FINAL REPORT

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Integrated Ocean Drilling Program – Management International

Implementation Plan for the

BEAM" – "Borehole into the

Earth's Mantle" Program

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Purpose:

Develop an implementation plan for the BEAM Project that moves the project from its current feasibility phase towards a project execution phase that could be used by the various project stakeholders as the basis for internal operational planning and decision making.

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Table of Contents

Ver	sion	Record	. 2
1	Exe	ecutive Summary	. 6
2	Pro	ject Background	. 8
	2.1	Feasibility Study Overview - 2011	
		2.1.1 Candidate Locations	
		2.1.2 Marine Drilling Riser Analysis.	
		2.1.3 Well Design Assumptions	
		2.1.4 Base Case Well Design Development	
	~ ~	2.1.5 Operations Time and Cost Estimate	23
	2.2	High Impact Systems Study Overview - 2012.	
		 2.2.1 Review of Hard Rock O&G Drilling Services	
		2.2.3 High Temperature Downhole Tools	
2	W a	2.2.4 Marine Drilling Riser	
3		Ilbore Design Revisited	
	3.1	Wellbore Configuration Options	36
		3.1.1 Wellbore Configuration Pros and Cons	
		Risk Discussion	
	3.3	Cocos Location Wellbore Diagrams	
		3.3.1 Base Case Wellbore Configuration:	
		3.3.2 Deepwater Wellbore Configuration:	
	~ 4	3.3.3 Expandable Wellbore Configuration:	
	3.4	Hawaii Location Wellbore Diagrams	
		3.4.1 Base Case Wellbore Configuration:	
		3.4.2 Deepwater Wellbore Configuration:	
	0 5	3.4.3 Expandable Wellbore Configuration:	
	3.5	Baja Location Wellbore Diagrams	
		3.5.1 Base Case Wellbore Configuration:	
		3.5.2 Deepwater Wellbore Configuration:	
	Mar	3.5.3 Expandable Wellbore Configuration:	
4		rine Riser Design Discussion	
		Introduction and Data	
		Marine Drilling Riser Options	
		Hydrodynamics in Ultra-deepwater	
		Dynamic Analyses – Frequency and Time Domain	
		Vortex Induced Vibrations Screening	
5		Conclusions for the Drilling Riser Analysis	
5		•	
		Results Summary	
	5.2	Cocos Location Operational Time Estimates	34



		5.2.1	Case 2a Operations Time:	. 84
		5.2.2	Case 2b Operations Time:	. 88
		5.2.3	Case 2c Operations Time:	. 92
		5.2.4	Case 4a Operations Time:	. 96
		5.2.5	Case 4b Operations Time:	. 99
		5.2.6	Case 4c Operations Time:	103
	5.3	Hawaii I	Location Operational Time Estimates	107
		5.3.1	Case 2a Operations Time:	
		5.3.2	Case 2b Operations Time:	
		5.3.3	Case 2c Operations Time:	
		5.3.4	Case 4a Operations Time:	119
		5.3.5	Case 4b Operations Time:	
		5.3.6	Case 4c Operations Time:	
	5.4		cation Operational Time Estimates	
		5.4.1	Case 2a Operations Time:	
		5.4.2	Case 2b Operations Time:	
		5.4.3	Case 2c Operations Time:	
		5.4.4	Case 4a Operations Time:	
		5.4.5	Case 4b Operations Time:	
		5.4.6	Case 4c Operations Time:	
6	Rev	ised Op	perational Cost Estimates	149
	6.1	Results	Summary	150
		6.1.1	Cost Sensitivity	153
		6.1.2	Cost of Drilling vs. Coring	154
	6.2	Cocos L	ocation Cost Estimates	
		6.2.1	Case 2a Cost Estimate:	156
		6.2.2	Case 2b Cost Estimate:	160
		6.2.3	Case 2c Cost Estimate:	
		6.2.4	Case 4a Cost Estimate:	
		6.2.5	Case 4b Cost Estimate:	
		6.2.6	Case 4c Cost Estimate:	
	6.3		Location Cost Estimates	
		6.3.1	Case 2a Cost Estimate:	
		6.3.2	Case 2b Cost Estimate:	
		6.3.3	Case 2c Cost Estimate:	
		6.3.4	Case 4a Cost Estimate:	
		6.3.5	Case 4b Cost Estimate:	
		6.3.6	Case 4c Cost Estimate:	
	6.4	•	cation Cost Estimates	
		6.4.1	Case 2a Cost Estimate:	
		6.4.2	Case 2b Cost Estimate:	
		6.4.3	Case 2c Cost Estimate:	
		6.4.4	Case 4a Cost Estimate:	-
		6.4.5	Case 4b Cost Estimate:	
		6.4.6	Case 4c Cost Estimate:	223



