

CHEVRON THAILAND'S USE OF ICS (INCIDENT COMMAND SYSTEM) IN ASSISTING WITH THE 2018 THAILAND CAVE RESCUE OPERATION

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ABSTRACT:

Chevron Thailand commenced using a form of the Incident Management System (ICS) for response to emergency incidents and conducted ICS training and hosted a large scale oil spill response exercise in 2017 and 2018 to increase Crisis Management Team (CMT), Asset Management Team (AEMT) and On-site Response Team (ORT) competency and team readiness, including maintaining relationships with organizations that provide emergency response support i.e. Thai government agencies, association and contractors.

On 23 June 2018, 12 members of a Thai boys soccer team along with their coach became trapped in a cave in northern Thailand when flood waters cut them off from the entrance. Chevron Thailand Management in Bangkok was contacted by the US Embassy Bangkok requesting Chevron Thailand to assist with providing personnel and resources for the rescue operations. Separately, the Thai Department of Disaster Prevention and Mitigation (DDPM) also called for industry support in the rescue mission.

This paper will present details of how Chevron Thailand utilized their preparedness training using ICS in responding to risks within Chevron Thailand's operations to take a leading role in assisting

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the Royal Thai Governments rescue of the 13 trapped soccer team members. The paper will also show how collaboration with Government officials in Company training and exercise events lead to not only a good working relationship but also better knowledge of the capabilities that Chevron Thailand can bring to the table in responding to any emergency incident.

INTRODUCTION:

Information background

Who we are:

Chevron is a global energy company that has played a leading role in pioneering and developing the Thai exploration and production industry for over 58 years. Since 1962, Chevron Thailand Exploration and Production, Ltd. has operated in Thailand with systematic management of safety, health and environment, reliability and efficiency to achieve world-class performance. We supply natural gas, condensate and crude oil for Thailand. Chevron was the first company to discover and produce natural gas in the Gulf of Thailand over 30 years ago. In 1981, eight years after the discovery of the first commercial natural gas field in the Gulf of Thailand, Chevron's Erawan field began production. Since then, natural gas has become the major source of energy for electricity generation in Thailand, and it also laid the early foundations for the nation's E&P industry by developing the knowledge and skills of the Thai workforce. The head office is located in Bangkok with other offices in Songkhla, Chon Buri and Nakhon Si Thammarat with approximately 1,500 employees (98% are Thai) and 1,100 contractors.

Chevron places the highest priority on the health and safety of our workforce and protection of our assets, communities and the environment. Chevron's emergency management efforts are focused on prevention, preparedness, response and recovery by providing processes and tools to effectively

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manage emergency response, business continuity and crisis management efforts. Chevron uses a tiered approach to emergency management. Operating units develop site-specific emergency response and business continuity plans to prepare for all significant risks. The Corporate Emergency Response staff is responsible for providing guidance and expertise in emergency response, crisis management and business continuity. The staff develops and maintains emergency notification procedures, trains and supports emergency response teams (including assisting with some of Chevron Thailand's training), conducts drills and maintains relationships with organizations that provide emergency response support.

Chevron Thailand and ICS Background

Beginning in 2005, Chevron International Upstream operations, including Chevron Thailand, commenced using a form of the Incident Management System for response to emergency incidents including oil spills, fires, heavy weather, etc.

In 2016, Chevron updated the Corporate Emergency Management process which Chevron Thailand used to revise the Asset Emergency Management Team (AEMT) structure and expand the team's competencies and readiness capabilities. Once the reorganization of the Chevron Thailand AEMT was completed, ICS training, including ICS 100, ICS 200, and ICS 300, was conducted in 2017 along with a large-scale emergency incident exercise.

In June 2018, Chevron Thailand – with assistance from the Chevron Corporate Emergency Response staff - hosted a large-scale tier 3 oil spill response exercise. This exercise involved over 250 people including: Chevron Thailand; Chevron Worldwide Emergency Response Team (WWERT); Chevron Functional Team (FT) members; and the Chevron Asia Pacific Regional Response Team (RRT). In addition, Chevron invited Thai Government agencies and key

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contractors to participate including representative from: the Royal Thai Navy; Thai Marine Department; Thai Pollution Control Department; the Thai Department of Minerals and Fuels; Oil Spill Response (OSRL); The Response Group (TRG); and Oil Industry Environmental Safety Group Association (IESG).

