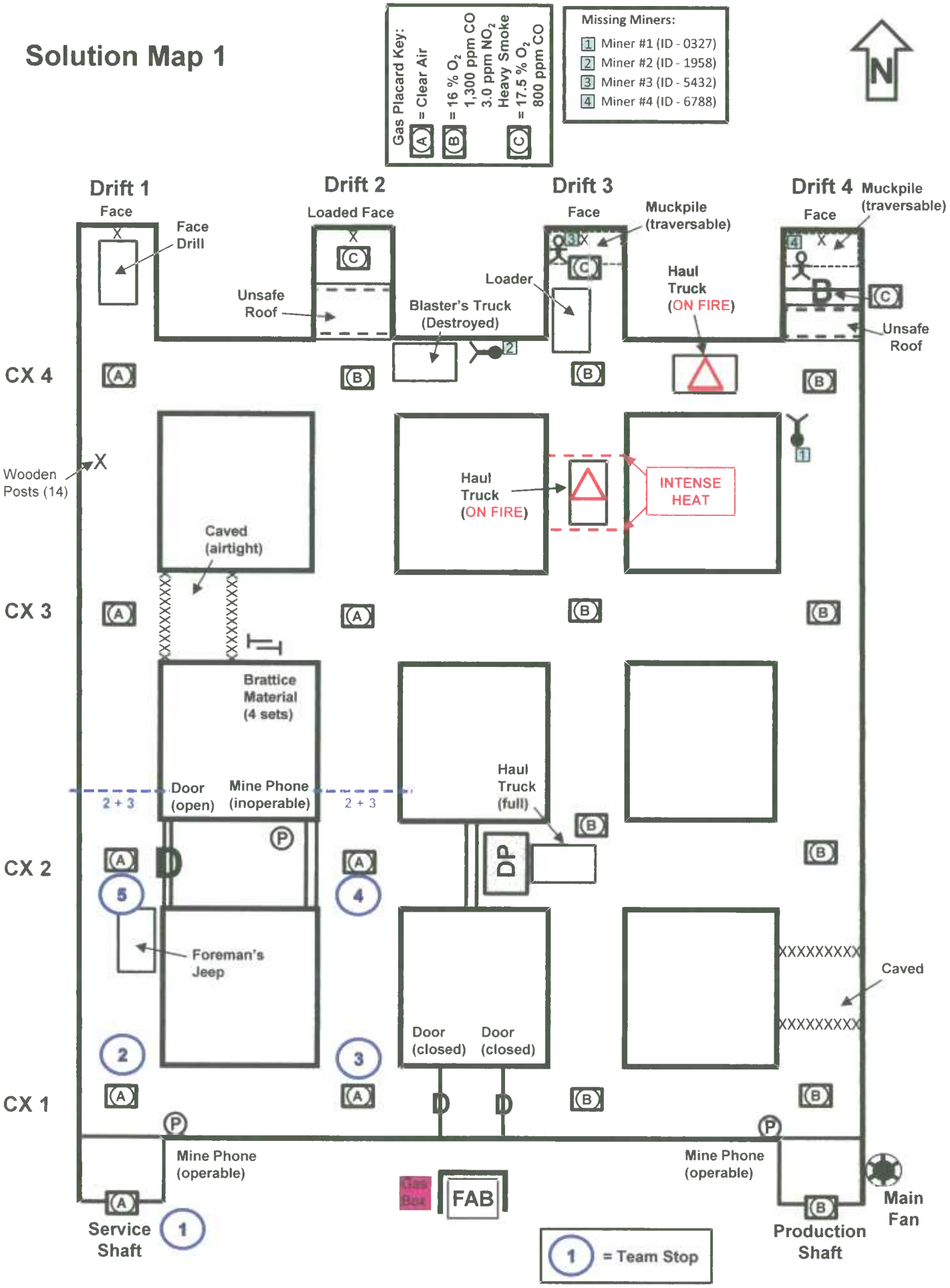
The captain's failure to verbally indicate he/she is checking the back or roof where required will result in discounts (5 x each occurrence) per Judge 1 – UG Rule #8(b)(4).

The team's failure to take necessary gas tests where required (each gas and each infraction) assess discounts (1x each omission) per Judge 2 - UG Rule #1. **All additional areas requiring gas testing by the team are shown on the Judge's Map (with Team Stops) as "GT".**

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 time, 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. If team fails to conduct 50 foot check, assess 10 discounts per Judge 1 – UG Rule #3. Also, if the team fails to conduct apparatus examinations exceeding 20-minute intervals, assess discounts per Judge 1 - UG Rule #5 (5x each occurrence).

Note: No physical comparison of the fresh air base map and team map will be allowed after this initial entry into the mine. No changes can be made to any map while the team is at the surface fresh air base. See Judge 2 – Surf Rule #5 (25 total discounts).

Solution Map 1



Team Stop No. 3
Since CX 1 is not blocked to the east, the team must advance in the crosscut toward Drift 2. At the intersection, the captain will check the roof or back and the team will conduct necessary gas tests. They will find clear air and Drift 2 to the north is open.

The team can stretch eastward in CX 1 to the western most airlock door and find that it is "closed." The captain must D&I the door as their furthest point of advance in this direction.

The captain's failure to D&I where required (at the point of farthest advance of the team in any direction such as at stoppings, faces of rooms and drifts, water over knee deep, impassable falls, barricades, fires out of control, and at the location of any survivors or bodies) assess discounts (2 x each place – max 10) per Judge 1 - UG Rule #9. **All additional areas requiring a D&I by the team captain are shown on the Judge's Map (with Team Stops) as "DI".**

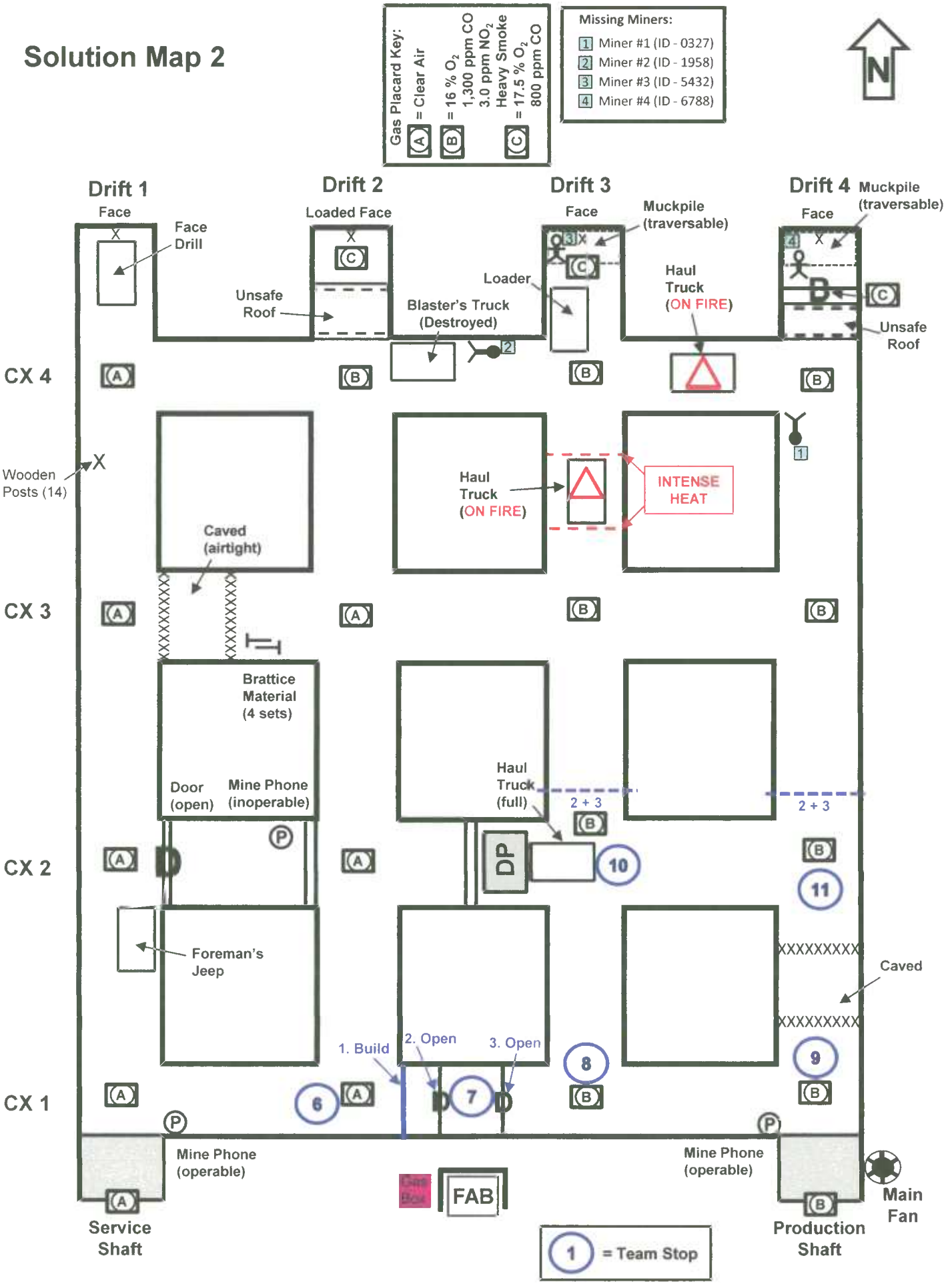
Team Stop No. 4
The team will advance northward in Drift 2 toward CX 2. At the intersection, the captain will check the roof or back and the team will conduct necessary gas tests. They will find clear air and Drift 2 to the north is open. To the west, they will find that the crosscut is blocked by a permanent stopping. The captain must D&I the permanent stopping as their furthest point of advance in this direction. The team can stretch eastward in CX 2 to find a permanent stopping. The captain must check the roof or back and the team will conduct necessary gas tests. The captain must D&I the permanent stopping as their furthest point of advance in this direction.

Note: The team cannot advance beyond 3 feet past CX 2, because they have not tied-in the entries behind them. If the team travels beyond this limit and fails to explore systematically, assess discounts (4 x each infraction) per Judge 1 – UG Rule #11.

Team Stop No. 5
To continue systematic exploration, the team will retreat to the intersection of Drift 1 and CX 1. Then, they can travel northward in Drift 1 toward CX 2. At the intersection, the captain will check the roof or back and the team will conduct necessary gas tests. They will find clear air and Drift 2 to the north is open. To the east, the team will find a permanent stopping with an "open" door. The captain must check the roof or back as the team stretches through the door into the enclosure (referred to as the "mine office" in the Team briefing Statement). Once inside, the team will find an inoperable mine phone located along the northern rib. At the permanent stopping, the captain must check the roof or back and the team will conduct necessary gas tests. The captain must D&I the permanent stopping as their furthest point of advance in this direction.

Note: The team cannot advance beyond 3 feet past CX 2, because they have not tied-in the entries behind them.

Solution Map 2



Note: Team Stop Nos. 6 - 11 (see Solution Map 2)

Team Stop No. 6
Now, the team can return to the airlock in CX 1 to access Drift 3. Since the conditions inside the airlock are unknown and to prevent an unintentional ventilation change, the team must build a temporary stopping before opening the westernmost door.

The team's failure to erect a temporary stopping will result in discounts (10 x each infraction) per Judge 2 – UG Rule #10. In addition, making a ventilation change before the effects of such changes are known will result in discounts (15 x each infraction) per Judge 2 – UG Rule #12.

If the captain doesn't check the roof and rib prior to building a temporary stopping, assess 5 discounts per Judge 1- UG Rule #8(b)(3). **Note: shown on the Judge's Map (with Team Stops) as "RR".** If the captain does not D&I the build, assess discounts per Judge 1 – UG Rule #9 (2x each place - 10 max).

Team Stop No. 7
Afterward, the door can be opened and the captain must check the roof or back before the team passes through. Once inside of the airlock, they will find the easternmost airlock door is "closed." They can open the second door. Again, the captain must check the roof or back before the team passes through.

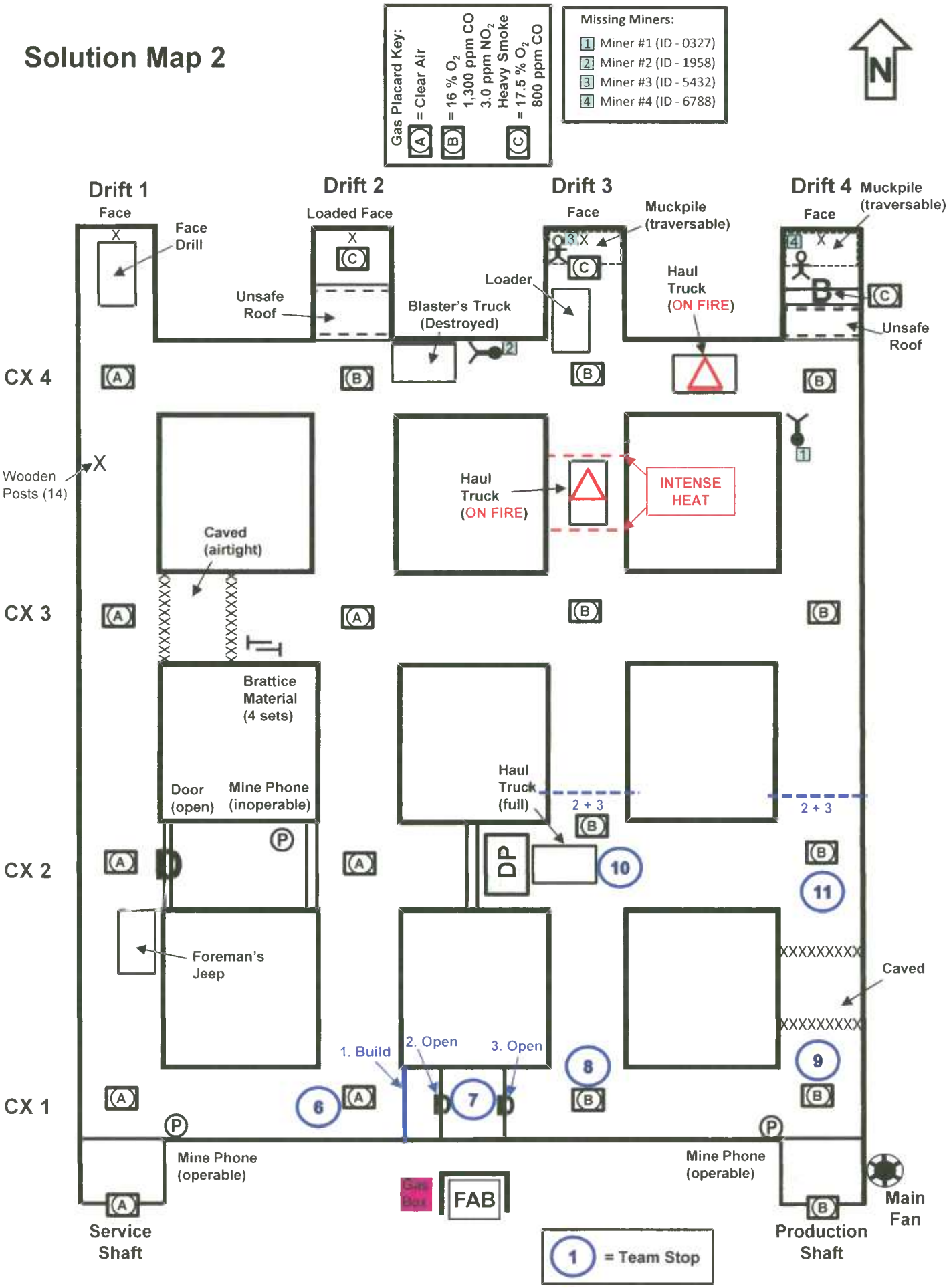
The captain's failure to verbally indicate he/she is checking the back or roof where required will result in discounts (5 x each occurrence) per Judge 1 – UG Rule #8(b)(4).

