Operation: 1. Well Clean-up

Activity: 2. Operation

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		6. Flare watcher monitors pilots, maintains good radio contact with Expro test crew / supervisor and empowered to activate ESD									
		7. Well shut in if adverse process conditions occur									
		8. Pre-charge the vessel with nitrogen									
13. Radiant heat from burners exceeds recommended American Petroleum Institute (API) exposure levels for personnel and equipment	1. Flaring	1. Radiant heat issues discussed in the pre-job meeting	1. Damage to rig facility	1. Emergency response plan 2. Medic on board	Property						
	2. Cooling system failure	2. Heat radiation modelled pre job and water screening fit for purpose	2. Burns to skin		Health						
	3. Mud pump failure	3. Equipment function tested prior to commencement of testing	3. Damage to burner boom rigging		Commercial	Minor	Highly Unlikely	Low			
	4. Incorrect pump line up	4. Personnel to wear appropriate PPE (long sleeved coveralls to protect them from radiant heat)									
		5. Key areas of the rig constantly monitored with thermal imaging camera, surface temperature gun and BTU meter									

Operation: 1. Well Clean-up

Activity: 2. Operation

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		6. Water screen adjusted as required based on measurement data 7. Non-essential personnel kept out of the testing area 8. Rig side checks of flammable material prior to start-up 9. Restrict access to essential personnel only (barriers etc) 10. Reflective heat blankets positioned in hot spots									
14. Compressor Failure	1. Compressor diesel tank leak	1. Spill kits available in area	1. Oil / diesel spill on deck	1. Emergency response plan	Environment				18. Ensure all well testing compressors	Dave Linkston	

Operation: 1. Well Clean-up

Activity: 2. Operation

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
	2. Equipment malfunction not observed	2. Continuous monitoring of compressor by mechanic	2. Oil spill into sea	2. Oil spill contingency plan	Environment	Minor	Highly Unlikely	Low	are fitted with self bunding to avoid spills.		
	3. Communication failure	3. Refuelling procedure agreed with drilling contractor	3. Fire		Health						
	4. Diesel spill during refuelling	4. Cantilever deck overboard drains plugged during testing operations	4. Delay in operations		Commercial						
		5. Agreed fuel transfer process in place									
		6. PTW									
		7. Compressor backups									
15. Oil discharged from surge tank vent line	1. Tank overflow due to operator absence	1. Operator in attendance when flowing to tank	1. Uncontrolled H/C release to the sea	1. Emergency response plan 2. Oil spill contingency plan	Environment	Minor	Highly Unlikely	Low	19. Fit an audible alarm to the tank when the tank is 75% full to avoid spills.	Dave Linkston	
	2. Inability to see level in tank	2. Expro operating procedures							21. Ensure that the tank level alarm is connected to the EDGE system.	Dave Linkston	
	3. Valves stuck or leaking	3. Limit fill volume to 75% capacity									
		4. QA on tank valves, pressure tested on rig - Audit pre test									

Operation: 1. Well Clean-up

Activity: 2. Operation

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		5. Sight glasses clean									
16. Tank over pressured by gas flowing to tank	1. Operator error	1. Flow restrictor between separator and surge tank as outlined in the Well Test Planning Report	1. Tank relief valve lifts, H/C release	1. Oil spill contingency plan	Environment	Slight	Highly Unlikely	Low			
	2. Separator dump valve sticks open	2. Operators in attendance									
		3. Expro operating procedures									
		4. High pressure pilot on tank connected to ESD system									

Operation: 1. Well Clean-up

Activity: 2. Operation

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		5. Open ended vent line									
17. Electric shock	1. Incorrect installation of equipment	1. QA of electrical equipment prior to being brought to the rig	1. Injury (electric shock)	1. Emergency response plan 2. Medic on board	Health	Moderate	Highly Unlikely	Medium			
	2. Water intrusion electrical connections from deluge water or rain	2. Rig acceptance procedure for 3rd party electrical equipment	2. Fire		Property						
		3. Certified rig electrician installs electrical equipment									
		4. Equipment suitably protected from water ingress									
		5. Limited water in test area.									
18. Excessive noise levels	1. Lack of hearing protection	1. Hearing protection available on the rig as PPE	1. Personnel hearing damage	1. Medic on board	Health	Slight	Highly Unlikely	Low			
	2. Hazard not identified	2. Non-essential personnel excluded from the testing area									

Operation: 1. Well Clean-up

Activity: 2. Operation

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		3. Pre-job meeting to remind all personnel of hazard									
19. Personnel fatigue	1. Overwork - crew arrive onboard without sufficient field break between jobs	1. 2 x crews on site to ensure 24 hour coverage (12 hrs per shift)	1. Injury	1. Emergency response plan 2. Medic on board	Health				22. Plan ahead for personnel movements (Hotels etc) to avoid the possibility of personnel fatigue.	Dave Linkston	
	2. Excessive hrs worked onsite	2. Offshore Installation Manager (OIM) controls working over 12 hours with PTW system	2. Incorrect decisions - disruption to test program		Health	Minor	Highly Unlikely	Low			
	3. Heat stress and fatigue	3. Working hours addressed in pre-well test meeting	3. Damage to assets		Property						
		4. Awareness training on symptoms of heat stress & fatigue at pre tour meetings									
20. Burner efficiency - oil	1. Insufficient combustion	1. Use of high efficiency burners	1. H/C release to the sea	1. Oil spill contingency	Environment	Minor	Unlikely	Medium			

Operation: 1. Well Clean-up

Activity: 2. Operation

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
fallout during flaring	2. High water cut	2. Ensuring water content in oil kept within acceptable design limits		plan							
		3. Backup air compressors on line and ready if required									
		4. Position compressors in areas that do not expose them to radiant heat that could cause overheating									
		5. Run compressors on load for 2 hours prior to start-up									
		6. Flare watcher assigned to observe for overboard discharge, able to alert Test Supervisor and shut in well at ESD station									
		7. System design reviewed in WTDP									
		8. All lines flushed and strainers checked prior to startup									
		9. Dual pilot system utilized									
21. Spill or leak, or discharge from burner goes undetected in darkness during flowing of the well at night	1. Inadequate lighting	1. Expro operators in attendance at all times	1. H/Cs released to environment without knowledge	1. Oil spill contingency plan	Environment	Minor	Unlikely	Medium			
	2. Burner fall out, leaks, inefficiency during flowing	2. Equipment pressure tested. Pressure relief system installed									
		3. Adequate lighting confirmed									

Operation: 1. Well Clean-up

Activity: 2. Operation

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		4. Flare watcher assigned to observe for overboard discharge, able to alert Test Supervisor and shut in well at ESD station									
		5. Initial flow from the well during daylight									
22. Oil spill during dumping of completion brine overboard	1. Off-specification water being dumped	1. Oil-in-water meter used	1. Oil spill in the sea	1. Oil spill contingency plan	Environment	Slight	Unlikely	Low	23. Review the method of completion brine disposal of during well testing operations.	Keith Brand	
	2. Human error	2. Measure oil-in-water level before discharge									
		3. Additional 100 bbl atmospheric settling tank									

Operation: 1. Well Clean-up

Activity: 2. Operation

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		4. Equipment manned at all times during discharge									

Operation: 1. Well Clean-up

Activity: 3. Slick line

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
1. Lifting pressure control equipment (PCE) to the rig floor	1. Swinging load	1. Pre-job meeting	1. Damage to equipment	1. Emergency response plan 2. Medic on board	Property				25. Manage access to drill floor whilst working in derrick during well testing equipment installation / rig down.	Graham Robertson	
	2. Non-symmetrical lift	2. JSA conducted prior to lift	2. Personnel injury / fatality		Health	Massive	Highly Unlikely	High			
		3. Tag lines used									
		4. Equipment lifting points and slings certified									

Operation: 1. Well Clean-up

Activity: 3. Slick line

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		5. Certification / inspection of cranes and tuggers 6. Expro operating procedures 7. Ensure no loose items on lift									
2. Dropped object during rig up / rig down of Slick Line (S/L) PCE on Surface Test Tree (STT)	1. Loose equipment	1. Lanyards on tools	1. Personnel injury / fatality	1. Emergency response plan 2. Medic on board	Health	Massive	Highly Unlikely	High	24. Review use of a tool-catcher or tool trap, to avoid dropped objects.	Keith Brand	
	2. Personnel working at height	2. Working at heights register 3. Avoid working at height wherever possible 4. Fit out on catwalk prior to hoisting into derrick 5. Work platform (cherry picker) to be used to minimize any man riding 6. Inspection of PCE prior to hoisting for potential loose items	2. Damage to equipment		Property				25. Manage access to drill floor whilst working in derrick during well testing equipment installation / rig down.	Graham Robertson	