How CHEVRON THAILAND got involved with Tham Luang incident:

In the evening of June 23 – just 10 days after the Chevron Thailand tier 3 exercise – a Tham Luang police officer in Chiang-rai Province in northern Thailand, discovered 11 bicycles and one motorcycle, without any sign of the owners, sitting outside the entrance of the Tham Luang cave. Shortly afterwards the parents of 12 boys and their 25-year-old soccer coach were reported missing to the police. The cave is a popular destination for people to explore and thus it was suspected the team members and their coach had gone to the cave after practice to do a little exploring and team building. After entering, though, heavy rains came causing parts of the cave to flood thus trapping the team and their coach. Figures 1 and 2 show the entrance to the cave. Local officials immediately commenced searching the cave but were stopped by the rising water. The next day the search team expanded with the arrival of members of the Thai Navy Seals and the establishment of a Joint Command Center for rescue operations at the cave entrance led by the Chiang-Rai Governor.

They too were stopped by the rising flood waters which were now filling some of the chambers to the ceilings of this large cave. Over the next few days attempts were made to pump flood waters out of the cave but, due to continuing heavy rainfall, the water level continued to rise thus hampering further rescue attempts. The search and rescue mission was widely publicized and quickly became the world news resulting in outpouring of support from governments and

industries around the globe. This included the arrival of British cave experts, a contingent of United States Army rescue specialist and other foreign cavers with expertise in cave rescues operations.



Figure 1 and Figure 2: The bicycles at the entrance to the cave.

Chevron Thailand - Actual Response:

On June 29, Chevron Thailand was directly contacted by U.S. Army representatives, the U.S. Embassy in Bangkok, and separately by the Thai Department of Disaster Prevention and Mitigation (DDPM) requesting industries support in the rescue mission.

Chevron Thailand immediately activated Asia South Business Unit (ASBU – which Chevron Thailand is part of) and the Chevron Thailand Crisis Management. Then, the on-duty Incident Commander had set up. In addition the Chevron Thailand AEMT was activated and established their Incident Command Post as outlined in the Emergency Management Plan (and tested at the tier 3 exercise only two weeks prior)

The first meeting of the AEMT, led by the Chevron Thailand Incident Commander (IC), utilized the pre-established agenda with the Planning Section Chief and Situation Unit Leader providing possible strategies, identifying potential escalation scenarios and identifying potential issues

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facing Chevron Thailand in their role in this incident. The AEMT worked through the incident details, reviewed sensitive information and set up objectives and evaluated their available resources with support from the Operations and Logistics Sections. Two key items the AEMT quickly identified were the identification of supplies and equipment possibly needed by the rescue operations that Chevron and other industry operations could supply and the establishment of a Chevron liaison within the on-scene command post

With nearly 100 Chevron employees and contracted personnel activated on the AEMT, a 24 hour support structure utilizing the ICS process was established. Utilizing standard ICS forms, the AEMT successfully identified all the appropriate supplies and equipment that was available or could be available on short notice. The AEMT also asked for volunteers from the various Chevron On Site Response Teams and the Bangkok office to travel to Chiang Rai to provide liaison with the On Scene Commander and provide additional expertise. Six volunteers were chosen and included: One ex-Navy Seal; two geologists; and three engineers.

Next, the line of communications between Chevron and the external parties was developed and is shown in Figure 3.