Team Stop No. 8
Now, the team can travel eastward to the intersection with Drift 3. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find a placard indicating 16 % O_2, 1,300 ppm CO, and 3.0 ppm NO_2 with heavy smoke. They will also find that Drift 3 to the north and CX 1 to the east are open.

The team's failure to conduct a team check before entering smoke at this location will result in discounts (5 x each infraction) per Judge 1 – UG Rule #12. Additionally, a team member's failure to be attached to or have hold of the lifeline when in smoke will result in discounts (2 x each infraction) per Judge 2 – UG Rule #9.

Team Stop No. 9
Since CX 1 is not blocked to the east, the team must advance in the crosscut toward Drift 4. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find that gas concentrations have not changed from their previous location. They will also find a working mine phone at the Production Shaft Station. To the north, they will find that Drift 4 is blocked by a cave stretching rib-to-rib. After again checking the roof or back and taking necessary gas tests, the captain must D&I the cave as their furthest point of advance in this direction.

Solution Map 2



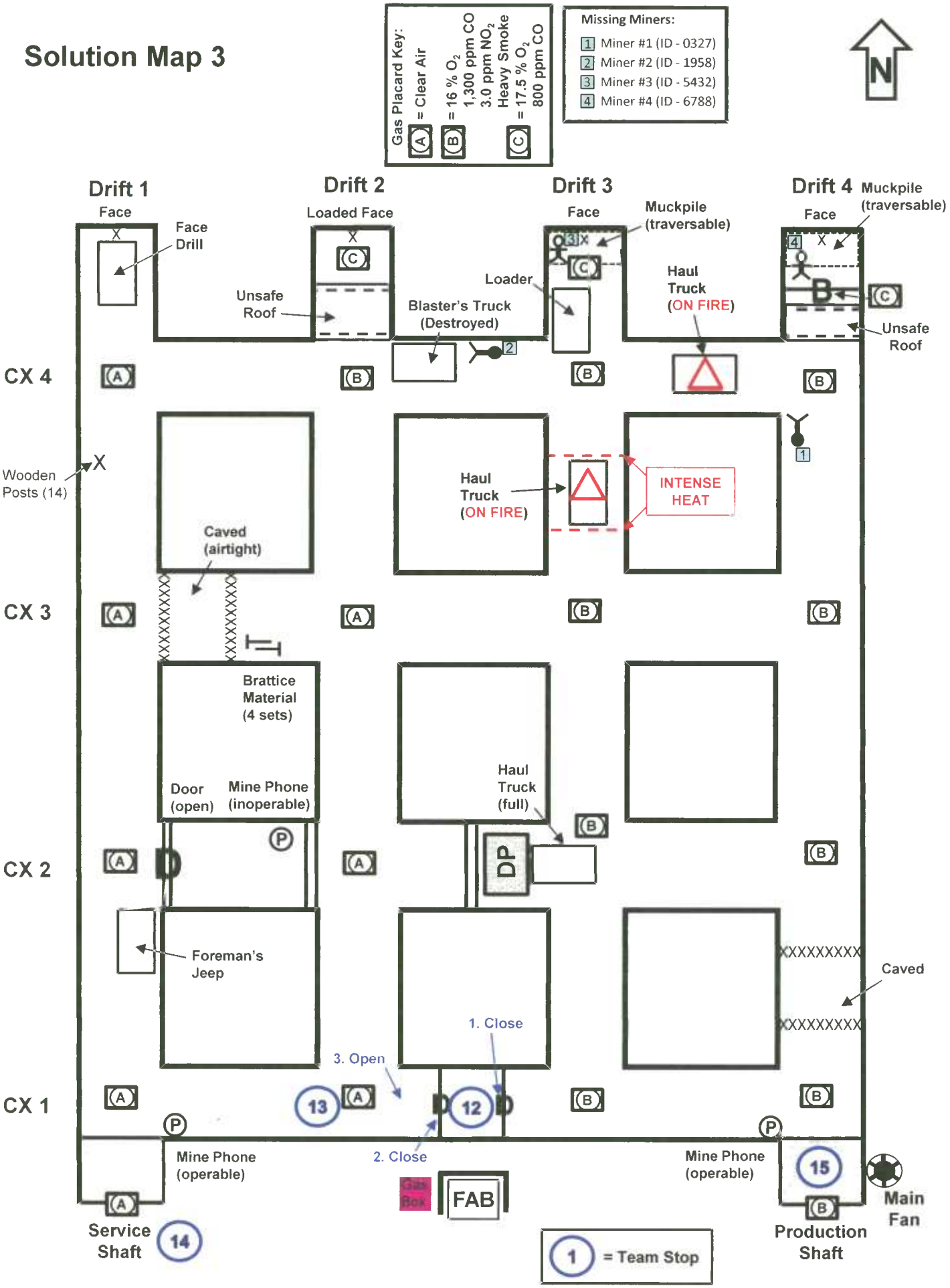
Team Stop No. 10
The team can retreat to Drift 3 and advance northward in the drift toward CX 2. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find "16 % O_2, 1,300 ppm CO, and 3.0 ppm NO_2 with heavy smoke." They will also find a loaded haul truck parked at the Dump Pocket and Drift 3 to the north and CX 2 to the east are open. A placard at the dump pocket indicates that it is "full with no air movement." The team can stretch westward in CX 2 around the dump pocket to the permanent stopping. The captain must warn the other team members to avoid this fall of person hazard. After again checking the roof or back and taking necessary gas tests, the captain must D&I the stopping as their furthest point of advance in this direction.

Note: The team cannot advance beyond 3 feet past CX 2, because they have not tied-in the entries behind them.

Team Stop No. 11
The team can advance eastward in CX 2 to Drift 4. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find that gas concentrations have not changed from their previous location. They will also find that Drift 4 is open to the north. The team can stretch southward in the drift to find the northern extent of a cave stretching rib-to-rib. After again checking the roof or back and taking necessary gas tests, the captain must D&I the cave as their furthest point of advance in this direction.

Note: The team cannot advance beyond 3 feet past CX 2, because they have not tied-in the Production Shaft behind them.

Solution Map 3



Note: Team Stop Nos. 12 - 15 (see Solution Map 3)

Team Stop No. 12
Before continuing further, the team must now exit the mine and reenter through the Production Shaft to tie-in behind. To do this, they must retreat to the airlock in CX 1. Once inside the airlock, they must close the easternmost door behind them.

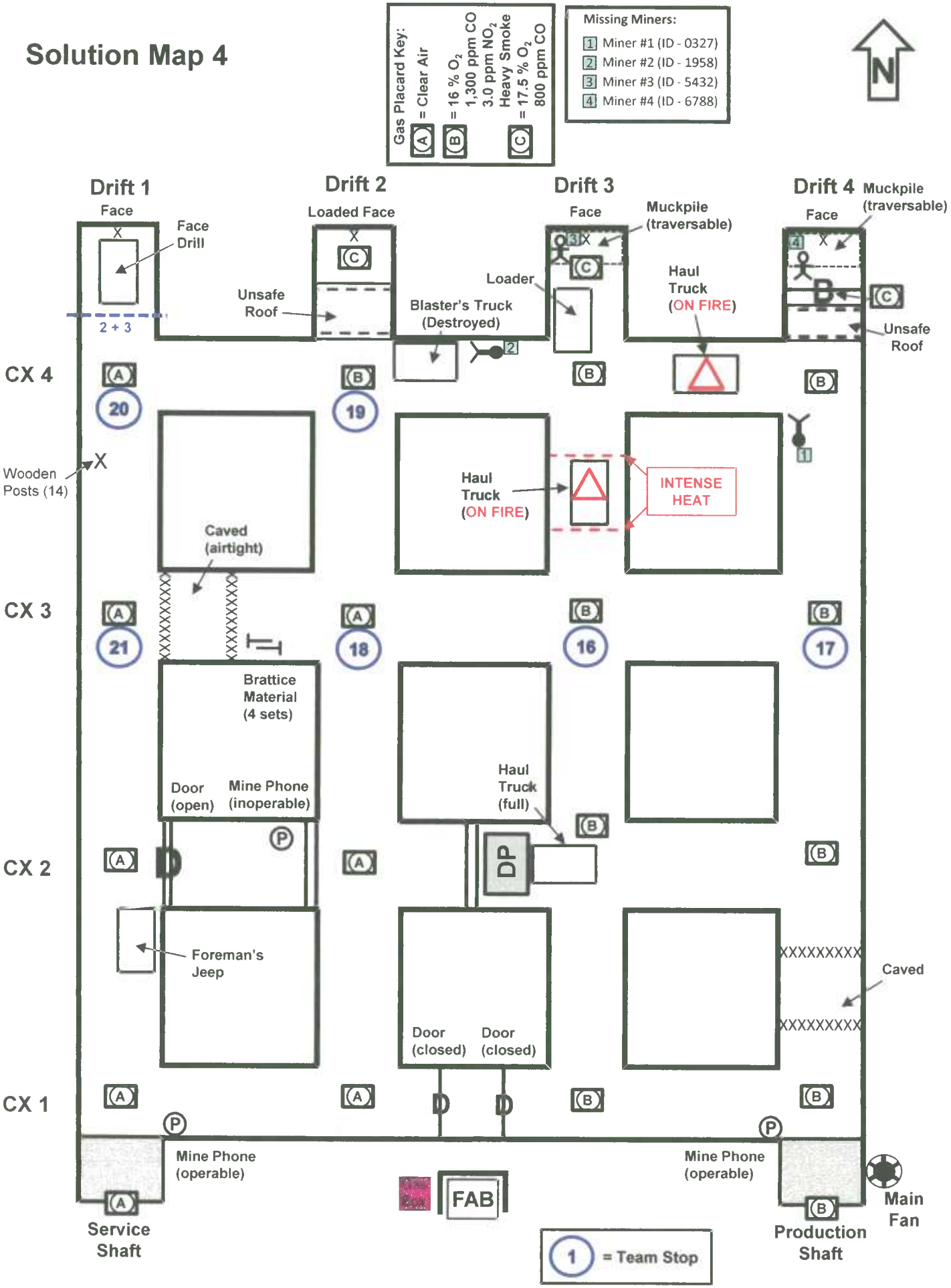
Team Stop No. 13
Now, they can pass through the westernmost airlock door and close it behind them. Afterward, they can tear down the temporary stopping that they had previously erected and travel to the Service Shaft station. They can take the brattice material with them for future use.

Team Stop No. 14
At the Shaft Station, they can enter the conveyance, close the shaft gate and signal the hoist engineer. Afterward, they will ascend to the surface (fresh air base).

Team Stop No. 15
Now, the team will travel to the Production Shaft, enter the conveyance, close the shaft gate and signal the hoist engineer. Afterward, they will descend in the escape hoist to the Production Shaft station in CX 1.

The team must conduct a team check before entering smoke at this location and all team members must be attached to or have hold of the lifeline.

Solution Map 4



Note: Team Stop Nos. 16 - 21 (see Solution Map 4)

Team Stop No. 16
To continue systematic exploration of the mine, the team will exit the cage and close the shaft gate. Then, they can advance westward in CX 1 and then northward in Drift 3 to CX 3. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find "16 % O_2, 1,300 ppm CO, and 3.0 ppm NO_2 with heavy smoke." They will also find that Drift 3 to the north and CX 3 to the east and west are open.

