

ภาคผนวกที่ 32  
Blowout Contingency Plan

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PTT Exploration and Production Public Company Limited

## Blow Out Contingency Plan Manual

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PTTEP

Blow Out Contingency Plan Manual

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## 1.0 PURPOSE

This PTTEP document has been written to detail the minimum requirements of projects and assets to comply with the PTTEP Corporate Policy on Blow Out Contingency Planning within the Well Engineering discipline.

This corporate level document provides the framework for the management and assurance of Well Engineering within all PTTEP assets and has the following objectives:

- To specify a mechanism to ensure that PTTEP assets remain fit for service and deliver the required safety, environmental and commercial performance throughout the asset life cycle.
- To provide a basis for the management of equipment reliability and integrity through the assets, business processes and organization.
- To ensure that effort is focused on the equipment most critical to safety, environmental and business performance.
- To ensure that the risk of Major Accident Events (MAE's) are reduced to 'As Low As Reasonably Practicable' (ALARP).
- To be flexible to and reflect operational experience and accommodate change.

PTTEP Assets shall adhere to this document and take account of other guidelines and procedures which shall be applied throughout the well/asset life cycle.

## 2.0 SCOPE

This document applies to the following project life cycle phases:				
Identify / Assess	Select	Define	Execute	Operate
X	X	X	X	X

This document defines the processes that shall be implemented by all PTTEP onshore & offshore oil and gas production and related assets. The processes shall be applied at project development phase through to abandonment.

Where National Regulatory requirements are more stringent, they shall take precedence over this document. In such cases, the document owner shall be notified to determine whether document revision is required.

### 2.1 LANGUAGE

In this document, the words may, should, and shall have the following meanings:

May	Indicates a <b>possible</b> course of action
Should	Indicates a <b>preferred</b> course of action
Shall	Indicates a course of action with a <b>mandatory</b> status

## 3.0 REFERENCES

### 3.1 PTTEP INTERNAL REFERENCES

Internal documents applicable to this document are indicated in the table below.

Document Number	Document Title
Various	WMS Controlling Documents
Various	SSHE Controlling Documents
Various	CMS Controlling Documents

### 3.2 INTERNATIONAL REFERENCES

International Standards applicable to this document are indicated in the table below.

Document Number	Document Title
Various	API/ISO Controlling Documents
Various	Norsok Controlling Documents

### 3.3 REGIONAL REFERENCES

Regional Standards applicable to this document are indicated in the table below.

Document Number	Document Title



## 4.0 DEFINITIONS

### 4.1 WELL BARRIER DEFINITIONS

Terminology	Description
<b>Well Barriers</b>	Well barriers are envelopes of one or several dependent Well Barrier elements located on a potential leak path able to stop any fluid flow. Each barrier element shall be designed with regard to fluid characteristics and maximum pressure constraints expected at the considered barrier depth.
<b>Well Integrity Envelope</b>	A well integrity envelope is that which can be a combination of barriers and shall be designed to meet all potential load and environment conditions for the required design life of the well. It is also a means to prevent fluid flow and pressure transmission from one zone to another or to the surface and allow safe well killing operations.
<b>Well Barrier Schematic</b>	Is the drawing that will show the well barrier elements, the envelopes at each stage of the wells lifecycle, from "cradle to grave".
<b>Primary Barrier</b>	A system which provides first line fluid containment.
<b>Secondary Barrier</b>	A system which provides backup to the primary system.
<b>Tertiary Well Barrier</b>	Third (and generally optional) well barrier that prevents flow from a source and can act as backup to Secondary or Primary Well Barriers.
<b>Independent Barrier</b>	A barrier system which does not rely on another barrier to ensure pressure integrity, e.g. two similar plugs, can be considered as independent, providing that each plug can be regarded as reliable in its own right.
<b>Verified Well Barrier</b>	Whereby appropriate measures have been taken to confirm the Well Barrier will provide the required isolations. In this document, the term "Well Barrier" means a verified Well Barrier.
<b>A barrier is also defined as either permanent or temporary as follows:</b>	
<b>Temporary Barrier</b>	Non-permanent on or in the well; i.e. BOPs, retrievable plugs. Under specific circumstances the drilling fluid or wellbore fluid, or reservoir fluid may be considered a temporary barrier.
<b>Permanent</b>	Those barriers remaining on or in the well to provide permanent isolation.
<b>Well Classification for Barriers:</b>	
<b>Non-Flowing</b>	A well shall be considered as non-flowing if once the injection / activation system is de-activated, once the injecting/producing bore had been bled-off to atmospheric pressure and once well mean temperature is stabilized, no sustained flow can be observed at surface. This test shall be repeated at least once a year or more often if reservoir conditions can vary.
<b>Eruptive</b>	Any well, which does not fulfil the "non-flowing" well criteria, is named Eruptive.

## 4.2 GENERAL DEFINITIONS

Terminology	Description
<b>Asset</b>	Any physical facilities onshore or offshore used in the exploration, production, processing or transportation of oil and gas, and any supporting facilities or equipment.
<b>Asset Integrity (AI)</b>	Asset integrity is related to the prevention of major accidents. It is the outcome of good design, construction and operating practices. It is achieved when facilities are structurally and mechanically sound and perform the processes and produce the products for which they were designed
<b>Audit</b>	A structured independent assessment of the efficiency, effectiveness and reliability of the process or system.
<b>As Low As Reasonably Practical (ALARP)</b>	A term used to define tolerable risk acceptance only where risk reduction is impractical or cost benefit analysis is carried out and a judgment is made that the cost of further risk reduction is grossly disproportionate when compared to the actual risk reduction that would be achieved.
<b>Hazard</b>	A hazard is an intrinsic property of anything with the potential to cause harm. Harm includes ill-health, and injury, damage to property, plant, products or the environment, production losses, or increased liabilities.
<b>Hazardous activity</b>	Activity or task that exposes the person(s) carrying out the task to a hazard (e.g. welding, falls, etc.).
<b>Hazard Register</b>	The Hazard Register is an assessment record and communication document that demonstrates that all hazards associated with the Facility or Activity have been identified, and their associated risks assessed, such that appropriate risk controls can be implemented.
<b>Major Accident Event (MAE)</b>	Any incident that results in multiple fatalities or equivalent damage, production loss, environmental impact as per the risk matrix.
<b>Mitigation</b>	Limitation of the undesirable effects of a particular event.
<b>Management Review</b>	A systematic and timely study of a facility's equipment and management systems to help ensure safe operation.
<b>Management System</b>	A structured set of interdependent doctrines, processes, documents and principles that are intended to ensure that the activities of an organization are directed, planned, conducted and controlled in such a way to provide reasonable assurance that the objectives of the organization at met.
<b>Quantitative Risk Assessment (QRA)</b>	QRA is the evaluation of the extent of risk arising, with incorporation of Calculations based upon the frequency and magnitude of hazardous events.
<b>Risk</b>	Risk is a combination of the probability of occurrence of a consequence and the severity of that consequence.
<b>Risk Assessment</b>	An overall process of risk analysis and risk evaluation.
<b>Safety Case</b>	A formal demonstration that Health safety and environmental risks associated with the facility have been assessed and are being effectively managed.
<b>Technical Authority (TA)</b>	PTTEP personnel responsible for technical standards, and for providing advice on issues relating to their discipline, including advice on whether proposals to change or to deviate from a standard or from the reliability and integrity envelope should be approved.

#### 4.3 ORGANISATION AND DEPARTMENTS

In this document, the terms Corporate, Division and Asset have the following meanings:

<b>Corporate</b>	Refers to the PTTEP Business Groups hierarchically above Asset level, and located in the PTTEP headquarters, Bangkok.
<b>Group</b>	Refers to a corporate level Business Group. These may have associated Divisions, Departments, or operational Assets within their hierarchy.
<b>Division</b>	A Business Group may have one or more distinct groups within its hierarchy.
<b>Asset</b>	Refers to an operational Asset, site, or location within a respective Business Group.
<b>Department</b>	A subgroup within a Business Group, Division or Asset.
<b>Subsidiaries</b>	Juristic persons which PTTEP is a shareholder of more than 50%.

#### 4.4 LANGUAGE

In this document, the words may, should, and shall have the following meanings:

<b>May</b>	Indicates a possible course of action
<b>Should</b>	Indicates a preferred course of action
<b>Shall</b>	Indicates a course of action with a mandatory status

#### 4.5 COMMON ACRONYMS

/E	Engineering
/O	Operations
ACV	All-Purpose Capping Vehicle
ALARP	As Low As Reasonably Practicable
AMSL	Average Mean Sea Level
API	American Petroleum Institute
B&C/IWC	Boots & Coots IWC
BCP	The Blowout Contingency Plan
BCTF	Blowout Contingency Task Force
BHA	Bottom Hole Assembly
BOP	Blow Out Preventer
BOPE	Blow Out Prevention Equipment
BOPs	Blow Out Preventers
BPV	Back Pressure Valve
CMP	Crisis Management Plan
CMS	CMS Controlling Documents
CMT	Crisis Management Team
CO <sub>2</sub>	Carbon Dioxide
CP	Command Post
CSE	Safety, Security, Health and Environment Division
CWCI	Cudd Well Control
DC	Drill Collars
DMF	Department of Mineral Fuels
DP	Drill Pipe
DSV	Drill Supervisor
E.C.R.	Emergency Control Room
E.V.P / EVP	Executive Vice President
EMP	Emergency Management Plan
EMS	Electro Magnetic Survey
EMT	Emergency Management Team
EPA	Environmental Protection Agency
EPC	Procurement
EPS	EVP, Eng., Operations & SC
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESD	Emergency Shut Down
ETA	Estimated Time of Arrival
EU	European Union
EZ	Exclusion Zone
FAC	Accounting Division
FNA	Finance & Accounting Group
GSX	Geoscience & Exploration Group

H <sub>2</sub> S	Hydrogen Sulfide
HDY	Hat Yai Airport designation - IATA
HHP	Hydraulic Horse Power
HHR	Personnel Administration
HIT	Information Technology & Information Management Dept.
HRS	Human Recourses & Business Services Group
HSE	Health, Safety, and the Environment
HTHP	High Temperature High Pressure
IATA	International Air Transit Association
ICAO	International Civil Aviation Organization
ICS	Incident Command Structure
IESG	Oil industry Environment Safety Group Association of Thailand
ISO	International Organization for Standardization
KOP	Kick Off Point
LEL	Lower Explosive Limit
MAE	Major Accident Event
MASP	Maximum Anticipated Surface Pressure
MNL	Manual
MODU	Mobile Offshore Drilling Units
MSV	Primary Support Vessel
MWD	Measurement While Drilling
N <sub>2</sub>	Nitrogen
OIC	On-Scene Incident Commander
OIM	Offshore Installation Manager
OLG	Logistics/Marine Support
OLG/O	Marine Engineering Operations Section
OP	Operations
OSC	On Scene Commander
OSHA	Occupational Safety and Health Administration
OTF	Thai Offshore Well Operations Department
OTF/D	Drilling Operations Section
OTF/E	Drilling Engineering Section
OTF/O	Thai Offshore Well Operations Department
PDT	Product Asset Group
PIC	Person in Charge
PIN	International Asset
POB	Persons On Board
PSB	Petroleum Development Support
QRA	Quantitative Risk Assessment
RTN	Royal Thai Navy
S.V.P. / SVP	Senior Vice President
SAR	Search And Rescue
SBD	Strategy & Business Development Group

SCBA	Self-contained breathing apparatus
SDSV	Senior Drilling Supervisor
SF	Safety Factor
SO <sub>3</sub>	Sulphur Dioxide
SOP	Standard Operating Procedure
SSHE	Safety, Security, Health and Environment
SSSV	Sub Surface Safety Valve
TA	Technical Authority
TSD	Technology & Sustainability Development Group
TSH	Safety, Security, Health & Environment Division
UTM	Universal Transverse Mercator (coordinate system)
VTSS	Hat Yai Airport designation - ICAO
WMS	Well Management System
WWCI	Wild Well Control Inc.

## 5.0 RESPONSIBILITIES

### 5.1 DOCUMENT OWNER

The owner shall be the Well Operations Division SVP and is responsible for:

- Issuing the approval of this document and its revisions.
- Leading and demonstrating commitment by endorsing the implementation of this document.
- Giving clear direction on how the document is to be implemented and maintained.

### 5.2 DOCUMENT CUSTODIAN

The custodian shall be the OWE VP and is responsible for:

- Identifying deficiencies or potential improvements.
- Initiating periodic revisions.
- Maintaining revision history and document status register.
- Advising the document controller of any document changes, including register status.

## 6.0 INTRODUCTION

In compliance with legislation and moral obligations to protect the safety of personnel and the environment, the corporate team at PTTEP has developed this document to use in support of a rapid and effective response to a well control emergency. This plan outlines the onshore response to an offshore well control incident from a minor situation to extreme case (e.g. blowout). This corporate document can be used as an example for assets to use as a basis for their country or workscope specific plans.

The Blowout Contingency Plan (BCP) is not intended to replace sound judgment and offers only **guidelines** to be followed in the context of the emergency. For illustration this document is written in the context of PTTEP's domestic operations in the Gulf of Thailand however it is intended to be used as a guide for other assets to define/develop a country or location specific BCP.

### 6.1 OBJECTIVE OF THE PLAN

The aim of any BCP is to enable the swift and effective mobilization internal and external resources to combat and minimize the effects of a blowout. Due to the nature of this type emergency *initial actions* can considerably affect the latter stages of control. Delays of critical actions can cause knock-on effects which would hamper later efforts to control the situation. For example, a minor leak can be easily controlled, but given time it may escalate into a major fire and explosion. Therefore, it may be important to act quickly in the initial stages of the event. The Contingency Plan provides, or indicates, the source of information to enable all those involved in combating the emergency to take the initial, crucial actions required.

The BCP is not a replacement for other manuals/plans such as the PTTEP "Emergency and Crisis Management Standard" or for example in Thailand the "Bongkot Field Emergency Procedure Manual". The BCP is to be used in conjunction with these manuals/plans and bring specific information to handling a blowout.

The BCP does not discuss procedures intended to prevent a loss of well control. The BCP presents only the reactions expected for well control incidents.

### 6.2 SCOPE OF THE PLAN

The plan also includes the **long-term-activities** required, as a guide to eventual control of the well such as capping operations and/or relief wells.

These procedures begin assumes that immediate actions have already been undertaken to reduce the exposure of personnel to the consequences of the loss of well control (e.g. down manning of non-essential personnel and they have been moved to a safe location, medical attention given where needed, etc.)

The well control event may be the cause or be related to other types of emergencies, such as oil spills. Therefore this BCP plan refers directly to relevant corporate Emergency Procedures and Contingency Plans, rather than including them in this procedure. Users of this plan should ensure that they are familiar with these related documents and corporate policies.

This plan has been kept reasonably concise for ease of use.

### 6.3 BCP PLAN SUMMARY

Although this BCP covers one operational area as an example (drilling utilizing a jack-up rig and tender assist barge in the Gulf of Thailand), all well control situations require unique equipment, services and procedures to ensure safety, to minimize loss and deal with the problem in an efficient and effective manner. This BCP presents a template and highlights to all assets the need for an operation plan complete with evaluation of the situation and a mobilization scheme.

The most important consideration in the early stages of a blowout, second only to personnel safety, is the mitigation of damage. The BCP includes damage control measures that may be implemented before Blowout Contingency Task Force (BCTF) takes command and a well control team arrives. At times these procedures may conflict with personnel safety which must remain the paramount consideration. These situations require common sense and professional judgment on the part of the person(s) who are directing any mitigation efforts and are in charge of operations.

NOTE: No operation should be undertaken if it involves risk to personnel.

#### 6.4 CONTROL OF A DRILLING EMERGENCY

In most cases, a blowout occurring during operations is the outcome of a period during which difficulties have been experienced in controlling the well. Shallow gas blowouts are exceptions. However, these do not generally require capping or relief wells. Therefore, the only action after a shallow gas blowout has started is abandonment and personnel protection. The figure 1.1 show 3 levels of incident classified.

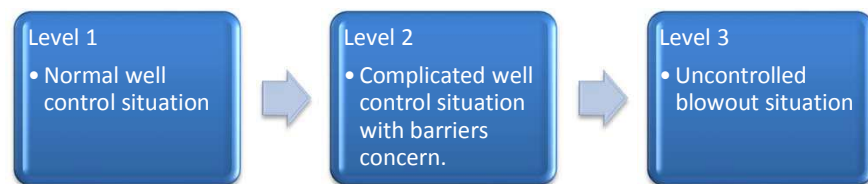


Figure 1 Level of Incident

The escalation period, between "well fully under control", and "well control lost" (e.g. Level 2 incident per definition of Section 1.4 above) during which well control operations are carried out, deserves a special status as regards to onshore management of operations. The escalation often lasts 10 hours, sometimes more, and the decisions taken during this time are often more critical than after the blowout has begun. The reason for this is that up to and until control is lost, one may avoid a potential disaster altogether, whereas after the disaster has already taken place, one can only mitigate the consequences, and often only ineffectively, until major logistics are in place.

In the control operation (example: for the control of a kick) the field team efforts should not be hampered in any way from the primary objective of regaining control of the well.

The decision to move to a Level 2 and thereby assemble the Blowout Control Task Force should be taken before losing control or when loss of control becomes a distinct possibility. Even then, care should be taken not to disrupt the on-going efforts made by the field crews to regain full control of the well.

#### 6.5 MULTIPLE EMERGENCY POTENTIAL

The repercussions of a blowout are likely to be more extensive than any other single event, with possible fire, explosion and associated damage risks. With the potential need for evacuation and oil spillage procedures, the emergency may require the deployment of large numbers of personnel in various teams to deal with specific aspects of the situation. One of the primary actions required in this event would therefore be the allocation of additional space and support in the field for emergency teams, in addition to the Emergency Response Room.

#### 6.6 COORDINATION OF EFFORTS

It should be emphasized that in the case of a blowout occurring on the field, the utmost coordination and cooperation must be established between Drilling Contractors and the Vice President of Drilling Department so as to avoid the redundancy of efforts and to optimize the mutual assistance.

To this end a dedicated telephone line shall be established between the drilling contractors and the Emergency Control Room (E.C.R). It must be emphasized that this line will be used for this purpose only.