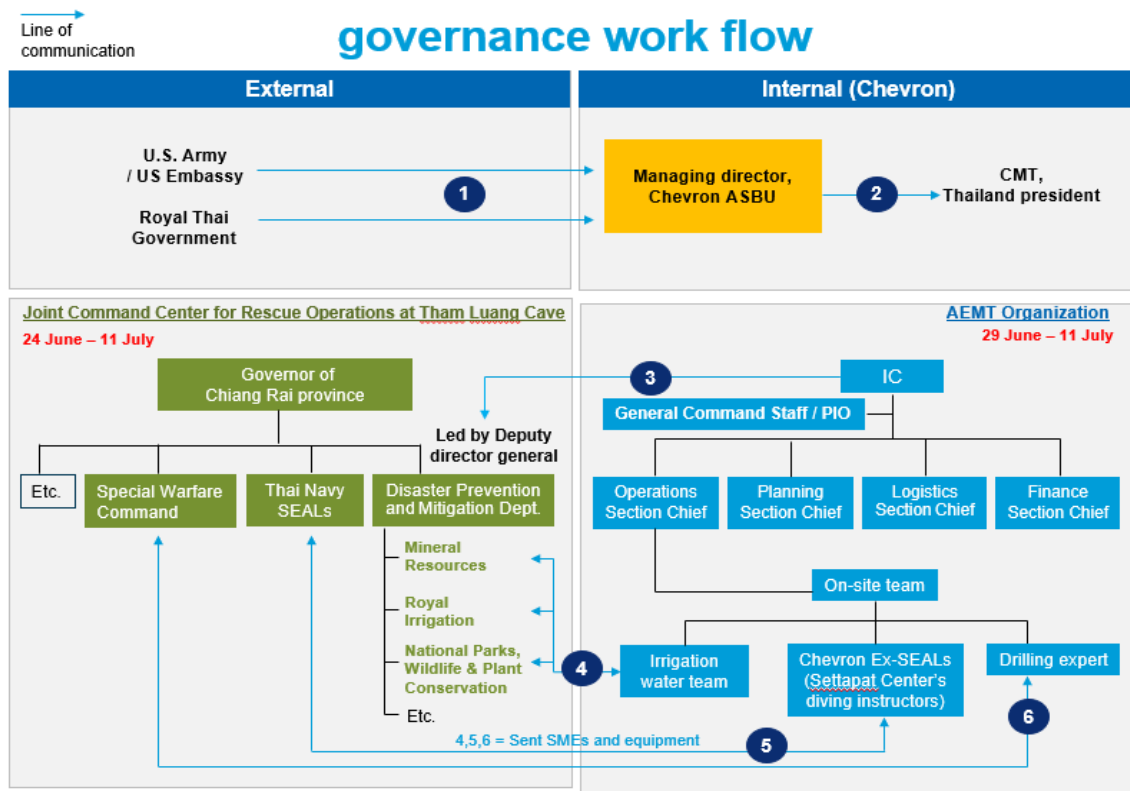


Figure 3: AEMT Organization Chart and Governance Workflow - *Line of Communication* between Chevron internal and external parties

The Chevron AEMT next created three separate ORTs with three separate missions to provide direct support to the Thai government’s rescue mission in Chiang Rai Province. The three teams’ responsibilities were:

1. Onsite Response Team: Task Team #1 Ex-Navy SEAL, Settapat Center’s diving instructors (3 Chevron volunteers).
2. Onsite Response Team: Task Team #2 Water diversion team – Geologist and Chevron Thailand colleagues supported water diversion and diving operations and also studied an option to drill an escape tunnel.

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3. Onsite Response Team: Task Team #3 Drilling team - Drilling Advisor and Chevron Thailand colleagues supported the drilling study and prepared the option for drilling operation, including risk assessment.

(The 34-member Chevron team was mobilized to the site to provide support.)

SYNOPSIS OF KEY RESPONSIBILITIES ASSIGNED TO CHEVRON IN SUPPORT OF THE THAI GOVERNMENT INCIDENT RESPONSE:

AEMT

- Quick response to approve and order materials including 200 diving tanks, 64 complete tank packs and 3,200 meters of High Density Polyethylene (HDPE) pipe.
- Assigned subject matter experts (SME) to Tham Luang including facilities engineers, construction engineers, electrical engineers, geologists, drilling engineer, supply chain management staff, public information officer and Chevron's contractors.
- Established line of communications and provided operational advice to the Deputy Director General of the Thai Disaster Prevention and Mitigation Department.

Onsite Response Team: Task Team #1 Ex-SEAL, Settapat Center's diving instructors

- Liaised with Thai Navy Seal commander to identify their equipment needs (200 diving tanks, 64 complete tank packs, and 5 gas detectors)
- Diving mission - Delivered tanks and food for divers inside the cave and worked as part of the support team the last three days in which the 12 boys and their coach were rescued.
- Worked with international diving team.