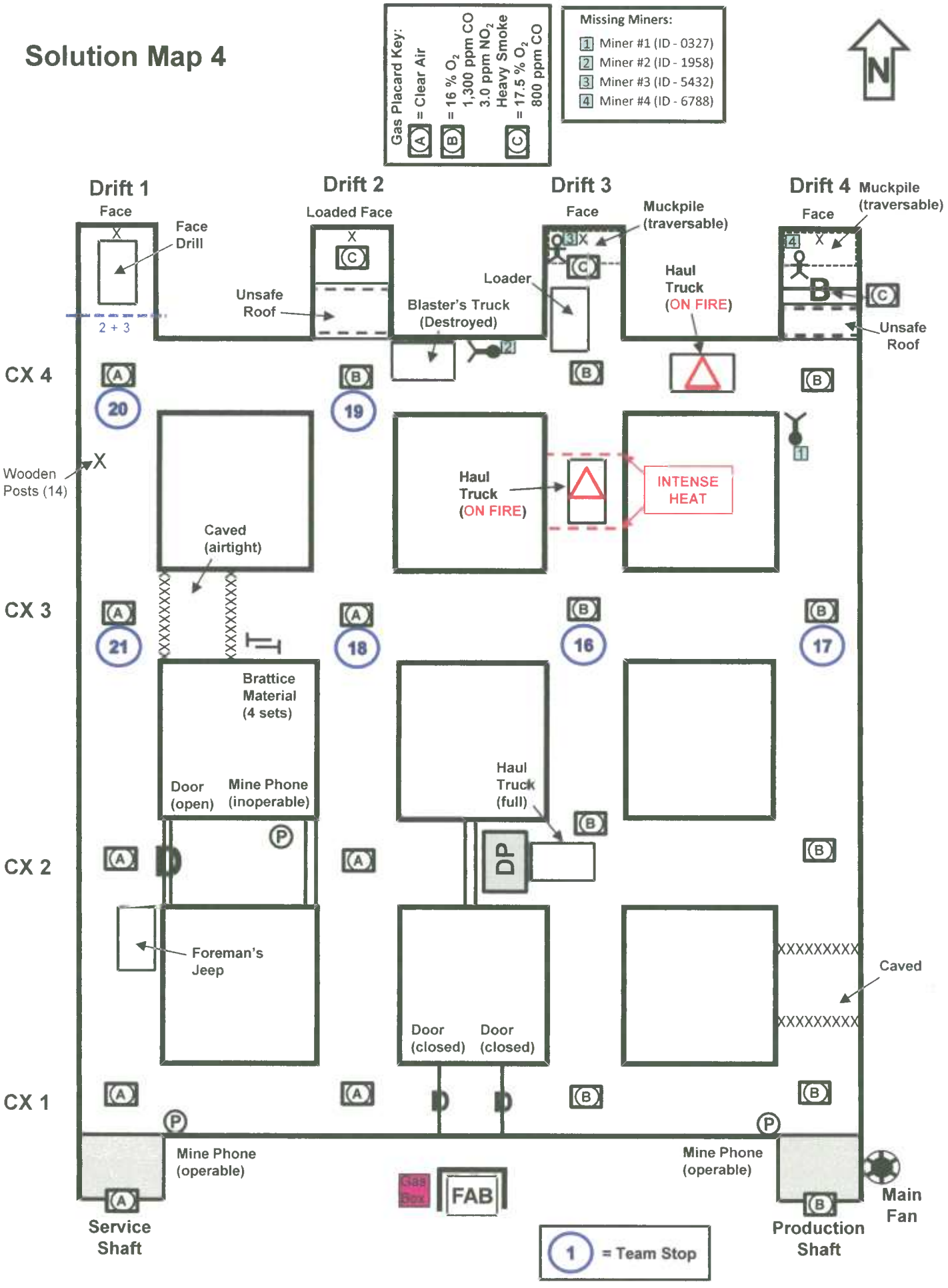
Team Stop No. 17
Since CX 3 is not blocked to the east, the team must travel in the crosscut toward Drift 4. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find that gas concentrations have not changed from their previous location. They will also find that Drift 4 to the north is open. They can stretch southward in Drift 4 to tie-in.

Team Stop No. 18
Again, since CX 3 is not blocked to the west, the team must retreat to the intersection and travel westward in the crosscut toward Drift 2. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. At this location, the team will be in "clear air." They can stretch southward in Drift 2 to tie-in. The team can also stretch westward in CX 3 to find that the crosscut is blocked by an airtight cave stretching rib-to-rib. After again checking the roof or back and taking necessary gas tests, the captain must D&I the airtight cave as their furthest point of advance in this direction. They will also find four sets of brattice material lying along the southern rib. The team must note the location of the extra brattice material but leave it in place, since they already have two sets with them.

Team Stop No. 19
Now, the team can advance northward in Drift 2 toward CX 4. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find "16 % O_2, 1,300 ppm CO, and 3.0 ppm NO_2 with heavy smoke." They will also find that CX 4 is open to the west. To the east, the team will find a blaster's truck with a placard indicating that it is "destroyed." To the north, the team will find a placard indicating an area of "unsafe roof" stretching rib-to-rib. The captain must warn the rest of the team members to avoid this hazard. At this point, the team has not located any posts or cribbing materials to support the unsafe roof. **If the team asks the mine manager for roof support materials, they will be told that all materials needed to work the problem can be found in the mine. Additional wooden posts have been ordered and a shipment is expected to arrive on the surface sometime today.**

The team must conduct a team check before entering smoke at this location and all team members must be attached to or have hold of the lifeline.

Solution Map 4

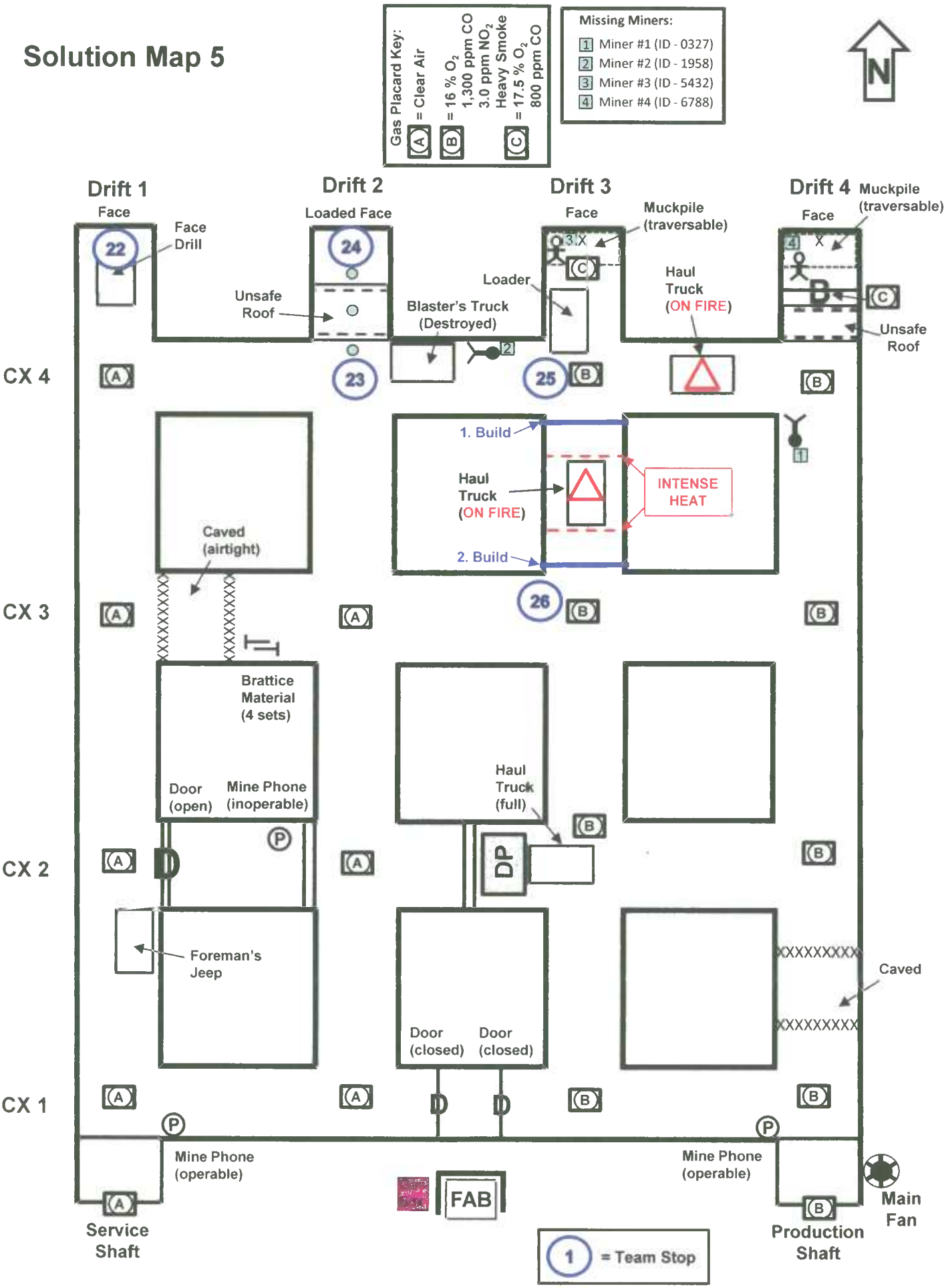


Team Stop No. 20
Since CX 4 is not blocked to the west, the team can travel westward in the crosscut toward Drift 1. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. At this location, the team will be in "clear air."

Note: The team cannot advance beyond 3 feet past CX 4, because they have not tied-in Drift 1 behind them.

Team Stop No. 21
The team must advance southward in Drift 1 toward CX 3 to tie-in. As they travel, they will find 14 wooden posts lying along the western rib. They can take the posts with them for future use to support areas placarded as "unsafe roof," such as the area previously found in Drift 2. At the intersection with CX 3, the captain performs roof or back checks and the team conducts necessary gas tests. At this location, the team will also find "clear air." To the east, they will find the western extent of the airtight cave stretching rib-to-rib. The captain must D&I the airtight cave as their furthest point of advance in this direction. Now, the team can stretch further southward in Drift 1 toward CX 2 to tie-in.

Solution Map 5



Note: Team Stop Nos. 22 - 26 (see Solution Map 5)

Team Stop No. 22
Now, that the entries behind have been successfully tied-in, the team can continue systematic exploration of CX 4 and the face areas of the drifts. The team can retreat to CX 4 and advance northward in Drift 1 to the face area. They will find a face drill parked in the center of the drift. At the face, the captain performs roof or back checks and the team conducts necessary gas tests. Before leaving the area, the captain must D&I the face as their furthest point of advance in this direction.

Team Stop No. 23
After retreating to CX 4, the team can travel eastward in the crosscut to Drift 2.

The team must conduct a team check before entering smoke at this location and all team members must be attached to or have hold of the lifeline.

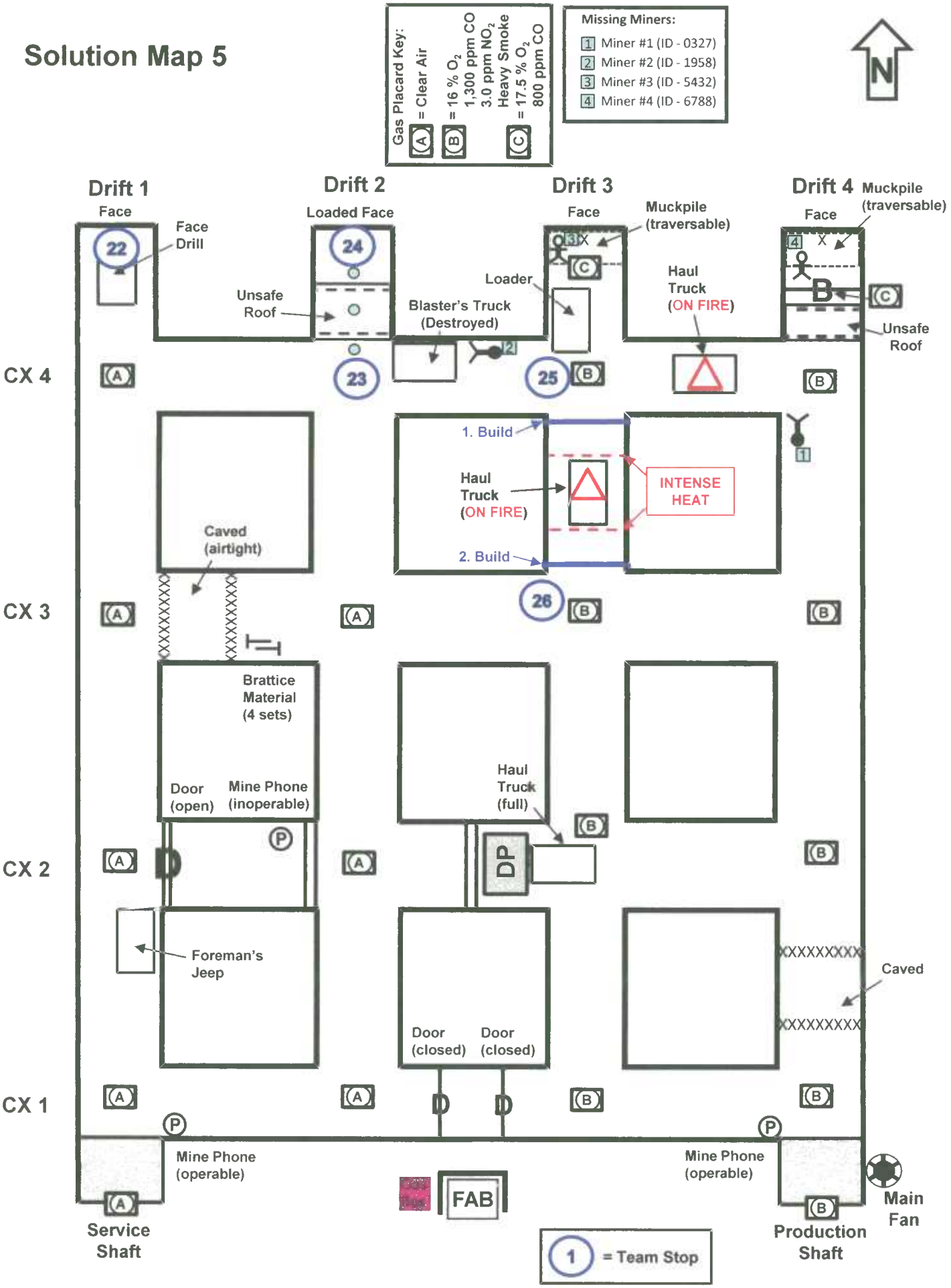
Team Stop No. 24
The team can use wooden posts to support the "unsafe roof" in order to access the face area. **The team should follow the example shown in Figure 1 on page 34 of the 2016 Metal and Nonmetal Mine Rescue Contest Rules booklet.** If the team removes any installed post after it has been set, assess a team endangerment (75 discounts) or individual endangerment (15 x each person) per Judge 1 – UG Rule #10(b)(7).

At the face, the captain must perform roof or back checks. At that time, the captain will find a placard indicating "Loaded Face Drift 2." The captain must warn the other team members to stay back from the "loaded" face. Then, the captain can shunt the blasting wires to disable the shot. Now, the team can conduct necessary gas tests. They will find a placard indicating 17.5% O_2 and 800 ppm CO. Before leaving the area, the captain must D&I the face as their furthest point of advance in this direction.

Team Stop No. 25
After retreating to CX 4, the team can travel eastward to Drift 3. As they travel past the blaster's truck, they will find the first missing miner along the northern rib, Miner #2 (ID – 1958), 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 is severely burned and exhibits no vital signs. The miner is dead."** The captain must D&I the location of the body.

At the intersection with Drift 3, the captain performs roof or back checks and the team conducts necessary gas tests. They will find that gas concentrations have not changed from their previous location. They will also find the back end of a loader parked along the western rib of the drift. Stretching southward in Drift 3 to tie-in, the team will find a placard indicating "intense heat" and a second placard indicating haul truck "on fire." The captain must D&I the location of the "intense heat." Then, the team must erect a

Solution Map 5



seal across the drift to isolate the fire. Note: Since no methane or explosive air/gas mixtures have been found in the mine, the team is not required to regulate the fire.

If a team member advances past the placard indicating "intense heat" assess individual endangerment discounts (15 x each person) per Judge 1 – UG Rule #10(a)(4). Also, if the captain doesn't check the roof and rib prior to building a temporary stopping, assess 5 discounts per Judge 1- UG Rule #8(b)(3). If the captain does not D&I the build, assess discounts per Judge 1 – UG Rule #9 (2x each place - 10 max).