7	Implementation Timeline	227
	7.1 High Level Timeline Overview7.2 Detailed Timeline Discussion	
8	Conclusions	
Арр	pendix 1: Evolution of ROP Assumptions	236
Арр	endix 2: Example Cost Estimate Element Assumptions	238
Арр	pendix 3: Implementation Timeline	243
Арр	endix 3: Example Well Delivery Process Flowcharts	244

1 Executive Summary

In September 2012, IODP-MI requested that Blade develop an Implementation Plan for IODP's "Borehole into the Earth's Mantle Program" - "BEAM". The goal was to develop a conceptual roadmap that moves BEAM from the current feasibility phase, towards a project execution phase that could be used by IODP, JAMSTEC/CDEX and the scientific community as the basis for their internal operational planning and decision making process.

The objectives of this BEAM Implementation Plan are to provide a detailed roadmap covering all the key technical steps that need to be completed to provide high success probability for BEAM operations.

More specifically, this Implementation Plan addresses the following:

- 1. Updated wellbore design that incorporates the results of the current 2012 bit and coring systems study, and reduction of the risks associated with down hole problems.
- 2. Updated operational time and cost estimates based on the results of the current 2012 bit and coring systems study.
- 3. Identification of long lead time tangible items (marine drilling riser, down hole tubulars).
- 4. Identification of necessary pre-operations technical improvement studies, and their impact on overall project time and cost (ultra-deep water drilling riser design, drilling string design, met-ocean and current surveys, geo-hazard surveys, high-temperature down hole tool specifications, high-temperature drilling fluid system and measurement design).
- 5. Identification of the key project decision points, how those key decisions fit in the BEAM critical path, and their overall impact on BEAM time and cost (i.e. site selection, science plan, pre-operations studies).
- 6. Development of an integrated BEAM Program timeline showing these key tasks, milestones, and operations implementation.
- 7. Specifically for marine riser system, conduct detail study for individual drilling candidate sites (water depth, 3,650m, 4,050m, and 4,300m).

Because this effort builds on the previous two studies that Blade has conducted, a summary of the key aspects of the Initial Feasibility Study and the High Impact Systems study are included in this report. Three different wellbore configurations are provided that attempt to account for the uncertainties in the down hole conditions. Revised estimates for the operational time and cost were prepared for the different wellbore configuration options and two different scientific drilling options for each of the candidate locations. This effort included a probabilistic evaluation to gain an understanding of the possible range of time and cost given the uncertainty with drill/core bit performance and rate of penetration. The operational time and cost estimates are substantially lower than what was initially developed for the feasibility study. The issues around the marine drilling riser were evaluated again and an updated riser analysis is provided as well as a summary of the pros and cons of the different material options. Finally, a project



implementation timeline was developed that is based around the well planning approach used for complex deepwater projects in the oil and gas industry and assuming that the BEAM project would begin in January 2018.

Again, the results of this project show that scientific drilling to the mantle is feasible. While there are no shortage of technical issues that will need to be resolved, there are existing solutions to most of them based on current practices in the deepwater drilling industry and the continued evolution of technology as the industry pushes into deeper water and more complex and harsh down hole environments.



2 Project Background

This project builds on previous work done by Blade Energy Partners in 2011 and 2012 which in turn builds on work that IODP had already done in a series of workshops that investigated the technical issues associated with scientific drilling to the mantle. In 2011 Blade conducted a high-level study to look at the overall feasibility of drilling to the mantle. In 2012 Blade conducted an additional study to identify and investigate equipment and services that could substantially decrease drilling time and risk drilling to mantle. An overview of the results of these first two studies is provided below because some familiarity with these studies will be useful for understanding the results of this project.

For reference, the titles of the initial studies are as follows:

- 1. Project Mohole Initial Feasibility Study For 2017 Drilling; Revision 4, 11 June, 2012
- High Impact Systems (Rock Bits, Coring & More) Technical Review & Risk Reduction Study for the BEAM - Borehole into Earth's Mantle, Mantle Quest Drilling Project, Revision 3, 4 February, 2013

2.1 Feasibility Study Overview - 2011

IODP requested that Blade conduct a high-level study investigating the feasibility of the MoHole Drilling Project.