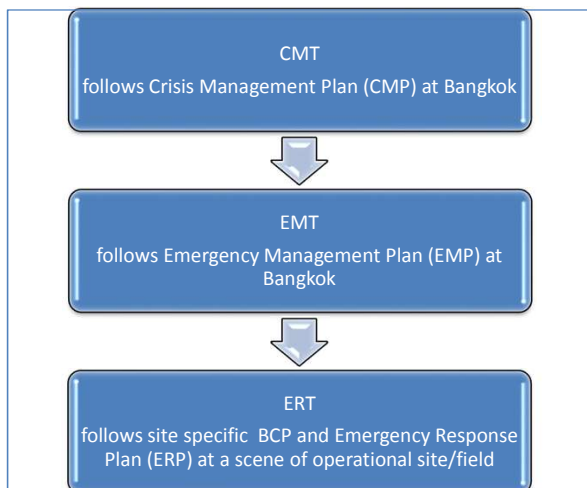
#### 6.7 NOTIFICATION

The first responder will typically be the Senior Drilling Supervisor (SDSV). The SDSV after collecting data will notify the **Drilling Superintendent** and the **Drilling Manager** of the Incident. Once the Level of Incident is known, the Drilling Superintendent will assist the SDSV and proceed to respond accordingly. It is common to have kicks or influxes of hydrocarbons and sometimes water during a drilling operation, and these are typically handled by using standard well control procedures. PTTEP has established well control standard procedures for the use of these common well control incidents. There may be cases where small well control incidents escalate into more severe ones. These incidents are known as Level 2 incidents and some examples of these are listed below. If this occurs it may be necessary to consult a well control specialist to assist in normalizing and controlling the well.

#### 6.8 ICS PRINCIPAL

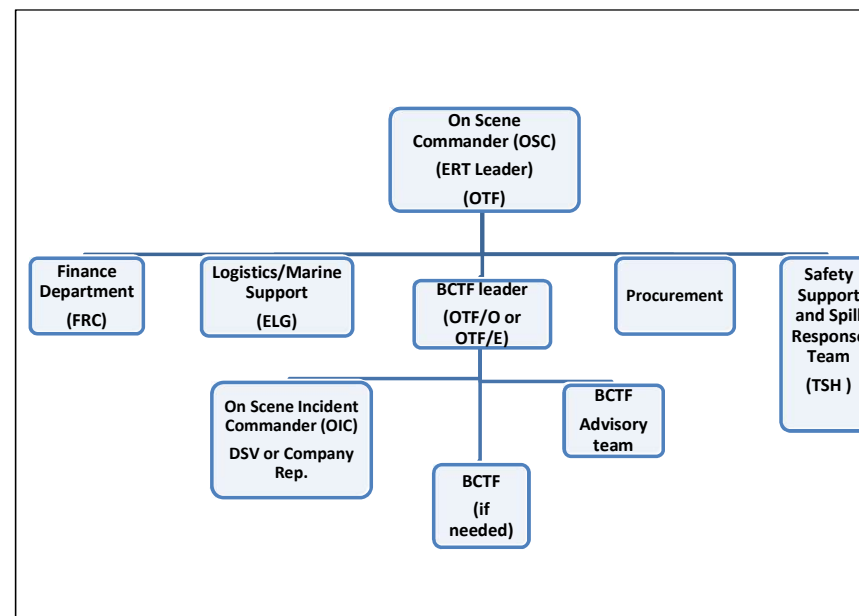
##### Emergency Response Organization

This plan employs the Incident Command Structure (ICS) system for response to a blowout. ICS is a system of definitions, procedures, job descriptions and instructions for actions to be taken in the event of an emergency. The Incident Command System (ICS) consists of three (3) organizations or teams, and these teams are designed to handle the planning and the response to all well control and blowout incidents specific to PTTEP. The teams are defined as the Emergency Response Team (ERT), the Emergency Management Team (EMT) and the Crisis Management Team (CMT). The Spill Contingency Plan will be launched by SSHE duty in EMT if required.



**Figure 2: Emergency of PTTEP and crisis management**

Emergency Response Team (ERT) on-scene initially and then onshore support teams. Onsite ERT member, comprise the site/field VP/Manager or top authorized person as an on-scene commander as show in Figure 3.



**Figure 3: Organization of the ERT**

Emergency Management Team (EMT) is involved with an emergency with greater magnitude and major severity in nature or has the potential to escalate and continue for significant period of time until the public may raise concern. EMT member, comprise the top management/authorities in the impact area i.e. the Oil industry Environment Safety Group Association of Thailand (IESG), Royal Thai Navy (RTN), etc., as show in Figure 4.

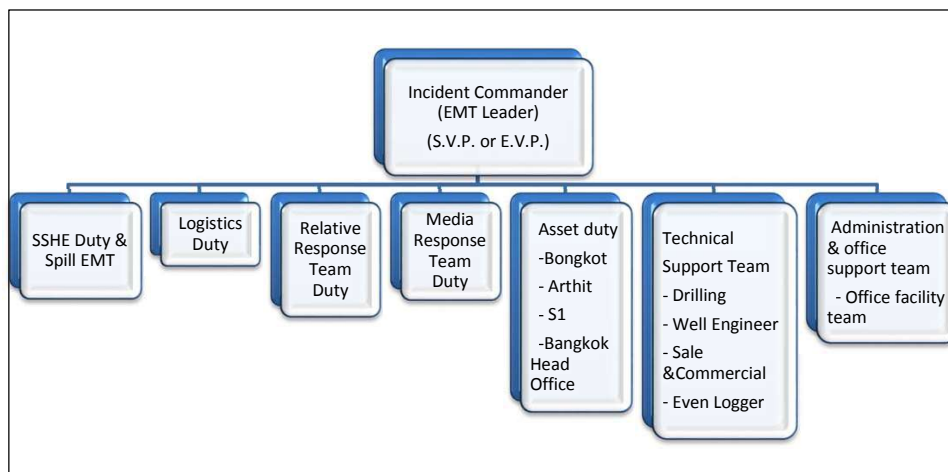


Figure 4: Organization of the EMT

Crisis Management Team (CMT) which is management's role in a complex event (in this plan PTTEP nomenclature will be the Crisis Cell). Corporate CMT member, consists of the top management at the corporate level and other supporting functions as show in Figure 5, their responsibilities and procedure, is defined in the corporate Crisis Management Plan (CMT).

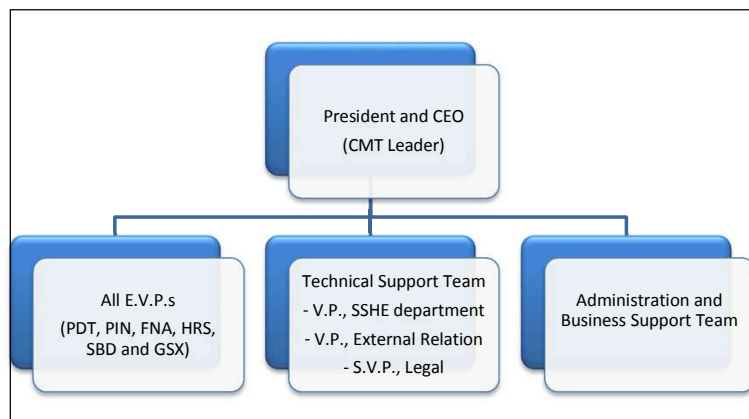


Figure 5: Organization of the CMT

## ICS

ICS is a highly structured organizational system developed specifically to manage emergency incidents. It uses a 'command & control' incident management approach to reduce responder risk and to optimize the outcome. It is adaptable, as it allows effective, predefined organizations to function in stressful, high-risk environments. ICS is modular from the top down, which allows it to expand or contract to meet the needs of the task at hand. It has proven to be effective over the past 20 years and has been adopted by many response organizations worldwide. In the USA it is a Federal Law that ICS be employed in emergency response situations (OSHA and EPA).

## Response Goals

The goals of the response team are to respond quickly and effectively with a bias toward a structured and unified organizational system. All levels of the overall response teams will follow the decision process described by Figure 6 below:



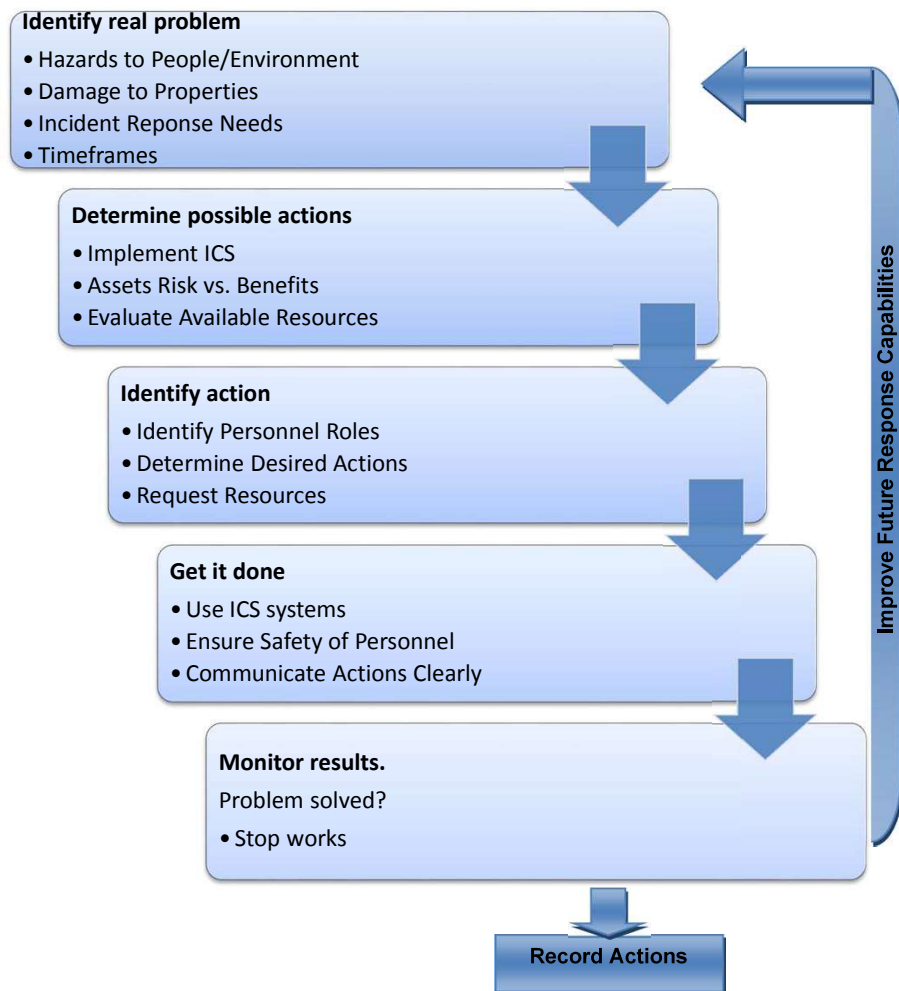


Figure 6: Response Decision Process

## ICS Components

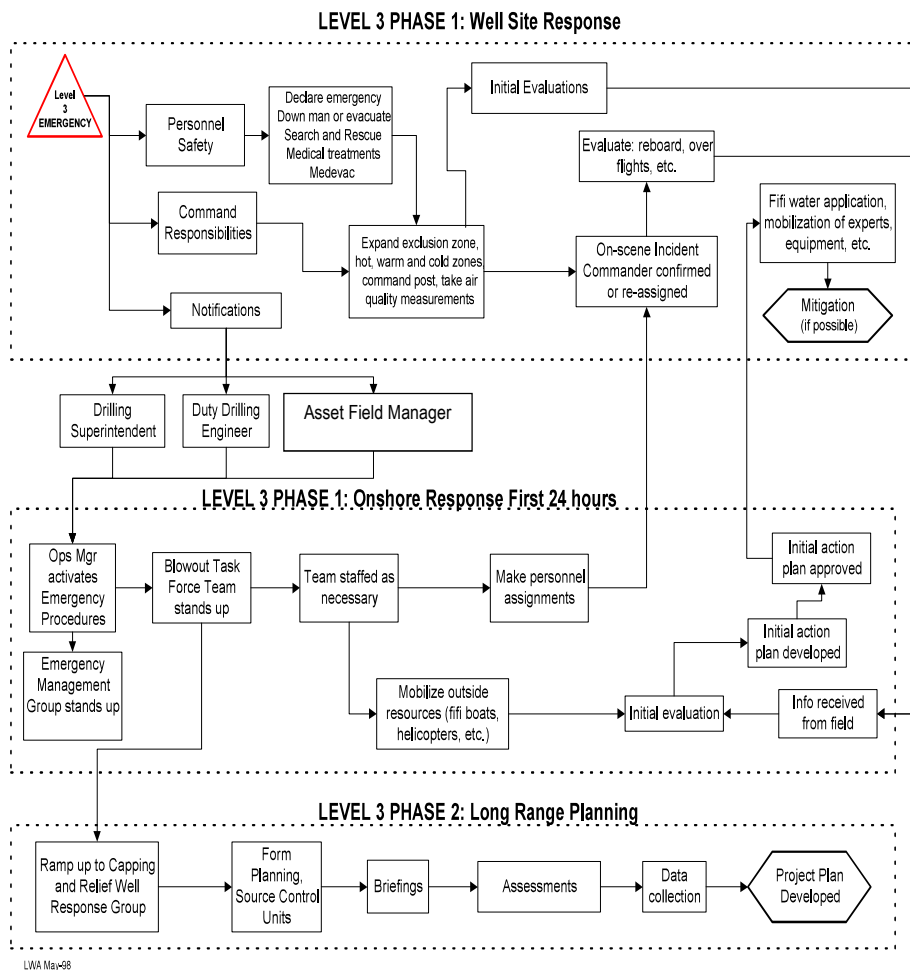
The ICS system depends on ten components to provide the glue that keeps the organization together and functioning properly:

- Common terminology
- Modular organization
- Manageable span of control
- Comprehensive resource management
- Pre-designated incident facilities
- Unified Command structure
- Integrated communications
- Incident action plans
- Common responsibilities for all ICS personnel
- Common Reporting system

## ICS Modification for Blowouts

ICS is designed for field activities that are not supported or for blowouts driven by project rules and systems. The first actions to be taken when a blowout occurs must be immediate, which fits the ICS very well. The proactive part of the response will be the control efforts that are best modelled and run as a project, similar to drilling an exploration well or constructing a refinery. Elements of the ICS will however work well for implementation of the project control plan. Therefore, the organizational structures offered in this guideline are modifications of the ICS system and project engineering and design control; e.g., the best of both systems have been utilized.





LWA May08

**Figure 7 Milestone Diagram for Onshore and Offshore Initial Response Action**

More detail of this diagram can be found in Section 8.

## 7.0 NOTIFICATIONS AND INCIDENT LEVELS

This section outlines notifications that are to be made should a well control incident occur. The section described three (3) levels of response, which range from the minor to the very serious. In line with the increasing levels of response, there will be a ramp up of personnel involved. This ramp up of involvement by key personnel is described in the matrix charts shown below:

Affected Personnel Incident Level Drilling	Drilling Supervisor	Drilling Superintendent	Manager, Drilling Operation	VP, Drilling Department	Asset Field Manager	SVP, Operation Support	Duty Officer	VP, Logistics Department	Songkhla Base manager	Executive Vice President	SVP, SSHE Manager	VP, Personnel & Admin. Manager	VP, Reservoir & Exploration Dept.	Blowout Control Task Force (BCTF)
Level 1	X	X	X	N	N									
Level 2	X	X	X	X	X	N	N	N	N	N	N	N		
Level3		X	X	X	X	X	X	X	X	X	X	X	X	X

**Figure 8: Drilling Rig Operations Notification Diagram**

N = inform only  
X = Action

## 7.1 INCIDENT RESPONSE LEVELS

A three (3) level response based on the severity of the incident is to be implemented. The operational circumstances, the potential for escalation and the potential risk/consequence impact on HSE and Company operations shall be considered in the declaration of the emergency and its level. This approach is outlined in Figure 9.

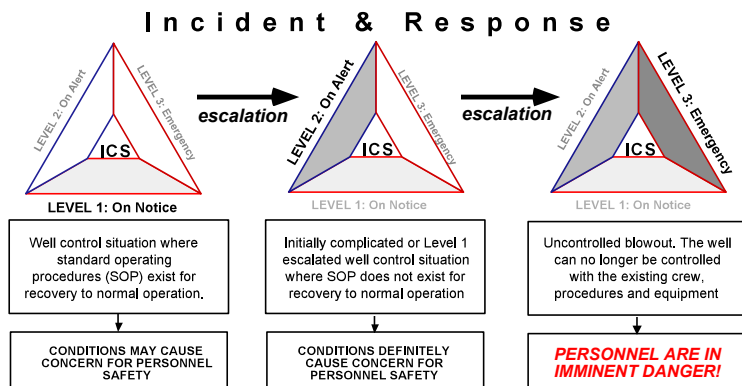


Figure 9: Well Control Incident and Response Levels

The primary components of the response levels are summarized in the following paragraphs:

### Level 1 Response (On Notice)

This response is for incidents that on-site operations staff should be capable of handling with standard operating procedures. The incident is of sufficient severity that there is concern for personnel safety and/or potential damage to the well or structure. Level 1 incident classification will be subjective and may be misinterpreted by the on-site staff as routine while it has the potential to escalate to a higher severity level. Notifications are made to immediate supervisors who will approve the classification and proposed control procedures. All level 1 incidents should be appropriately documented and made available for review by other operations staff.

### Level 2 Response (On Alert)

This response is for well control or related incidents where there is not a Standard Operating Procedure (SOP) for recovery to normal operations. Control may require resources in addition to the on-site operations staff and/or the use of unfamiliar, more difficult, well control procedures. The incident is of sufficient severity that there is **DEFINITE** concern for personnel safety and/or potential damage to the well or structure. Well control, however, has not been lost. The Level 2 incident classification will be subjective. The Drilling Manager and Area Operation Manager will make the final decision as when Level 1 becomes Level 2. This decision will be based on the risk/consequence for further escalation during non-routine, potentially higher risk, control procedures.

## Level 3 Response (Emergency)

This response is for well control incidents where control of the well has been lost. The personnel and structure are potentially in **IMMINENT DANGER**. This would include underground, surface or subsea blowouts. A Level 3 response would initiate a ramp-up to an incident response organization. Resources will potentially be required from outside Thailand. Level 3 incidents have the potential to escalate further during control procedures. Further escalation may include massive pollution, loss of life, serious structural damage or total loss of the MODU or platform and wellhead due to explosion, fire or seabed cratering. Adjacent wells may also be damaged at the surface and seabed, due to fire or flow erosion damage caused by the initial blowout, creating multiple, simultaneous blowouts. Production from other parts of the field may be suspended if the blowout is on a platform that acts as a gathering station for multiple pipelines.