Onsite Response Team: Task Team #2: Water diversion team

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- Proposed water diversion plan to the core team and successfully executed the plan which resulted in the continuous lowering of the water level in the cave.
- Coordinated gaining support and assistance from more than 400 villagers and local government agencies.

Onsite Response Team: Task Team #3: Drilling team

- Conducted a Chevron internal feasibility study on the drilling of an escape tunnel
- Conducted a Risk Assessment with involved parties including PTTEP, ITD, US Army, SpaceX and other specialist.
- Presented the drilling proposal to the Royal Thai Army and the Thai Department of Mineral Resources (DMR).

Onsite Response Team - Summary of Actions:

June 30th, 2018: Chevron ORTs arrived at the location and collaborated with the government agency.

- Chevron ORTs arrived at Tham Luang and collaborated with the government agencies;
 - Department of Disaster Prevention and Mitigation (DDPM)
 - Department of Mineral Resources (DMR)
 - Royal Irrigation Department (RID)
 - Department of National Park, Wildlife and Plant Conservation (DNP)
 - Royal Thai Army
 - Naval Special Warfare Command (SEAL)
- Chevron ORTs assessed the situation, discussed and advised the government agencies as to various options as well as the assistance Chevron could provide.

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- ORT discussed with the AEMT Incident Commander, the requests to send special equipment and personnel to Tham Luang as soon as possible.
 - 200 sets of Diving Air Tanks
 - 2,000 meters of 4” High Density Polyethylene (HDPE) Pipe
 - 20 Chevron Engineers and Technicians/specialist to assist with a special mission to lower the water level in the cave.

July 1st, 2018: The special mission at Ban Pha Mee.

- The Government Incident Commander gave approval of the special mission to lower the water level in the cave by bypassing the natural water flow from the fractured zones that connected to the Tham Luang cave system. This mission would prevent the natural water flow from moving into the cave.
- Requested personnel and equipment from the Chevron AEMT arrived on scene and commenced assisting the onsite team and appropriate Government agency representatives with this special mission.
- This mission was located on the mountain near the border between Myanmar and Thailand and was very difficult to access. As a result, all personnel and equipment had to be brought in by porters. For safety reasons, work could only be performed during daylight hours.
- Chevron was the primary focal point for this mission and, working with the appropriate Government agencies, prepared the equipment and implemented the plan. At one-point Chevron requested more manpower from the government agencies and local villagers to accelerate the mission. The additional manpower was quickly added.

July 2nd, 2018: Special mission at Ban Pha Mee was accomplished. The 12 boys and their coach were found.

- With the assistance of about 350 villagers and the Government agency representatives, the Chevron ORT accomplished this special mission around midday. It is important to point out that the Deputy Director General of the DNP stated that, without Chevron’s and other industry representatives assistance, this special mission would have taken about a week to complete instead of one day.
- This mission, shown in Figures 4 and 5, significantly reduced the amount of natural water entering the cave thus allowing the pumps to start to significantly lower the water level in the cave.
- Later this night, the 12 boys and their coach were safely found by two expert British cave divers, Rick Stanton and John Volanthen.