The objectives of this study were as follows.

- New technologies which need to be implemented on the IODP drillship Chikyu that are expected to be available now or with enough time before 2017 to prepare for their use.
- Investigate the sensitivity to success and cost relative to the primary operational variables at IODP's three candidate sites.
- Investigate the primary scientific coring methods (whole 'full' coring vs. spot coring vs. no coring).
- Provide a recommendation of the most efficient and most viable first order operational implementation plan for (various levels of scientific) success.
- Provide an estimate of the total cost of the complete project scoping and well design study following feedback from IODP on the results of this Initial Feasibility Study.

The study focused on what would be required for planning, drilling and coring a mantle hole from one of three candidate locations in Pacific Ocean and to identify some of the critical issues since, to date, no wells have been drilled with the combined extreme conditions of deep water (\pm 4000 meters) and high temperature formations (\pm 200-250°C). The main challenges discussed in the study were as follows:



- Drilling with riser in ultra-deepwater environments with water depths around 4000 meters, which will set a new world record.
- Drilling and coring in very high temperature igneous rocks with bottom-hole temperatures that are estimated to be as high as 250°C, which will also set a new world record.
- Drilling and coring a very deep hole with a total drilled and/or cored interval around 6000 meters in the oceanic crust below the Pacific Ocean seafloor in order to reach the upper mantle.

The key constraints for this project versus 'normal' offshore operations are the extreme water depths where drilling and coring operations need to be conducted, the extreme high temperatures present in very hard igneous rocks that push the limit of all the drilling and coring tools, and special procedures that are routinely used in less demanding environments.

The study reviewed and compared different marine drilling riser options and subsea equipment that are currently available in the ultra-deepwater industry and showed that the Chikyu could conduct drilling and coring operations through the deep seawater column with some component upgrades or modifications. The study also investigated the current state-of-the-art drilling and coring methods and instruments for high temperature igneous rocks, and current limitations and design efforts that would be needed to reach the mantle. Finally, a base case wellbore configuration was developed and preliminary estimates were made of the amount of time it would take to drill/core to the mantle and how much it would cost.

The study concluded that offshore drilling and coring are mature technologies and many commercial tools are currently available from several industries (oil and gas, mining, and aerospace). However, to reach extreme depths in the oceanic crust, while drilling and coring in very hard hot rocks and operating in ultra-deep water, require the use of the most recent tools and techniques. In addition, technologies and techniques are continuously advancing and can be expected to continue to close the gap between what is required for the 'Mohole Project' and what is currently possible.

The results of the study showed that drilling/coring a scientific hole into the upper mantle is certainly feasible, and there are existing solutions to many of the technological challenges based on work being done in the oilfield and geothermal industries. In fact, a hole could be drilled "today" at the Hawaii location because it has the lowest bottom-hole temperature of the three candidate locations.

The key conclusions from the study were:

- 1. There are existing solutions to the riser design issues.
- 2. There are existing solutions to the drill-string design issues.
- 3. A key issue would be the development of down hole tools capable of withstanding the extreme down hole temperatures.



4. A key issue would be the development of bits with improved bit life since this will have a huge impact on the operational cost and also improved core techniques that could result in faster coring rate.

The following sections summarize of some of the key topics that were addressed in the study.

2.1.1 Candidate Locations

Three potential well-site locations are being considered as shown in the following map.

- <u>Location A Cocos Plate</u>: this area encompasses a region of the Cocos Plate off Central America from Guatemala to northern Costa Rica and is the location of the 1256D site.
- <u>Location B Baja</u>: this area encompasses a region of the eastern Pacific plate located off Baja / Southern California.
- Location C Hawaii: this area is located off the northeastern cost of Oahu.