Operation: 1. Well Clean-up

Activity: 3. Slick line

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		7. Fall arrestor fitted whilst working in cherry picker attached to derrick									
		8. Wire clamp fitted to avoid tools moving									
3. Pressure testing S/L pressure control equipment	1. Seal / equipment failure	1. Equipment design / pressure rating appropriate for the well conditions	1. High pressure release of pressure test liquid	1. Emergency response plan 2. Medic on board	Commercial						
		2. Only essential personnel in the area	2. Personnel injury		Health	Minor	Highly Unlikely	Low			
		3. Conduct low pressure test prior to high pressure test	3. Damage to equipment		Property						
		4. Expro procedures used									
		5. All equipment certified									
		6. Bleed off pressure before rectifying any leaks									
		7. Ensure adequate illumination for night time operations for detection of leaks									
		8. Pre mob audit to include NPT thread inspection									

Operation: 1. Well Clean-up

Activity: 3. Slick line

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		9. Radio communications between cement unit and drill floor									
		10. Seadrill PTW required									
		11. JSA for pressure testing utilized									
		12. PA announcement for pressure testing									
4. H/C Leak from lubricator	1. Stuffing box seal failure	1. Expro operating procedures	1. High pressure H/C release	1. Emergency response plan 2. Medic on board	Environment	Slight	Unlikely	Low			
	2. O-ring failure in Quick Union connection	2. Equipment design / pressure rating appropriate for the well conditions									
		3. All equipment certified									
		4. Equipment pressure tested prior to use									
		5. S/L BOP hydraulically actuated to isolate leak above the BOP									
		6. Stuffing Box BOP will seal (with plug) if wire blows out of stuffing box									
		7. STT able to cut slickline if leak below the S/L BOP									
5. Slick line breaking whilst	1. Wire failure	1. Barriers	1. Personnel injury / fatality	1. Emergency response plan	Health	Massive	Highly Unlikely	High			

Operation: 1. Well Clean-up

Activity: 3. Slick line

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
across the deck	2. Heavy duty jarring	2. JSA	2. S/L tools lost downhole	2. Medic on board	Commercial						
	3. Dropped object	3. Pre job test and inspection on wire									
		4. Expro operating procedures									
		5. No lifting over the slick line									
		6. PA announcement									
		7. Weight indicators in calibration and configured correctly for the rig-up									

Operation: 1. Well Clean-up

Activity: 4. Rig Down

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
1. Blockage of access routes with well test	1. Heavy pipework	1. Equipment layout planned to provide sufficient access / egress	1. Personnel trapped in major accident event	1. Emergency response plan 2. Medic on	Health	Massive	Remote	Medium	1. Ensure access and egress routes are marked on a well	Dave Linkston	

Operation: 1. Well Clean-up

Activity: 4. Rig Down

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
equipment layout	2. Wrong positioning	2. Equipment lay out plan to ensure safe routing of high pressure or high temperature piping	2. Lack of access for personnel for maintenance	board	Property				test lay out poster and posted on rig notice boards.		
	3. Large well testing spread	3. Site inspection / walk round to ensure access / egress routes remain open during well test operations	3. Slips, trips and falls		Health						
	4. Lack of accessibility	4. Emergency drill prior to commencing testing operations									
	5. SIMOPS	5. Review layout with Seadrill prior to load-out									
		6. Restriction of access to testing and rig-up area									
2. H/C release during breaking down of well test hook up	1. Incomplete flushing	1. Entire well test package to be displaced and flushed through with drill water after test and prior to rigging down	1. Oil spill on deck	1. Oil spill contingency plan	Environment	Slight	Highly Unlikely	Low			
		2. Spill kits available in the well testing area									
		3. All overboard drains plugged									
3. Stored potential energy	1. Trapped pressure not recognised	1. Expro procedures. Ensure pressure released and all valves open	1. Personnel injury	1. Emergency response plan 2. Medic on	Health	Minor	Highly Unlikely	Low			

Operation: 1. Well Clean-up

Activity: 4. Rig Down

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		2. JSA		board							
4. Lifting units from deck and positioning on boat	1. Poor communication / control of operation / conflicting operations	1. Certification / inspection of cranes	1. Personnel struck or crushed by objects swinging or falling	1. Emergency response plan 2. Medic on board 3. Expro spare parts on rig and in Darwin	Health	Massive	Highly Unlikely	High	2. Ensure the port side is used for loading and unloading whenever possible.	Graham Robertson	
	2. Weight of unit exceeds crane rating	2. Equipment lifting points and slings inspected prior to load out to ensure compliance with certification requirements	2. Injury or fatality to deck crew on boat or rig		Health				3. Ensure that Crane Operator has the Well test layout plan in crane cabin.	Dave Linkston	
	3. Crane failure	3. Dogman / crane driver / boat to maintain good communications - 2 - way radios provided	3. Damage to equipment (resulting in potential lost time) causing delays in well test (no back up equipment is available for primary testing equipment)		Commercial						
	4. Lifting equipment failure	4. Dogman to supervise lift (rather than participate in lift)									
	5. Swinging load	5. Only Dogman to signal crane									

Operation: 1. Well Clean-up

Activity: 4. Rig Down

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
	6. Lack of space - load traps personnel or impacts with other units	6. Use tag lines, stand clear below									
	7. Loose items fall from equipment	7. Check load out list for weights of units									
	8. Poor weather / sea conditions	8. Ensure load weights are clearly identified on equipment and load-out documents									
	9. Supply boat positioning failure	9. PTW for heavy lift in place as necessary									
		10. Slings / lifting equipment are certified and condition checked prior to load out from base									
		11. Boat captain agrees that weather condition and boat readiness are suitable and safe for offloading									
		12. Well test supervisor to liaise with Dogman during lifting operations									
		13. Loose item check prior to lift									
		14. JSA conducted prior to lift									
5. Burner booms dropped	1. Poor communication	1. PTW for heavy lift in place as necessary	1. Damage to burner boom	1. Emergency response plan	Property				6. Review burner boom rig down	Graham Robertson	

Operation: 1. Well Clean-up

Activity: 4. Rig Down

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
or damaged during rig down	2. Lifting equipment failure	2. Installation / Rig down (which covers appropriate lifting points) and JSA used before rigging down burner booms	2. Personnel injury / fatality	2. Medic on board 3. Expro spare parts on rig and in Darwin	Health	Massive	Highly Unlikely	High			
	3. Loose items fall	3. Equipment lifting points and slings inspected prior to load out to ensure compliance with certification requirements	3. Damage to booms causing delays in well test (no back up equipment is available for primary testing equipment)		Commercial						
	4. Poor weather / sea conditions	4. Certification / inspection of cranes									
	5. Collision with jack-up legs and crane	5. Dogman / crane driver / boat to maintain good communications - 2 - way radios provided									
		6. Dogman to supervise lift (rather than participate in lift)									
		7. Only Dogman to signal crane									
		8. Use tag lines, stand clear below									
		9. Boat captain agrees that weather condition and boat readiness are suitable and safe for offloading									
		10. Well Test Supervisor to liaise with Dogman during lifting operations									

Operation: 1. Well Clean-up

Activity: 4. Rig Down

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		11. Loose item check prior to lift									
6. Object dropped from derrick during flowhead rig down	1. Loose equipment	1. Lanyards on tools	1. Personnel injury / fatality	1. Emergency response plan 2. Medic on board 3. Expro spare parts on rig and in Darwin	Health	Massive	Highly Unlikely	High	25. Manage access to drill floor whilst working in derrick during well testing equipment installation / rig down.	Graham Robertson	
	2. Equipment failure	2. Working at heights register	2. Equipment critically damaged causing lost time		Commercial						
	3. Awkward lift	3. Work platform (cherry picker) to be used to minimize any man riding									
		4. Inspection of flowhead prior to laydown for potential loose items									
		5. Rig tool aloft procedures followed									
		6. JSA prior to job									

Operation: 1. Well Clean-up

Activity: 4. Rig Down

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		7. Ensure only essential personnel in area during lifting operations									
7. Lifting flowhead from the drillfloor - Awkward lift	1. Swinging load	1. Pre-job meeting	1. Struck / crushed by flowhead - personnel injury / fatality	1. Emergency response plan 2. Medic on board 3. Expro spare parts on rig and in Darwin	Health	Massive	Highly Unlikely	High	15. Provide a drawing and rig-up / rig down procedure of the flowhead to Seadrill to assist in creating a lift plan.	Dave Linkston & Graham Robertson	
	2. Non-symmetrical lift	2. JSA conducted prior to lift	2. Equipment damage		Commercial						
		3. Tag lines used									
		4. Equipment lifting points and slings certified									
		5. Certification / inspection of cranes and tuggers									
		6. Expro operating procedures									