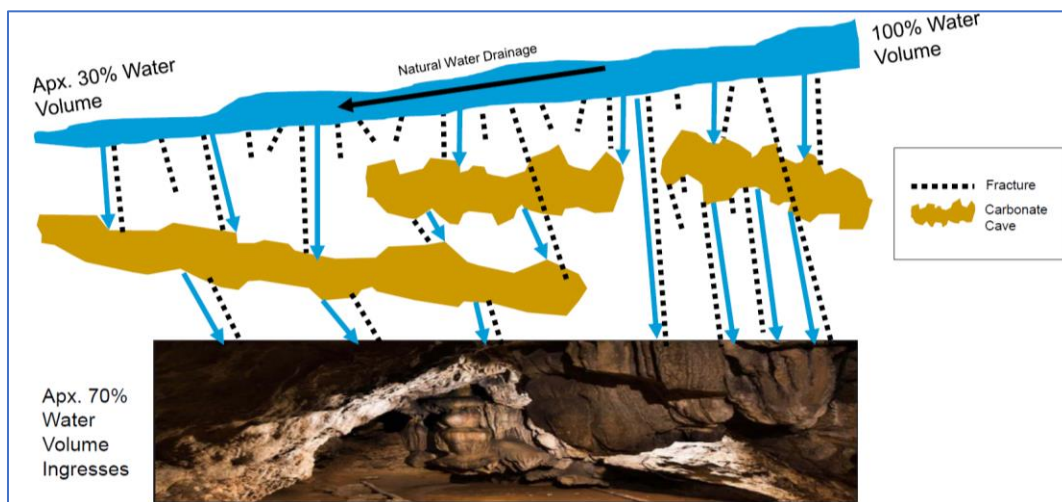


Figure 4: Bypassing the natural water from the fractured zones model (BEFORE).

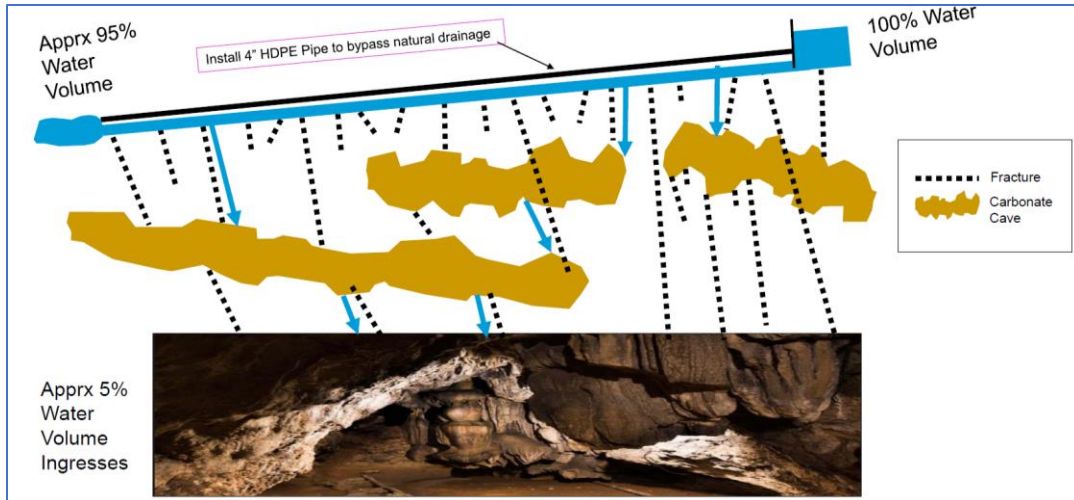


Figure 5: Bypassing the natural water from the fractured zones model (AFTER).

July 3rd, 2018: Success of the Ban Pha Mee mission leads to the Ban Pha Hee mission.

- After the special mission at Ban Pha Mee was accomplished, Chevron ORTs and government agencies began exploring for another location to perform the same mission and further decrease the amount of water seeping into the cave from the heavy rains.
- A second location at Ban Pha Hee was found where the fracture zones are linked to the Tham Luang cave. A second mission at Ban Pha Hee was proposed to the Government Incident Commander who, in turn, gave approval.
- Again, the Chevron ORT discussed with Chevron AEMT Operations Section Chief, and requested the necessary equipment and personnel be sent to the incident site as quickly as possible including:
 - 1,200 meters of 4” High Density Polyethylene (HDPE) Pipe
 - Four Engineers and one Geologist

July 4th, 2018: Mission at Ban Pha Hee.

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- All requested personnel and equipment arrived at the location around midday
- A total of approximately 400 personnel from the neighboring villages, the Chevron ORTs and appropriate Government agencies assisted with this mission as well.
- As with the Ban Pha Mee mission, Ban Pha Hee was located on the mountain and was difficult to access due to the slope of the mountain. Again, all equipment had to be transported by foot.

July 5th, 2018: Mission at Ban Pha Hee was accomplished. The drilling operation is an option.

- This second mission at Ban Pha Hee was accomplished since in the morning of July 5. The pumping of the water out of the cave system continued to show signs of success.