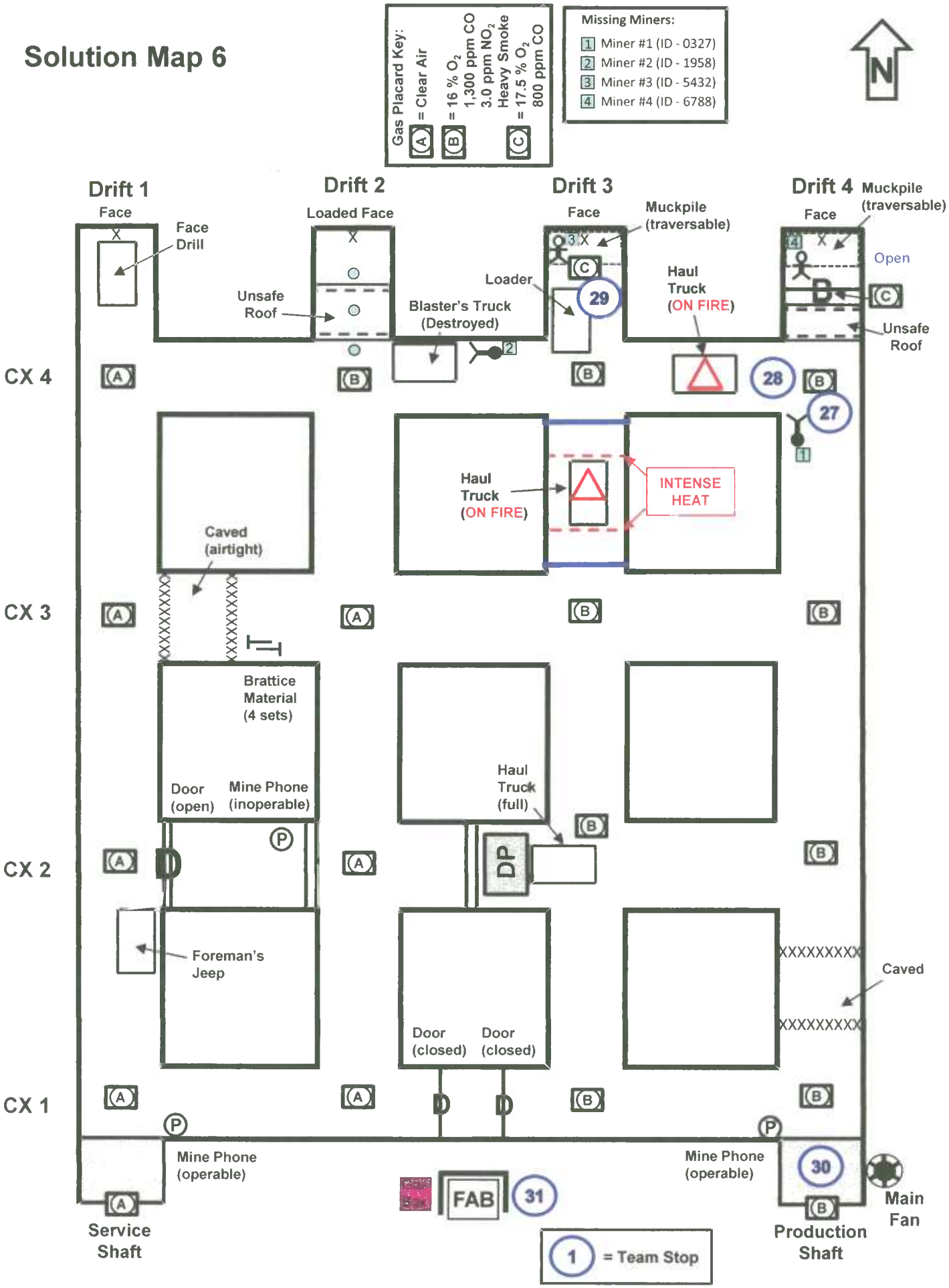
Team Stop No. 26

Without undue delay, the team must find and seal all other approaches to the fire. The team will retreat to the intersection of CX 3 and Drift 3. Then, traveling northward in the drift, the team will find a placard indicating "intense heat." The captain must D&I the location of the "intense heat." Then, the team must erect a seal across the drift to completely seal the fire.

If the team does not make every effort to locate, seal, if possible, without undue delay, assess discounts (50 x each infraction) per Judge 1 – UG Rule #13.

Again, if a team member advances past the placard indicating "intense heat" assess individual endangerment discounts (15 x each person) per Judge 1 – UG Rule #10(a)(4). Also, if the captain doesn't check the roof and rib prior to building a temporary stopping, assess 5 discounts per Judge 1- UG Rule #8(b)(3). If the captain does not D&I the build, assess discounts per Judge 1 – UG Rule #9 (2x each place – 10 max).

Solution Map 6



Note: Team Stop Nos. 27 - 31 (see Solution Map 6)

Team Stop No. 27
With the truck fire sealed, the team can continue systematic exploration. They can advance eastward in CX 3 to Drift 4 and continue northward in the drift toward CX 4. As they travel, they will find the second missing miner along the western rib, Miner #1 (ID – 0327), 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 is severely burned and exhibits no vital signs. The miner is dead."** The captain must D&I the location of the body.

At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find "16 % O_2, 1,300 ppm CO, and 3.0 ppm NO_2 with heavy smoke." To the north, the team will find a placard indicating an area of "unsafe roof" stretching rib-to-rib. The captain must warn the rest of the team members to avoid this hazard.

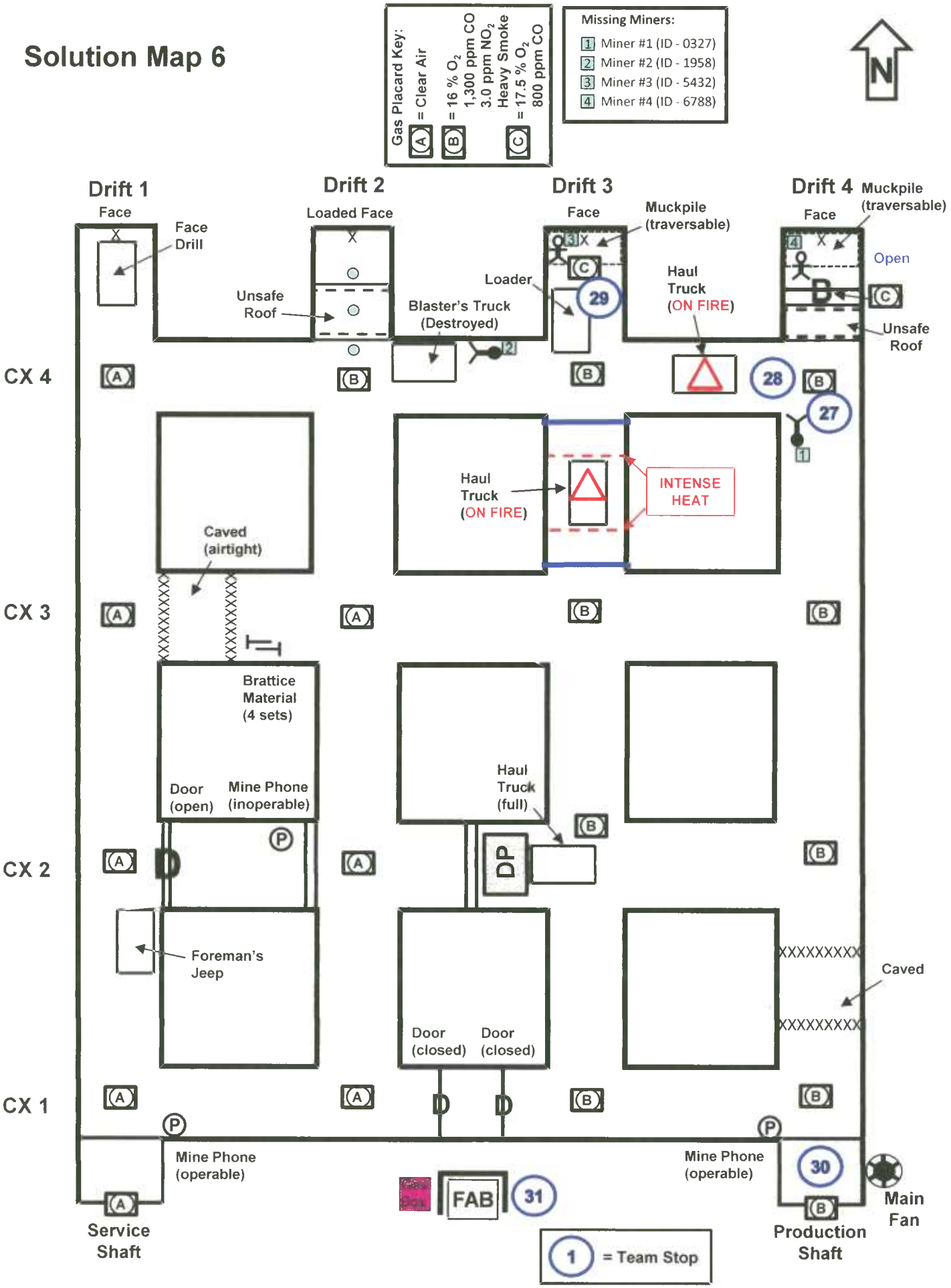
Team Stop No. 28
Since CX 4 to the west is not blocked, the team must travel westward through the crosscut to Drift 3. As they travel, they will find a haul truck with a placard indicating that it is "on fire." The team can use their fire extinguishers to fight the fire. **When the team uses both fire extinguishers, the #1 Judge can flip the placard to show that the "Fire is Out."**

Now, that all fires have been extinguished or sealed. At this point in the problem, the seven gas placards in CX 1, CX 2, CX 3, and at the Production Shaft ("B" Placard - Nos. 13, 15, 17, 21, 22, 39, and 43) can be flipped to show "clear air." One placard in CX 4 ("B" Placard – No. 62) can also be flipped to show "clear air."

Team Stop No. 29
The team can continue to advance westward in CX 4 to Drift 3. Then, they can advance northward around the loader to the face area. The team will find a "muckpile (traversable)" extending from the face of the drift and a placard indicating "17.5% O_2 and 800 ppm CO." On top of the muckpile, the team will find the last missing miner, Miner #3 (ID – 5432), who is unresponsive. The captain must examine the roof or back over Miner #3. After a team member conducts a primary assessment, the #1 Judge will hand the team a placard which reads: ***"The miner is unconscious with no apparent injuries."*** Since there are no injuries, the team must follow the prescribed treatment for prevention of shock (listed in Brady's 9th Edition on pages 402 – 403).

The team must prepare Miner #3 for travel. At this time, the team can continue with their secondary survey and then secure the miner to the stretcher. **The unconscious miner must also be fitted with proper respiratory protection.**

Solution Map 6

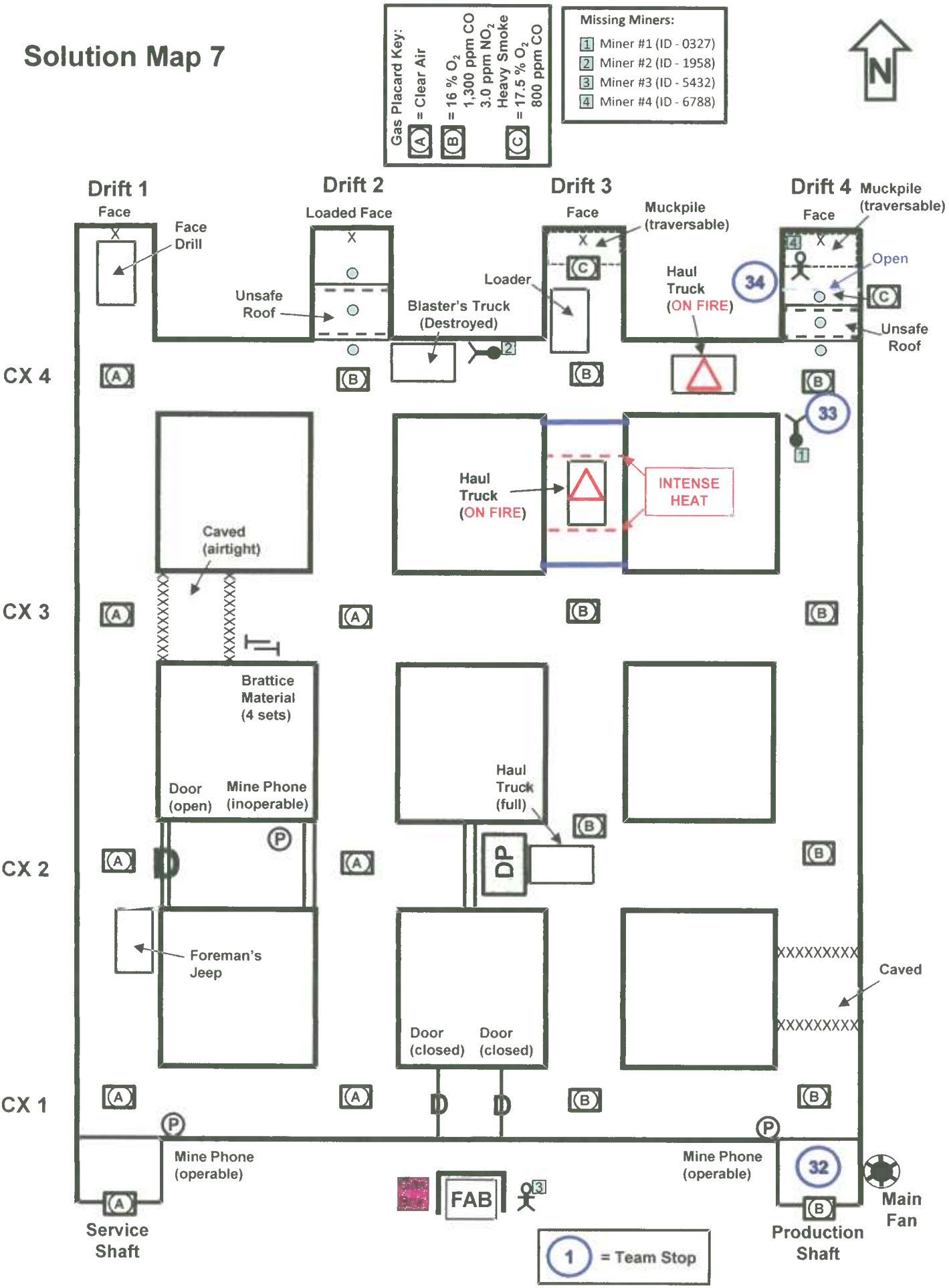


The captain can continue to explore while team members are preparing Miner #3 for transport. At the face, the captain must perform roof or back checks at the face while the team conducts necessary gas tests. Before leaving the area, the captain must remember to D&I the location of the miner and the face (as their furthest point of advance in this direction).