Operation: 1. Well Clean-up

Activity: 4. Rig Down

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		7. Ensure no loose items on lift									
8. Working over the side	1. Working over water during boom rigdown	1. Rig working over the side procedures	1. Man overboard hungup with fall arrestor	1. Emergency response plan 2. Medic on board	Health	Moderate	Highly Unlikely	Medium			
	2. Working over water during burner head maintenance	2. PTW									
		3. JSA prior to job									
		4. Life jackets required									
		5. Standby vessel									
		6. Watchmen with radio									
		7. FRC team on standby									
		8. Fall arrestor used when working outside of the handrails									

Operation: 1. Well Clean-up

Activity: 5. General

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
1. Fire	1. H/C releases from equipment failures	1. Fire extinguishers spotted and rig crew trained and drilled for fire fighting	1. Personnel injury / fatality	1. Emergency response plan 2. Medic on board	Health	Massive	Highly Unlikely	High			
		2. Temporary fire hoses located to fight fires in well test area	2. Equipment damage		Commercial						
		3. Fire team briefing prior to well test									
		4. ESD system shut-ins									
		5. Electric equipment is suitably zone rated									
2. Oil spills on cantilever	1. H/C releases from equipment failures	1. Cantilever deck overboard drains plugged during testing operations	1. Spill	1. Emergency response plan 2. Medic on board 3. Oil spill contingency plan. 4. Spill on deck?	Environment	Slight	Highly Unlikely	Low			
	2. Sampling	2. Spill kits available in the well testing area									
	3. Rigging down equipment										
3. Confusion when high level alarm sounds	1. Lack of knowledge	1. Drill of different alarms prior to well test	1. Incorrect action taken		Commercial	Slight	Highly Unlikely	Low	20. Familiarise personnel with alarms.	Graham Robertson	
		2. Pre-job meeting									
4. Failure of communications	1. Personnel do not understand their roles and responsibilities	1. Driller on rig floor at all times during well testing - unless relieved by Toolpush / Superintendent / OIM	1. Reduced responsivenes in an emergency		Health				26. Implement Integrated valve status board for use in drillers shack to assist in identifying	Keith Brand	

Operation: 1. Well Clean-up

Activity: 5. General

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
	2. Insufficient radios	2. Driller is focal point on drill floor for all drill floor operations while testing 3. Well Testing engineer is in charge of overall well testing operations 4. Valve status board kept up to date - Driller to be responsible aided by Expro / test engineer 5. Driller coordinates between rig and test crew activities 6. Roles and responsibilities communicated during pre-test meeting and during shift changes 7. Sufficient communications system in place 8. Pre-job meeting involving all parties	2. Operational delay		Commercial	Minor	Unlikely	Medium	all valve positions required in well testing and normal operations.		
5. Incompatible hammer unions	1. Not recognising Incompatible hammer unions	1. Program in place to eliminate all 2" 602 fittings 2. Brand new rig with no 2" 602 fittings on rig 3. Expro loadout procedure to check for 602 fittings	1. Personnel injury / fatality	1. Emergency response plan 2. Medic on board	Health	Massive	Highly Unlikely	High			

Operation: 1. Well Clean-up

Activity: 5. General

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
6. Ferrule on burner booms melting	1. Overheating of aluminium ferrule	1. All burner boom slings fitted with steel ferrules 2. Cooling system on burner booms 3. ESD system shut-ins	1. Boom collapsed	1. Emergency response plan 2. Oil spill contingency	Commercial	Moderate	Highly Unlikely	Medium			
7. Occupational hazards	1. Pinch points	1. Crane used for heavy lifts	1. Personnel injury	1. Emergency response plan 2. Medic on board	Health				10. Ensure adequate supervision personnel are supplied during well testing operations.	Craig Duncan	
	2. Trip hazards not recognised	2. Adequate lighting provided in the work area	2. Personnel dehydration leading to fatality		Health	Moderate	Possible	High	9. Ensure heat stress awareness is incorporated into Rig induction.	Graham Robertson	
	3. Rushing job	3. Good stepping and handling techniques utilized									
	4. Lack of recognition of heat exhaustion signs	4. Pipe baskets / racks close to work area 5. Adequate personnel plan and supervision to ensure not rushing 6. Appropriate use of PPE for the tasks (back supports, gloves, goggles, etc.)									

Operation: 1. Well Clean-up

Activity: 5. General

Hazard	Potential Causes	Controls	Consequences	Recovery	Risk Type (HEPCR)	Risk Matrix			Recommendations	Actionee	Comments
						C	L	RR			
		7. Conduct pre-job meetings and JSA prior to commencing tasks									
		8. Manage fluid intake to manage heat exhaustion									
		9. Tools checked as appropriate for the job and in good condition									
		10. Dupont STOP system in place to identify pinch points etc									

Attachment 3
Recommendations

Recommendations	Actionee	Place(s) Used
1. Ensure access and egress routes are marked on a well test lay out poster and posted on rig notice boards.	Dave Linkston	Hazard: 1.1.1, 1.4.1
2. Ensure the port side is used for loading and unloading whenever possible.	Graham Robertson	Hazard: 1.1.2, 1.4.4
3. Ensure that Crane Operator has the Well test layout plan in crane cabin.	Dave Linkston	Hazard: 1.1.2, 1.4.4
4. Ensure that the Dogman has a copy of the Well test layout plan.	Dave Linkston	Hazard: 1.1.2
5. Review burner boom installation plan to include bringing the boom onboard prior to installation.	Graham Robertson	Hazard: 1.1.3
6. Review burner boom rig down.	Graham Robertson	Hazard: 1.4.5
7. Ensure JSAs are modified to include SIMOPS.	Graham Robertson	Hazard: 1.1.6
8. Investigate the use of additional supervision during SIMOPS.	Graham Robertson	Hazard: 1.1.6
9. Ensure heat stress awareness is incorporated into Rig induction.	Graham Robertson	Hazard: 1.5.7
10. Ensure adequate supervision personnel are supplied during well testing operations.	Craig Duncan	Hazard: 1.5.7
11. Review the extent of the area to be isolated during pressure testing of the well test equipment.	Graham Robertson	Hazard: 1.1.8
12. Identify an appropriate primary and secondary explosive storage area and review jettison capability.	Graham Robertson	Hazard: 1.1.9
13. Determine whether explosives need to be removed from rig during well testing operation (Schlumberger and Graham Robertson to liaise with Coogee).	Graham Robertson	Hazard: 1.1.9
14. Ensure that the well testing and Rig crew are briefed on fire fighting requirements for methanol.	Dave Linkston	Hazard: 1.1.10
15. Provide a drawing and rig-up / rig down procedure of the flowhead to Seadrill to assist in creating a lift plan.	Dave Linkston & Graham Robertson	Hazard: 1.1.7, 1.4.7
16. Write Hydrate contingency plan for well testing.	Dave Linkston	Hazard: 1.2.5
17. Run the Well test planning report to include sand in calculations to determine the degree of possible erosion.	Dave Linkston	Hazard: 1.2.7
18. Ensure all well testing compressors are fitted with self bunding to avoid spills.	Dave Linkston	Hazard: 1.2.14
19. Fit an audible alarm to the tank when the tank is 75% full to avoid spills.	Dave Linkston	Hazard: 1.2.15
20. Familiarise personnel with alarms.	Graham Robertson	Hazard: 1.5.3
21. Ensure that the tank level alarm is connected to the EDGE system.	Dave Linkston	Hazard: 1.2.15
22. Plan ahead for personnel movements (Hotels etc) to avoid the possibility of personnel fatigue.	Dave Linkston	Hazard: 1.2.19
23. Review the method of completion brine disposal of during well testing operations.	Keith Brand	Hazard: 1.2.22
24. Review use of a tool-catcher or tool trap, to avoid dropped objects.	Keith Brand	Hazard: 1.3.2
25. Manage access to drill floor whilst working in derrick during well testing equipment installation / rig down.	Graham Robertson	Hazard: 1.1.5, 1.3.1, 1.3.2, 1.4.6

Recommendations	Actionee	Place(s) Used
26. Implement Integrated valve status board for use in drillers shack to assist in identifying all valve positions required in well testing and normal operations.	Keith Brand	Hazard: 1.5.4