An appropriate response will depend on an accurate assessment of the situation. Therefore, information is essential both in the initial phases and throughout the intervention project. Suggestions are included in each section for information that should be gathered both at the wellsite and from well records.

All situations will require the availability of immediate medical assistance. Additional safety measures and equipment will be required to deal with toxic gas if it is present.

The equipment best suited for intervention varies with each operational setting (i.e., jack-up, platform, floater, etc.). A "standard" firefighting and well control package are specified for the PTTEP Operations setting based on previous experience with such situations. Other equipment and services are specified for support of the intervention project.

## 7.2 EMERGENCY RESPONSE TEAM (ERT)

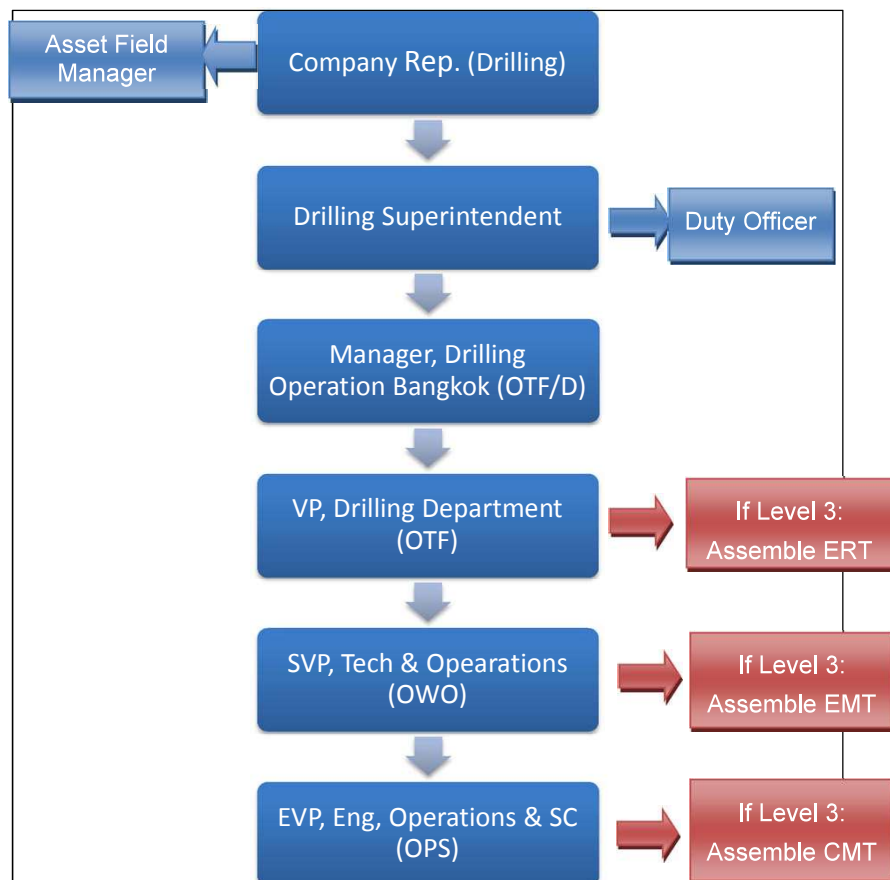
The Emergency Response Team (ERT) will be mobilized by the Vice President (VP) or acting VP. It will be assembled in the Emergency Response Room (room 2948) at the Energy Complex Building A 29th floor. The primary duties of the ERT are to:

- Follow the rules as detailed in the PTTEP Emergency and Crisis Management Standard.
- Take control of the logistics situation.

## 7.3 NOTIFICATION, ACTIVATION AND ASSEMBLY

The notification charts for personnel involved in the activation of the various response teams are given in diagram below:

a) **Alert Diagram (including out of working hour)**



## 8.0 INITIAL FIELD RESPONSE ACTION

The response to a well control incident will be according to the appropriate level of the incident (e.g. Level 1, 2 or 3) as defined in Section 2.0. Additionally, the response will be divided into "reaction" and "proactive" actions. The reaction will take place in the first 48-hours +/- of the event. The proactive actions follow the reaction and are designed to bring the situation back to normal operations.

### 8.1 ON SCENE INCIDENT COMMANDER AND PERSON IN CHARGE

In the situation where a Level 3 emergency has begun certain priorities and actions are required. The most important will be the safety of all personnel, second the facility and support vessels, rig and equipment. The operation will then focus on a solution once initial damage control steps have been taken.

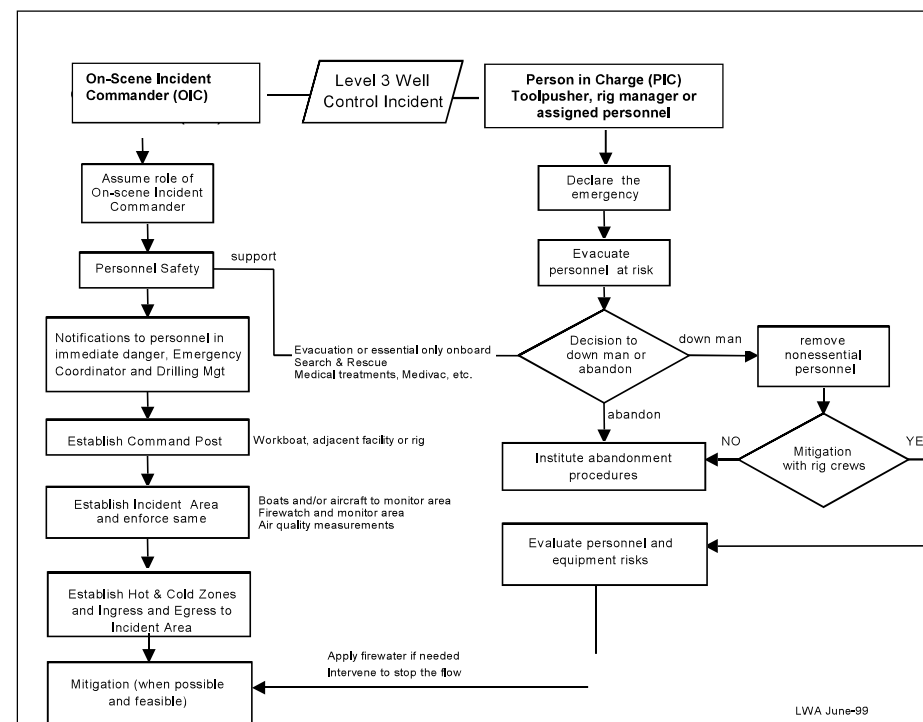


Figure 10 On-Scene Incident Commander and Person In Charge Tasks Flowchart

## 8.2 PERSONNEL RESPONSIBILITIES AND DESCRIPTION

<b>Responsibilities of Key Off-shore Personnel</b>	Listed below are brief descriptions of the responsibilities of key off-shore personnel who are expected to respond to a well control incident. This plan defines three levels of incident escalation: Level 1 - Notice, Level 2 - Alert and level 3 - Emergency. Level 1, normal and routine well control incidents, are covered by PTTEP's standard operational procedures, and are not addressed here. Responsibilities for Level 2 and Level 3 are outlined below.
<b>Drilling Supervisor On-site Incident Commander (OIC)</b>	Drilling Supervisor is responsible for ensuring that the Drilling Program, Procedures and Policies are carried out by the Drilling Contractor and Third-party Service Companies. The OIC is designated as being in charge of all emergency situations on the drilling rig. He may be advised by the barge captain and rig superintendent (PIC), but the ultimate authority is his and his decision will be final.
<b>LEVEL 2 Alert</b>	The Drilling Supervisor will be responsible for: <ul style="list-style-type: none"> <li><input type="checkbox"/> determining that Level 2 should be declared, in consultation with the PIC.</li> <li><input type="checkbox"/> notifying management of a Level 2 well control incident</li> <li><input type="checkbox"/> activating the appropriate response level on the rig</li> <li><input type="checkbox"/> maintaining liaison between the PIC and management</li> </ul>
<b>LEVEL 3 Emergency</b>	The Drilling Supervisor will continue the appropriate duties above and: <ul style="list-style-type: none"> <li><input type="checkbox"/> declare the emergency.</li> <li><input type="checkbox"/> take on the role of OIC (On-scene Incident Commander) until relieved by the Drilling Superintendent or a designee nominated by OTF.</li> <li><input type="checkbox"/> notify management of a Level 3 well control incident per the notification guidelines</li> <li><input type="checkbox"/> provide the communications focal point for PTTEP's shore-based management</li> <li><input type="checkbox"/> coordinate with the Marine Superintendent for standby/supply vessels, fiifi vessels, helicopters, search and rescue support, shore-based support, support from other rigs in the field, medivac, etc.</li> <li><input type="checkbox"/> assist in the abandonment, medivac and search &amp; rescue as needed</li> <li><input type="checkbox"/> monitor the situation and communicate developments to Drilling as they occur</li> <li><input type="checkbox"/> declare an exclusion zone (see guidelines in Section 4.0)</li> <li><input type="checkbox"/> assist in asset protection procedures (application of firewater, etc.)</li> </ul>

<b>Person in Charge (Contractor Rig Superintendent)</b>	The PIC has responsibility for safety of the drilling rig and the safety, health and welfare of all personnel on board or working in the near vicinity of the drilling rig, including the Drilling Contractor's personnel, PTTEP personnel and Third-party Contractors' personnel.
<b>LEVEL 2 Alert</b>	The PIC will be responsible for: <ul style="list-style-type: none"> <li><input type="checkbox"/> safety of personnel at all times</li> <li><input type="checkbox"/> declaring a Level 2 alert</li> <li><input type="checkbox"/> making notifications to contractor management.</li> <li><input type="checkbox"/> down-manning of personnel if necessary</li> <li><input type="checkbox"/> directing the Drilling and Rig crew in performance of their specific response duties while assisting a Drilling Supervisor to control the well</li> <li><input type="checkbox"/> liaison with the Drilling Supervisor in performance of his duties</li> <li><input type="checkbox"/> notifying the Drilling Supervisor of emergencies</li> <li><input type="checkbox"/> suspension of hot work</li> <li><input type="checkbox"/> securing rig for abandonment if this becomes necessary</li> <li><input type="checkbox"/> advising Drilling Supervisor when the emergency is over and the return to normal operating status</li> <li>• In case the OIC is incapacitated, he shall assume this role until relieved by PTTEP.</li> </ul>
<b>LEVEL 3 Emergency</b>	The PIC will continue the duties above as well as: <ul style="list-style-type: none"> <li><input type="checkbox"/> declare the emergency after consulting with Drilling Supervisor.</li> <li><input type="checkbox"/> along with Drilling Supervisor determine a decision of abandonment</li> <li><input type="checkbox"/> along with Drilling Supervisor determine method of abandonment.</li> <li><input type="checkbox"/> along with Drilling Supervisor order evacuation of personnel.</li> <li><input type="checkbox"/> initiate emergency SOP's for abandonment (emergency disconnect).</li> <li><input type="checkbox"/> call an immediate muster of all persons on board when necessary.</li> <li><input type="checkbox"/> ensure crew has responded to the alarm.</li> <li><input type="checkbox"/> Direct and control support vessel and helicopter operations in the vicinity of the rig.</li> <li>• In case the OIC is incapacitated, he shall assume this role until relieved by PTTEP.</li> </ul>
<b>Vessel Master (if On-site)</b>	One or more vessels may be tied up to or be in the vicinity of the drilling rig during an emergency or may be dispatched to the site by the marine superintendent. Any vessel in the immediate vicinity or participating in the emergency shall be responsible for the following:
<b>LEVEL 2 Alert and LEVEL 3 Emergency</b>	The VESSEL MASTER has ultimate responsibility and authority for the safety of his vessel and crew. The primary objective of the Vessel Master, in the event of an emergency, shall be to SAVE LIVES by assisting in rescue efforts and/or the application of firewater. If he is notified of an emergency on a drilling rig, he will immediately suspend current operations and offer assistance as requested or as he deems appropriate.  He will be responsible to the PIC on the drilling rig, but he may also be directed by the Marine Superintendent or Drilling Supervisor. A partial list of responsibilities are to: <ul style="list-style-type: none"> <li><input type="checkbox"/> accommodate all drilling rig personnel on a short term basis.</li> <li><input type="checkbox"/> provide first aid to rescued people as necessary.</li> </ul>

	<ul style="list-style-type: none"> <li><input type="checkbox"/> act as a reserve/relay radio station between base and installation.</li> <li><input type="checkbox"/> standby close to the drilling rig for helicopter landings and take offs.</li> </ul>
	<ul style="list-style-type: none"> <li><input type="checkbox"/> oversee personnel working over the side; personnel working in/near water</li> <li><input type="checkbox"/> keep continuous look-out for other vessels that might come near the drilling rig</li> <li><input type="checkbox"/> assume responsibility for communication with other vessels as the situation demand OTF/O</li> <li><input type="checkbox"/> transmit messages to air and surface craft</li> <li><input type="checkbox"/> act as an On-scene Incident Commander until relieved, as directed by management</li> <li><input type="checkbox"/> maintain communication with the drilling rig, using all visual and audible means available for as long as possible</li> <li><input type="checkbox"/> monitor the situation and report development to management and the On-scene Incident Commander</li> </ul>
<b>Safety Officer/ Technician</b>	Support PIC and OIC as follows: <ul style="list-style-type: none"> <li>• Oversee the practices being used for emergency response.</li> <li>• Participate in decision making process.</li> <li>• Provide advice to Drilling Supervisor and O.I.M.,</li> <li>• Ensure safety equipment is available and working properly.</li> <li>• Make preparations for evacuation, if necessary.</li> </ul>
<b>Driller</b>	Support PIC and OIC as follows: <ul style="list-style-type: none"> <li>• Secure well as instructed or based on experience.</li> <li>• Assist Offshore Installation Manager (O.I.M.) and Drilling Supervisor.</li> <li>• Carry out assigned emergency actions.</li> </ul>
<b>Barge Engineer, Crane Operator, Electrician, Mechanic, Mud Engr., Radio Operator, Derrickman, Floorman, and Roustabouts</b>	<ul style="list-style-type: none"> <li>• Assist O.I.M. and Drilling Supervisor.</li> <li>• Carry out assigned emergency actions as per SOP.</li> </ul> As shown in Transocean Emergency Response Plan.

### 8.3 GUIDELINES FOR INITIAL RESPONSE

#### 8.3.1 Personnel Safety

In blowout situation the most important consideration is personnel safety. PTTEP operations have developed this document and plan which refer with Emergency Management Plan (EMP). Once the well blowout, all personnel on board need to be checked and accounted. Emergency team such as rescue team needs to be activated. Medivac will be organized if needed. Then activate evacuation plan.

#### 8.3.2 Activate Exclusion Zone

After the rig/platform has been abandoned, the On-scene Incident Commander will be responsible for activating an Exclusion Zone (EZ) for: third party general marine and aviation traffic and any fixed structures and MODUs within the zone. The initial EZ should be a fixed radius around the blowout exit point(s) (some broached blowouts have surfaced several kilometres from the wellhead). The fixed radius should be based on gas dispersion and oil slick modelling for a worst case blowout. Consider:

- Maximum blowout oil flow rates and slick movement on dead calm water
- Lower Explosive Limit (LEL) distances for very stable atmospheric conditions and light wind (< 2 mph).

If modelling parameters are uncertain assume 1 km as a minimum initial radius. Air quality measurement will be used to alter the generalized no-go zones.

#### 8.3.3 Establish On-Scene Command Post

A command post (CP) needs to be established by the On- scene Incident Commander as soon as practical to facilitate coordination of further response activities. If the rig has been partially evacuated, the CP would be the drilling rig, with an observing standby boat acting as a backup in case rapid escalation prevented On-scene Incident Commander communication with support resources. If the rig has been abandoned the CP might be established on a supply vessel, another rig or offshore structure outside the exclusion zone. Good communication equipment is essential between the On-scene Incident Commander, the field support resources and the shore base. The location of the CP may be moved as appropriate at the discretion of the On-scene Incident Commander.

#### 8.3.4 Site Safety

After evacuations and the other initial command structure steps are **taken** by the On-scene Incident Commander, the next issue to be addressed is site safety. Site safety for third parties and responders will be addressed by these steps:

##### Activate the Initial. Exclusion Zone

This is a pre-determined no-go and evacuation zone designed around a worst case blowout release using gas dispersion modelling tools. Under certain stable atmospheric and wind conditions dangerous concentrations of H<sub>2</sub>S gas can travel long distances. For this reason the size of the initial Exclusion Zone should be conservative.

The activation of this zone is a safety measure designed to protect third parties and non-essential personnel from potential exposure while measurements are taken to define a more accurate Exclusion Zone. The activation of the zone will be made by notification to all vessels, aircraft and structures inside the zone. Securing the zone after activation will require several of vessels and/or aircraft.



### Define Hot, Warm and Cold Zones

These are safety zones designed to establish levels of increasing potential risk to responders as they move from Cold to Hot. Each zone will have increasing levels of safety requirements before responders are allowed to enter. The combined Hot, Warm and Cold zones will establish the working Exclusion Zone for third parties and non-essential personnel. These zones will be established systematically and should consider the longest reaching hazards first, for example:

- H<sub>2</sub>S and/or SO<sub>2</sub> exposure (if applicable)
- gas ignition and explosion with flying debris
- gas ignition and fire
- pool fires
- secondary explosions after primary ignition
- oxygen deficiency
- gas plume hazards on sea surface
- rig instability and/or deterioration
- shifting wind directions and velocities
- blowout intensity escalating
- oil slick movement

These zones will initially be established by the On-scene Incident Commander in consultation with the Safety Officer (if possible) evaluating each of the potential hazards individually and again as a system. A site specific safety plan must be developed for the team designated to access the zone boundaries, to include support and escape plans. Weather and blowout conditions can change on short notice, therefore these boundaries can also change and must be re-evaluated constantly. If there is uncertainty concerning the potential hazards involved then the On-scene Incident Commander should maintain the Initial Exclusion Zone until relieved trained response person. See also Guidelines, Flowcharts and Checklists section at the end of this chapter.