Team Stop No. 30
The team can carry Miner #3 toward the Production Shaft station. Once there, they can enter the conveyance, signal the hoist engineer and ascend in the escape hoist to the surface.

Team Stop No. 31
Upon exiting the cage, the team can report to the fresh air base and arrange for follow-up medical treatment for Miner #3. Then, the team can prepare to re-enter the mine.

Solution Map 7



Note: Team Stop Nos. 32 - 34 (see Solution Map 7)

Team Stop No. 32
Now, the team will travel to the Production Shaft, enter the conveyance, close the shaft gate and signal the hoist engineer. Afterward, they will descend in the escape hoist to the Production Shaft station in CX 1. After exiting the cage and closing the shaft gate, the team can continue systematic exploration.

Team Stop No. 33
They will advance to the intersection of Drift 4 and CX 4. There, they can use wooden posts to support the "unsafe roof" (to the north) in order to access the face area. **The team should follow the example shown in Figure 1 on page 34 of the 2016 Metal and Nonmetal Mine Rescue Contest Rules booklet.** If the team removes any installed post after it has been set, assess a team endangerment (75 discounts) or individual endangerment (15 x each person) per Judge 1 – UG Rule #10(b)(7).

Once the area has been posted, they will find a "barricade (8-feet by 10-feet)" stretching rib-to-rib. At the barricade, the captain must perform roof or back checks and the team will conduct necessary gas tests. They will also find a placard indicating "17.5% O_2 and 800 ppm CO." The team can converse with the missing miner inside. Judge No. 1 will hand the team a placard with the following statement:

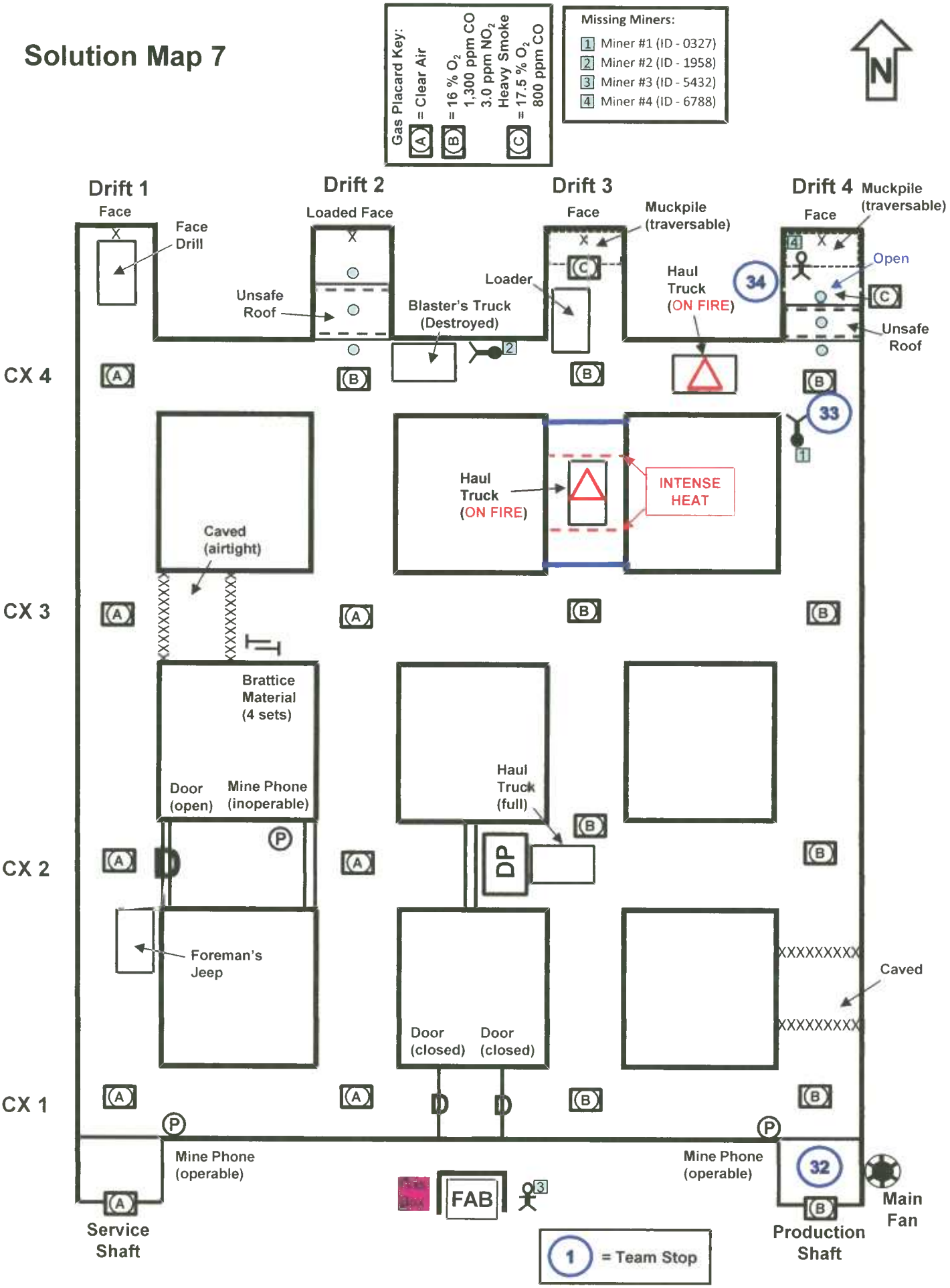
> *"I am Miner #4 (ID – 6788). I was operating a haul truck when I heard a loud explosion and the mine filled with smoke. I tried to leave but could not see to find my way out. I retreated and found a place to barricade. The air inside of this barricade is O.K. There is a solid face behind me. Please get me out of here."*

Since the atmosphere in front of the barricade contains sufficient oxygen and a carbon monoxide concentration less than that listed under "Barricades" on Page 28 of the 2016 Metal and Nonmetal Mine Rescue Contest Rules booklet, the team can enter the barricade without re-ventilating.

The team can instruct the miner to step back so that they can safely enter.

Team Stop No. 34
The captain can open the barricade just enough to allow the team members to pass through and minimize contamination from the outside. The captain must examine the roof or back before the team passes through. Once inside of the barricade, the captain must examine the roof or back over Miner #4. Then, team members can conduct a secondary assessment to determine that he/she is capable of walking out with them to the fresh air base. The team will also find a "muckpile (traversable)" extending from the face of the drift. Before leaving the area, the captain must perform roof or back checks at the face while the team conducts necessary gas tests. The captain must remember to D&I the location of the miner and the face (as their furthest point of advance in this direction).

Solution Map 7

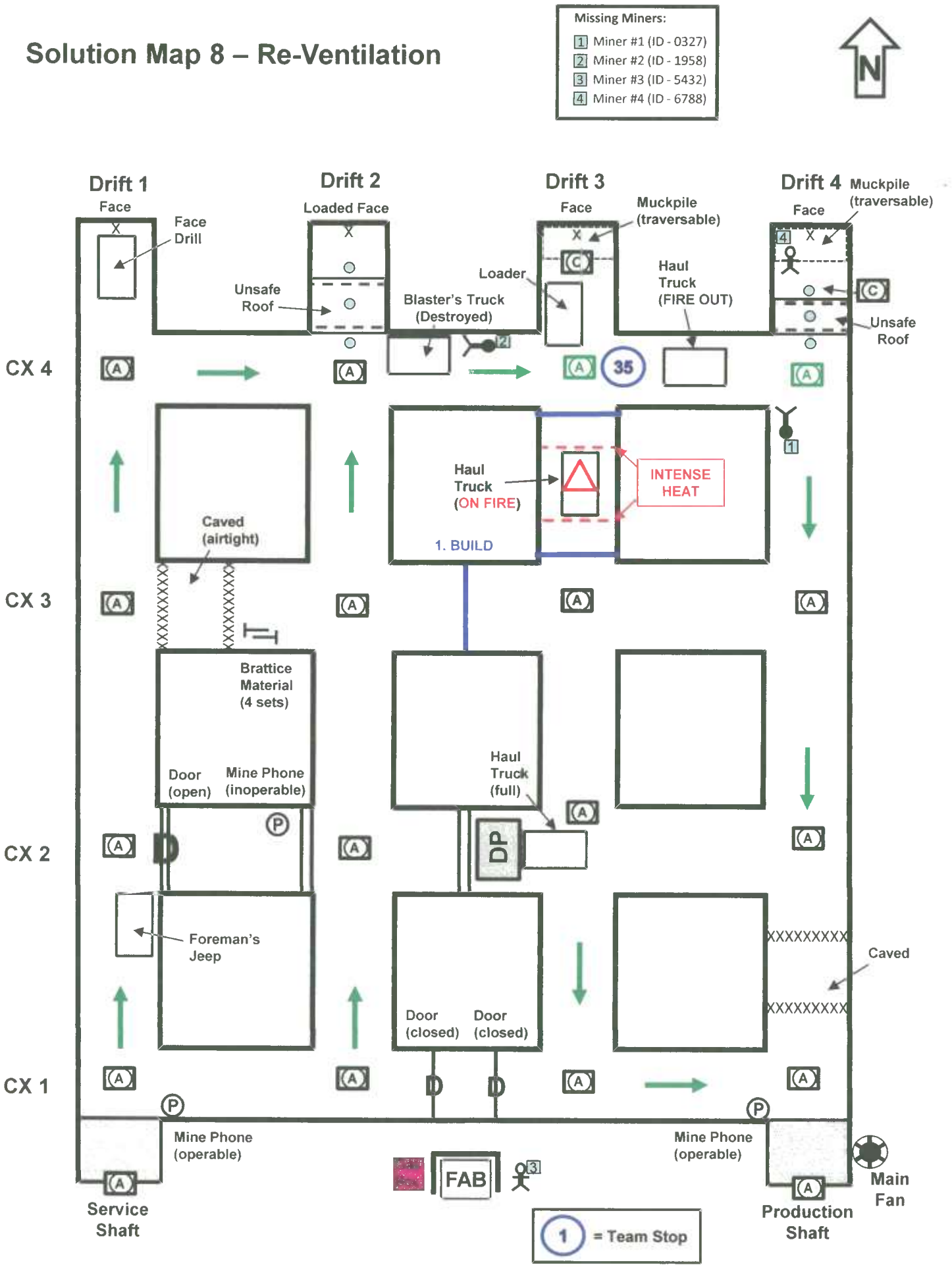


Because toxic airborne contaminants still exist along the team's route of travel back to the fresh air base, Miner #1 must be fitted with proper respiratory protection or the remaining toxic gases in CX 4 must be cleared before traveling to the fresh air base.

The captain's failure to verbally indicate he/she is checking the back or roof where required will result in discounts (5 x each occurrence) per Judge 1 – UG Rule #8(b)(4). Also, if the captain does not assess roof conditions directly over the miner, assess discounts (5 x each infraction) per Judge 1 – UG Rule #8(c).

If the team performs any act that may result in death or injury to the survivor, including failure to provide proper respiratory protection when needed, assess discounts (50 x each person) per Judge 1 – UG Rule 18(a) – 18(d).

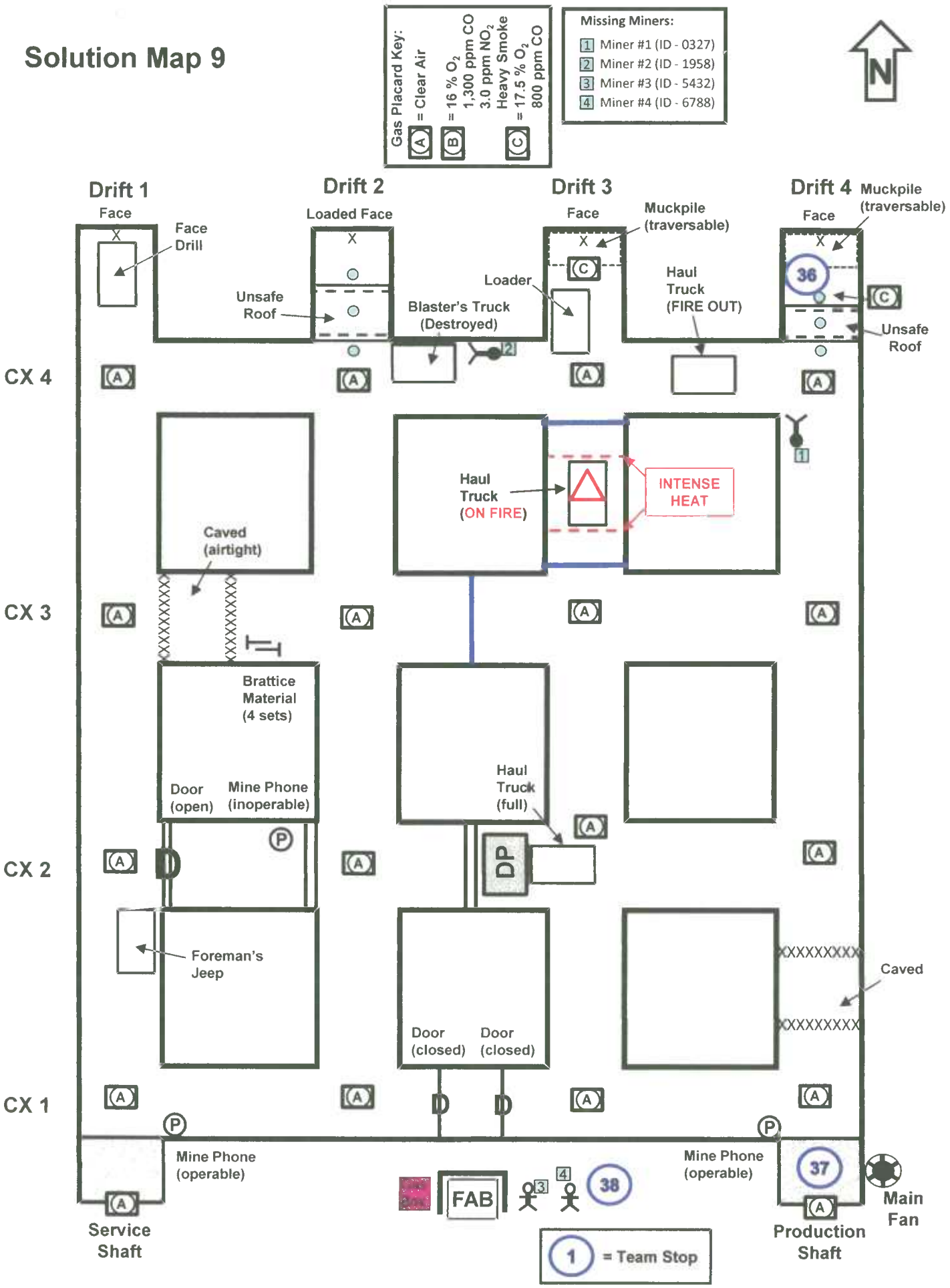
Solution Map 8 – Re-Ventilation



Note: Team Stop No. 35 (see Solution Map 8 – Re-Ventilation)

Team Stop No. 35 (OPTIONAL)
If the team decides to re-establish ventilation in the mine to clear CX 4, they can discuss the needed change with the Mine Manager and the Fresh Air Base. That is, build a temporary stopping in CX 3 between Drift 2 and Drift 3. If the team makes this change, fresh air will flow from the Service Shaft northward in Drift 1 and across CX 4 to Drift 4. At that time, the remaining two gas placards (Nos. 45 and 54) can be flipped to show "clear air."