APPENDIX 2 – ACTION TRACKER

Workshop Recommendations – Compliance Matrix

Item	Recommendations	Hazard applicable	Actionee	Actioned by	Comments	Closure Date
1	Ensure access and egress are routes are marked on a well test layout poster on rig notice boards	1.1.1, 1.4.1	D. Linkston	10 Nov 07	WT Layout drawing updated to show egress and access routes	14 Nov 07
1.1	Well Test Layout drawing to be posted on the rig notice board	1.1.1, 1.4.1	D. Linkston	Prior to rig-up		
2	Ensure Port side is used for loading and unloading whenever possible	1.1.2, 1.4.5	G. Robertson	Ongoing current Op		Completed
3	Ensure that the Crane Operator has the Well Test Layout plan in the crane cabin	1.1.2, 1.4.5	D. Linkston	Prior to rig-up		
4	Ensure that the Dogman has a copy of the Well Test Layout plan.	1.1.2, 1.4.5	D. Linkston	Prior to rig-up		
5	Review burner boom installation plan to include bringing the boom onboard prior to installation	1.1.3, 1.4.6	G. Robertson	15 Jan 08	Booms will be installed on the rig for the MEO work and learning from that operation will be applied to the Coogee operations	
6	Ensure JSAs are modified to include SIMOPS	1.1.6	G. Robertson	15 Jan 08	Drilling Supervisor(DS)/Offshore Installation Manager (OIM) to be advised of requirements	
7	Investigate the use of additional supervision during SIMOPS	1.1.6	G. Robertson	15 Jan 08		
8	Ensure Heat Stress awareness is incorporated in the Rig Induction	1.1.12, 1.4.4	G. Robertson	15 Nov 08	Heat stress induction is currently in place as per NOPSA operating requirement	Completed 1 Nov 07
9	Ensure adequate supervision personnel are provided during well testing operations	1.1.12, 1.4.4	C. Duncan	15 Jan 08		
10	Review the extent of the area to be isolated during pressure testing of well test equipment	1.1.8	G. Robertson	15 Jan 08	DS/OIM to review with the WT Engineer to agree areas to be isolated based on operations ongoing at the time of PT and JSA	
11	Identify an appropriate primary and secondary explosives storage area and review jettison capability	1.1.9	G. Robertson	15 Nov 08	Explosive magazines installed on the rig and jettison system is place as per NOPSA requirements	Completed 1 Nov 07
12	Determine whether explosives need to be removed from the rig during well test operations (Schlumberger & G. Robertson to liase with Coogee)	1.1.9	G. Robertson	15 Dec 08	Testing operations will be conducted on the rig with MEO prior, learnings to be applied	
13	Ensure that the well testing and Rig Crews are briefed on fire fighting requirements for methanol	1.1.10	D. Linkston	During rig-up		
14	Provide a drawing and rig-up procedure for the flowhead to Seadrill to assist in creating a lift plan	1.1.7, 1.4.8	D. Linkston/G. Robertson	15 Dec 08		

15	Write hydrate contingency plan for well testing	1.2.5	D. Linkston	15 Dec 07		
16	Run the well test planning report to include sand in the calculations to determine the degree of possible erosion.	1.2.7	D. Linkston	5 Nov 07		
17	Ensure all well testing compressors are fitted with self bunding to avoid spills	1.2.14	D. Linkston	15 Jan 08		
18	Fit an audible alarm to the surge tank that trips at 75% of capacity to avoid spills	1.2.15	D. Linkston	15 Jan 08		
19	Familiarize rig personnel with alarms associated with well testing operations	1.5.3	G. Robertson	During rig-up	DS/OIM/WT Engineer to brief the crew on the different alarms during the WT Pre-start meeting	
20	Ensure that the tank level alarm is connected to the EDGE System	1.2.15	D. Linkston	15 Jan 08		
21	Plan ahead for personnel movements (Hotels, etc) to avoid possibility of personnel fatigue	1.2.19	D. Linkston	Prior to Rig-up		
22	Review method of completion brine/mud disposal during well testing operations	1.2.22	K. Brand	5 Nov 07	A 200 bbl Atmospheric Tank is to be added to the WT Equipment package and a Hazop run on the addition	Completed 5 Nov 07
23	Review use of a tool-catcher or tool trap during slickline operations to avoid dropped objects	1.3.2	K. Brand	16 Nov 07	In discussions with Expro, due to the tool string configurations that we will have on Skua, a tool catcher will not be of assistance to us. We would end up having to make up longer tool strings and space out our lubricator to enable the catcher to work	Completed 14 Nov 07
24	Manage access to the drill floor whilst working in derrick during well test equipment installation	1.1.5, 1.3.1, 1.3.2, 1.4.7	G. Robertson	During Rig-up	DS/OIM to manage access based on operations during rig-up	
25	Implement Integrated Valve Status Board for use in the Drillers' Shack to assist in identifying all valve positions required during well testing and completion operations	1.5.4	K. Brand	15 Jan 07		

Well Test Appendix 3

HAZOP Report

CoogeeResources
Coogee Resources (Ashmore Cartier) Pty Ltd
ABN 27 004 210 164

Target Zero Injuries

Hazard Operability Workshop for Skua 10 & 11 Well Clean-ups

Document Number: TM-CR-SKU-R-150-00001

Rev: 0

NOVEMBER 2007

Revision List					
0	21 Nov 07	Issued for Signature	DCS	CAW	CMD
B	15 Nov 07	Issued for Review	DCS	CAW	CMD
A	26 Oct 07	Issued for Review	DCS	CAW	CMD
Revision	**Date**	**Reason for Issue**	**Prepared by**	**Checked by**	**Approved**

CoogeeResources

Target Zero Injuries

Coogee Resources (Ashmore Cartier) Pty LtdError!
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Revision History

Rev	Description	Date
1.		
2		

Approvals

Position	Name	Signature	Date
Well Construction Manager	Craig Duncan		

Distribution

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Well Test Engineer	5		
Seadrill	6		

CoogeeResources
Coogee Resources (Ashmore Cartier) Pty Ltd
ABN 27 004 210 164

Target Zero Injuries

Table of Contents

1 ABBREVIATIONS

ALARP	As Low as Reasonably Practicable
BHP	Bottomhole Pressure
BHT	Bottomhole Temperature
BPV	Back Pressure Valve
CO2	Carbon Dioxide
D/S	Downstream
EDGE	Expro Electronic Data Acquisition System
ESD	Emergency Shutdown
FSV	Flow Safety Valve
FWV	Flow Wing Valve
HAZOP	Hazard Operability
H2S	Hydrogen Sulphide
ILC	In-line Choke
MMscfd	Million standard cubic feet per day
MPa	Mega Pascal
MSL	Mean Sea Level
NACE	National Association of Corrosion Engineers
NOPSA	National Offshore Petroleum Safety Authority
PFD	Process Flow Diagram
PSH	High Pressure Pilot
PSL	Low Pressure Pilot
PSV	Pressure Safety Valve
SCFM	Standard cubic feet per minute
SSV	Surface Safety Valve
STT	Surface Test Tree
U/S	Upstream

2 INTRODUCTION

The Skua 10 & 11 wells are subsea wells that are part of the Montara Development located in the Timor Sea in Permit AC/P-34 approximately 690 km west of Darwin. The wells once completed will be tied back to the Montara Platform via a 23 km pipeline. The wells will be batch drilled and completed in early 2008 utilizing the Seadrill West Atlas Jackup Drilling Rig.

The wells will be flowed back on a clean-up flow through a surface test equipment spread provided and operated by Expro. The technical and HSE objectives of the clean-up flows are as follows;

- To complete the well test with zero injuries or incidents.
- To have no reportable spills to the environment.
- To comply with statutory regulations
- To complete the well cleanup within the estimated time and budget.
- Clean-out the drilling fluid in the horizontal section of the well and remove any drilling fluid damage to the formation
- Flow appropriate levels of hydrocarbons around the Swell Packers to ensure that they are being activated and providing zonal isolation in the horizontal section
- Flow at a stabilized rate (5,000 bopd) in both the toe and heel section of the horizontal section to confirm contribution from both sections utilizing the completion flow control devices. The flow volume objective is three horizontal hole section volumes from the well.