With the oxygen level in the cave starting to decrease, two options were considered for bringing the team members and their coach out of the cave:

- The preferred method was to bring them out through the cave using Thai Navy Seal divers to escort each individual out one at a time
- Given the lowering oxygen levels it was agreed a second option be studied: The drilling of a rescue tunnel. Chevron would play a key role in studying this option with a Chevron Drilling Advisor being assigned to the incident site to assist

July 6th, 2018: Study and prepare the option for drilling operation.

- The Chevron Drilling advisor arrived at Tham Luang and worked with the Chevron ORTs Task #3 members to study and prepare the option for a drilling operation with the government agencies.

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- *On this day sad news was received when a Thai Ex-Navy Seal, Saman Gunan, died inside the cave during preparations for the rescue effort*

July 7th, 2018: Feasibility study of drilling operation for escape tunnel.

- Chevron's ORT (Task #3) organized a meeting with many drilling specialists from the Thailand private sector in Thailand and government agency representatives. The purpose of the meeting was to:
 - Study various options for drilling of an escape tunnel; and
 - Conduct a risk assessment for the possible drilling operation

July 8th, 2018: First four boys were brought out of the cave.

- The Chevron ORT, along with the other private sector and government agency representatives, prepared to present the study for the drilling of an escape tunnel including the risk assessment for the drilling operations to the Government Incident Commander and his team.
- In the evening, the first four boys were brought out from the cave by the dive team. They were sent to the hospital in Chiang Rai town for medical checkup but appeared to be in very good condition.
- With the initial success in bringing out the first four boys, the Chevron ORTs and the other private sector and government agency representatives were placed in standby mode by the Government Incident Commander.
- AEMT and Chevron ORTs agreed for keep Chevron teams onsite in standby mode until all 12 boys and their coach were fully rescued.

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July 9th, 2018: Four more boys were rescued from the cave.

- Chevron ORTs and the other private sector and government agency representatives continued to standby.
- Four more boys were rescued from the cave, bringing the total to eight who had been rescued. These four joined the previously rescued boys in the hospital to recover.

July 10th, 2018: The remaining four boys and their coach were rescued from the cave.

- Chevron ORTs and the other private sector and government agency representatives continued to standby. The remaining four boys and their coach were rescued from the cave. After spending approximately 18 days deep inside the Tham Luang cave, the entire team and their coach were safely back above ground and recovering from their ordeal in the hospital.
- The Tham Luang cave rescue operation was completed. The Government Incident Commander communicated to all they were to stand down from the incident response and confirmed that the Chevron ORTs and the other private industry representatives could pack up and head home.

July 11th, 2018: Medical checkup before going back home.

- All Chevron personnel on scene flew back to Bangkok
- Upon arrival in Bangkok, all Chevron personnel had a medical check-up and evaluation performed before heading to their homes for a well-deserved rest.

The summary timeline and details of Tham Luang Cave Rescue Operation is shown in Figure 4.