Solution Map 9



Note: Team Stop Nos. 36 - 38 (see Solution Map 9)

Team Stop No. 36
The team and Miner #4 can retreat southward in Drift 4 toward the Production Shaft Station.

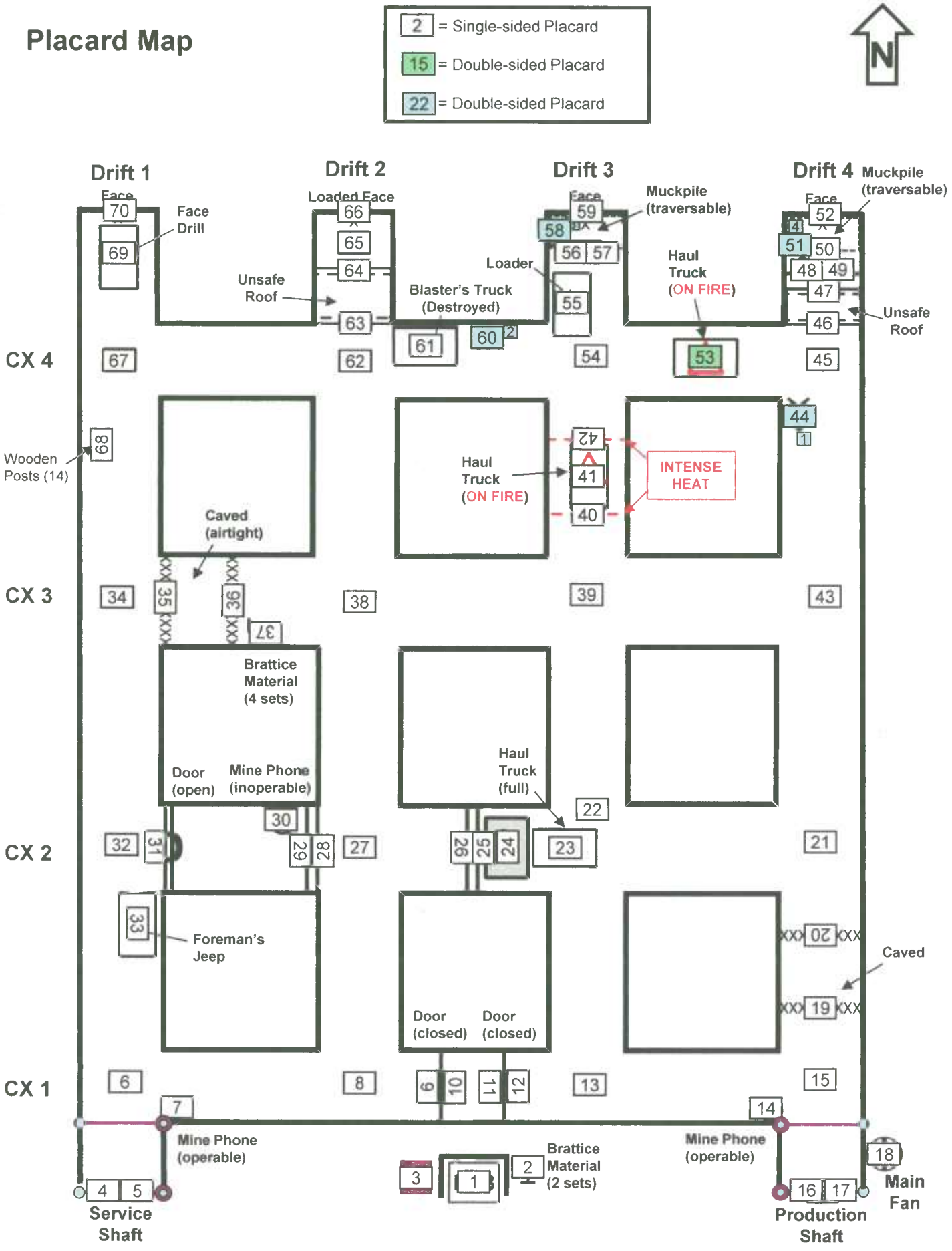
Note: Whether Miner #4 needs to wear an apparatus depends on the team's choice to re-ventilate or not.

Team Stop No. 37
Once there, they can enter the conveyance, close the shaft gate, signal the hoist engineer and ascend in the escape hoist to the surface.

Team Stop No. 38
Upon exiting the cage, the team must count off (this is the last time that the team exits the mine). Afterward, they can leave Miner #4 with the attendants for any follow-up medical treatment. Then, the captain can inform the mine manager that the team has completed their mission. That is, they have explored all accessible areas of the mine, sealed one fire and extinguished another, located the four missing miners, and brought two of them out alive. During the rescue mission, they did not need to re-ventilate the mine.

*** **THE END** ***

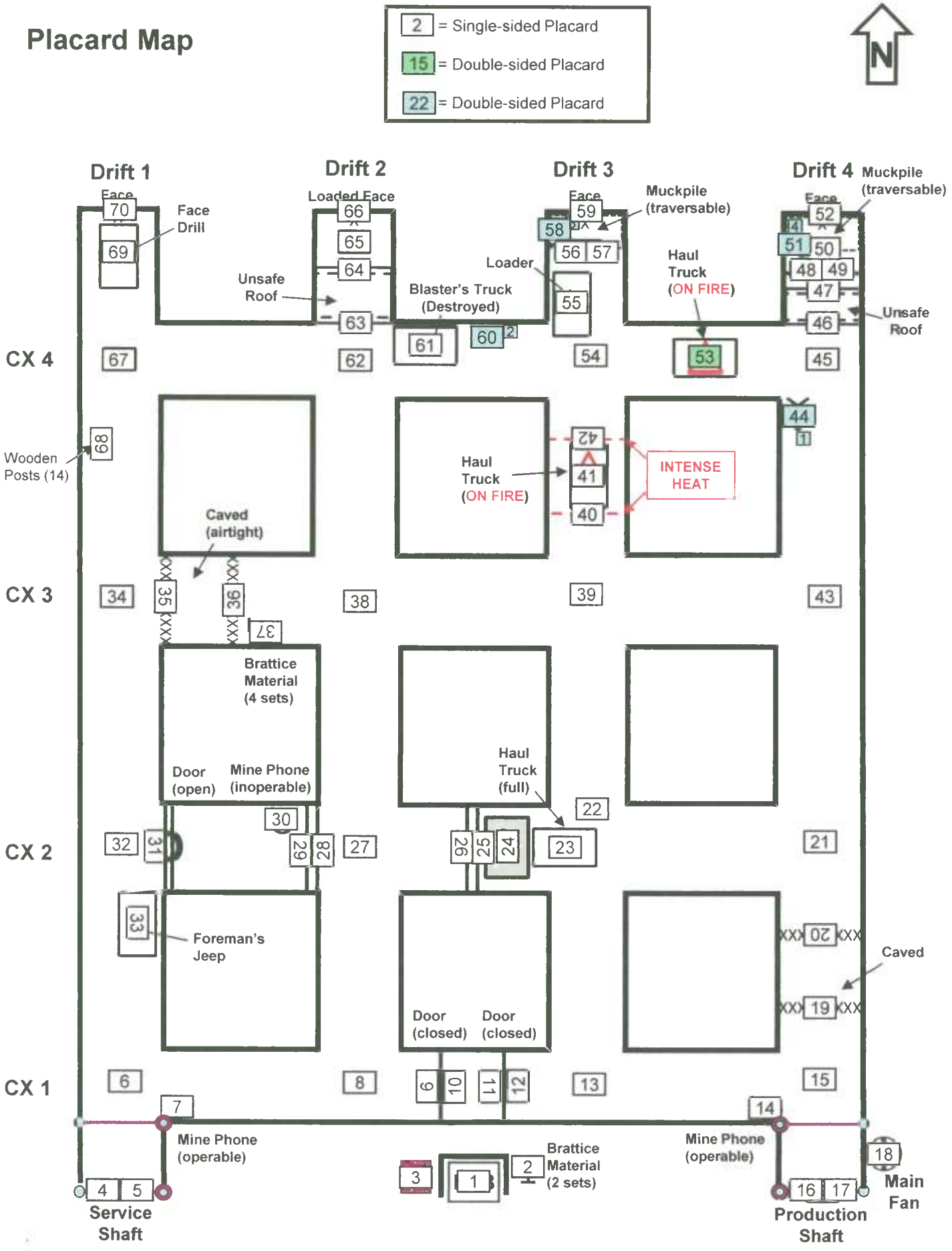
Placard Map


2 = Single-sided Placard
15 = Double-sided Placard
22 = Double-sided Placard
N
Drift 1
Drift 2
Drift 3
Drift 4
Face
Face Drill
Loaded Face
Unsafe Roof
Blaster's Truck (Destroyed)
Loader
Muckpile (traversable)
Haul Truck (ON FIRE)
Face
Muckpile (traversable)
Face
Unsafe Roof
CX 4
CX 3
CX 2
CX 1
Wooden Posts (14)
Caved (airtight)
Haul Truck (ON FIRE)
INTENSE HEAT
Brattice Material (4 sets)
Door (open)
Mine Phone (inoperable)
Haul Truck (full)
Foreman's Jeep
Caved
Door (closed)
Door (closed)
Mine Phone (operable)
Brattice Material (2 sets)
Mine Phone (operable)
Main Fan
Service Shaft
Production Shaft

Placard Key:

1. Fresh Air Base
2. Brattice Material (2 sets)
3. Gas Box Test Station
4. Service Shaft
5. Clear Air
6. Clear Air
7. Mine Phone (operable)
8. Clear Air
9. Permanent Stopping with Door (closed)
10. Permanent Stopping with Door (closed)
11. Permanent Stopping with Door (closed)
12. Permanent Stopping with Door (closed)
13. 16 % O_2
    1,300 ppm CO
    3.0 ppm NO_2
    Heavy Smoke
14. Mine Phone (operable)
15. 16 % O_2
    1,300 ppm CO
    3.0 ppm NO_2
    Heavy Smoke
16. Production Shaft
17. 16 % O_2
    1,300 ppm CO
    3.0 ppm NO_2
    Heavy Smoke
18. Main Fan (on)
19. Caved
20. Caved
21. 16 % O_2
    1,300 ppm CO
    3.0 ppm NO_2
    Heavy Smoke
22. 16 % O_2
    1,300 ppm CO
    3.0 ppm NO_2
    Heavy Smoke
23. Haul Truck (full)
24. Dump Pocket
    (full, no air movement)
25. Permanent Stopping
26. Permanent Stopping
27. Clear Air
28. Permanent Stopping
29. Permanent Stopping
30. Mine Phone (inoperable)
31. Permanent Stopping with Door (open)
32. Clear Air

Placard Map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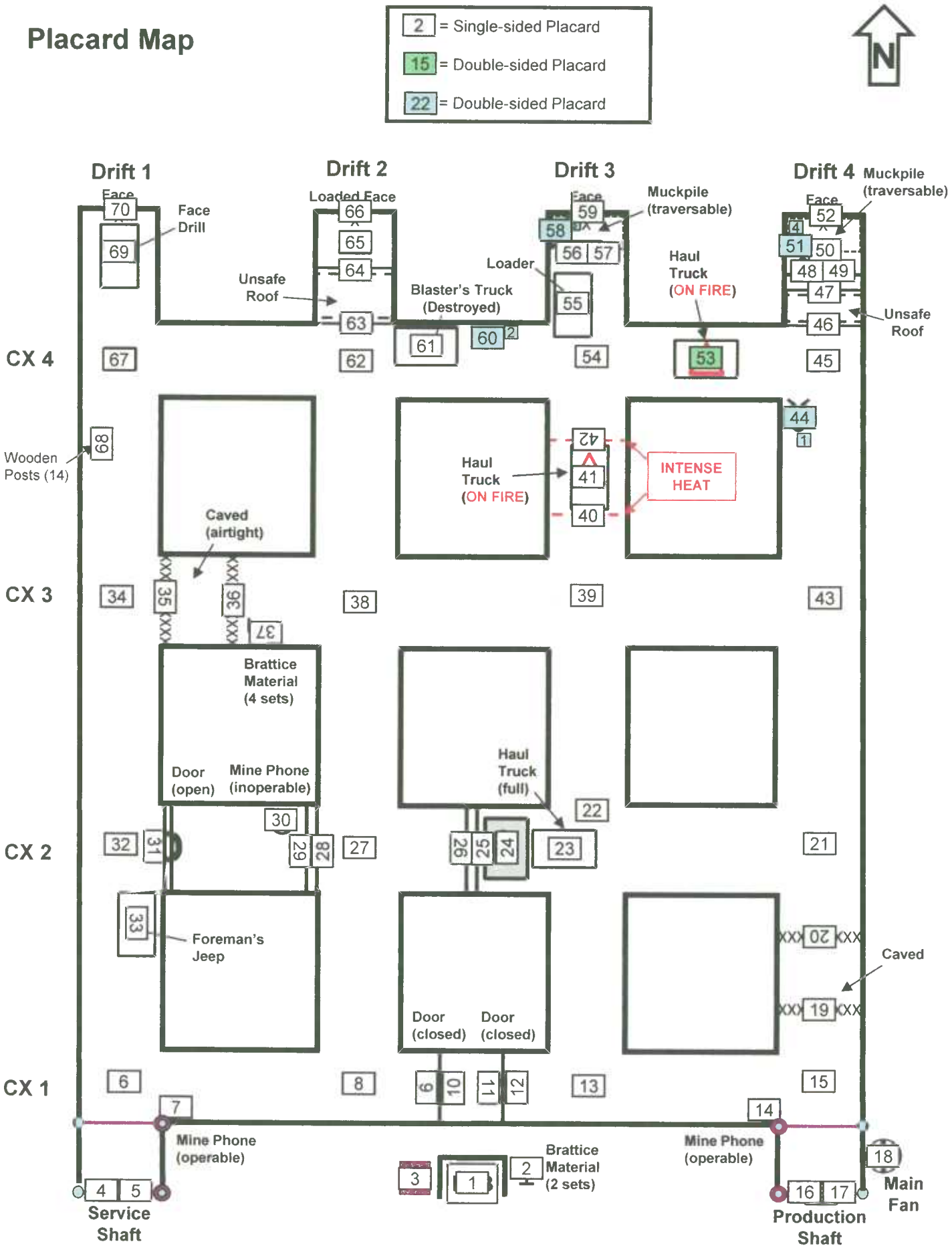
N
Drift 1
Drift 2
Drift 3
Drift 4
Muckpile (traversable)
Face
Face Drill
Loaded Face
Unsafe Roof
Blaster's Truck (Destroyed)
Loader
Muckpile (traversable)
Haul Truck (ON FIRE)
Unsafe Roof
CX 4
CX 3
CX 2
CX 1
Wooden Posts (14)
Caved (airtight)
Haul Truck (ON FIRE)
INTENSE HEAT
Brattice Material (4 sets)
Door (open)
Mine Phone (inoperable)
Haul Truck (full)
Foreman's Jeep
Caved
Door (closed)
Door (closed)
Mine Phone (operable)
Brattice Material (2 sets)
Mine Phone (operable)
Main Fan
Service Shaft
Production Shaft