3 HAZARD OPERABILITY WORKSHOP OBJECTIVES

As part of the Drilling Management System, a Hazard Operability (HAZOP) Workshop of the well test equipment is an integral part of the well test design process. The objectives and outcomes of the HAZOP are to be as follows;

- Review the well test equipment design to determine fitness for purposes based on the Well Testing BOD.
- Evaluate process deviations based on standard HAZOP guidewords to ensure appropriate safety systems are in place to protect the equipment from the deviation.
- Based on the evaluation, recommendations and changes are made to put further safeguards in place to ensure the hazards are ALARP.

The following assumptions were made for the HAZOP;

- Equipment functions as per its intended design
- Personnel are trained and competent in their assigned duties
- Adequate supervision is in place
- Human factors such as but not limited to fatigue is managed effectively.

4 WORKSHOP METHODOLOGY

The process flow diagram (PFD) was developed with consultation between Coogee Resources and Expro based on the Skua 10 & 11 Wells Basis of Design documents to meet the well cleanup objectives. The evaluation nodes were agreed and the HAZOP Worksheets were pre-populated based on previous Hazops' that have been conducted on similar well test configurations as a base line for the workshop.

The initial workshop was held on October 18, 2007 and reviewed the PFD, equipment layout, and the safety system SAFE Chart prior to the review of the nodes in the process equipment design to ensure everybody in the workshop understood the fundamentals of the system design. The PFD was divided into seven different nodes and each was reviewed using standard process deviations to determine if any changes or enhancements were required to ensure that the system hazards were ALARP. These changes are captured on the HAZOP worksheets in Appendix 2 and as Agreed Actions in Appendix 1 with individuals assigned and time lines set for closure of each action.

In further discussions and internal reviews of the well cleanup program following the initial HAZOP, a requirement for additional fluid handling capabilities was recognized to manage the various interface fluids that would be flown back. An additional HAZOP was held on November 19, 2007 to evaluate the change in system design that incorporates a 200 bbl atm. Gauge Tank, hoses, and transfer pumps. The changes are captured on the HAZOP Worksheets for Node 8 in Appendix 2 and as Agreed Actions in Appendix 1.

5 PROCESS DESCRIPTION

The well test package consists of a temporary production system for the safe control and separation and disposal of the well clean up fluids.

Well fluids are produced from the well through the flowhead flow wing valve into a Coflexip hose. The hose is laid down the Vee door and is connected to a ESD Valve upstream of the choke manifold.

The purpose of the choke manifold is to control the well production and for taking samples of the well fluids to determine qualitatively, fluid production, solid production and liquid specific gravities.

From the choke manifold the well fluids enter the test separator which is used to separate the well production into three phases, oil, water and gas.

Gas is flowed from the separator via a back pressure valve to the gas manifold through the rig pipework to either boom and the gas flare line to the gas tip.

The oil will flow from the separator controlled by a level control valve to either the Surge tank or directly to the SuperGreen burners mounted on the burner booms. A five valve oil manifold is used to divert the flow stream either to the burners or the tank based on the activity required.

The Surge tank is a low pressure vessel with an open vent used for temporary storage of oil to allow residual gas to vent off. The tank can be pumped out using the transfer pump to the SuperGreen burners. An additional 200 bbl Gauge Tank and transfer pumps is incorporated to enhance the system fluid handling capabilities.

The SuperGreen burners require compressed air in large quantities to atomise the oil for combustion and therefore three 1100 scfm compressors will be rigged up on location to provide sufficient air plus a backup capability in the event of a compressor shutdown/failure.

6 ATTENDEES

A cross section of personnel from Coogee Resources, Expro Group, and Labrador Petro-Management who will be involved the management, supervision, design, and operation of the surface test equipment that will be used on the Skua 10 & 11 Well Cleanups made up the workshop attendees. The initial HAZOP Workshop details were reviewed with Seadrill management (Graham Robertson – Rig Manager) to ensure that they as operator under the NOPSA regulations are satisfied that operations can be carried out in a fashion that is ALARP.

Table 1 - Hazop Workshop

Name	Position	Organisation	Pre-Hazop (17 Oct 07)	Hazop (18 Oct 07)
Craig Duncan	Well Construction Manager	Coogee Resources		✔
Chris Wilson	Drilling Superintendent	Coogee Resources		✔
Keith Brand	Sr. Completions Engineer	Coogee Resources		✔
Andy Wroth	Drilling Engineer/Facilitator	Coogee Resources	✔	✔
Dan Smith	Well Test Engineer	Labrador Petro-Management	✔	✔
Dave Linkston	Technical Manager	Expro	✔	✔
Ursala Steenkamp	Scribe	Coogee Resources		✔
Graham Robertson	Rig Manager	Seadrill	HAZOP reviewed outside the Workshop for Seadrill input on 29 Oct 2007.	

Table 2 - Node 8 - Hazop Review

Name	Position	Organisation	Hazop (19 Nov 07)
Craig Duncan	Well Construction Manager	Coogee Resources	✔
Chris Wilson	Drilling Superintendent	Coogee Resources	✔
Dan Smith	Well Test Engineer	Labrador Petro-Mgmt	✔
Robert van der Most	Operations Engineer	Seadrill	✔
Dave Linkston	Technical Manager	Expro	✔

7 SUMMARY OUTCOMES

A total of 32 recommendations/action items were made and assigned to suitably qualified personnel for action and closeout. There were four key changes to the design that were made based on the workshops;

1. The set points on the inline relief valve (PSV 1) was increased from 1380 psi to 1440 psi and the separator relief valves (PSV 2 & 3) setting were reduced to 1380 psi to minimize the possibility of oil discharge in the event of a high pressure event downstream of the choke manifold.

2. The high pressure pilot (PSH 1) was lowered from 1200 psi to 800 psi to provide a larger safety window to work in combination with the PSVs to minimize the possibility of oil discharge in the event of a high pressure event downstream of the choke manifold.
3. Process alarms are to be set in the EDGE System and noted in the well test program to further enhance process control.
4. Specific Tank Fluid Handling Guidelines are required to be developed for use with the 200 bbl Atm Gauge Tank.

All action items will be tracked in an action tracker (Appendix 1) by Coogee Resources to ensure compliance.

The drawings and charts used during the HAZOP and the updated drawings have been included in the Appendix 4 & 6 as below

Process Flow Diagram

- PFD J07-461 Rev 0 — Used during the initial HAZOP
- PFD J07-461 Rev 2 — Used during the HAZOP of Node 8
- PFD J07-461 Rev 3 — Updated PFD from Node 8 HAZOP

Layout Drawing

- WTLAY 07/461 Rev B — Used during the initial HAZOP
- WTLAY 07/461 Rev 0 — Used during the HAZOP of Node 8

Safe Chart

- WTPR J07-461 Rev 2 — Used during the initial HAZOP

APPENDIX 1 – AGREED ACTIONS

Table 2 – Agreed Actions

Node	Recommendations	Actionee	Action by	Closure Date
1	Integrated valve status board to be implemented	Keith Brand	15 Jan 08	
1	Cementer to wear headphone radio	Chris Wilson	15 Nov 07	
1	Audible alarms set within EDGE System for all piloted devices	Dave Linkston	During WT Rig-up	
1	EDGE pilot set points to be noted in program	Dan Smith	15 Nov 07	Completed 15 Nov 07
1,2	Low Pressure Pilot is locked out during start-up with guidelines for re-activation are to be noted in the program	Dan Smith	15 Nov 07	Completed 16 Nov 07
1	Chemical injection to flowhead to be investigated	Dave Linkston	15 Dec 07	
1	Confirm check valve is a non-lock open type between the flowhead and cement unit	Dave Linkston	15 Nov 07	Completed 20 Nov 07
1,2,3,4	Review condition of ESD pneumatic loop hose	Dave Linkston	During WT Rig-up	
2	PSH1 pressure to be lowered to 800 psi	Dave Linkston	During WT Rig-up	
3	Change pressure settings of PSV2 and PSV3 to 1380 psi and change PSV1 to 1440 psi	Dave Linkston	15 Jan 07	
3	Continuous Nitrogen purge during start-ups utilizing N2 bottle rack rigged up to the separator	Dave Linkston	During WT Rig-up	
3	Include N2 pre-charge system on the PFD	Dave Linkston	5 Nov 07	Completed 15 Nov 07
3	Review requirement for restrictive orifice in surge tank inlet if surge tank is bypassed when flowing into separator	Dave Linkston	15 Nov 07	Completed 23 Nov 07
3	Investigate requirements to install a suitable audible high level alarm on the Surge Tank	Dave Linkston	30 Nov 07	