### Define Access and Egress Routes

OIC is responsible for setting the boundaries for the Hot, Warm and Cold Zones. Routes into and out-of the zones must be established for response personnel for re-entry and emergency escape. Generally the access and egress routes are best made in the upwind hemisphere. If approach is made in a vessel current and waves should also be considered if an oil slick is to be avoided or if power failure of the vessel might cause it to drift down wind into the danger zone. The preferred course of access may be to approach at 90° angles to the wind/current direction. All hazards must be considered, however, before finalizing the routes note that the egress route may change during the course of a work period, due to changes in conditions and should be monitored continuously.

### Exclusion Zone Safety Procedures

Site specific exclusion zone safety procedures must be established for all personnel entering each of the three zones. The On-scene Incident Commander in consultation with the Safety Officer and Toolpusher (as applicable) and shore base supervisor would define these procedures. If re-entry is to be considered after an abandonment, the OIC must consider the following:

- The need for entry
- Evaluate risks for entry team
- Develop tasks for entry team
- Develop contingency plans and escape means for various scenarios, e.g.:

- Operational "Site Safety" meeting with all concerned
- discuss personnel safety
- - emphasis on buddy system
- set objectives of re-entry- emphasis on escape and contingencies,
- equipment checks for hot and warm zone participants
- Issue Personnel Protection Equipment For Staff In Each Zone (if needed)
  - SCBA (if appropriate)-
  - heat fire resistance clothing-
  - hearing and eye-protection (with heat shielding)-
  - hand held communications-
  - air quality monitoring devices-
  - head, hand and foot protection
- General Site Security and areas to avoid:
  - closed areas- highly contaminated areas (gas, oil, etc.) g
  - as concentration (high LEL, H<sub>2</sub>S, etc.)
  - onsite toxicants and chemical exposure (caustic, acids, etc.)
  - site procedures for access control and personnel monitoring
- Site safety will be a particularly important issue if the decision is made to allow essential personnel to remain on the facility to execute mitigation procedures (pumping, firefighting, etc.) or if firefighting vessels are to be deployed in the warm zone to spray water after the rig has been abandoned. If the facility is destroyed or the perceived danger is high, the site safety issue should be left to the Level 3 Source Control Team

### 8.3.5 Asset Protection & Damage Control

After the site safety issues are addressed, asset protection and damage control may be addressed by the On-scene Incident Commander. Listed below are a few procedures that may be considered:

- ESD initiation (if appropriate)
- Blowdown of site hydrocarbon inventory
- Shut-in of wells and pipelines feeding facility
- Secure adjacent wells in well bay (if possible)
- Firewater Application, deluge systems (if appropriate), fifi water application from marine vessel(s) to minimize ignition hazard or to cool structure and/or adjacent wells

Some of the steps listed above may be part of the facility operations standing procedures in a Level 2 emergency (example: simultaneous operations on a joint drilling and production operation). They are mentioned here to alert the reader to the situation where they are not standing procedures and may be considered in the overall action plan taken by the on On-scene Incident Commander. It is important to maintain control over any firefighting vessel that might be deployed to spray water on the rig. The captain and crew of the vessel must be debriefed and fully understand the potential dangers of escalation and safety procedures that must be followed before they are deployed into a potentially dangerous situation. Non-essential crew should be removed before entry into the Hot or Warm Zone.

All safety equipment and breathing systems must be checked before entry.

### 8.3.6 Rig or Structure Re-entry by Initial Response Team

Re-entry of the rig or structure where a surface blowout is underway should not be attempted by the Initial Response Team without approval from PTTEP management. The case of search and rescue (SAR) may be accepted, but only then after a detailed safety/rescue plan is in place for the responders. For all other purposes (e.g., assessment or mitigation) the Initial Response Team should wait for the Level 3 professional response team to arrive and develop a detailed proactive plan of action.

### 8.3.7 Blowout Control Response Actions

Blowout control response actions should not be attempted by the field personnel unless approved by PTTEP management and only then after a credible operation plan has been devised along with a site safety and escape plan. In cases where the blowout occurred rapidly with no chance for off-site support, the rig/structure should be secured and abandoned. Blowout control response would wait for the Level 3 ramp-up and a proactive plan to be developed by the Source Control Team. Circumstances where the ECT might attempt blowout control actions would be where an escalation has occurred gradually from a Level-2, Incident, the rig has been down manned, and the shore based support team has already been activated. In this case, if the ECT and the support team both feel an immediate control attempt has a high probability of success, the safety risk is low, further rapid escalation risk is low and a site safety plan has been developed then control attempts may be initiated. An underground blowout that has a low probability of breaching would be an example.

#### \*\*\* WARNING \*\*\*

- In no case shall the response team be subjected to unreasonable risk. At all times during this initial phase 1 period, safety of personnel will be the number 1 priority. The rig crews should not be expected or asked to perform potentially dangerous tasks that they have not been trained to perform.

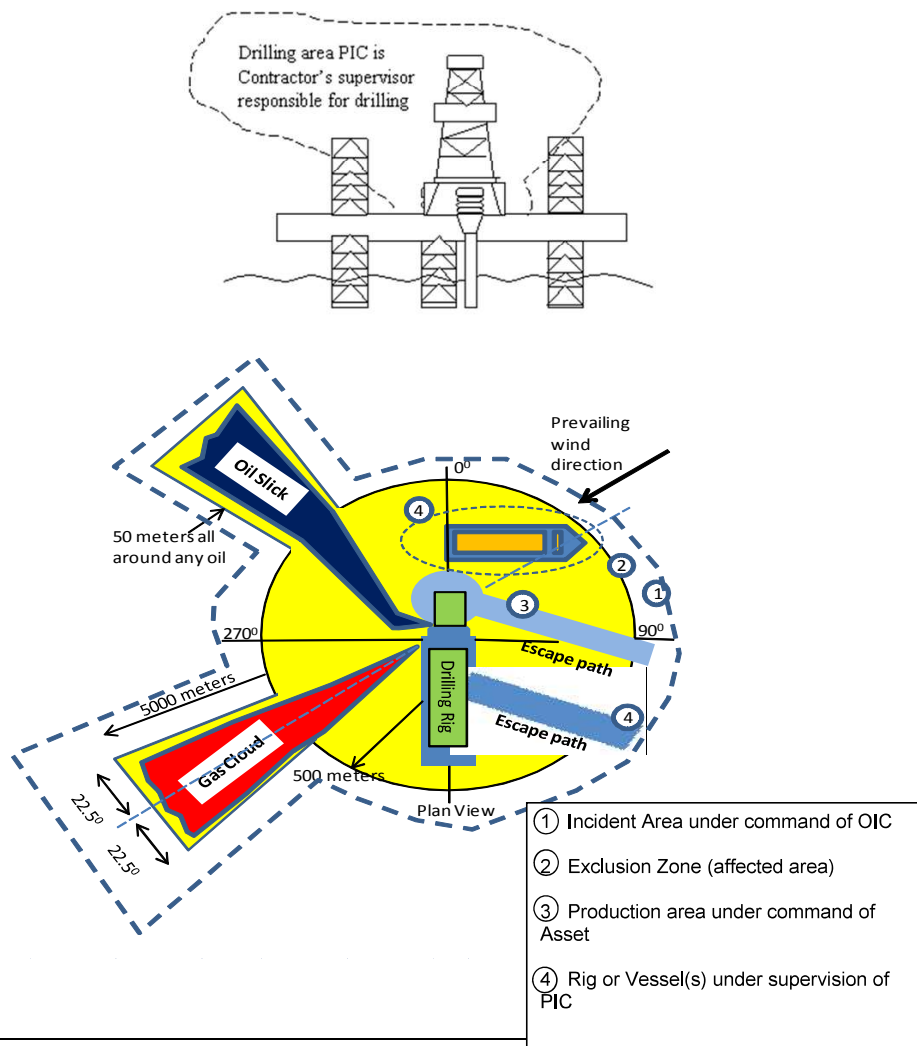
Level 3 - Phase 1 on-site blowout control response actions will be specific to company approved policy and: (1) the type of rig or structure (e.g., rig or platform rig); (2) the circumstances of the blowout (e.g., surface, on fire, underground, potential risk for escalation); (3) the operation at the time of the incident (e.g., drilling related, workover related, testing related or production related); (4) potential for sabotaging future proactive control plans if an immediate attempt fails, and (5) the local environment at the time of the incident (e.g., night/day, weather, fire, pollution, available resources, willingness, training level and skill of crew.

### 8.4 ON-SCENE INCIDENT COMMANDER & PERSON IN CHARGE TASK LISTS

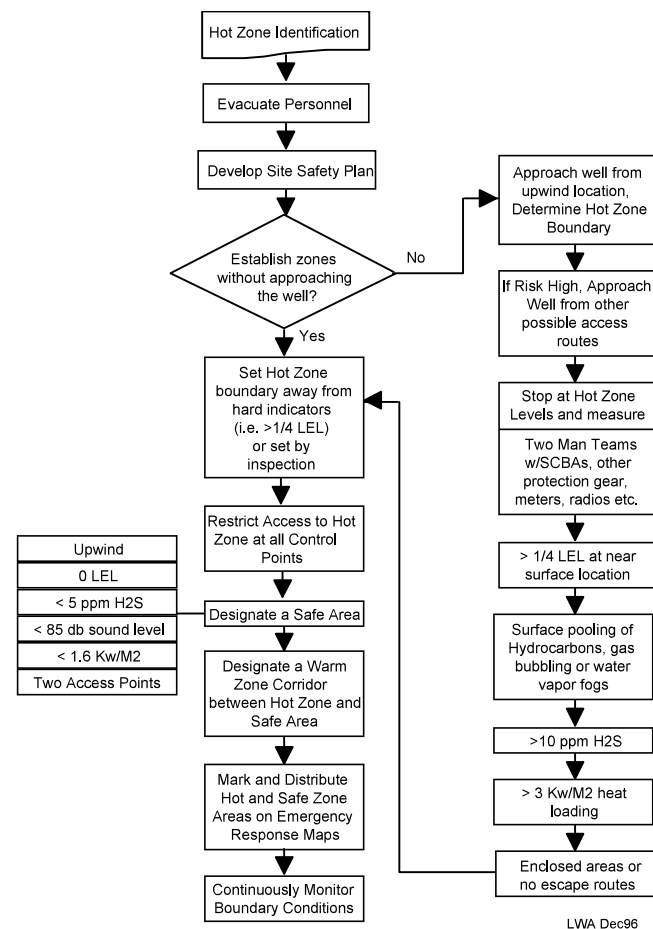
Command Organization and Responsibilities	
Level 3 - Phase 1	
Initial On-scene Incident Commander and essential crew only	
Item	Action or Consideration
1	When the decision is made to abandon the rig or platform, the PIC will maintain command of the evacuation operation until his charges have been rescued and is relieved of his duties. During this time, close liaison will be maintained with the PTTEP Representative, whose duties will be to assist the PIC as directed and to coordinate off site notifications and support. After the rig or platform has been abandoned the PTTEP OIC will assume command of further response operations. There can be only one man in charge, if the pre-designed On-scene Incident Commander cannot assume his command one must be appointed.
2	Make notifications as per the notification diagram in section 2.
3	Appoint deputy On-scene Incident Commander and team leaders (ex: toolpusher is deputy, barge engineer becomes team leader, etc.).
4	Establish essential personnel roster. Appoint support staff and outline responsibilities (drillers, electrician, mechanic, medic, etc.).
5	Set up command post (standby boat, control room, radio room, etc.) Man communication equipment, keep channels of communication open for important relays (e.g. essential communications only).
6	Establish Incident Area, activate Exclusion Zones for general aviation and marine traffic enforce the same.
7	Establish preliminary Hot Zone boundary.
8	Hold initial briefing meeting with team members - address personnel safety and medical issues - search & rescue necessary? - mitigation and or damage control objectives - re-board for evaluation - refer to BCP plans and checklists
9	Assign monitoring responsibilities - begin fire watch, organize fly-by and or marine observation.
10	Begin reporting sequences
11	Mitigation when possible (firefighting, etc.) and <i>ONLY</i> with approval of management.

## 8.5 HOT ZONE IDENTIFICATION

If a level 3 event occurs (like a blowout) certain key personnel are expected to take charge of their respective areas. In the drilling scenario the Companyman becomes the On-scene Incident Commander (OIC) in charge of the overall incident area. The rig or, any vessel, will be commanded by a Person In Charge (PIC) who has ultimate responsibility for his respective area. The diagram below shows the various areas of responsibility:



## 8.5.1 Hot Zone Identification Flow Chart







## 8.5.2 Hot Zone Identification Checklist

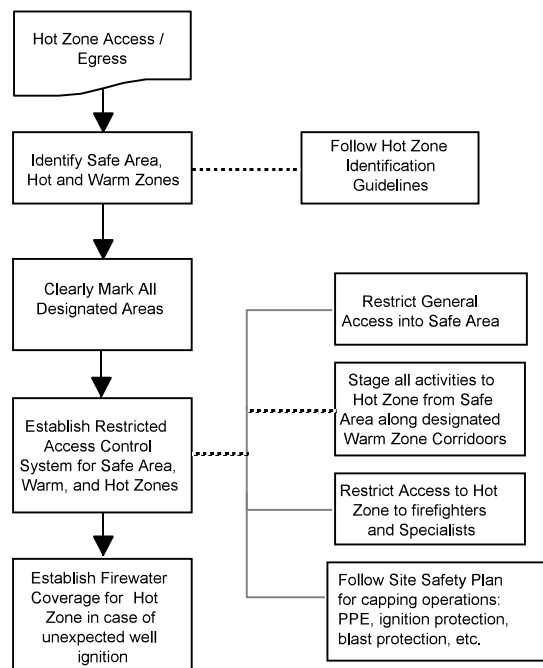
HOT ZONE IDENTIFICATION	
Level 3 - Phase 1	
Initial On-scene Commander and essential crew only	
Item	Action or Consideration
1	A "SITE SAFETY PLAN" is required before wellsite work can start. This plan is developed and implemented by the On-scene Incident Commander after initial evacuation of personnel.
2	The "Hot Zone" boundary must be realistically based on presence or the anticipated presence of an explosive mixture (LEL levels), rain of hydrocarbons or H <sub>2</sub> S and is principally controlled by wind direction but is influenced by the leak rate and location as well as the direction of the flow.
3	On burning blowouts the "Hot Zone" will likely be set on radiant heat limits and smoke avoidance. Wind direction also has considerable impact in Hot Zone boundaries. Some fires do not burn clean and product can exist in the presence of a fire, therefore item 2) and 3) must be considered together.
4	Generally the hot zone will be set by inspection and not from a quantitative analysis. This will be revised as time goes on and will be monitored carefully throughout the project.
5	If the "Hot Zone" boundary is set by actual measurements, it will be done by two men with SCBAs. They should approach blowout using LEL meter, H <sub>2</sub> S meter, dB meter and Radiant Heat Meter (if available) and check levels down wind of the well area. Initial approach should be from an upwind direction.
6	The boundary of the HOT zone is defined as when first indication is seen of either: <ul style="list-style-type: none"> <li>• &gt;1/4 LEL level (1% concentration of hydrocarbons in air) at any near surface elevation (ground level or standing on top of a truck).</li> <li>• surface pooling or streaming of liquid hydrocarbons, surface gas bubbling or hydrocarbon and water vapor fogs (restricted visibility and explosive vapor)</li> <li>• &gt;10 ppm H<sub>2</sub>S</li> <li>• &gt;90 dB noise level</li> <li>• Over 3 Kw/m<sup>2</sup> heat loading or practically the point where exposed skin cannot sustain exposure without protection for more than a few minutes. CONTINUED....</li> </ul>
7	When measuring parameters, approach problem well from any possible access route (including those located downwind) and repeat this process.
8	Where possible, set Hot Zone boundaries away from these hard indicators (ex: 1/4 LEL) at good control points. CONTINUED....
9	"Hot Zone" shall be restricted to well control experts or designee of the On-scene Incident Commander and shall be allowed in the zone on a permit only basis and only for a prescribed and defined task. Buddy system will be maintained at all times and cover of water provided for each when appropriate.
10	Manpower with radios from drilling rig crew, safety and production can be used at these defined "Hot Zone" control points to restrict access into the "Hot Zone". Downwind "Hot Zone" boundary must be tightly controlled and continuously monitored as variable winds can quickly change the boundary. Some access routes should be blocked to prevent accidental entry.
11	The "Safe Area" or "Cold Zone" location is based on the "measurable" Hot Zone boundaries, available work areas and access and wind direction.



12	The safe distance seen in the downwind approach of the "Hot Zone" boundary is then used as one guideline for setting the "Safe Area". Additionally dispersion modeling can be used with the measurements taken to help predict downwind conditions if wind is blowing across blowout out to sea.
13	The "Safe Area" is not a contour like the "Hot Zone" but is a dedicated staging area for control efforts for blowout. Access to areas inside the "Hot Zone" must be from "Safe Area". Other alternate paths into "Hot Zone" are blocked.
14	"Safe Area" should be accessible from two directions.
15	"Safe Area" restricted to essential personnel with proper protective equipment.
16	"Safe Area" should be in area with 0 LEL, <5 ppm H <sub>2</sub> S, <85 dB sound level and <1.6 Kw/m <sup>2</sup> heat loading.
17	Mark the designated "Hot Zone" and "Safe Area" on the available Emergency Response Maps for distribution and all procedures.
18	As the well and wind conditions change, the "Hot Zone" boundaries will shift. The "Safe Area" could also be moved. An example would be shifting boundaries after well ignition.
19	The "Warm Zone" is the route between the "Safe Area" and the "Hot Zone". Control indicators (LEL levels, H <sub>2</sub> S, radiant heat etc.) are continuously monitored within the "Warm Zone" at the entrance to the "Hot Zone".
20	The "Warm Zone" is restricted to essential support personnel only.