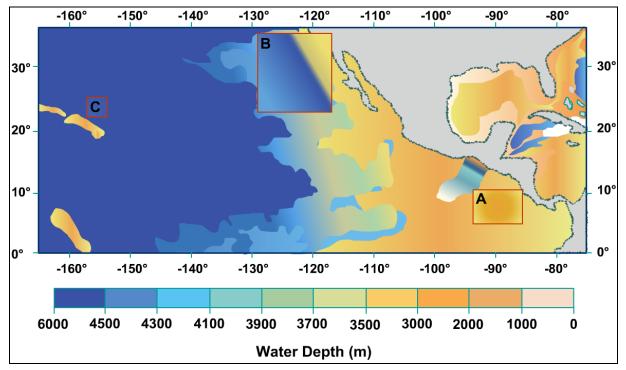


Figure 1. Bathymetric Map of Candidate Well Site Locations



	Location A: C	ocos Plate	Location B: Ba	ija California	Location C: Hawaii		
	This Area Encompas the Cocos Plate off (from Guatemala to I Rica.	Central America Northern Costa	the Eastern Pacific	This Area Encompasses a region of the Eastern Pacific Plate Located off Baja/ Southen California.		cated off the ost of Oahu.	
Water Depth :	3,650m	11,975ft	4,300m	14,108 ft	4,050m	13,287ft	
Penetration(bsf) :	6,250m	20,505ft	6,100m	20,013 ft	6,700m	21,982 ft	
Total Depth (brf) :	9,900m	32,480ft	10,400m	34,121 ft	10,750m	35,269 ft	
Crustal Age :	15 - 19 Ma	32,480ft	20 - 30 Ma		78 - 81 Ma		
Est. Moho Temperature:	≥ 250°C	482°F	200 - 250°C	392 - 482°F	±150°C	302°F	
Sediment Thickness :	250-300m	820-984 ft	80 - 130°m	262-427 ft	±200m	392 ft	
Latitude :	67-87°N		25 - 33°N		229 - 239°N		
Longitude :	89.5-91.9°W		120 - 127°W		154.5 - 155.8°W		
Analog Holes :	1256D		None		None		
Nearest Port :	Puerto de Caldera, Costa Rica, Port of Corinto, Nicaragua	±644 km (400 miles)	Long Beach, San Diego, Puerto de Ensenada Mexico	±800 - 1000km (500-620 miles)	Honolulu Harbor, Oahu	±400km (250m)	
	shallowest Wa	ater Depth	Wide Water D	epth Range	Lowest Moho	Temperature	
Advantages	Well Known	Tectonics	Moderate Moho	Temperature	Nearby Port	Facilities	
	Previous Expedit	ion Experience					
	Highest Moho T	emperature	Few Data	Available	Deepest To	tal Depth	
Disadvantages			Off Ridge V	olcanism	Near Large	Hotspot	
			Deepest Wa	ter Depth	Arch Volc	anism	

Figure 2. Candidate Location Comparison

2.1.2 Marine Drilling Riser Analysis

Several different types of analysis were performed to assess the current limitations of the steel marine drilling riser which is onboard the Chikyu drilling vessel, and to investigate different riser design options, configurations and materials that could be viable options for operating in the expected ultra-deep water depths. For this preliminary analysis, the work was mainly focused on determining the required tension set by the drilling rig tensioning system and the loads seen by the marine drilling riser over the full column of seawater (between 3650 and 4300 meters) while the drilling riser is in a 'connected' mode (marine drilling riser is connected to the BOP with the LMRP). The different options that were investigated are listed below.



- Current Chikyu marine drilling riser
- Current Chikyu marine drilling riser bare joints with lighter buoyancy modules
- Titanium marine drilling riser
- Slim marine drilling riser
- Hybrid marine drilling riser
- Current Chikyu marine drilling riser with 2 more tensioners

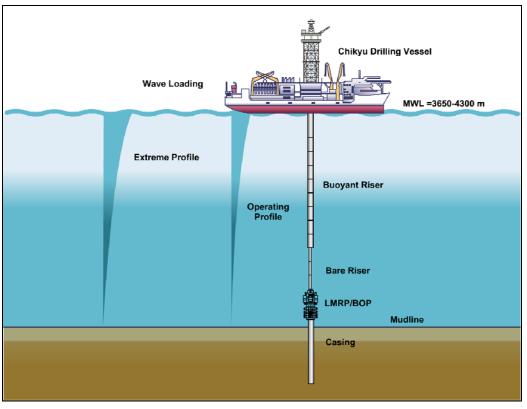


Figure 3. Marine Drilling Riser Configuration

The results of this work are summarized in the following below lists the limitations and benefits for each of the six drilling riser configurations that were analyzed. Mud weight value limits in specific gravity (S.G.) are provided, and "OK" means that a mud weight greater than 1.7 S.G. can be used with the drilling riser configuration at the noted location.