3	Install a audible high level alarm on the tank set at 75% fill	Dave Linkston	15 Jan 07	
3	Review handling of interface fluids and applicability of flow limiter	Dan Smith	10 Nov 07	Completed 23 Nov 07
3	Upper fill level marked on tank at 70%	Dave Linkston	During WT Rig-up	
3	Review with Graham Robertson possibility of flowing interface fluids back to surface mud pits	Dan Smith	7 Nov 07	Completed 5 Nov 07
5	Confirm all the burner head valves are open during flushing prior to start	Dave Linkston	During WT Rigup	
5	Write pressure test procedure	Dan Smith	15 Nov 07	Completed 14 Nov 07
5	Review requirement for debris strainer for the Burner Head	Dave Linkston	15 Dec 07	
5	Debris strainer in the burner checked and cleaned prior to every burn	Dave Linkston	During WT Rigup	
5,6	Investigate manufacture of mechanism to ensure that valves in the diverter manifold cannot be left both open or both closed	Dave Linkston	15 Dec 07	
5	Review handling of interface fluids	Dan Smith/Keith Brand/Dave Linkston	10 Nov 07	Completed 5 Nov 07
5	Review mud program to determine if improvements can be made regarding solids free fluids being left down hole	Chris Wilson	15 Nov 07	
5	Emulsion tests to be conducted with crude and drilling fluid to be left in the horizontal section of the well	Chris Wilson	15 Nov 07	
8	Specific Tank Fluid Handling Guidelines are to be developed and made part of the program and included in the Expro WTPR.	Dan Smith	15 Nov 07	Completed 15 Nov 07
8	A sample point is to be installed on the Gauge Tank suction manifold	Dave Linkston	15 Jan 08	
8	The suction hose from the Surge Tank is to be kept as short as possible to minimize the	Dave Linkston	During WT Rig-	

	possibility of a spill if it has to be broken out for service. Spill kits are to be kept in the WT area to clean up any spillage that may occur		up	
8	Update PFD to include integral check valves in the diaphragm pumps, and note the gauge tank vent to the mud trough	Dave Linkston	22 Nov 07	Completed 23 Nov 07
8	Diaphragm pump output pressure ratings to be confirmed	Dave Linkston	22 Nov 07	Completed 22 Nov 07
8	The routing and connection point to transfer fluids from the Gauge Tank to the rig oily water separator and surface mud tanks to be defined	Robert van der Most	30 Nov 07	
Node 1-7	Update PFD with revised set points for PSV1, PSV 2, PSV 3, PSH 1	Dave Linkston	5 Nov 07	Completed 09 Nov 07

APPENDIX 2 – HAZOP WORKSHOP SHEETS

APPENDIX 3 – PROCESS DESIGN CRITERIA

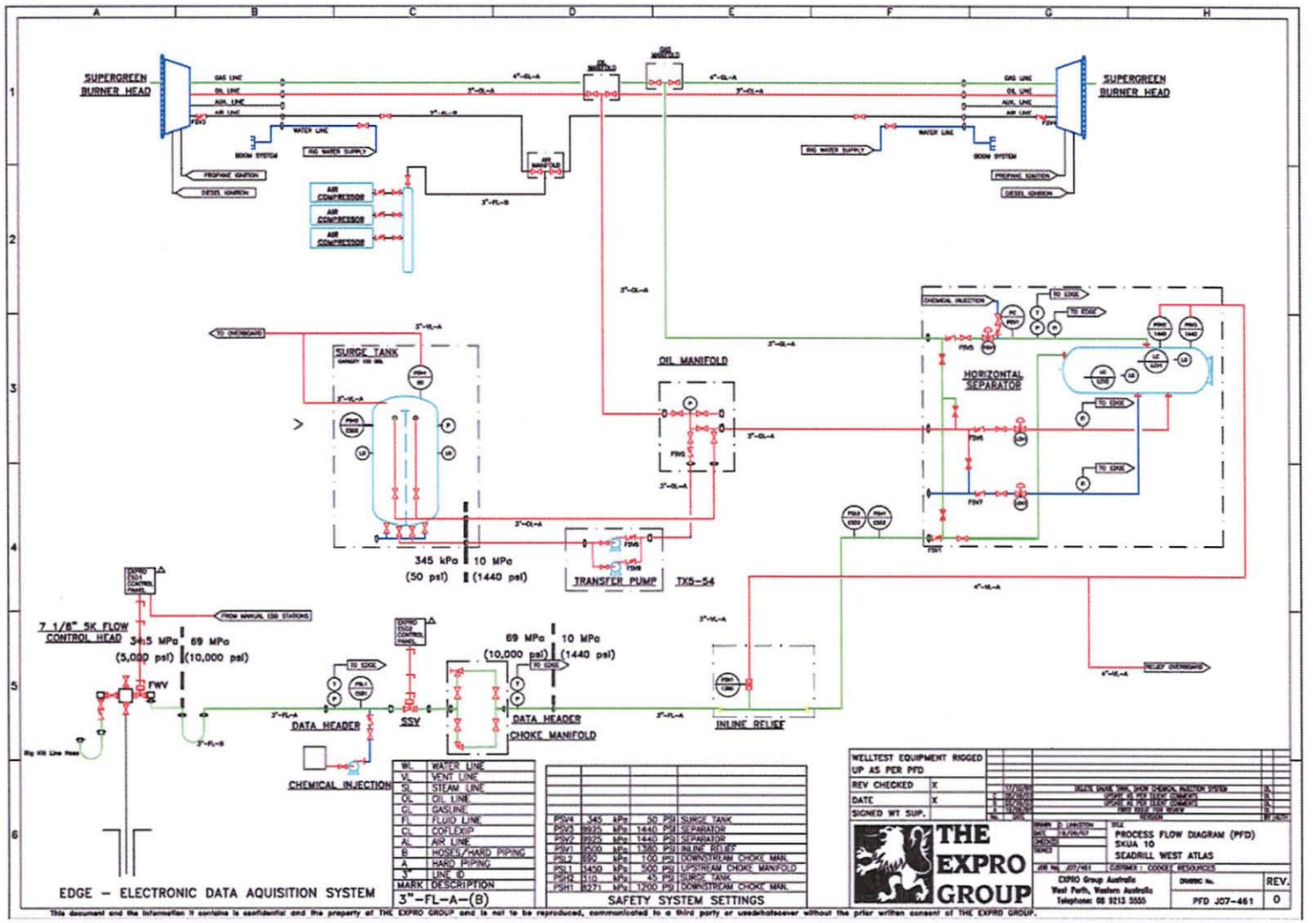
Well Data

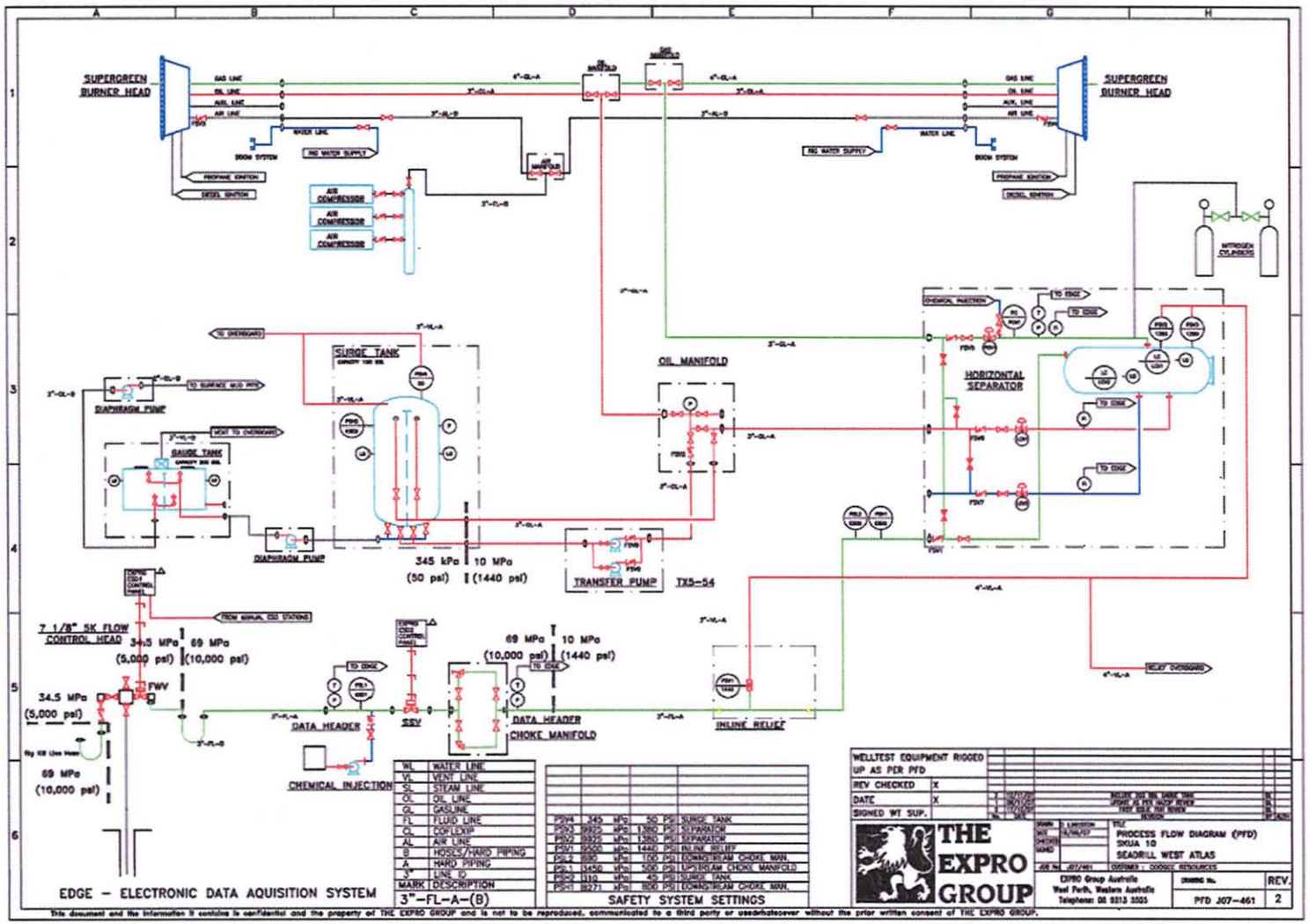
Water Depth	82.6 m MSL	
Maximum BHP	23.13 MPa	(3,355 psi)
Maximum BHT	96 Deg C	(204 Deg F)
Maximum SIWHP (gas to surface)	20.00 MPa	(2,899 psi)
Maximum SIWHP (fluid to surface)	9.18 MPa	(1,332 psi)
Expected FWHP	7.58 MPa	(1,100 psi)
Maximum Depth	2,609 m MDSS	
Formation Depth	2,274 m TVDSS	