## 8.6 HOT ZONE ACCESS & EGRESS

### 8.6.1 Hot Zone Access and Egress Flow Chart

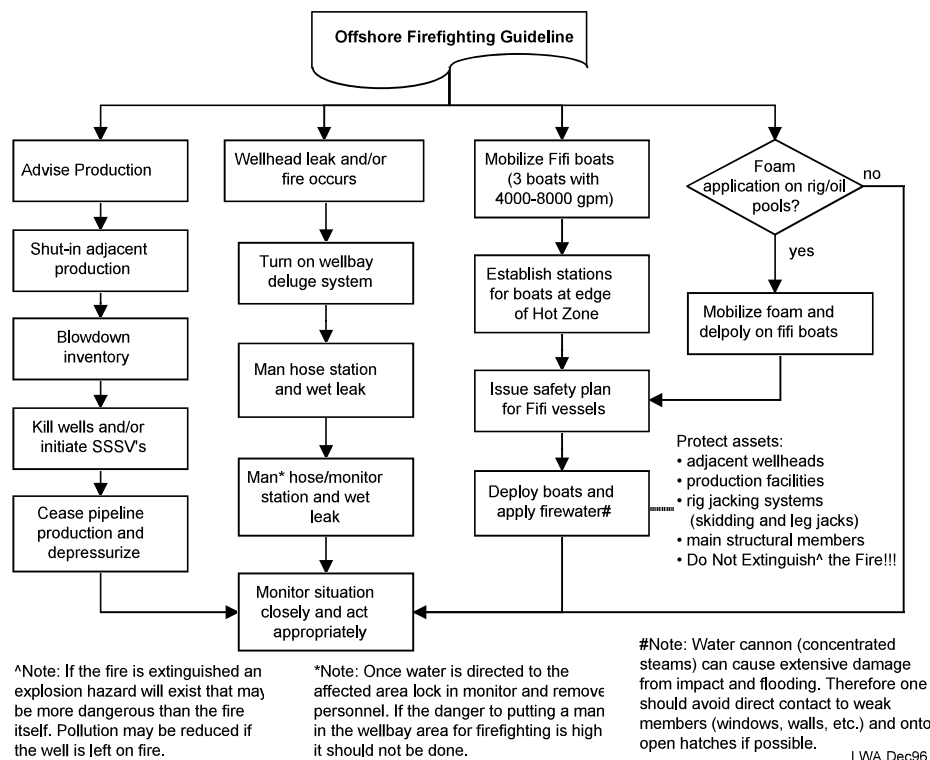


### 8.6.2 Hot Zone Access and Egress Checklist

HOT ZONE ACCESS and EGRESS ROUTES	
Level 3 - Phase 1	
Initial On-scene Incident Commander and key personnel from the site crew	
Item	Action or Consideration
1	On-scene Incident Commander to define "Hot Zone" boundaries and "Safe Area". This defines "Warm Zone" along access route between the "Hot Zone" and "Safe Area".
2	Stage all activities to the "Hot Zone" out of the "Safe Area" along the designated and continuously monitored "Warm Zone".
3	On-scene Incident Commander to establish access system at "Safe Area"
4	On-scene Incident Commander to maintain control points at all possible access routes and/or block the access
5	On-scene Incident Commander to allow access to "Hot Zone" only along the Warm Zone" route by strict control.
6	Only experienced firefighters and blowout specialists are allowed within the "Hot Zone" under strict access coordination with Safety and the OIC.
7	Offshore rigs may have significant blast hazard inherent in design. Enclosed spaces filled with explosive vapor may explode if well ignition occurs.
8	"Hot Zone" approach lanes must be set up with fire water coverage to protect men from fire or unexpected well ignition. Shield safe havens may be needed.
9	Approach lanes to and within "Hot Zone" must be upwind and clearly marked
10	"Hot Zone" approach lanes must be aligned straight away from rig structure corner to limit potential blast exposure from unexpected ignition. Make use of available blast cover.
11	Personnel working in "Hot Zone" may will require Decontamination areas at edge of "Hot Zone" with communications.
12	Personnel must check in and out of Warm areas
13	Access must be tightly controlled if well is not burning. A minimum of exposed personnel must be maintained as explosive vapor cloud ignition can occur naturally at any time.
14	Vapor clouds have the capability to throw debris great distances if ignition occurs. Debris away from the ignition source can be thrown great distances and therefore present a grave danger to personnel.

## 8.7 FIREFIGHTING AND ASSET PROTECTION

### 8.7.1 Firefighting and Asset Protection Flow Chart

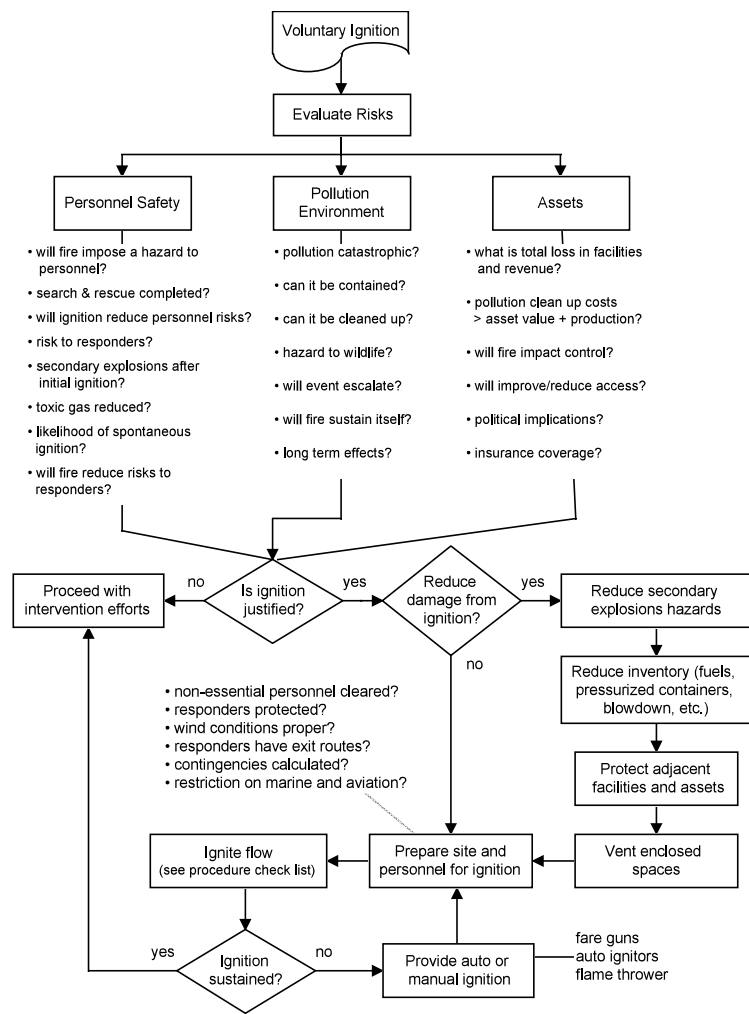


### 8.7.2 Firefighting and Asset Protection Checklist

FIREFIGHTING & ASSET PROTECTION	
Level 3 - Phase 1	
On-scene Incident Commander & Company Representative	
Item	Action or Consideration
1	Initial firefighting and asset protection should start at the rig and expand to the locally available Firefighting Units. This list assumes that there is a pressure fed well fire.
2	Turn on rig sprinkler system and use fire hoses to keep fire away from personnel if necessary during evacuation (if rig is equipped and feasible).
3	Establish "Hot Zone" & "Safe Area"
4	Establish Hot Zone Access & Egress Control
5	Mobilize locally available mobile fighting equipment, field boats with firewater capability (three boats with 4000 to 8000gpm each are needed)
6	Local firewater capability must not wait for blowout specialists to arrive as fire damage to the structure, surrounding wells and process equipment must be quickly limited.
7	All of the required firefighting equipment (outside of vessel fifi) is currently located in Europe or the USA and must be mobilized to the site.
8	Crew should hook up to rig deluge system if possible & activate if rig is on fire.
9	<p>Spray water to protect adjacent wellhead areas and production equipment.</p> <p>Spray water to protect rig equipment and jacking hydraulics to assist in skidding drilling package.</p> <p>Blow down all production lines and displace with nitrogen or water if possible.</p> <p>Confirm that all adjacent wells are shut-in on subsurface safety valve and surface valves. If possible kill offset wells.</p> <p>If possible, dump or pump out all stored combustible fluids on rig or nearby production facilities (diesel, methanol, glycol). Displace storage vessels with water or nitrogen.</p> <p>Remove any stored chemicals or pressurized containers. Even fire extinguishers can blow up if they get too hot.</p> <p>Spray water only on those areas that are too hot. Do not extinguish fire.</p>

## 8.8 VOLUNTARY IGNITION PROCEDURE

### 8.8.1 Voluntary Ignition Flow Chart



See ignition guidelines below

### 8.8.2 Voluntary Ignition Guideline and Procedure Ignition Criteria

#### Voluntary Ignition Guidelines and Procedures Ignition Criteria

The following sections discuss purposeful ignition of a blowout. If significant concentrations of oil, toxic gas (H<sub>2</sub>S, SO<sub>2</sub>, etc.) or pollution are resulting from the blowout, consideration should be given to ignition of the well. The following is suggested criteria, equipment and procedures for ignition. Under certain conditions it may be necessary to ignite well flows which do not contain H<sub>2</sub>S. This is typically a difficult decision based on safety and environmental factors such as pollution and the perception that ignition will reduce risks and pollution. This decision can involve legal and insurance related issues. If significant concentrations of H<sub>2</sub>S are resulting from the blowout, consideration may have to be given to ignition of the flow. This is especially important if the well is situated in or near navigable waterways (inland waters), near populated areas or in extremely sensitive environmental areas.

**NOTE!** Unless ignition of the well flow will obviously reduce the immediate danger to the public or personnel, the OIC in charge should consult with ERT before making the decision to ignite the well.

Ignition can be a very dangerous operation, especially if oil slicks surround the structure or appreciable oil accumulates on and in the rig. The ignition of any blowout by untrained or under-equipped personnel should only be attempted if no other means exists to protect the safety of personnel in the vicinity. Further, proper equipment to do so safely must be available. If it is apparent that the hydrogen sulfide gas being released may endanger the health and safety of the public or wellsite personnel or may cause serious environmental contamination, the OIC in charge (or personnel designated by the OIC in charge) will ignite the gas cloud.

In some instances it may be prudent to ignite well flows which do not contain toxic concentrations of hydrogen sulfide. This is typically a difficult decision based on safety and environmental factors and often involves legal and insurance related issues. Unless ignition of the well flow will obviously reduce the immediate danger to the public or wellsite personnel, the OIC in charge, or designated representative, should consult with Regional Management before making the decision.

The decision to voluntarily ignite a blowout carries with it major implications. The worst being that the situation becomes worse rather than better. The greatest concern is that ignition will cause severe structural damage or, in the worst case, will damage adjacent wellheads causing additional blowouts and fires (multiple wells in an inland water situation). Further, this may cause the well control effort to be orders of magnitude greater than if a single well was blowing out but not on fire. The decision to purposefully ignite a blowout can only be done if it is thought that human life can be saved as a result or major pollution avoided. There will be other considerations that enter into the decision and are outlined below.

When H<sub>2</sub>S is emitted from a blowout the decision becomes somewhat less complex due to the eminent danger to life. What must be considered in the ignition of an H<sub>2</sub>S flow is the by-product of the reaction, SO<sub>2</sub>. Sulfur dioxide is also a toxic gas that causes irritation of the upper respiratory tract, inflammation of mucous membranes, dry throat, cough and burning of the eyes with concentrations of 5 ppm to 100 ppm. High SO<sub>2</sub> levels or extended exposure can lead to death by asphyxia, chronic pneumonia or bronchitis, increased sensitivity to SO<sub>2</sub> and possibly cancer. The outcome is that fire does not remove the danger but it alters the characteristics. The downwind side of the fire still poses a danger in the form of SO<sub>2</sub> and should be isolated from access by personnel and vessels. In certain situations, where H<sub>2</sub>S levels in the flow are not extreme, the SO<sub>2</sub> released due to burning may be manageable. Ignition in these cases may be the best alternative where extreme risk to the lives of personnel is at stake. Under most conditions, it is not advisable to automatically ignite an H<sub>2</sub>S flow unless lives are in danger.

Once the decision to ignite is made, the decision then turns to the method. Although a remotely operated ignition system similar to that used to ignite a flare is an alternative, the risk of an unintentional or premature actuation due to panic makes this method undesirable. In most

situations the best alternative may be the use of a flare gun or other similar device to ignite the flow from the upwind side. This may be risky due to the limited access caused by the H<sub>2</sub>S.

To assure proper consideration is given, the matters listed below should be examined:

- evacuation of all personnel from the area or facility.
- assure that no one or no equipment is working within a minimum of a two (2) kilometer or 1.2 miles downwind radius of the site.
- close valves or other devices which may provide a possible fuel source or migration path for a fire or flow.
- evaluate wind and weather conditions to ascertain whether the situation can change to endanger personnel either on the wellsite or at an adjacent installation.
- the nature of the flow, cause, probability of increased severity and assessment of methods to stop the flow through short term efforts
- will conditions permit a safe assessment without putting the evaluation team in undue risk
- whether ignition using a flare gun is possible from a safe distance, i.e., strong prevailing winds away from the firing position, H<sub>2</sub>S free atmosphere from which to work, available cover from a flashback and clear access for escape.
- the range of the flare gun and whether access to the wellsite within this range is safe and possible in view of the presence of H<sub>2</sub>S and heat radiation from the fire after ignition. Proceed if these conditions can be met.
- can one clear all personnel, aircraft, vehicles and equipment from within a 2 kilometer (1.2 mile) radius except for the vehicle required for a firing base.
- is an approach to the site from upwind side while monitoring H<sub>2</sub>S levels available.
- once ignition has taken place no attempt to approach the site should be made until the situation stabilizes and conditions permit access with reasonable safety and under strict supervision of experts.

A basic decision tree is presented in the flowchart shown in section 8.8.1 to aid in the decision making process that must take place before igniting an H<sub>2</sub>S flow. An alternate method using a helicopter may be considered. In this case a flare gun is the recommended method to ignite the flow.

#### Ignition Equipment

The following equipment will be available and on-site for use by the ignition team personnel:

- 2 - Flare gun with two dozen flares (one for ignition and one for spare).
- 2 - 500 ft. fire resistant retrieval rope.
- 1 - Portable Combustible Gas Detector.
- 1 - Portable H<sub>2</sub>S meter and/or personnel monitors.
- 3 - Adequate number of SCBA's for ignition team members (min. of 3).
- 1 - Marine vessel with communication equipment (two-way radio, etc.).

#### Specific Ignition Procedures

The OIC in charge or alternate will ensure that wellsite personnel are evacuated to a safe location upwind of the well. The OIC in charge will then proceed with the following ignition procedures:

- The OIC and a designated assistant (either drilling supervisor or safety consultant), backed up by one or two designated wellsite personnel, will comprise the ignition team.
- The backup member(s) will be positioned by a radio equipped vehicle at a safe distance from the gas/oil release. They will standby to rescue the primary ignition team with the retrieval ropes, if necessary.
- The assistant of the team will carry an explosimeter and will continuously monitor the area for explosive gases.
- The OIC in charge will carry the flare gun. (Flare shells are to be carried in a separate container - not in your pocket).
- All personnel not required to operate the vessel used to make the approach should have been removed. Once within a safe range a single man should stand behind a protective barrier (vehicle, etc.). Escape from the area should be made with haste due to the possibility of secondary explosions and falling debris.
- The ignition team will determine the hazardous area (10% of lower flammable limits) and establish safe perimeters. Once this is determined, the ignition team should move to the upwind area of the leak perimeter and fire a flare into the area. If the leak is not ignited on the first attempt, move in 20 to 30 meters parallel to the well and fire again. If trouble is incurred in igniting the gas, attempt to fire a flare at 40 to 90 degrees to each side of the area where you have been firing. If adequate equipment is not available or ignition is not possible, the toxic leak perimeter must be established and continued until the emergency is secured.
- Escape from the area should be made with haste due to the possibility of secondary explosions and falling debris.

**8.9 PERSONNEL SAFETY & VICTIM MANAGEMENT CHECK LIST**

Date : \_\_\_\_\_ Time : \_\_\_\_\_ Filed by : \_\_\_\_\_ Title : \_\_\_\_\_

IMMEDIATE VICTIMS	YES	NO	REMARK
• All personnel/contractors accounted for?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Triage/treatment/transport functions established?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Medical facilities identified/notified?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Transportation to specialty hospitals?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Police notifications?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Victims identified?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Victim list complete/verified?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Victims' families notified?	<input type="checkbox"/>	<input type="checkbox"/>	_____
<b>SEARCH AND RESCUE</b>			
• PTTEP personnel rescue?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Public agency rescue?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Full protection for rescue/back-up personnel?	<input type="checkbox"/>	<input type="checkbox"/>	_____
<b>PUBLIC</b>			
• Evacuation of public required?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Medical assistance required?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Local agencies notified to assist?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Weather or other factors to potential affect the isolation area?	<input type="checkbox"/>	<input type="checkbox"/>	_____
<b>CONTROL (MINIMIZE IMPACT)</b>			
• Special diagnostic and care facilities identified?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Employee and family assist/counselling identified?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Human resources support identified?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Personnel Center activated?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Liaison with Authorities underway?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• All communication between sites OK?	<input type="checkbox"/>	<input type="checkbox"/>	_____



RESPONSE	YES	NO	REMARK
<b>SPILL MANAGEMENT</b>			
• ECG/EOC activated?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Source identified?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Leak/release stopped?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Release continuing?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Downwind evacuation?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Ignition sources eliminated?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Released ignited/burning?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Perimeter/exclusion zone established?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Exposures?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Command Post established?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Unified command with responding agencies?	<input type="checkbox"/>	<input type="checkbox"/>	_____
<b>CONTROL &amp; SUPPRESSION</b>			
• Incident Action Plan developed?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Control method identified?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Control method risk v. gain agreement?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Foam applied to suppress flammable vapors?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Foam applied to burning pool fires?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Fire allowed to burn out?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Water fog applied to exposed wellheads and equipment?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Fuel control accessible?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Suppression strategy developed?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Suppression strategy acceptable for safety?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Expected release duration: _____ days/hrs.			
<b>STATUS</b>			
• Extinguished?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Still burning/size?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Contained?	<input type="checkbox"/>	<input type="checkbox"/>	_____
• Exposures?	<input type="checkbox"/>	<input type="checkbox"/>	_____





RESPONSE	YES	NO	REMARK
<b>SAFETY</b>			
• Site Safety Plan completed?	<input type="checkbox"/>	<input type="checkbox"/>	
• Hazard monitoring completed?	<input type="checkbox"/>	<input type="checkbox"/>	
• PPE requirements defined?	<input type="checkbox"/>	<input type="checkbox"/>	
• Decon area(s) established?	<input type="checkbox"/>	<input type="checkbox"/>	
• Site Security plan completed?	<input type="checkbox"/>	<input type="checkbox"/>	
• Site Security enforced?	<input type="checkbox"/>	<input type="checkbox"/>	
• Air quality monitoring underway?	<input type="checkbox"/>	<input type="checkbox"/>	
<b>HAZARDOUS MATERIALS</b>			
• Affected facilities notified?	<input type="checkbox"/>	<input type="checkbox"/>	
• Gas characteristics known?	<input type="checkbox"/>	<input type="checkbox"/>	
• Toxic or hazardous?	<input type="checkbox"/>	<input type="checkbox"/>	
• Plume model run?	<input type="checkbox"/>	<input type="checkbox"/>	
• Exposure areas identified?	<input type="checkbox"/>	<input type="checkbox"/>	
• Site control in effect to protect response workers?	<input type="checkbox"/>	<input type="checkbox"/>	
• Evacuation or affected-area-control initiated?	<input type="checkbox"/>	<input type="checkbox"/>	
<b>WELL CONTROL</b>			
• Well control be established field/rig?	<input type="checkbox"/>	<input type="checkbox"/>	
• Capping and or firefighting required?	<input type="checkbox"/>	<input type="checkbox"/>	
• Technical well-control ex-perts on-scene at command post or tele-linked?	<input type="checkbox"/>	<input type="checkbox"/>	
• Relief well required?	<input type="checkbox"/>	<input type="checkbox"/>	



## 9.0 BLOW OUT RESPONSE PLAN INTRODUCTION

The Blowout Response Plan is cover to the long-term action once the immediate emergency is blow out in Level 3 accident. The Blowout Response Plan will be under Blowout Control Task Force (BCTF) member.