Placard Key (continued):

33. Foreman's Jeep
34. Clear Air
35. Caved Airtight
36. Caved Airtight
37. Brattice Material (4 sets)
38. Clear Air
39. 16 % O_2
    1,300 ppm CO
    3.0 ppm NO_2
    Heavy Smoke
40. Intense Heat
41. Haul truck (ON FIRE)
42. Intense Heat
43. 16 % O_2
    1,300 ppm CO
    3.0 ppm NO_2
    Heavy Smoke
44. Person / Miner #1 (ID – 0327)
45. 16 % O_2
    1,300 ppm CO
    3.0 ppm NO_2
    Heavy Smoke
46. Unsafe Roof
47. Unsafe Roof
48. Barricade (8' x 10')
49. 17.5% O_2
    800 ppm CO
50. Muckpile (traversable)
51. Person / Miner #4 (ID – 6788)
52. Face – Drift 4
53. Haul truck (ON FIRE)
54. 16 % O_2
    1,300 ppm CO
    3.0 ppm NO_2
    Heavy Smoke
55. Loader
56. Muckpile (traversable)
57. 17.5% O_2
    800 ppm CO
58. Person / Miner #3 (ID – 5432)
59. Face – Drift 3
60. Person / Miner #2 (ID – 1958)
61. Blaster's Truck (destroyed)
62. 16 % O_2
    1,300 ppm CO
    3.0 ppm NO_2
    Heavy Smoke
63. Unsafe Roof
64. Unsafe Roof
65. 17.5% O_2
    800 ppm CO
66. Loaded Face – Drift 2
67. Clear Air

Placard Map


2 = Single-sided Placard
15 = Double-sided Placard
22 = Double-sided Placard
N
Drift 1
Drift 2
Drift 3
Drift 4
Muckpile (traversable)
Face
Face Drill
Loaded Face
Unsafe Roof
Blaster's Truck (Destroyed)
Loader
Haul Truck (ON FIRE)
Unsafe Roof
CX 4
CX 3
CX 2
CX 1
Wooden Posts (14)
Caved (airtight)
Haul Truck (ON FIRE)
INTENSE HEAT
Brattice Material (4 sets)
Door (open)
Mine Phone (inoperable)
Haul Truck (full)
Foreman's Jeep
Caved
Door (closed)
Door (closed)
Mine Phone (operable)
Brattice Material (2 sets)
Mine Phone (operable)
Main Fan
Service Shaft
Production Shaft

Placard Key (continued):

68. Wooden Posts (14)

69. Face Drill

70. Face – Drift 1

Note: Double-Sided Placards

One placard (53), can be flipped to show "Fire Out," when the team uses its two fire extinguishers to combat the flames of the burning haul truck.

Four placards (44, 51, 58 and 60), one for each missing miner, can be flipped to show their respective identification number.

Eight gas placards (13, 15, 17, 21, 22, 39, 43 and 62), can be flipped to show "clear air" when the team has successfully sealed and extinguished the two fires in the mine.

Two additional gas placards (45 and 54), can be flipped to show "clear air" if the team chooses to re-ventilate the mine and makes the necessary changes to direct airflow to CX 4.

PNP Mining Company
Segway Mine No. 2
I.D. No. 30-02016
Clymer, NY

Map Legend:

Shaft Dump Pocket

Mine Phone

Check Curtain


Permanent Stopping


Airlock


Door

Regulator

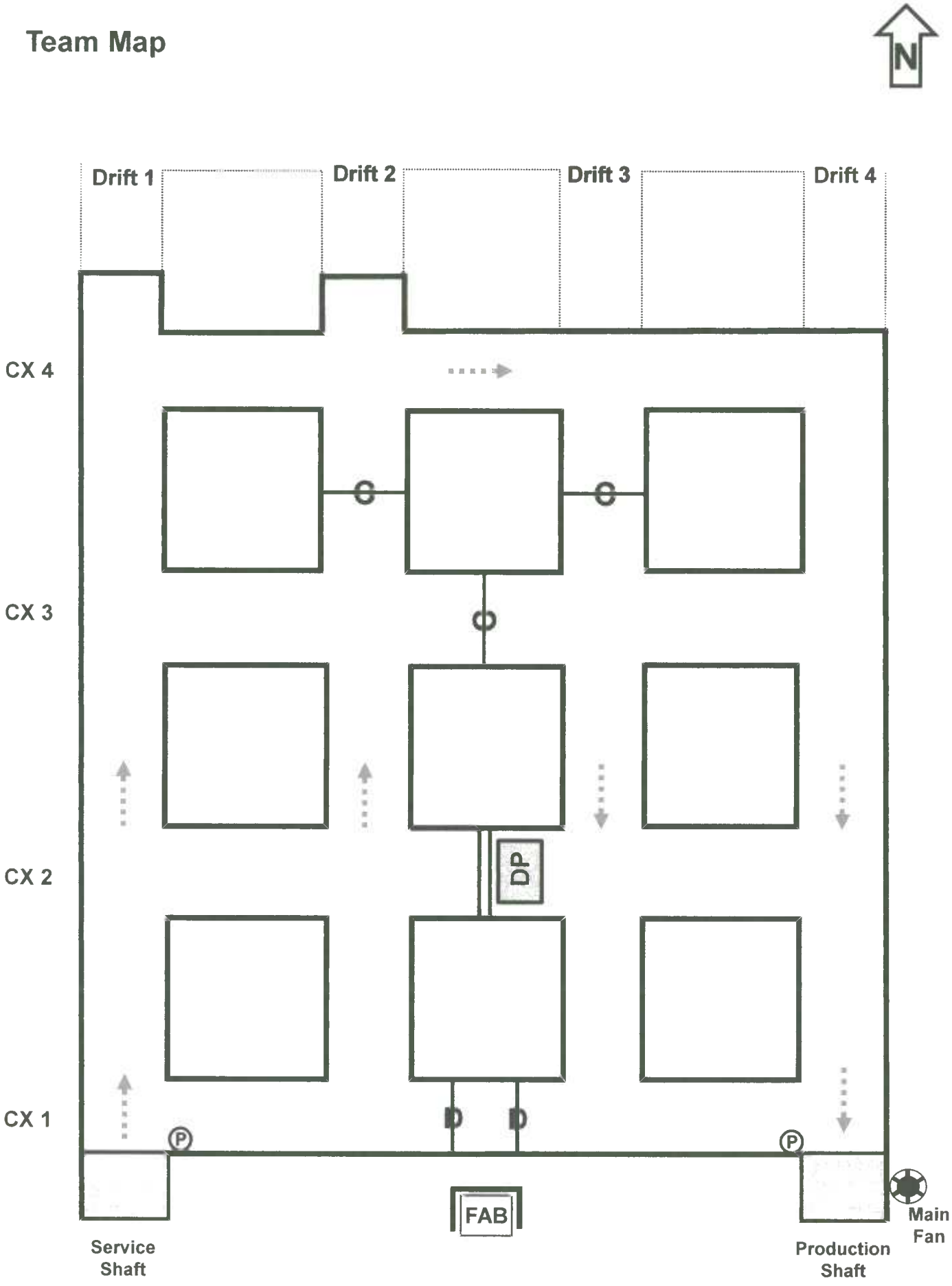

Airflow & Direction


Ventilation Fan

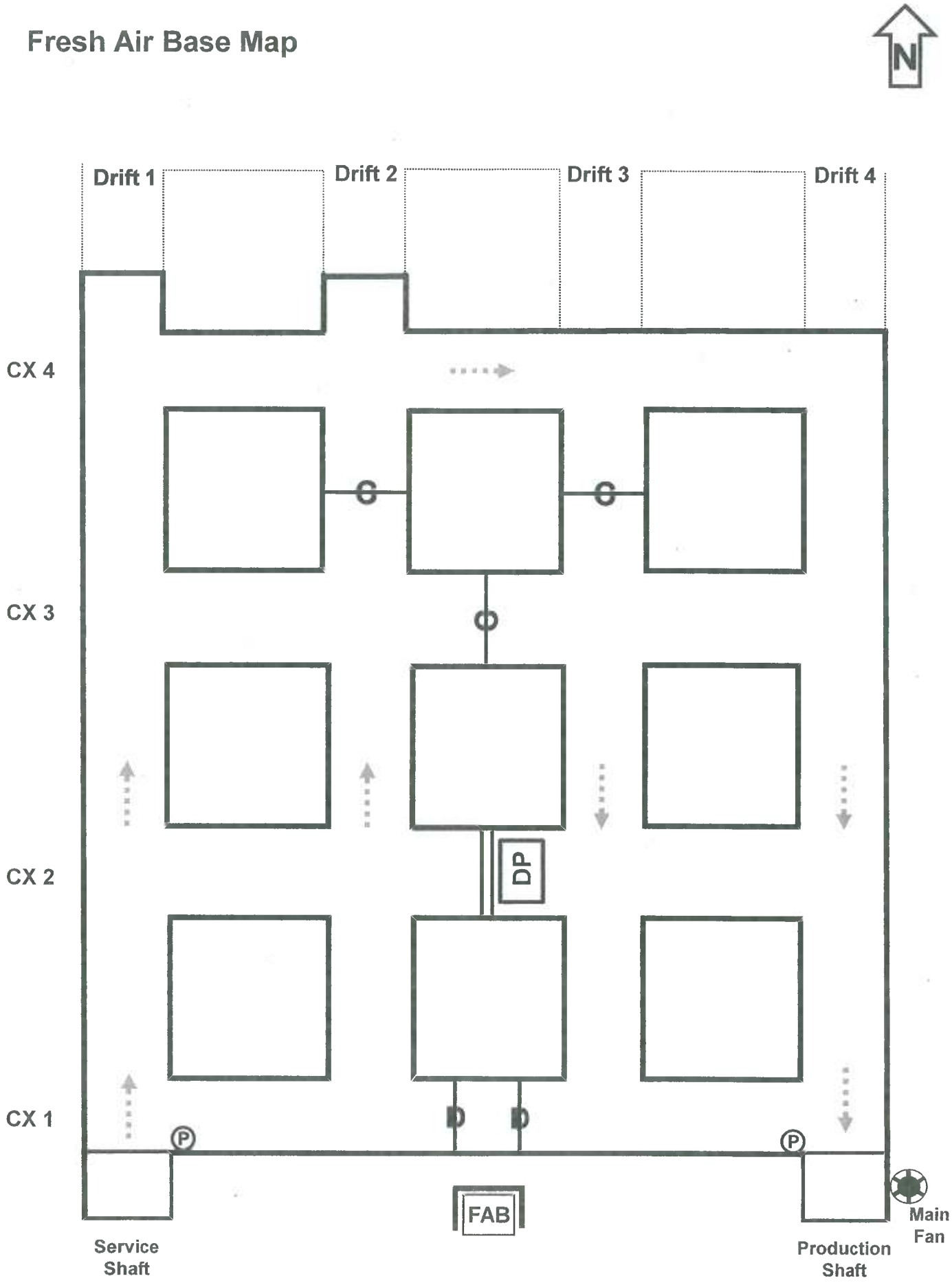
Projected Development

Updated June 1, 2016
Approx. Scale 1 in . = 10 ft.