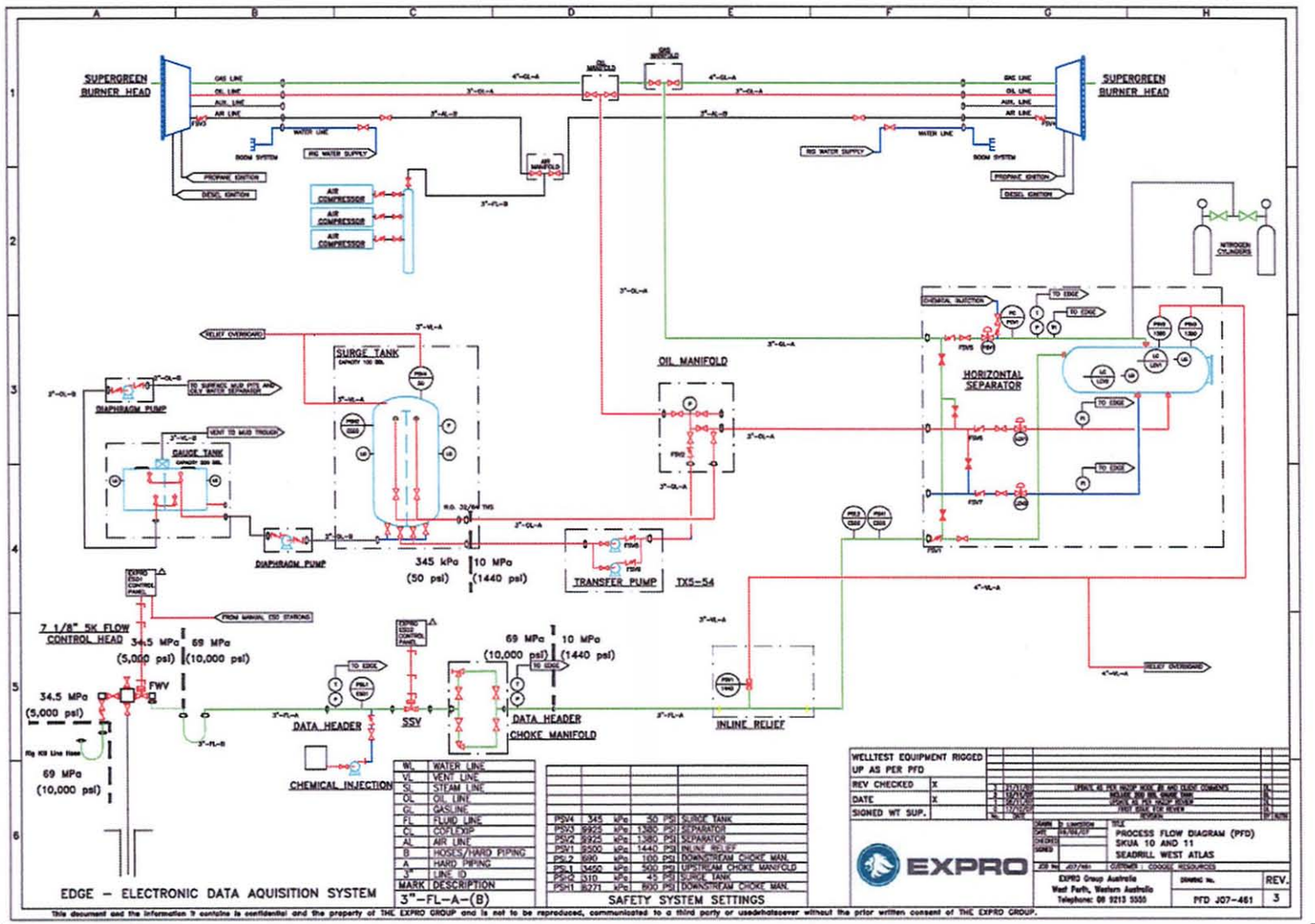
Flow Rate Data

Maximum Oil Rate	795 m^3/day	(5,000 bopd)
Maximum Gas Rate	127 x 10^3 m^3/day	(4.5 MMscfd)
Maximum Water Rate	none expected	

APPENDIX 4 – PROCESS FLOW DIAGRAMS







APPENDIX 5 – SAFE CHART

SAFETY ANALYSIS FUNCTION EVALUATION (S.A.F.E.) CHART

WTPR J07-461 Skua 10

EXPRO PRODUCTION TESTING INSTALLATION

OPERATOR : Coogee Resources
RIG : West Atlas

WELL: Skua 10

Refer to PFD J07-461 Draft C

PROCESS COMPONENT		ALTERNATE PROTECTION				SHUTDOWN OR CONTROL DEVICE	FUNCTION PERFORMED	SHUT IN WELL AT FLOWHEAD/WING VALVE	SHUT IN WELL AT SURFACE SAFETY VALVE	PRESSURE RELIEF VIA RELIEF LINE	PRESSURE RELIEF VIA SEPARATOR RELIEF LI	PRESSURE RELIEF VIA SURGE TANK RELIEF L	MINIMISES BACK FLOW FROM SEPARATOR	MINIMISES BACK FLOW FROM OIL LINE	MINIMISES BACK FLOW FROM OIL LINE	MINIMISES BACK FLOW FROM GAS LINE	MINIMISES BACK FLOW VIA AIR LINE	MINIMISES BACK FLOW VIA OIL MANIFOLD	MINIMISES BACK FLOW VIA OIL MANIFOLD
IDENTIFICATION	SERVICE	DEVICE I.D.	SAC REF NUMBER	NOTES	ALTERNATE DEVICE IF APPLICABLE			PWV	SSV	PSV1	PSV2&3	PSV4	FSV1	FSV2	FSV6&7	FSV5	FSV8	FSV9	
	Flowline from Flowhead to Choke Manifold	PSL1	A1 b.1					X											
	Flowline from Choke manifold to Separator through to oil and gas burner	PSH1	A.1 a.1						X										
		PSL2	A1 b.1						X										
		FSV1	A4 f.1										X						
		PSE1 / PSH2	A1 c.1								X								
	Separator and oil flow line to burners and gas flow line to flare tips	PSH1	A4 a.1						X										
		PSV2	A4 c.1		PSV3						X								
		PSV3	A4 c.1		PSV2						X								
		FSV 6 & 7	A4 f.1												X				
		FSV5														X			
	Surge Tank	PSH2	A4 a.1						X										
		PSV4	A4 c.1	2								X							
		FSV2	A4 f.1											X					
	Transfer Pump	FSV8	A4 f.1														X		
		FSV9	A4 f.1														X		
	Burner Heads	FSV3	A4 f.1														X		
		FSV4	A4 f.1														X		
	ESD Panel (Expro)							X											
	ESD Manual Stations							X											
	ESD Fusible loop							X											