The Blowout Control Task Force is a team within the ERT. Decision to mobilize the Blowout Task Force is taken by the ERT Leader and the BCTF leader will report to the Incident Commander.

The BCTF will be independent of normal activities to minimize the impact on routine operations. There will always be single point leadership of the various components of the Task force to ensure that they are working in a coordinated manner.

The Task force will generally consist of two or more teams:

- Well capping team
- Relief well team.

### 9.1 EMERGENCY RESPONSE TEAM -ERT

The Emergency Response Team (ERT) will be activated and mobilized by the Vice President or acting VP and assembled in the Emergency Response Room (room 2948) at the Energy Complex Building A, 29th floor. The ERT **shall follow the guidelines and procedures** as detailed in the PTTEP Duty Officer and Emergency Management Plan. The ERT is charged with the full responsibility for the control operation and shall take control of all aspects of the logistics situation.

Notification of the Emergency leading to the ERT mobilization will be done as per section 2.3, Notifications.

#### 9.1.1 Authorities and Responsibilities (1<sup>st</sup> Priorities Assigned to ERT)

A summary of action and liaison responsibilities for the ERT during a Blowout Emergency is given here below. This just highlights the main duties. For the additional tasks the reference manual is the Duty Officer and Emergency Response Group manual. ERT organization chart as per Figure 1.

ERT Member	Action	External Liaison Responsabilités
On-Scene Commander (OSC)  ERT Leader (EDL)	<ol style="list-style-type: none"> <li>Ensure that all appropriate ERT disciplines have been contacted and have a representative.</li> <li>Maintain permanent contact with site.</li> <li>Mobilize additional resources if needed.</li> <li>Assess the number, type and identity of casualties, extent of damage to facilities.</li> <li>Nominate a Blowout Control Task Force leader.</li> <li>Liaise with EMT leader.</li> </ol>	Site of Emergency. Specialized Contractors in Blowout Control.
Manager, Drilling Operation (EDL/O)	<ol style="list-style-type: none"> <li>Receive Control of BCTF from Emergency Controller.</li> <li>Coordinate and Organize the Blow Out Control Task Forces.</li> <li>Notify the Blow Out to the rig owners and all sub contractors.</li> <li>Contact Blowout Advisor.</li> <li>Start to organize the BCTF.</li> </ol>	Rig owners, Capping Co., Blowout Advisors.
Logistic/Marine Support (OLG)	<ol style="list-style-type: none"> <li>Liaise with the Logistic Base Superintendent in Songkhla (OLG/O) and establish the position of the marine vessels and helicopters that can be made available.</li> <li>Ensure readiness of logistics in nearby PARTNERS subsidiaries in the event they have the necessary equipment and personnel</li> <li>Obtain Weather Forecast.</li> <li>Contact and liaise with the shipping contractor, marine contractor and helicopter contractor.</li> <li>Arrange general transport.</li> <li>Arrange transportation for specialists.</li> </ol>	Marine Weather Services Service Vessels Owners Lloyd Helicopter GCNK Logistics Singapore Equipment Suppliers Transport
Safety, Security, Health, & Environment Division (TSH)	<ol style="list-style-type: none"> <li>Obtain POB information for the site concerned and dispatch to all ERT members.</li> <li>Advise the Emergency controller on health, safety and</li> </ol>	<ul style="list-style-type: none"> <li>Police, Thai Navy, DMF.</li> <li>Fire fighting resources, Contractors</li> </ul>

	<ol style="list-style-type: none"> <li>environmental matters.</li> <li>Establish fire-fighting resources that can be made available for support.</li> <li>If relevant implement the Spill Contingency Plan.</li> <li>Obtain immediate assistance from other companies as required.</li> <li>Establish liaison with DMF.</li> </ol>	
Personnel Administration (HHR)	<ol style="list-style-type: none"> <li>Organize the administrative support required by the BCTF.</li> <li>Supply housing to outside experts joining the BCTF.</li> <li>Takes care of visa / work permit problems (if any)</li> <li>Supply additional medical support.</li> <li>Support Relatives Response Team</li> </ol>	
Asset Finance Department (FAC)	<ol style="list-style-type: none"> <li>Organize the finance officer on duty support required by the BCTF.</li> <li>Support Risk Management Information</li> </ol>	
Procurement (POC)	<ol style="list-style-type: none"> <li>Organize the procurement officer on duty support required by the BCTF.</li> <li>Support Procurement Information and Process</li> </ol>	



## 9.2 BLOWOUT CONTROL TASK FORCE- BCTF

The BCTF is a team composed of PTTEP, Partners and external personnel dedicated to the well killing operations.

The different leaders in the BCTF will be nominated by the Operation Support.

### 9.2.1 Notification, Activation and Assembly

The BCTF is the operational entity that is exclusively dedicated to the blowout control operation.

Some main principles must be kept in mind in organizing the BCTF:

- Personnel assigned to the BCTF from within PTTEP must be relieved from all other duties.
- Personnel who might have been deeply affected by the trauma caused by the blowout should not be assigned to the BCTF in any case, and should be replaced by other personnel.
- The best experts must be chosen to perform the job within or outside of PTTEP, such as partners. There should be no hesitation in obtaining assistance from whatever source necessary.
- It is the responsibility of both the Operations Manager, Chief Engineering Operation, and the DSV to gather the best team possible, as quickly as possible, to deal with the situation.
- The BCTF leader will first organize the BCTF with the Operations Unit people and complete it thereafter with external assistance such as PARTNERS personnel.
- A secretarial assistance should be organized for the BCTF in order to keep an accurate and detailed log of events. The ERT will organize this.
- A specific cost controller (from Finance Department) must be assigned to the BCTF to follow up the costs related to the capping and relief well operations.

**THE BCTF MUST BE GIVEN ALL AVAILABLE MEANS TO  
FULFILL 100% OF ITS OBJECTIVE:**

**RECOVERING THE CONTROL OF THE WELL**

The Manager, Drilling Operation is nominated by the Technology and Operations Division as the Task Force Leader.

In case he is not available the Technology and Operation Division will then designate another Task Force Leader.

The basic philosophy adopted by PTTEP Operations and adhered to, will be to create two separate teams inside the BCTF:

- The Capping Operations Team.
- The Relief Well Operations Team.

The main objective of the BCTF Leader (OTE/O) will be to simultaneously start preparation of both activities, so as each one may start independently of the other one and in the shortest possible time scale.

The BCTF leader will then appoint the leaders for the Capping and Relief Well teams. He will submit the names of the above persons to the Operation Support for his approval.

In addition and in parallel to the BCTF a Crisis Advisory is set up. The Crisis Cell will be led by the BCTF leader. A composition of the Crisis Cell is shown in the Fig below.

### 9.2.2 General Organization of the BCTF

The basic philosophy adopted by PTTEP Operations and adhered to is to create two (2) separate teams inside the BCTF.

They are

- The Capping Operation Team
- The Relief Well Operation Team



**Note :** The Blowout Advisor will be mobilized by the BCTF leader.

The Insurance Advisor will be mobilized through PTTEP

## 9.3 BCTF MEMBERS JOB DESCRIPTION

The following pages outline the "Job Specifications" for various critical members of the BCTF. They intend to fulfil two purposes:

- To outline the requirements for various members of the BCTF so that a fast and effective search can be made within or outside PTTEP for the best personnel to assist in dealing with the emergency.
- To assist in briefing the personnel as they arrive at their desired location, enabling a speedy assimilation into the organization.
- Any personnel assigned to the BCTF will be relieved of all other duties for the duration of the emergency.
- The selection of the people to be assigned to the BCTF should be as follow:

- Operational Staff having the required level of knowledge and competency shall be assigned to the blowout task force as much as possible. This is motivated by their good knowledge of the specific field problems.
- However, as per EMP, OTF/O judgment any PTTEP personnel deeply affected by the trauma caused by the blowout shall be replaced by other available engineers, PARTNERS for instance.
- Specific tasks must be assigned to people having already gained practical field experience. Therefore the BCTF leader shall not hesitate to call for PARTNERS specialists, if none are available in PTTEP staff.

### 9.3.1 The Crisis Advisory

Crisis Cell Member	Origin	Responsibilities
BCTF Leader	Shall be Chief, Drilling Operation (OTF/O).	<ul style="list-style-type: none"> <li>Coordinates the various operations and takes the experts advice.</li> <li>He is responsible for the operations carried out.</li> <li>He shall report to the Incident Commander and obtain his approval for major decisions.</li> </ul>
Partners and/or Management Representative	A Expert with good leadership and technical background. He must have a good knowledge of blowout control operations.	<ul style="list-style-type: none"> <li>Strictly an advisory function: as PARTNERS representative he shall provide the best advice possible so as to assist the local team in decision making.</li> <li>He is not entitled to take any technical leadership during the operations nor to give any orders or instructions</li> </ul>
Blowout Advisor	<ul style="list-style-type: none"> <li>Boots &amp; Coots IWC or</li> <li>Any reputable Consultant.</li> </ul>	<ul style="list-style-type: none"> <li>Advisory role only.</li> <li>Due to his high competence in blowout engineering he will advise on the best well control strategy.</li> <li>He shall assist the BCTF leader in making the decision on relief wells matters.</li> <li>He shall only give advises to PTTEP management. His assistance will be of particular importance in the liaison with the insurance representative to their full cooperation and assistance.</li> </ul>
Insurance Surveyor	Insurance Company Representative	<ul style="list-style-type: none"> <li>Consultation Information only.</li> </ul>

### 9.3.2 Blowout Task Force Teams

#### Capping Operations

Capping Team Member	Origin	Responsibilities
Capping Operation Leader  Drilling Superintendent	PTTEP staff must have :  - Good knowledge of the overall structure and systems on the particular installation (Rig, Platform).  - A perfect knowledge of the well status  - A perfect knowledge of local suppliers and of the general logistics organization. This providing he has not been deeply affected by the shock of the blowout.  - He shall be relieved from any other duty if deemed necessary.	<ul style="list-style-type: none"> <li>- Planning and Supervision of Capping operations.</li> <li>- Submit to the BCTF leader all the plan of actions he has approved.</li> <li>- He is the only person entitled to give orders/instructions to the Capping Consultant</li> <li>- Define materials and equipment</li> <li>- Preparation of the Capping Operations and decision tree.</li> <li>- Liaison with the Blowout Advisor and Capping Consultant to find out the quickest and the safest way to kill the well.</li> <li>- He shall supply the above specialist with all data in relation to the concerned installation.</li> <li>- He shall give assistance to the Capping Team.</li> <li>- He is responsible for carrying out the technical investigation with the local suppliers so as selecting the specific equipment required. He then passes the investigation results to Logistic for actions.</li> </ul>
Drilling Engineer	Supply the Blowout Advisor with field data as well as the Capping Consultant.	<ul style="list-style-type: none"> <li>- Preparation of the capping program and in relation with Drilling Superintendent and Capping Consultant.</li> <li>- Liaison with capping specialist and Operations safety representative to Organize efficient well site safety and security coverage.</li> </ul>
		<ul style="list-style-type: none"> <li>- Responsible for supplying pertinent well and field data.</li> </ul>
Mud Superintendent	Staff with a perfect knowledge of local supplying capacities for swift assistance to the capping team.	<ul style="list-style-type: none"> <li>- Assistance to the capping team to find all required killing equipment such as pumps, killing fluid, piping.</li> </ul>

Capping Team Member	Origin	Responsibilities
Capping Consultant	<p>Recommended companies are:</p> <ol style="list-style-type: none"> <li>1. Wild Well Control Inc. (WWCI)</li> <li>2. Boots &amp; Coots IWC (B&amp;C/IWC)</li> <li>3. Alert Disaster Control Singapore</li> <li>4. Cudd Well Control (CWWCI)</li> </ol>	<ul style="list-style-type: none"> <li>- Organization and safety for capping personnel and operation.</li> <li>- They shall advise the BCTF Leader and the Capping Operation Leader and report to them.</li> <li>- They receive orders only from the capping Operation leader.</li> <li>- They may require the assistance of the Drilling Superintendent and Logistic support for the supply of any required item.</li> <li>- They will require data from the Drilling Engineer.</li> <li>- Once their plan of action is completed they must get the approval of the Capping Operation Leader before implementation.</li> </ul>
Logistic Support	A minimum of two (2) persons must be assigned to the Capping Team. One will be in charge of the Procurement and the other one of the Transport.	<ul style="list-style-type: none"> <li>- Urgent contact with the local Assistance Organization (if any), in liaison with the safety team, in order to bring the additional facilities to the field, to fight the fire, to provide lifting and power facilities.</li> <li>- Assignment of supply boats in liaison with the Marine Superintendent and of the Helicopters to the exclusive use of the capping operations.</li> </ul> <p>Mobilization of emergency accommodation for the various specialized personnel and additional hands required to carry out construction, firefighting, debris cleaning.</p> <p>Coordination of all engineering tasks to be implemented on the blowout site (works for supply, spraying, placing protection shield, illumination for night works...).</p> <p>Organization of an efficient and rapid transportation of all specific equipment (from USA or EU).</p> <ul style="list-style-type: none"> <li>- Quick settlement of all purchasing and rental paperwork, for earliest delivery.</li> <li>- Rapid contact with all possible suppliers.</li> <li>- Massive and rapid purchase of cement and barite that might be required for killing operations.</li> </ul>

## Relief Well Operations

Relief Well Team Member	Origin	Responsibilities
Relief Well Leader	-Should normally be Senior Drilling Engineers -Shall have a good leadership capability and a good knowledge of PTTEP field's specific problems. -He also needs experience in directional drilling in the Gulf of Thailand.	- Planning and supervision of relief well drilling, completion and subsequent kill . - Shall submit to the BCTF Leader all the programs of action for approval, review or comments.
Drilling Engineer	- Engineer with a good knowledge of BHA behaviour. - He must be experienced drilling engineer to be able to rapidly starts to organize a possible relief well. - He shall be relieved from any other duties.	- Preparation and day to day follow up of the program with the directional coordinator. - Preparation of the relief well decisions tree. - He is responsible for finding all directional equipment and proximity tools. - He shall provide full assistance to the directional coordinator, as well as all the data required by him. - He is responsible for the relief well casing design and geometry according to the selected kill strategy and program. - Liaise will kill coordinator and reservoir engineer
		- Carry out all necessary calculations related to the relief well options. - Work out the necessary pumping pressure and power required to stop the blowout. - To advise the killing coordinator.
Reservoir Engineer	PTTEP or PARTNERS shall be integrated in the BCTF He must be an expert in mono or biphasic flow calculations	- To liaise with the blowout advisor to supply him data required for the killing calculations. - To liaise with the killing coordinator and perform the necessary computer runs to assess the BHFP, the required kill pumping rate and the related killing procedure. - Evaluate the possible depletion that may affect the formations drilled by the relief well.
Mud Engineer	If both capping and relief well activities are ran in paralleled the local Mud Engineer will need external support.	
Drilling Superintendent	PTTEP staff or PARTNERS if needed	- Follow up of day to day drilling operations. - Shall be involved in the selection of the relief well drilling rigs and shall closely supervise the BOP inspection and refurbishing. - Shall liaise with the Kill coordinator to select the proper kill string.
Directional Coordinator	Contracted. Must be an expert in directional drilling	- Lead the relief well location. - Deciding in cooperation with the

Relief Well Team Member	Origin	Responsibilities
	and proximity tools.	Drilling Engineer the directional drilling and survey policy of the relief well. - To submit the program to the Relief Well leader for approval. - Fully in charge of field leadership. - Shall be the only person to give orders or instructions to the offshore directional team and to the proximity tool operator.
Kill Coordinator	Contracted Must be a specialist having already managed similar operations and / or having a good knowledge of HP pumps technology.  He shall be nominated as soon as the blowout has initiated to immediately start to investigate on pumping equipment needed.	- Immediately investigate for pumping equipment available in the South East Asia, Europe and United States. - Calling out for a competent pump expert from Halliburton or Dowell or BJ and put at PTTEP sole disposal. - Design the equipment layout with the pump expert. - Organize the kill program as per the selected killing procedure. - Liaise with Reservoir and Petroleum engineers and workout the pumping program in order to avoid any formation breakdown. Investigate according to the situation the need of a second kill line system is necessary and settle the matter with the suppliers, in liaison with the Drilling Superintendent regarding all matters in relation with BOP risers modifications. - Liaise with the Drilling Superintendent to design the kill string, to check the rig deck space, pit capacity, BOP design, riser modifications, quality control..... - Request Mud Engineer to build the kill mud for the relief well. Assign specific transportation means to the relief well rig.
Pump Expert	Contracted from one company like Halliburton, Dowell or BJ. He must be competent in massive pumping operations and if possible some experience in this kind of operation.	- Organize the localization and the availability of all necessary pumping units in South East Asia, United States or Europe. - Perform the pre-assembly, test and modifications if needed onshore. - Organize the future offshore pattern. - Planning for offshore transportation, spare parts, offshore hook-up, water and mud supply, monitoring, communications, etc. - Selection of the proper surface piping and manifolding in order to minimize the pressure drops.
Drilling Supervisor	As a 24 hours continuous supervision is mandatory two (2) supervisors will be needed. They must have a consistent experience in regards with the type of rig selected for the relief well operation.	- Supervision of the relief well operations and drilling on site. - Permanent communication with the Drilling Superintendent. - Give to the onshore team all the information needed to make the best decision.