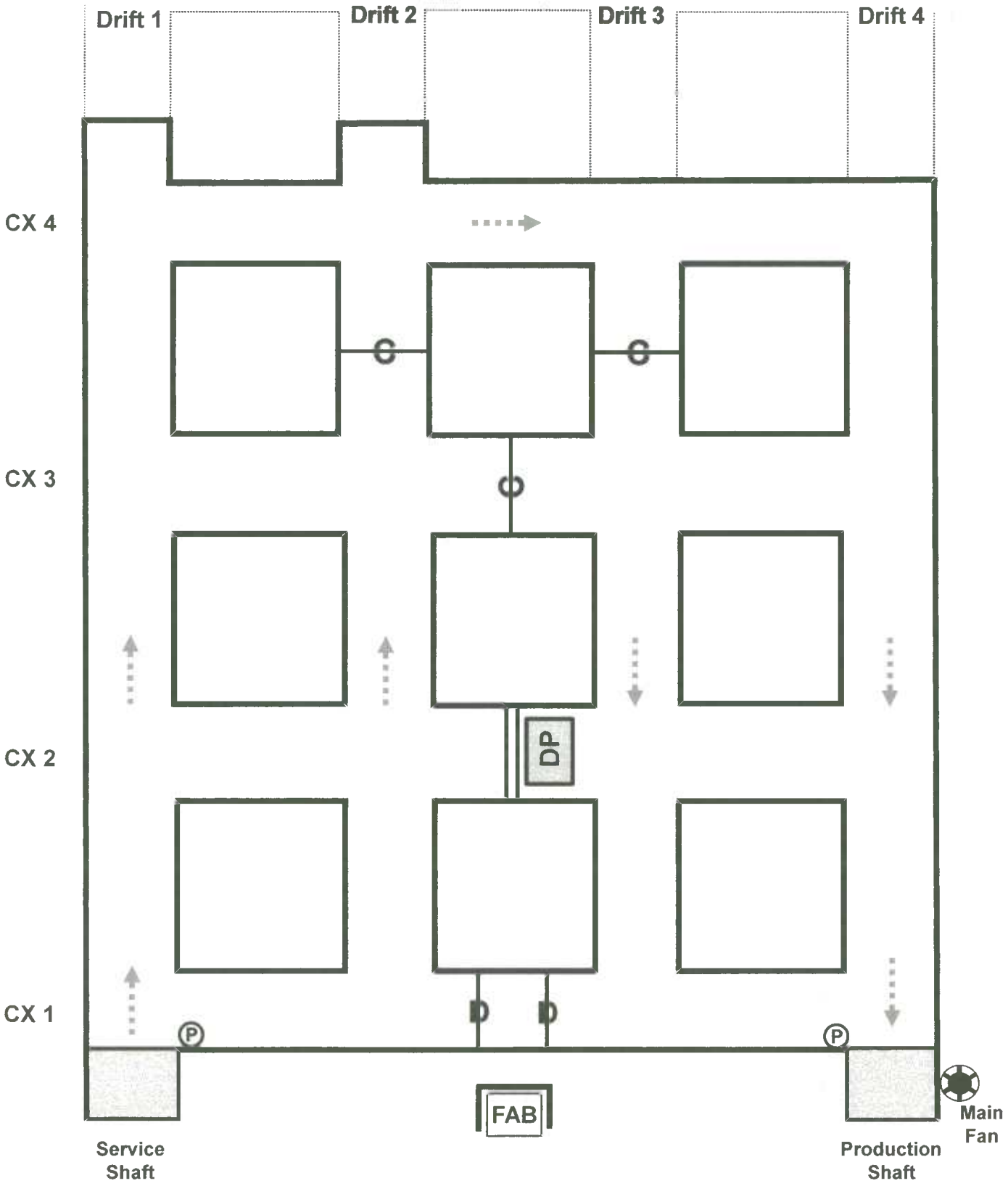
Team Map


N
Drift 1
Drift 2
Drift 3
Drift 4
CX 4
CX 3
CX 2
CX 1
DP
FAB
Service Shaft
Production Shaft
Main Fan

Fresh Air Base Map



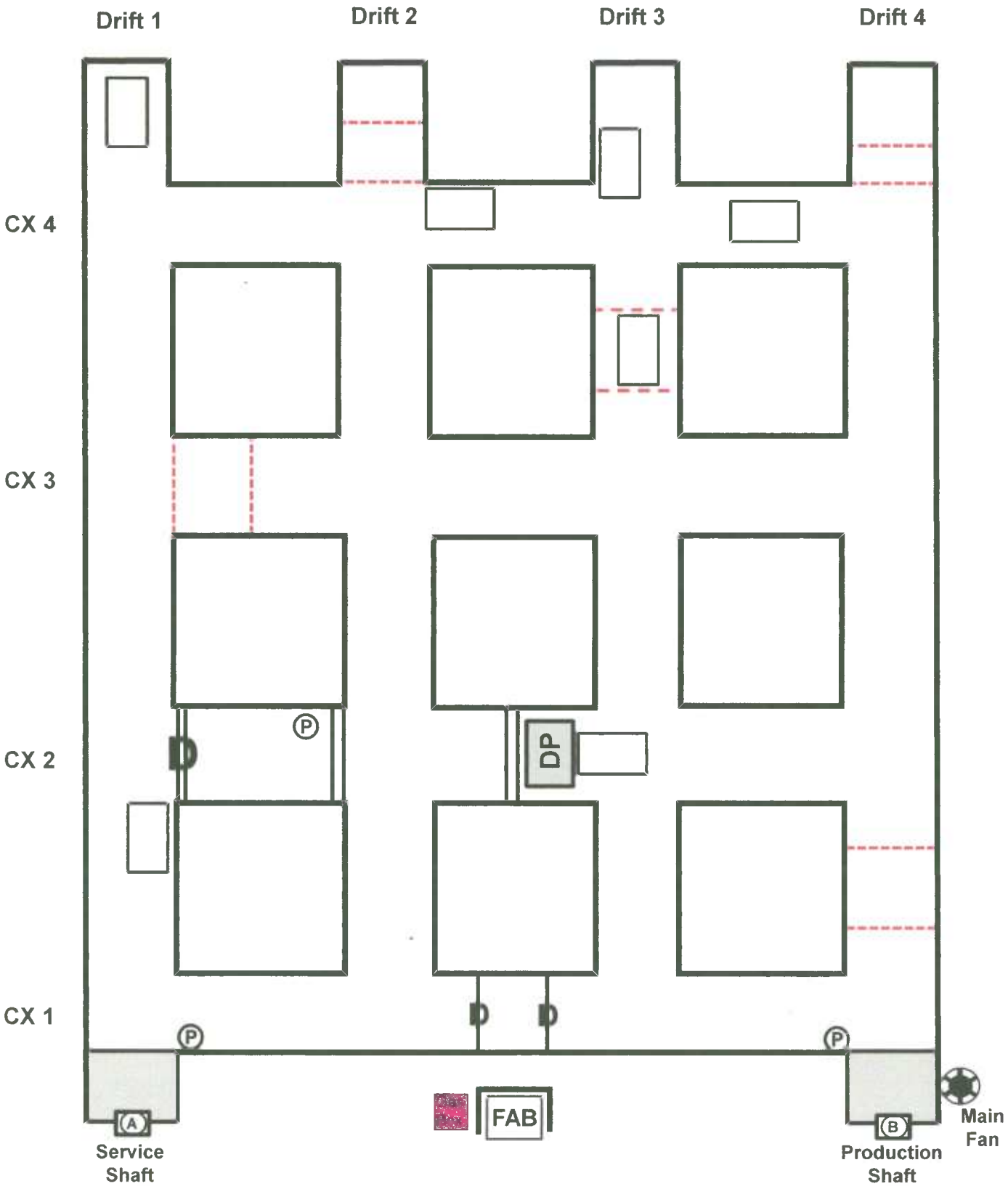
Fresh Air Base Map (Alternate - Do Not Score)



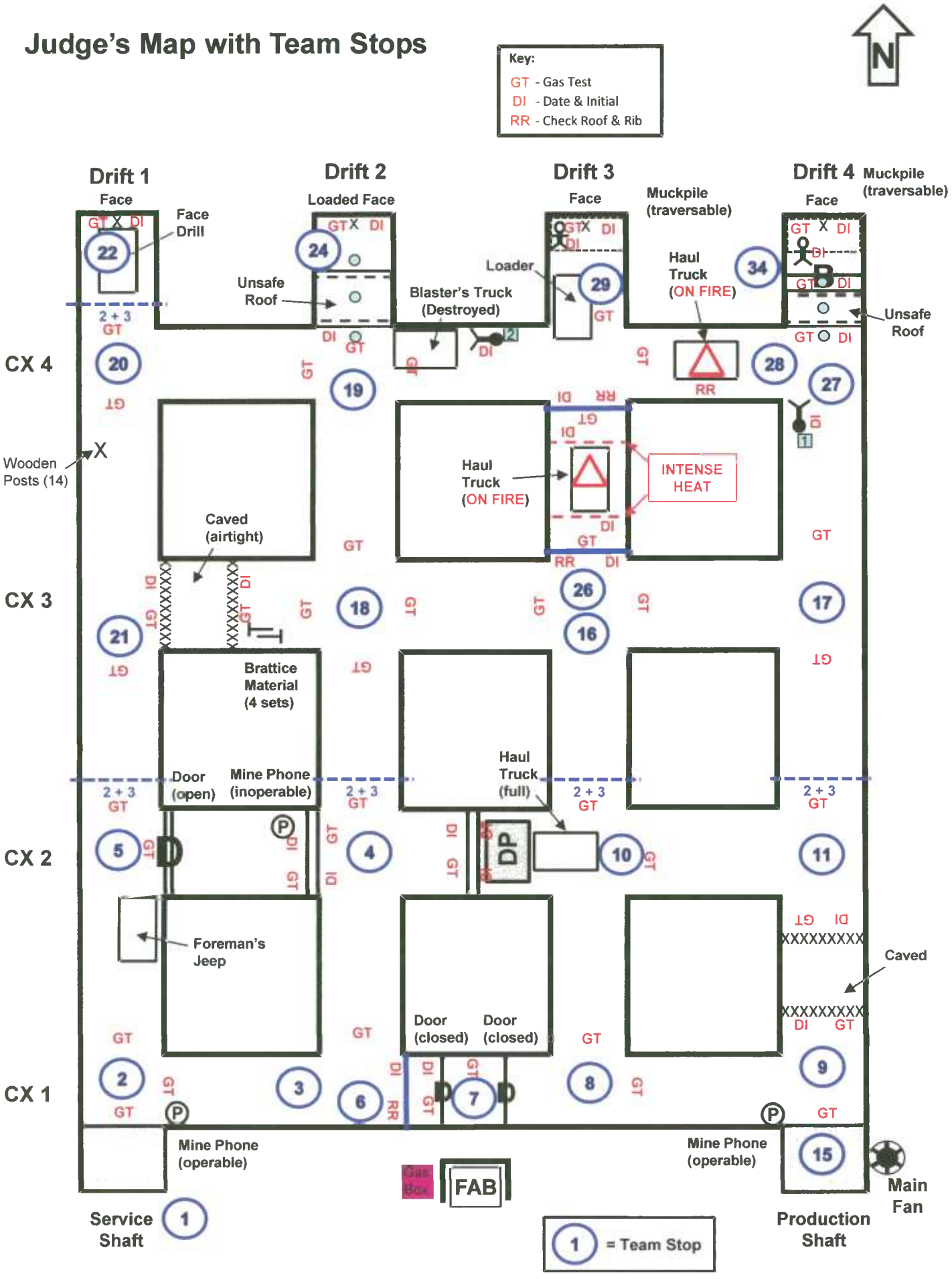
Judge's Blank Map

Judge Name - _____

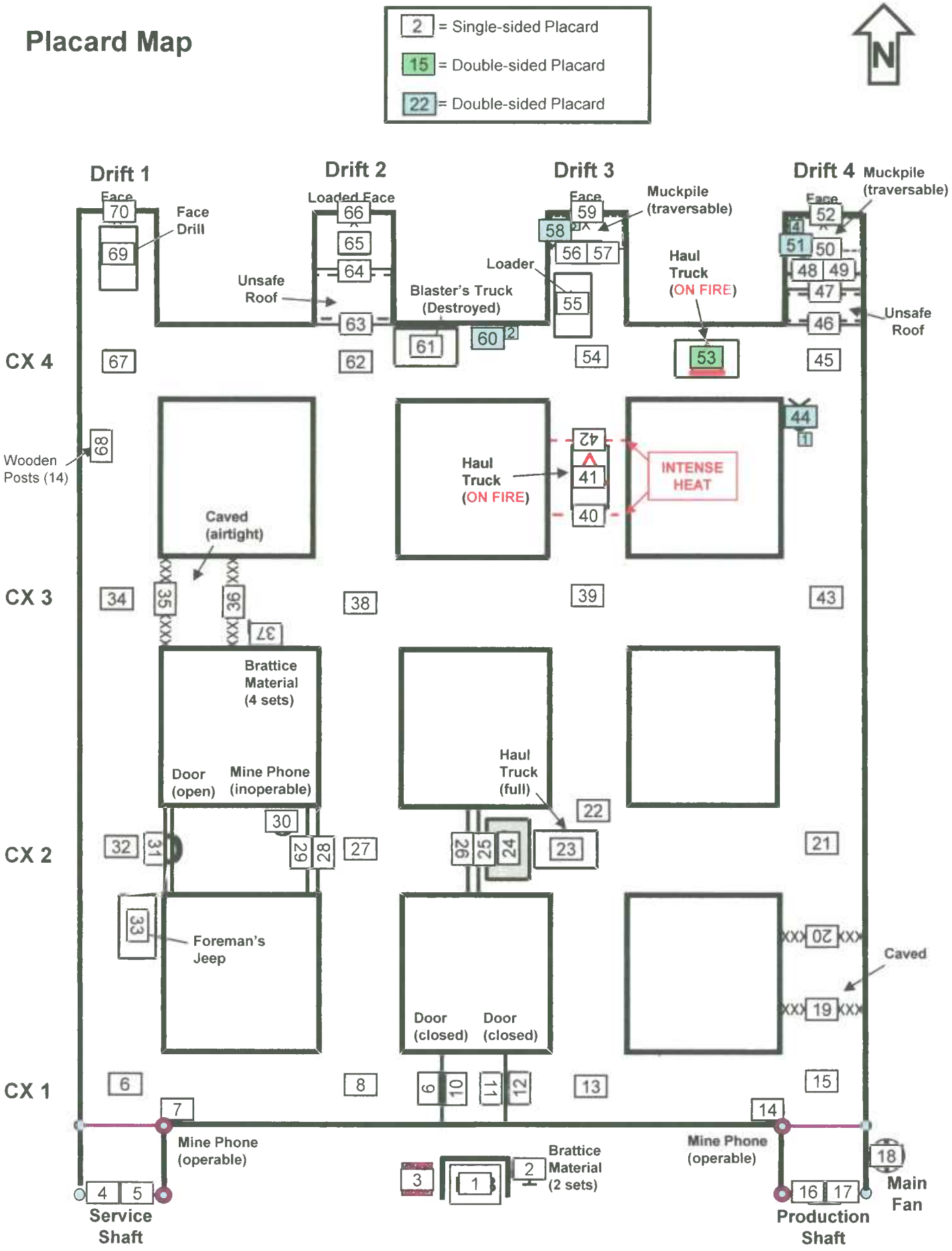
Team No. - _____



Judge's Map with Team Stops



Placard Map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Drift 1
Drift 2
Drift 3
Drift 4
Face
Face Drill
Loaded Face
Unsafe Roof
Blaster's Truck (Destroyed)
Loader
Face
Muckpile (traversable)
Haul Truck (ON FIRE)
Face
Muckpile (traversable)
Unsafe Roof
CX 4
CX 3
CX 2
CX 1
Wooden Posts (14)
Caved (airtight)
Haul Truck (ON FIRE)
INTENSE HEAT
Brattice Material (4 sets)
Door (open)
Mine Phone (inoperable)
Haul Truck (full)
Foreman's Jeep
Caved
Door (closed)
Door (closed)
Mine Phone (operable)
Brattice Material (2 sets)
Mine Phone (operable)
Service Shaft
Production Shaft
Main Fan

Construction Map