NOTES:
1. Maximum shut in presure is less than line MAWP
2. Flow restrictor in Oil line to tank fitted

No	DATE	DESCRIPTION	ENG.	CHECK	LEAD	P.ENG		DATE
Rev 2	9/10/2007	Updated as per PFD	DL					
Rev 1	4/10/2007	Updated as per PFD	DL					
Rev 0		Issued for review	DL					

REVISIONS

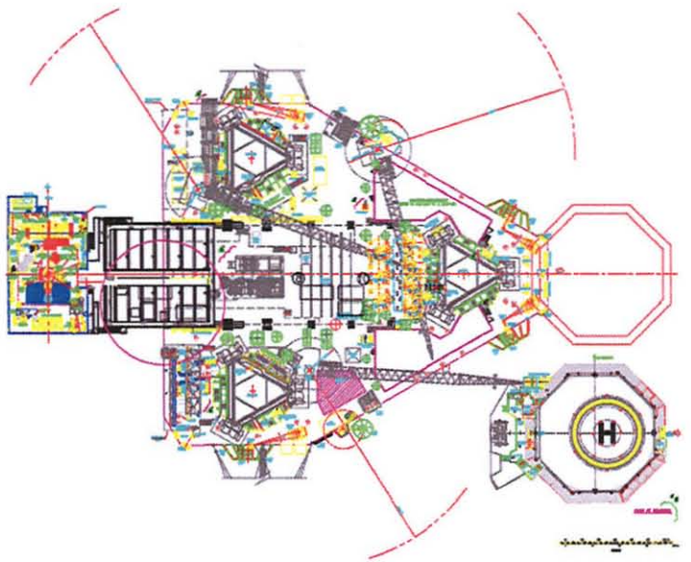
APPROVALS
NAME: D.LINKSTON EXPRO
SIGN: DATE:
NAME: D.Smith
SIGN: DATE:

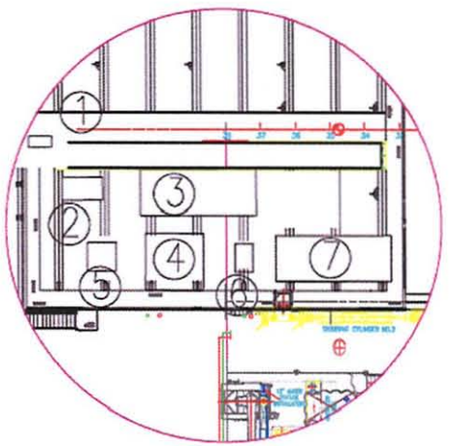
EXPRO PRODUCTION TESTING INSTALLATION SAFE CHART

WTPR J07-461

SCALE	DRAWN D.LINKSTON DATE: 26/09/07	CHECK DATE:	DRAWING No. J07461 SAFE CHART	REVISION 2
NTS				

APPENDIX 6 – EQUIPMENT LAYOUT





ITEM	DESCRIPTION	LENGTH ft	WIDTH ft	HEIGHT ft	WET WEIGHT kg
1.	SSV VALVE	4.0	2.0	5.0	500
2.	CHOKE MANIFOLD	7.0	6.0	1.0	3000
3.	SEPARATOR	20.0	8.0	20.0	16000
4.	SURGE TANK	10.0	10.0	20.0	20700
5.	TRANSFER PUMP	5.0	3.0	6.0	1100
6.	OIL MANIFOLD	5.0	5.0	2.0	500
7.	ZONE II LABORATORY	20.0	8.0	8.0	7000
8.	AIR COMPRESSOR	16.0	7.0	7.0	6500
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					

LEGEND

REMOTE ESD BUTTON

ESCAPE ROUTE

CHECKED

DATE

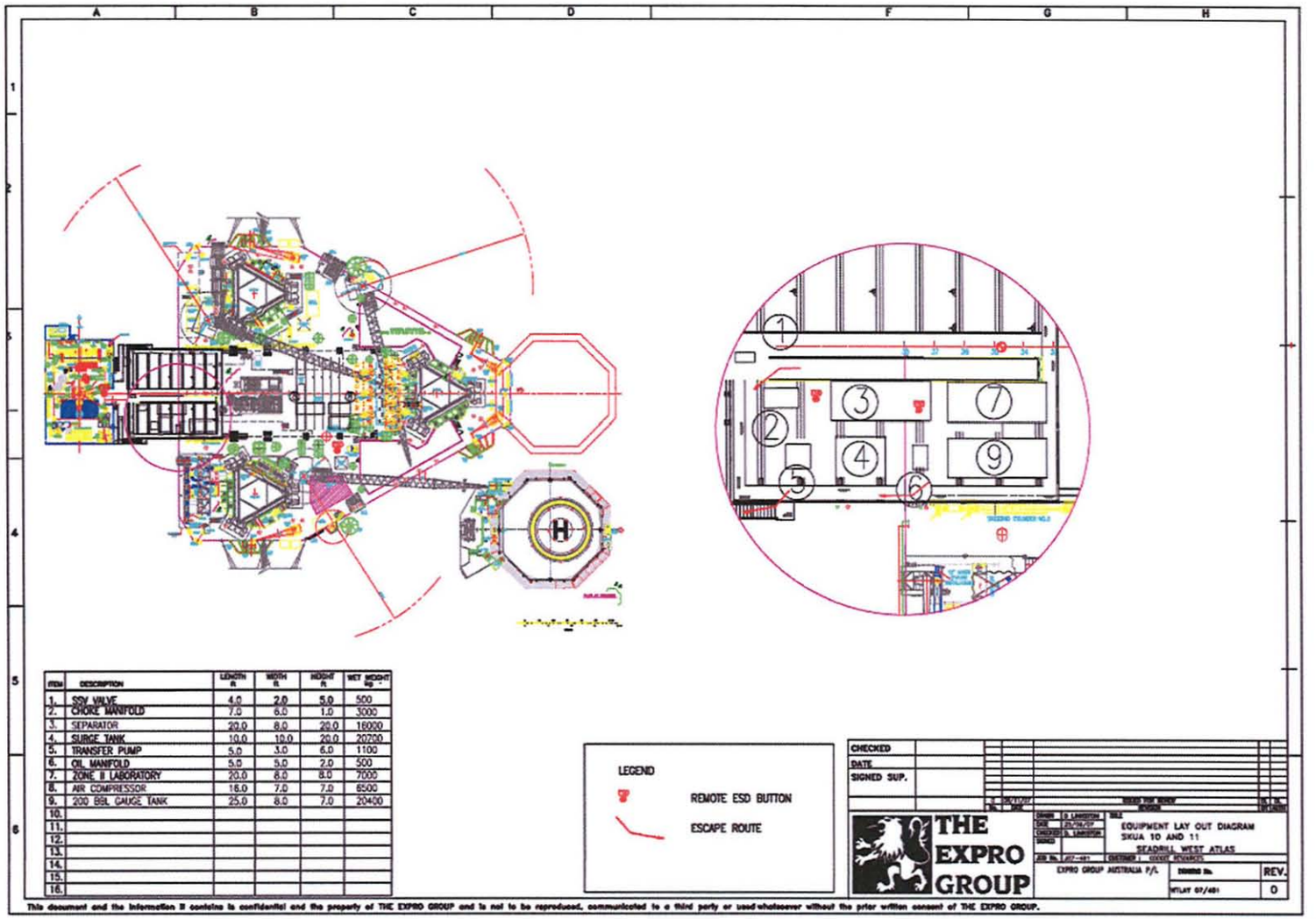
SIGNED SUP.

THE EXPRO GROUP

EQUIPMENT LAY OUT DIAGRAM
SKUA 10
SEADRILL WEST ATLAS

EXPRO GROUP AUSTRALIA P/L

REV. B



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5.	TRANSFER PUMP	5.0	3.0	6.0	1100
6.	OIL MANIFOLD	5.0	5.0	2.0	500
7.	ZONE II LABORATORY	20.0	8.0	8.0	7000
8.	AIR COMPRESSOR	16.0	7.0	7.0	6500
9.	200 BBL GAUGE TANK	25.0	8.0	7.0	20400
10.					
11.					
12.					
13.					
14.					
15.					
16.					