Relief Well Team Member	Origin	Responsibilities
Rig Engineer	Only if deemed necessary by the BCTF leader. Must have experience in directional and well engineering.	- Adaptation and follow up of the relief well engineering on a day-to-day basis.
Mud Supervisor	One must be assigned in each supervision team.	- In charge on site of the follow up of the mud program.
Logistic Support	A minimum of two (2) persons must be assigned to the Relief Well Team. One will be in charge of the procurement. One will be in charge of the Transports	Release the casing required. Arrange for urgent delivery if not available. - Investigate with other operators stocks. - Arrange reception/storage for extra equipment in pre-designated area. - Assistance to the transfer of the relief well rig to the required location.

#### 9.4 BLOW OUT RESPONSE PLAN IN 1<sup>ST</sup> 24 HOURS

PTTEP Emergency Response Team (ERT) will be activated after received notice of emergency from offshore. The initiate action need to be done in first 24 hrs as follow.

- Initial evaluation
- Make personnel assignments
- Develop Initial Action Plan and Approve
- Issue Initial Action Plan detail to field
- Mobilize outside experts
- Make notices to Government and Partners
- Mobilize fifti boats and oil booms
- Activate BCTF

PTTEP Emergency Response Team (ERT) Mobilization

The procedure shall be as per PTTEP EMP Manual and the alert diagram shown in the Notifications section 2.3 of this plan.

Action Required	Action By
Notification of the Blowout to TSD, OTF, or Duty Officer and Field Manager	Drilling Supervisor or Duty Drilling Superintendent
Notification of the blowout to EVP, VP or acting VP. and TSD.	TSD, OTF or Drilling Superintendent or Duty Officer
Assembly of the ERG in PTTEP Emergency Response Room in ENCO office building A 29th floor, room 2948	TSD (Authorization by EVP, actual callouts by Duty Officer/telephone operator)

##### 9.4.1 First Priorities assigned to the ERT (first hours after the blowout)

Once all personnel has been safely evacuated, the main objective is to initiate simultaneously the Capping operation and the Relief Well preparation, whilst safeguarding the installation. (refer to PTTEP Emergency Management Plan)

Always remember that, it is as important thinking about the vital need to slow down the fire destruction effect as initiating capping and relief well activities. The Logistics efforts will thus be of prime importance to ensure that all available firefighting means are on the site before the arrival of the capping team, so as:

- to avoid a total havoc and destruction from the fire.
- to facilitate the capping team job.
- However, obtain first of all a correct assessment of the situation:
- discuss with the PIC at the rig or location if still feasible
- obtain reports from witnesses still on the scene (supply boats, helicopters).
- organize (if needed/if possible) helicopter flights to visualize the disaster.

The objectives are:

- To give assistance to the casualties.
- To assess the **magnitude** and the type of problem.
- To determine the type of flow and source of flow.
- To identify the number of blowing/burning well.
- To evaluate the need for firefighting.
- To assess the extent of the structural damages.
- To find out whether the main power of the platform has been totally/partially lost.

Once this has been done it is important to avoid dissipation of energies and repetition of major phone calls, to define each person objectives, and to ensure the effective mobilization of the BCTF

**At that time give the first major phone calls.**

Action Required	Action By
Contact government and local authorities, and request support (Hospital, Police, Thai Navy, etc.)	TSD
Organization of the BCTF (see table 1 and 2 in section 2)	TSD/O
Contact with Partners to notify the blowout. Request Partners Rep. to come to Bangkok PTTEP Office. Request extra personnel assistance to: Take over routine activities (if any). Take part in the BCTF organization. (if required)	TSD
Notify the blowout to the rig owner and all subcontractors.	TSD/O
Contact the Blowout Advisor	TSD/O
Contact Insurance Co. and request the Insurance surveyor to come to Bangkok.	FAC
Contact Capping consultant.	TSD/O
Contact with "Operator Assistance club", if any, to call for MSV, crane barge, cranes, firefighting support.....	OLG
Assignment of workboats and helicopter exclusively to the blowout.	OLG

#### 9.4.2 Second Priorities (First 24 Hours after the blowout)

The objectives are

- To finalize the BCTF organization.
- To start investigating about the major required equipment (Capping, Relief Wells).
- To initiate massive purchasing (barite, cement).
- To gather the fundamental data required by the "Crisis Cell" and the Consultants.

Action Required	Action By
Select all required Partners assistance team.	EDL/O (BCTF leader)
Instruct Drilling Engineer to start gathering data on the blowing well.	Capping Operation Leader
Contact Rental Suppliers to specify equipment required by Capping Consultant.	Drilling Superintendent (Capping Ops.)
Notify DOWELL/HALLIBURTON /BJ to initiate search for pumps required by Capping Consultant.	Drilling Superintendent (Capping Ops.)
Organize heavy logistics to bring specific equipment (Capping) from Singapore, USA or Europe if needed	Logistic Coordinator (Capping)
Arrange for urgent transfer of extra firefighting support units to the site.	Logistic Coordinator (Capping)
Investigation about available drilling rigs for the Relief Wells.	Relief Well Leader
Notify to Directional Drilling Co. to put tools on standby and to mobilize experienced directional team.	Drilling Engineer (Relief Well)
Notify to Proximity Tools Co. to investigate on tools and delivery conditions.	Drilling Engineer (Relief Well)
Mobilize the means to fight or contain pollution if needed.	SSHE Manager

#### 9.4.3 Convening the "Crisis Advisory" (within 48 hours after the blowout)

Once the "Crisis Advisory" members have been gathered in Bangkok (Special conference room, different from the ERT) all gathered data are supplied so as to assist them in decisions making.

Information about the "Crisis Advisory" suggestion / recommendations are given to the TSD by the BCTF leader.

The objectives of that phase is to define the delicate first steps of action. The experience / judgment of the PTTEP Manager and Partners Representative and blowout Advisor will be of particular importance, to assess the feasibility of a direct cap and kill which would not worsen the situation and/or put the whole structure in jeopardy



## 9.5 BLOW OUT RESPONSE PLAN IN CYCLE 2-5 DAYS

Once the BCTF is properly organized, and once the major options have been taken by the "Crisis Cell", the next step involves the practical implementation of the said options by the two BCTF teams.

This is a non-exhaustive list of the main actions which shall be taken so as to start capping and relief well activities under shortest term:

### Relief Well Team

Action Required	Action By
Convening a Kill Strategy meeting to: <ul style="list-style-type: none"> <li>Set up the type of killing procedure</li> <li>Decide on the number of killing wells.</li> <li>Define exact calculations and reservoir simulation requirements.</li> <li>Assess the possible type of pumping support.</li> </ul>	Relief Well Leader Kill Coordinator Reservoir Engineer Petroleum Engineer
Convening a Directional Strategy meeting to: <ul style="list-style-type: none"> <li>Decide on general relief well(s) profile / program.</li> <li>Analyse all potential problems (Surface formation pressure charging.)</li> <li>Decide the surface location of the relief wells.</li> <li>Select the directional equipment.</li> </ul>	Relief Well Leader Drilling Engineer (Relief Well Team) Directional Coordinator Reservoir Engineer Drilling Superintendent (Relief Well Team)
Notification to SCHLUMBERGER / HALLIBURTON / BJ to initiate search for pumping support (skid unit or frac vessel) needed for the killing through the relief well.	Kill Coordinator
Inspection of the drilling rig(s) (if needed) to be used for the relief well.	Drilling Superintendent (Relief well team)
Preparation of the relief well programs and decision trees.	Directional Coordinator Drilling Engineer (Relief Well Team)
Release of casing for relief wells. Prepare to receive / store extra equipment / material in pre-designated area.	Logistic Support (Relief Well Team)
Transfer of selected rig to the relief well location. Transportation of all equipment to rig.	Logistic Support (Relief Well Team) Marine Superintendent
Installation of communication Network on the rig (if needed)	HIT
Analysis / Finalisation of Relief Well program and decision trees.	BCTF Leader Relief Well Leader

## Capping Team

Action Requested	Action By
Convening a Capping Strategy Meeting to: <ul style="list-style-type: none"> <li>Set up the field action/coordination</li> <li>Set up the exact requirements for equipment.</li> <li>Set up the logistic support / assistance.</li> </ul>	Capping Operation Leader Capping Consultant Drilling Superintendent (Capping Team) Drilling Engineer (Capping Team) Logistic Coordinator (Capping Team)
Preparation of Capping program and decision tree.	Drilling Engineer (Capping Team) Drilling Superintendent (Capping Team) Capping Consultant
Analysis / finalisation of the Capping program and decision tree.	BCTF Leader Capping Operation Leader
Transfer of specific equipment required for the capping to the site. Follow up of firefighting conditions, supply of back-up means if needed.	Logistic Coordinator (Capping Team)

Remark: Blowout Capping, Relief Well Drilling and Kill Strategy meetings shall be run simultaneously:

Blowout Capping is to be treated as urgent and with priority.

Kill Strategy will have a tremendous impact on relief well design (diameters) and profile (depth of kill, proximity required), on rig equipment, pumping equipment, kill fluid types, pump rates and pressures, etc.

Relief Well Drilling requires an extensive equipment mobilisation.

Before starting the operations do remember an important factor which will be very important for proper implementation of decisions and for logging of events:

Set all leaders' watches to ZERO, make sure they all show the same time.

## 9.6 ROUTINE OPERATIONS

According to the PTTEP philosophy three different situations have to be taken into account, which are:

- A blowout on the Exploration/Delineation rig operation.
- A blowout on the Development rig operation.
- A blowout on the Production Facility (production operations, wireline, coiled tubing, etc.

## 9.7 GEOLOGICAL ASSISTANCE

A geologist will be entirely dedicated to the relief well operations.

The mud logging company selection for the relief well shall be left in the hands of the Relief Well Operation leader.

## 9.8 SAFETY MEASUREMENTS AND ASSISTANCE

The ERT should be aware, following a blowout, of the potential of further incidents resulting from a lack of preventive measures.

Although many aspects of these safety measures will be met and attended to in the normal course of communication with various authorities and specialist groups, care should be taken in the following area:

- The setup of safety zone around the site of the blowout. All shipping in the vicinity, and for the duration of the emergency, should be made aware of the hazard.
- The Thai Navy should be continually kept informed on the area affected by the blowout.
- Adjacent facilities and any marine activities should be notified of the situation as soon as possible by whatever means necessary.
- All assessments of the situation should be notified to any craft proceeding toward the area to help in dealing with the emergency. This should enable the timely provision of the necessary safety facilities to protect personnel and equipment on board.

ALL THESE ACTIVITIES HAVE TO BE PERFORMED IN CO-ORDINATION WITH THE NAVY VIA THE PTTEP HSE MANAGER.

It is suggested to request the assistance of CSH and/or partners and ask for the most experienced and competent safety personnel especially in the case of pollution.

It is suggested also to call for people field experienced with blowout events.

The safety team shall focus on:

- Mobilizing rescue facilities and protective clothing.
- Providing full medical and evacuation support close to the blowout site.
- Evaluating the fire-fighting needs. Remember that the well capping success highly depends on the quick response to the fire destructive effect (\*)
- Carrying out gas monitoring and erecting warning signs.
- Evaluating the needs to fight against the pollution.
- Identifying hazardous areas and finding out whether it is necessary (in cooperation with the blowout advisor) to ignite the blowout to secure the safety of the people.
- (\*)Note that the "Blowout Concept" shall be taken into account when designing the fire-fighting equipment of offshore development drilling platforms.
- The main objective is to be able to cool the structures and avoid its collapse.
- Advise the capping consultant on safety matters in order to have a safe capping operation.
- Call for external fire-fighting means and to have these supports on the site in the shortest time.

## 10.0 APPENDICES

### 10.1 LOGISTICAL CONSIDERATIONS FOR OFFSHORE AND MAJOR RESPONSE

**IMPORTANT:** Prior knowledge of what will be required and how it can be obtained will be extremely important. This is precisely what this section will outline and discuss. One of the very first assignments of the Incident Manager should be to designate the Logistics Coordinator to locate and define the availability of equipment and services required to respond to a major blowout.

In the event of a major blowout, efficient mobilization of the necessary equipment will depend on knowledge of what equipment is needed. This section provides guidance on such logistical considerations.

A listing of the equipment typically requires for a large surface blowout is outlined below. In Thailand, much of this type of equipment is available and can be procured in country. If this equipment is unavailable, specialized firefighting equipment has to mobilize from Houston and Singapore.

#### 10.1.1 Logistics

PTTEP's logistic base, Petroleum Development Support Base (PSB), is located in the Singhanakorn District at 07° 14' N 100° 34' E close to the entrance of Songkhla Lake. The Base is about 50 km from Hat Yai Airport and 30 km from Hat Yai railway station. Access to the Base by road is either via Highway 407 from Hat Yai or by coastal Highway 408 from Nakorn Srithammarat. The base is about 900 km North of Singapore by road.

PSB will be used as the logistic base to support the three fields covered by this plan, namely, Bongkot, Arthit and Nang Nuan, which are at a distance of about 110, 132 and 195 nautical miles from the base, respectively. PSB is the subsidiary of PTTEP International. It is the only dedicated supply base supporting oil and gas industry in the Gulf of Thailand. It operates year round, 24 hours a day. Base facilities include a six-berth Jetty, warehouses, open storage yards, bulk storage tanks and silos, cold storage, workshops, and a marshalling yard. The facilities are fully protected by security services. All marine activities are controlled from the Operations Centre in the Base Administrative Building. PSB is located close to Songkhla Deep Sea Port, and within easy reach of PSB Heliport, Songkhla Town and Hat Yai Airport.





Excluding the organization of the blowout intervention team, the most complicated and typically overlooked components of implementing an emergency project are the logistics of required services and equipment. Many of these services are very specialized and may not be available in the immediate region or area. Also, knowledge of many of these services and the companies which provide such services may be unknown to the typical oil company engineer who has minimal experience with an intervention project.

An expensive and time consuming learning curve, with sometimes disastrous results, has been evidenced in many projects which utilized standard services beyond their capabilities and overlooked details which became insurmountable. There are methods to reduce the associated problems with good logistics practices for any project. The primary one is planning for what will be required and how it can be obtained.

### 10.1.2 Drilling Rigs

PTTEP is currently operating jack-up drilling rigs and tender assist barge for support exploration and development campaign.

### 10.1.3 Location and Distances

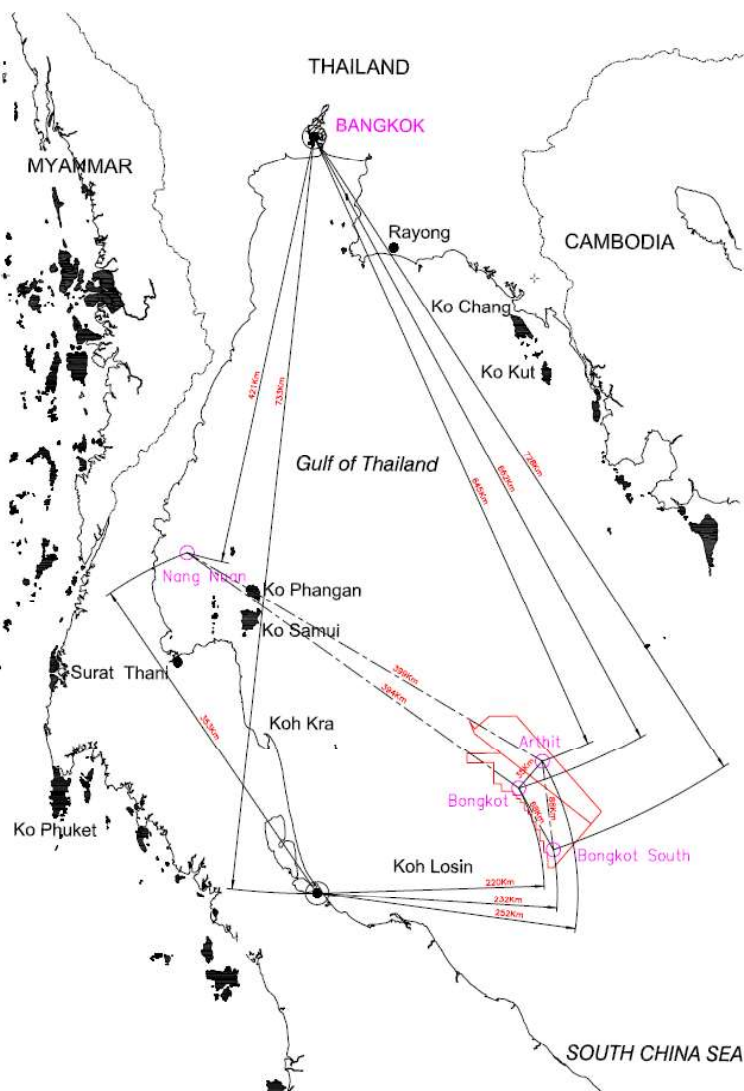
#### Distances and ETA

Point of Reference		Approximate Distance	ETA	By Mean		
From	To			Trailer Truck	Air	Sea
Singapore	Logistic Base in Songkhla	900 km	10 hrs	X		
		900 km	2 hrs		X	
Songkhla	Nang Nuan	195 nm	20 hrs			X
		361 km	1.5 hrs		X	
Songkhla	Bongkot	110 nm	12 hrs			X
		204 km	50 min		X	
Songkhla	Arthit	132 nm	14 hrs			X
		244 km	1 hr		X	

#### Petroleum Development Support Base (PSB) Coordinates and Addresses

07° 14' N 100° 34" E

**PTTEP Offices in Bangkok**  
**Energy Complex Building A Floors 6, 19-36**  
**555/1 Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900, Thailand**  
**P: +66(0) 2537-4000**  
**F: +66 (0) 2537-4444**



#### 10.1.4 Met-Ocean Information (Gulf of Thailand)

The Gulf of Thailand is bordered by [Cambodia](#), [Thailand](#) and [Vietnam](#). The northern tip of the gulf is the [Bay of Bangkok](#) at the mouth of the [Chao Phraya River](#). The gulf covers roughly 320,000 km<sup>2</sup>. The boundary of the gulf is defined by the line from [Cape Bai Bung](#) in southern Vietnam (just south of the mouth of the [Mekong](#) river) to the city [Kota Baru](#) on the Malayan coast. At the height of the last [ice age](#) the Gulf of Thailand did not exist, due to the lower sea level, the location being part of the Chao Phraya river valley.