Water Depth	Maximum Fluid S.G.	Current Chiyu Drilling Riser	Steel Riser With Lighter Buoyency Modules	Titanium Riser	Slim Riser (16" OD)	Hybrid Riser (Steel + Titanium)	Current Chikyu Drilling Riser with 8 Tensioners
ater Depth (3650 m)-Cocos Plate	Maximum Drilling Fluid (S.G.) in Riser if 1 Tensioner is lost=	OK up to 1.3 SG	OK up to 1.45 SG	ок	ок	OK up to 1.55	ок
Water Depth (3650 m)-Cocos Plate	Maximum Drilling Fluid (S.G.) in Riser if API Maximum Allowable (90%)=	OK up to 1.55 SG	ок	ок	ок	ок	ок
er Depth (4050 m)- Hawaii	Maximum Drilling Fluid (S.G.) in Riser if 1 Tensioner is lost=	OK up to 1.2 SG	OK up to 1.35 SG	OK up to 1.65 SG	ок	OK up to 1.43	ок
Water Depth (4050 m)- Hawaii	Maximum Drilling Fluid (S.G.) in Riser if API Maximum Allowable (90%)=	OK up to 1.45 SG	OK up to 1.65 SG	ок	ок	ок	ок
Water Depth (4300 m)- Baja California	Maximum Drilling Fluid (S.G.) in Riser if 1 Tensioner is lost=	Not OK	OK up to 1.2 SG	OK up to 1.55 SG	ок	OK up to 1.35	OK up to 1.55 SG
Water De m)- Baja (Maximum Drilling Fluid (S.G.) in Riser if API Maximum Allowable (90%)=	Not OK	OK up to 1.45 SG	ок	ок	ок	ок

Figure 4. Summary of 6 Riser Options Analyzed for the 3 Locations

As is illustrated, existing technologies, components and materials available in the ultradeepwater industry should enable the Chikyu drilling vessel to conduct offshore operations in water depths ranging between 3650 and 4300 meters off Baja, Cocos and Hawaii.

Note that some drilling riser options such as aluminum drilling riser and composite materials drilling riser were not analyzed because of their technology maturity and relative low interest for specific drilling riser applications. Therefore, at the time, reliable data could not be found to run detailed analyses.

To help comparing and ranking the different drilling riser options, three independent criteria were identified:

- Technology maturity ranging from "emerging" to "very mature"
- Capital cost ranging from "low" to "high"
- Easiness to design, construct and maintain the riser system option ranging from "easy/flexible" to "difficult"

In order to rank the marine drilling riser options, a Boston Square Matrix (BSM) which allows consistent ranking with the several criteria can be used. For this application, it includes capital cost on the "x" axis, easiness to design, construct, and maintain on the "y" axis, and technology maturity using four different circle sizes ranging from small for "emerging" to large for "very mature". The figure shown below ranks the different marine drilling riser options as of mid-2011. Current research and development programs and oil and gas operations field trials may cause these ranking to change in the future.



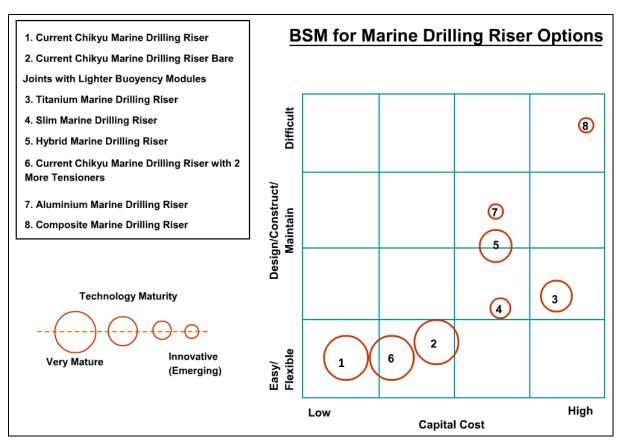


Figure 5. Boston Square Matrix Ranking of Riser Options

2.1.3 Well Design Assumptions

A key objective of this study was to investigate the operational time and cost implications of the main scientific coring methods being considered by the IODP such as continuous coring of the entire hole, long core intervals of key sections, or spot coring, as described in their 2011 Mohole workshop report. In order to do this, some assumptions had to be made about the fundamental down-hole conditions that impact the design of a well. It was recognized that most of the information about the down hole conditions is presently unknown. However, after discussions with the IODP, it was agreed that the assumptions discussed below are reasonable, or at least not unreasonable for the feasibility study work.

A cross-section showing the general stratigraphy / lithology that can be expected is shown below in Figure 6 which is based on information published by the IODP from their 2010 Mohole workshop report. The three main scientific coring methods (A, B and C) being considered are also shown. Note that a method D option was added which consists of drilling to the Moho and then just coring the Mantle to provide a comparison with method A.