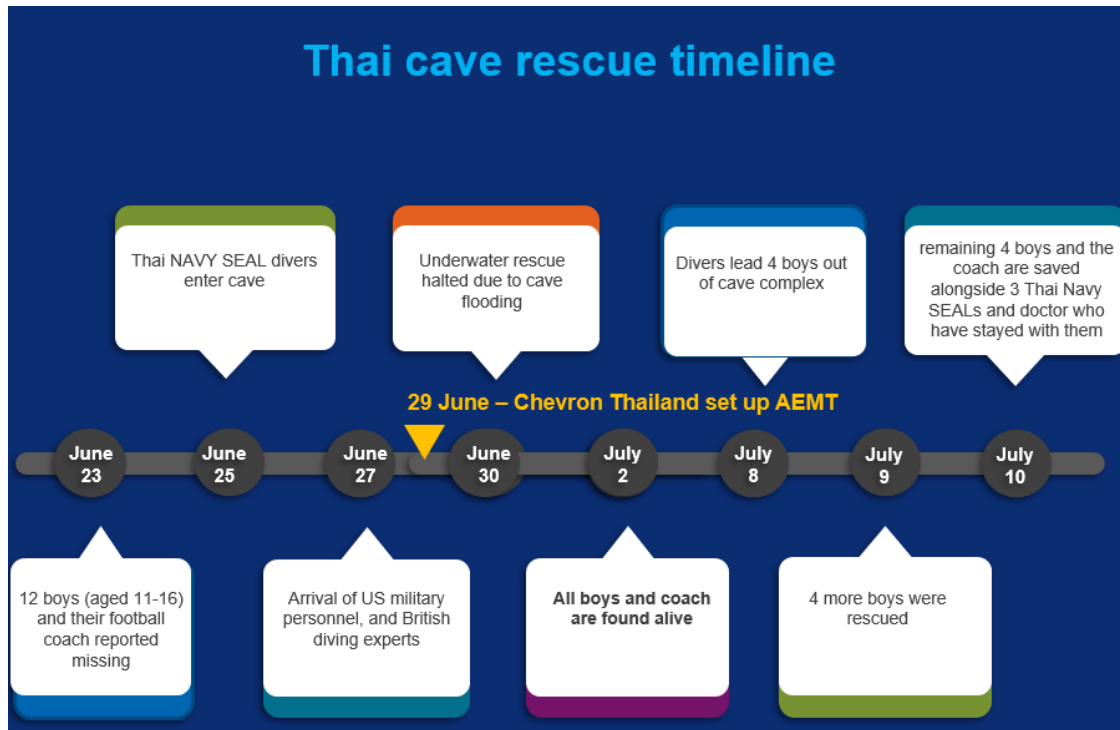


Figure 4: Summary Timeline and details of Tham Luang Cave Rescue Operation

CONCLUSION:

The Tham Luang cave rescue proved how important it is for all those involved to have good Emergency Management plans and the importance ICS plays in those plans. For Chevron Thailand, the Emergency Management plan does NOT cover responding to “cave rescues”. But because ICS is designed to cope with any type of emergency incident, Chevron personnel, Government agency personnel, and other private industry personnel and volunteers were able to quickly and effectively come together to perform a miraculous rescue. Chevron Thailand played a small but significant role in the rescue mission at the Tham Luang cave. Chevron Thailand activated its Emergency Management Command post to provide round the clock operational support to the Thai government’s rescue mission. The AEMT followed the EM process and utilized its ICS structure, including the use of some of the ICS forms to identify and track resources and

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keep records for the daily meetings. Of equal importance is the conduct of regular training and incident response exercises that includes the participation of relevant Government agency representatives. These joint training and exercise functions serve a number of purposes including becoming familiar with each other's strengths and capabilities. In this instance, this information was very fresh in everyone's mind given the training and large scale exercise Chevron Thailand had carried out only 10 days prior to the incident.

Chevron Thailand is proud of our collaboration and long-standing partnership with key government and non-governmental organizations on environmental issues and preparation for emergency responses. We are honored to be invited to take part in the rescue operations as this symbolizes trust that the Royal Thai Government has in Chevron Thailand's crisis response capabilities having seen this first-hand through participation in Chevron Emergency Management training and exercises. The response outcome shows that the Chevron Way culture supports Chevron's ability to proactively respond to an emergency event that was not associated with core company operations. Being prepared had a positive impact on Chevron's reputation in the region. The integration of the Chevron Way and how it applies to ICS in the emergency response for the Tham Luang Cave Rescue is shown in Figure 5.