The Gulf of Thailand is relatively shallow: its mean depth is 45 m, and the maximum depth only 80 m. This makes water exchange slow, and the strong water inflow from the rivers make the Gulf low in [salinity](#) (3.05-3.25%) and rich in [sediments](#). Only at the greater depths does water with a higher salinity (3.4%) flow into the gulf from the [South China sea](#) and fills the central depression below a depth of 50 m. The main rivers which empty into the gulf are the Chao Phraya (including its distributary [Tha Chin River](#)), [Mae Klong](#) and [Bang Pakong](#) Rivers at the [Bay of Bangkok](#), and to a lesser degree the [Tapi River](#) into [Bandon Bay](#) in the southwest of the gulf.

< <http://www.answers.com/topic/gulf-of-thailand#ixzz1I4vU8VbT> >

#### 10.1.5 Petroleum Development Support Base (PSB) Jetty Facilities.

In the event additional heavy equipment should need to be transported from Singapore or Houston, it would arrive at Hat Yai International Airport.

The Russian 124 Antonov aircraft brokered by Heavylift Air Cargo Ltd., Standsfield, U.K. can be made available (24 hour operations center phone number is 44-279-680611. This aircraft is capable of hauling 120 metric tons of oddly proportioned equipment and capable of hauling a

complete set of firefighting equipment and associated equipment for a major fire in a single load and unloading itself. No other commercially available aircraft has this capability.

Nose-load 747 cargo aircraft can also be used to haul all firefighting equipment. The large pipe rack unit and the 20' containers are the most difficult to load in a 747 cargo aircraft. Special cargo handling equipment is required to unload this type of aircraft. Any emergency air cargo charter flight will have to work with Thailand's transport agencies.

Heavylift Aircraft would land at the Hat Yai International Airport where the runway length can accommodate the Antonov 124 or 747-400.

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#### 10.1.9 Incident Response Challenges at PTTEP offshore Locations

Personnel, equipment, and supplies during an incident will be flown to the installations or the drilling rigs (Level III) by helicopter or supply vessel (approximately 1 to 1.5 hours by helicopter and 12 to 20 hours by supply vessel). The main obstacles are:

- Distance from the Onshore Base.
- Transportation of Equipment, Supplies and Personnel
  - Any additional equipment, supplies and personnel will have to be mobilized via helicopter or supply boat. All heavy equipment and machinery will have to be transported by supply boat only.
- The limitations in working area and space typical of an offshore drilling facility.
  - Limits the ability to place additional well control auxiliary equipment.
- Any major incident will require evacuating all non-essential personnel from the drilling unit.
- Offshore operations represent a challenge.
- High seas that impede mobilization of equipment and personnel.

#### 10.1.10 Role of a Rig Contractor

The key to successful blowout control is fast and efficient mobilization of the required support. The following list is not complete but can be used as a reference as to what may be required. The greatest key team member if a blowout is experienced will be the rig contractor, especially if they are experienced in how to acquire local available services, equipment and materials. The rig crew may be needed to assist the well control specialists. PTTEP should hold a pre-planning meeting with the rig contractor and discuss these and any additional points:

- Third party billing and purchase order system
- Cash flow assistance (must maintain good credit with local vendors)
- Increased rig crew pay for hazard duty (triple time is not uncommon)
- Added staff from rig contractor to handle logistical duties
- Spare equipment sources (ex: BOPs & choke manifolds)
- Welding/fabrication sources
- Oilfield supply sources
- Implementation of the fire water system



#### 10.1.11 Minimum Recommended Firefighting Equipment

#### 10.1.12 Specialized Firefighting Equipment

Quantity	Mobilized	Description
2		Fire pumps, minimum 4000 gpm @150 psi
1		Pipe rack, complete with suction & discharge hoses, water monitors, pipe nipples, fittings, butterfly valves, flanges, hammer unions, aluminium pipe, high temperature cloth, etc. necessary in rigging up fire pumps (see pipe rack inventory)
1		Job Box, complete with hand tools, hammer wrenches, brass hammers, air impact wrenches w/sockets, pipe wrenches, air grinders etc. (see job box inventory)
30		4" x 20" aluminum pipe w/indusco fittings
4		8" x 20' oil, suction and discharge hose complete with figure 100 hammer union
12		4" x 10' discharge hose complete w/ fig. 100 hammer Union
6		4" x 10' discharge hose complete w/ fig. 100 hammer union/male aluminium adapter
6		4" x 10' discharge hose complete w/ fig. 100 hammer union/female aluminium adapter
2		4" Stang monitors complete w/ nozzle & base
1		2" – 5" Porta-Lathe cutter
1		3" – 6" Porta-Lathe cutter
1		6" – 9" Porta-Lathe cutter
1		9" – 14" Porta-Lathe cutter
1		14" – 16" Porta-Lathe cutter
1		18" – 20" Porta-Lathe cutter
1 Lot		Miscellaneous spare parts for Porta-Lathe cutter
20		Double edge cutter blades for Porta-Lathe cutter
1		Halliburton Abrasive Jet Cutter
1		Spare parts for fire pumps
1		Junk shot Manifold complete w/rope, rubber, steel balls, golf balls and other plugging material



## 10.1.13 Rental Equipment

Quantity	Mobilized	Description
1		185 cfm air compressor
4		Light plants, trailer mounted
1		Generator
2		Pressure Washers

## 10.1.14 Metal for Fabricating Support Equipment

Quantity	Mobilized	Description
250 Sheets		3' x 8' sheets corrugated tin
1000 ft.		Large diameter pipe for fire water supply line (12" – 16")
1 sheet		2" steel plate
2 sheets		1" steel plate
2 sheets		½" – 5/8" steel plate
1500 ft.		2" x 2" x ¼" angle iron (heat shields for bulldozers)
50 sheets		3/16" or ¼" diamond plate, expanded metal or floor grating (flooring for monitor sheds, cutting sheds, etc.)
2000 ft.		2 3/8" or 2 7/8 " junk tubing (structural for building monitor sheds, sheds and heat shield)
1 Lot		Casing for diverter lines

## 10.1.15 General Oilfield Supplies

Quantity	Mobilized	Description
6		8" Figure 100 hammer unions
6		6" figure 100 hammer unions
12		4" figure 100 hammer unions
6		8" x 12" pipe nipples, threaded both ends
12		6" x 12" pipe nipples, threaded both ends
12		4" x 12" pipe nipples, threaded both ends
6		4" wafer type butterfly valves
12		4" 150# R.F. threaded flange
50		5/8" x 6 1/4 " studs w/nuts both ends
10 rolls		Tie wire
20		3/8" x 15' high test chain w/grab hooks
40		2" shackles, pinned
40		1 ¼" shackles, pinned
40		1 ½" shackles, pinned
40		1 ¾" shackles, pinned
40		1" shackles, pinned
40		¾" shackles, pinned
1-roll		½" manila rope
1 roll		¾" manila rope
4		200 psi liquid filled gauges
4		600 psi liquid filled gauges
4		1000 psi liquid filled gauges
4		3000 psi liquid filled gauges
4		5000 psi liquid filled gauges
4		10000 psi liquid filled gauges
2 Boxes		Shop Rags
2		Snatch blocks for 1 1/8" cable, shackled not hooked
		Structural lumber (2 x 4's) for heat shields



1		Awning
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## 10.1.16 Specialized Oilfield Supplies

Quantity	Mobilized	Description
10 min.		Tanks for fire water or mud supply
2		Large volume diesel driven water transfer pumps (3000 gpm min.)
2		Mud charging pumps (to feed pumping equipment and tanks)
1		Mud system – complete with mixing and circulating capabilities
1000 ft.		High pressure tubing, for pumping or cutting operation (to maintain good distance between well and pumping equipment) size to be determined per requirement
1		Coil tubing unit
1		Snubbing Unit

## 10.1.17 Explosives and Associated Supplies

Quantity	Mobilized	Description
1000 lbs.		Explosives, 90 – 100%, general oilfield type
		Dry chemical
		Blasting caps for explosives
4		55 gallon drums
2000 ft.		auge wire, 2 wire minimum

## 10.1.18 Cables, Slings and Clamps

Quantity	Mobilized	Description
2000 ft.		1 1/8" 6 x 36 soft lay cable (for rig removal)
1000 ft.		¼" 6 x 36 soft lay (slings for debris removal)
1000 ft.		5/8" 6 x 36 soft lay cable (slings for debris removal)
100		11/8" cable clamps
100		¾" cable clamps
100		5/8" cable clamps
10		1 ½" x 10' wire rope slings 6 x 36 soft lay cable
20		1 ¼" x 10' wire rope slings 6 x 36 soft lay cable
20		1 ¼" x 20' wire rope slings 6 x 36 soft lay cable
20		1" x 10' wire rope slings, 6 x 36 soft lay cable
20		1" x 20' wire rope slings, 6 x 36 soft lay cable
40		3/4 " x 10' wire rope slings, 6 x 36 soft lay cable
40		¾" x 20' wire rope slings, 6 x 36 soft lay cable
40		5/8" x 10' wire rope slings, 6 x 36 soft lay cable
40		5/8" x 20' wire rope slings, 6 x 36 soft lay cable

## 10.1.19 Welders and Associated Equipment

Quantity	Mobilized	Description
6		Structural welders with helper and equipment
1		Certified Welder with Helper and equipment
4		Cutting torch complete with large supply of oxygen, acetylene and accessories, 250 ft. of hose per torch, strikers, tip cleaners and spare tips
2		Long reach cutting torch, complete with large supply of oxygen, acetylene and accessories, 250 ft. of hose per torch, strikers, tip

		cleaners and spare tips
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#### 10.1.20 Personal Protective Equipment (PPE), Personnel and Equipment

Quantity	Mobilized	Description
1		Decontamination area for personnel with change room
1		Decontamination area for equipment
2		Wind socks
		Flagging tape
6 min.		Two way radios with headsets
1 lot		Work gloves, ear plugs for work force
1		Weather forecast updated regularly
		Living accommodations for crew
		Meals for all work force
1 lot		H <sub>2</sub> S equipment (if necessary)
1 lot		Drinking water with water cooler and cups
1 lot		Rain suits
1 lot		Rubber boots, work gloves and ear plugs for work force

#### 10.1.21 Wellhead and Capping Equipment

Quantity	Mobilized	Description
1		Replacement wellhead for blowout well
1		Capping stack
1		Choke manifold
1		Choke house
1 lot		Spacer spools
1 lot		Diverter spools
1 lot		Spare flanges for diverter lines
1 lot		Spare parts for capping equipment (ring gaskets, studs, etc.
1		Extension tube for capping BOPS
1		Wellcat tool box
1		Mud/Gas Separator
1		Bowl/Slips
1 lot		Chicksan Iron Basket (loops, swings, straights, tees)
		Plug valves
		TIW valve w/handle
1		Drillpipe tree

## 10.2 LOGISTICAL CONSIDERATIONS FOR ONSHORE AND MAJOR RESPONSE - IMPORTANT

Prior knowledge of what will be required and how it can be obtained will be extremely important. This precisely what this Document will outline and discuss. One of the very first assignments of the incident Manager should be to designate the Logistics Coordinator to locate and define the availability of equipment and services required to respond to a major blowout.

In the event of a major blowout, efficient mobilization of the necessary equipment will depend on knowledge of what equipment is needed. This section provides guidance on such logistical considerations.

A listing of the equipment Boots & Coots typically requires for a large surface blowout is outlined below. In Thailand, much of this type of equipment is available and possibly be procured in country. If this equipment is unavailable, Boots and Coots has specialized firefighting equipment in Singapore and Houston and this equipment could be mobilized from there.

### 10.2.1 Logistics

The logistic base supporting PTTEP Thailand's onshore operations (S-1 and Ratana Fields) is located in the S-1 block about 400 km North of Bangkok. The Ratana field is about 400 km east of the S-1 logistic base, with a trucking time of about 8 hrs between the two locations.

In an emergency large cargo would move from Singapore or Houston to either Phitsanulok Airport (80 km from Ratana). An alternative would be trucking the equipment if coming from Singapore, which would require about two days of travel time.





## 10.2.2 Regional Perspective



## 10.2.3 Transport

In the event additional heavy equipment should need to be transported from Singapore or Houston, it would arrive at Phitsanulok Airport (80 km from S-1) or Khon Kaen Airport (80 km from Ratana).

Phitsanulok Airport			
IATA: <span>PHS</span> – ICAO: <span>VTTP</span>			
Summary			
Airport type	Public		
Operator	Government		
Serves	<span>Phitsanulok, Thailand</span>		
Elevation <span>AMSL</span>	154 ft / 47 m		
<span>Coordinates</span>	<span>Coordinates:</span> 		
	<span>16°46′23″N</span>		
	<span>100°16′56″E</span> <span><span><span>16.77306°N</span></span></span>		
	<span>100.28222°E</span>		
<span>Runways</span>			
<span>Direction</span>	Length		Surface
	m	ft	
14/32	3,000	9,843	<span>Asphalt</span>
Source: <span>DAFIF</span> <sup>[1][2]</sup>			

Khon Kaen Airport			
IATA: <span>KKC</span> – ICAO: <span>VTUK</span>			
Summary			
Airport type	Military/Public		
Operator	<span>Military</span>		
Location	Khon Kaen		
Elevation <span>AMSL</span>	670 ft / 204 m		
<span>Coordinates</span>	<span>Coordinates:</span> 		
	16°27′59.86″N		
	102°47′01.18″E16.4666278°N		
	102.7836611°E		
Runways			
<span>Direction</span>	Length		Surface
	ft	m	
03/21	10,007	3,050	<span>Asphalt</span>

#### 10.2.4 Heavy Airfreight

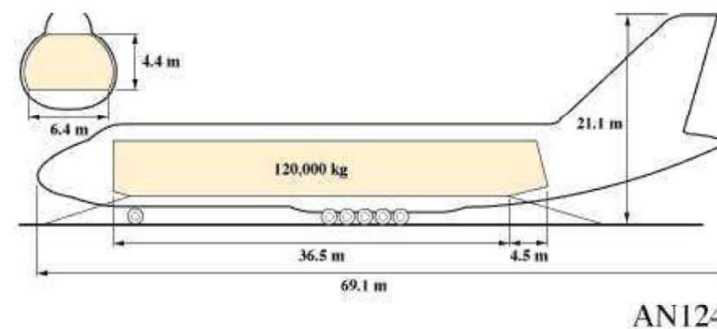
The Russian 124 Antonov aircraft brokered by Heavylift Air Cargo Ltd., Standsfield, U.K. can be made available (24 hour operations centre phone number is 44=279-680611. This aircraft is capable of hauling 120 metric tons of oddly proportioned equipment and capable of hauling a complete set of firefighting equipment and associated equipment for a major fire in a single load and unloading itself. No other commercially available aircraft has this capability.

Nose-load 747 cargo aircraft can also be used to haul all firefighting equipment. The large pipe rack unit and the 20' containers are the most difficult to load in a 747 cargo aircraft. Special cargo handling equipment is required to unload this type of aircraft. Any emergency air cargo charter flight will have to work with Kurdish transport agencies.

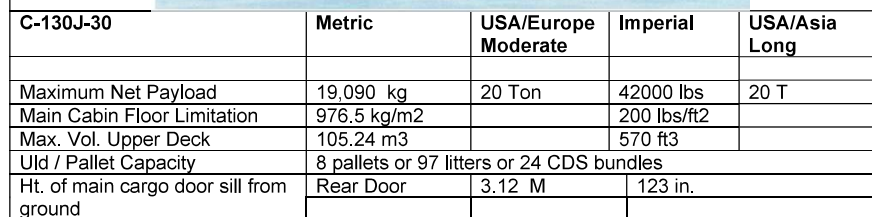
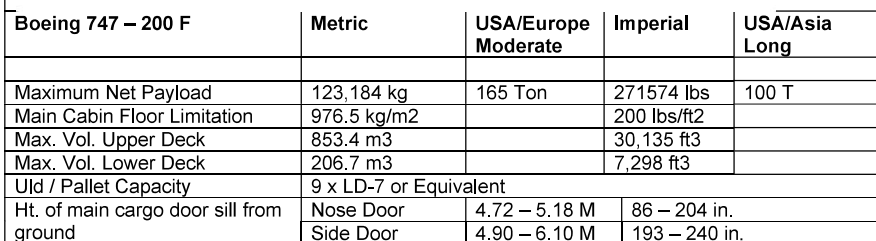
Heavylift Aircraft would most likely land in Khon Kaen or Phitsanulok where runway lengths can accommodate the Antonov 124 or 747-400.

List below are some data on air craft commonly for hire for air cargo.

Aircraft	Payload	Cargo Cabin		
		Length	Height	Width
Antonov 124	120,000 Kgs	36.5 metres	4.4 metres	6.4 metres
Antonov 22	55,000 Kgs	26 metres	4.4 metres	
Antonov 12	15,000 Kgs	23.5 metres	2.4 metres	
Llyushin 76	48,000 Kgs	20 metres	3.4 metres	
Belfast	25,000 Kgs	19.76 metres	3.65 metres	
Begula	74,000 Kgs	37.7 metres	7.10 metres	
Airbus A300 B4	45,000 Kgs	20 x P1 pallets, 20 LD3 containers		
Hercules L100-30	23,136 Kgs	17.07 metres.	2.74 metres	3.12 metres
S-64 E Helicopter	9,071 Kgs	Limited only by payload		
S-64 F Helicopter	11,339 Kgs	Limited only by payload		



Antonov AN-124	Metric	USA/Europe Moderate	Imperial	USA/Asia Long
Maximum Net Payload	150,000 kg	165 Ton	330,693 lbs	100 T
Main Cabin Floor Limitation	10,000 kg/m <sup>2</sup>		2048 lbs/ft <sup>2</sup>	
Max. Vol. Upper Deck	750 m <sup>3</sup>		26,486 ft <sup>3</sup>	
Uld / Pallet Capacity	10 x 6 m - 150 Containers			
Ht. of main cargo door sill from ground	218 – 300 cm			86 – 118 in.



Excluding the organization of the blowout intervention team, the most complicated and typically overlooked components of implementing an emergency project are the logistics of required services and equipment. Many of these services are very specialized and may not be available in the immediate region or area. Also, knowledge of many of these services and the companies which provide such services may be unknown to the typical oil company engineer who has minimal experience with an intervention project.

- Remote field location
- Supply of water at high rates at the remote location
- Potential H<sub>2</sub>S presence
- Limitedness and/or difficulty of access to the location during the rainy season
- Difficulty of drenching reserve pits at the Ratana location due to the hard nature of the surface.