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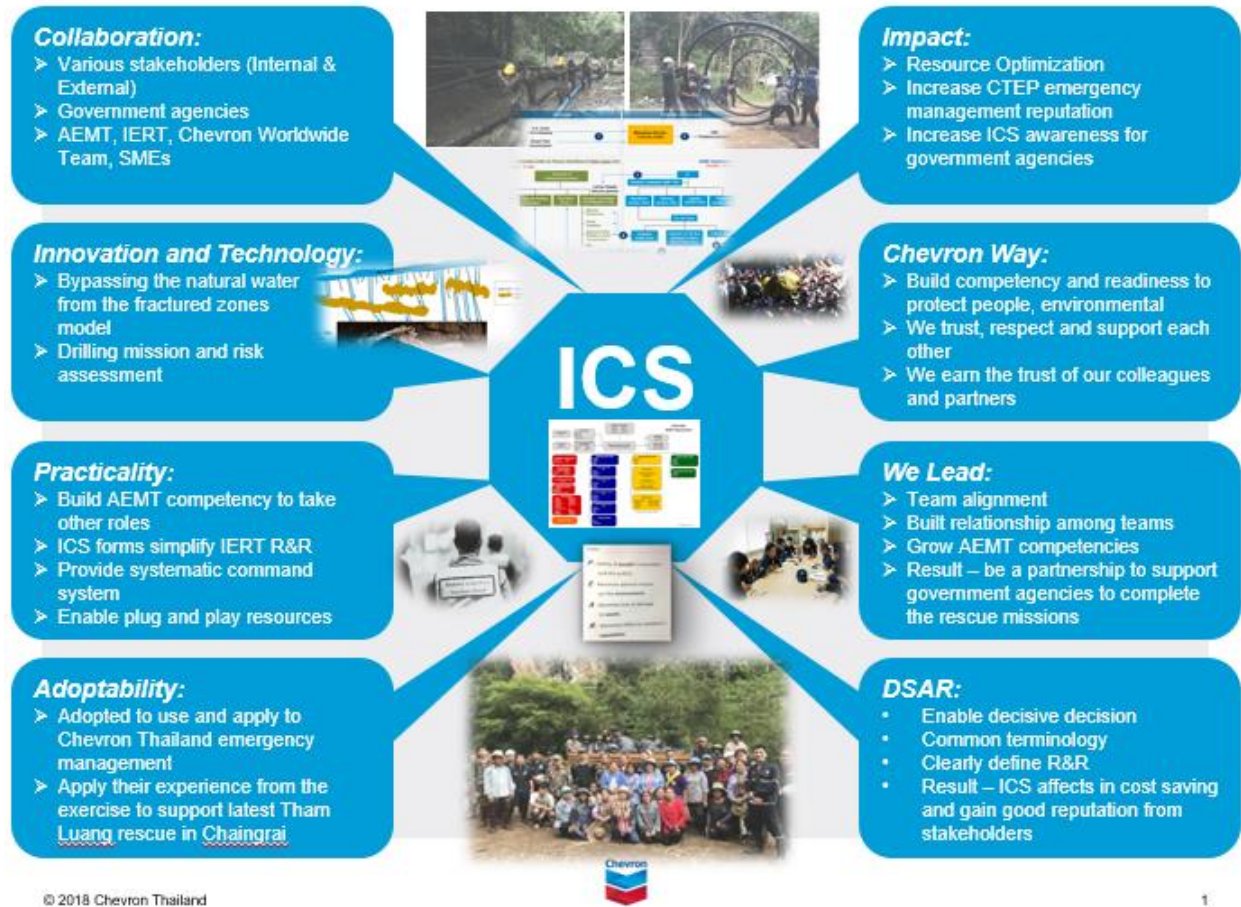


Figure 5: Integration of Chevron Ways to apply ICS in the emergency response for Tham Luang Cave Rescue.

After the successful conclusion of the rescue operations, Chevron Ex-SEALs and Earth Scientist who were Chevron On Scene Commanders received the Royal decoration (Figure 6). The Royal Thai Government also held a reception and dinner to thank all those involved in the cave rescue mission including Chevron Thailand personnel. Lastly, the United as One thank you banquet for rescuers of the Tham Luang Cave was held where the attendees received a copy of His Majesty the King's written note to extend appreciation to them (Figure 7).

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Figure 6: Chevron Thailand representatives to participate on the royally sponsored dinner at the Royal Plaza to thank for their rescue operation at Tham Luang cave



Figure 7: Chevron Thailand representatives received a copy of His Majesty the King’s written appreciation note

THANK YOU REMARKS: Many thanks to all the members of the Chevron Asia South Business Unit CMT, the Chevron Thailand CMT (Brad Middleton and Pairoj Kaweeyanun), the Chevron Thailand AEMT and all the Chevron personnel who traveled to Chiang Rai Province and assisted with the on scene response. Also a special thanks to the Chevron Corporate Emergency Response staff members: Angela Barrow; Gregg Eaton, and Michael Hunt. And a very special thanks to Chevron retiree Dave Davidson in assisting with the writing of this paper.

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