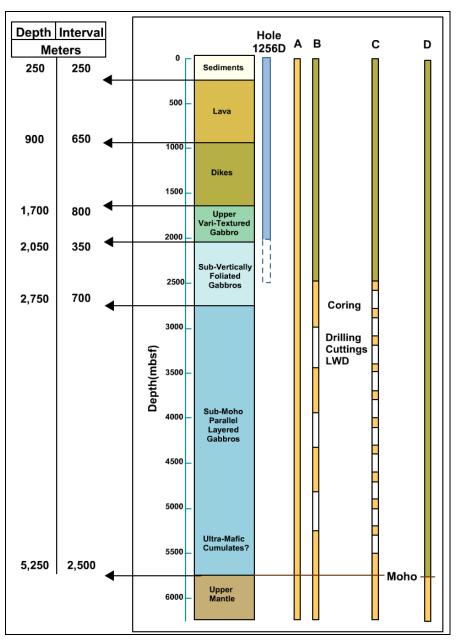


Figure 6. Assumed General Stratigraphy for the 3 Well Locations

From this, an assumed stratigraphic / lithologic column was developed for the three candidate locations as shown below.



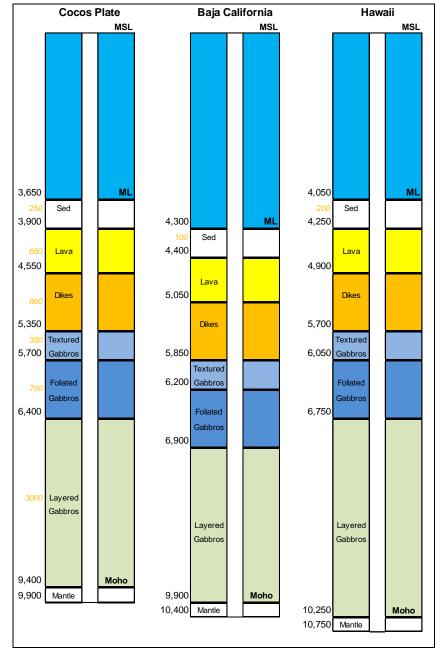


Figure 7. Assumed Lithological Column for Each Location

The assumed down hole temperature profiles for the candidate locations are shown below. The maximum bottom hole temperature (BHT) estimate is based on previous models of formation burial depth and age as provided by the IODP. The profiles are based on the water depth, available temperature measurements made during operations at the 1256D site, and the estimated BHT. The uncertainly in the BHT estimate is believed to be $\pm 50^{\circ}$ C. Therefore, a maximum expected temperature of 300°C was used for design and planning purposes.



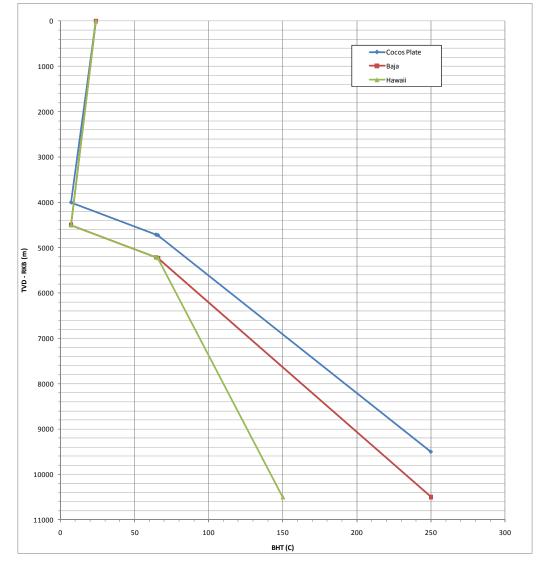


Figure 8. Assumed Geothermal Temperature Profiles

The wellbore is "unequivocally" expected to be normally pressured (1.03 SG / 8.66 ppge in oilfield units) to total depth. As such, the presence of abnormally pressured intervals, which is typically a critical design consideration, will not be an issue. Therefore, casing point selection will be done on the basis of wellbore stability. The figure below shows the assumed pore pressure (Pform), formation fracture (FG), and overburden gradients that were used for this study. The overburden gradient (OBG) is assumed to be 22.6 kPa/m (1.0 psi/ft) which is a common oilfield assumption for sedimentary basins and represents a conservative minimum case since the OBG in igneous rocks will be higher. The FG was then assumed to be 95% of the OBG.



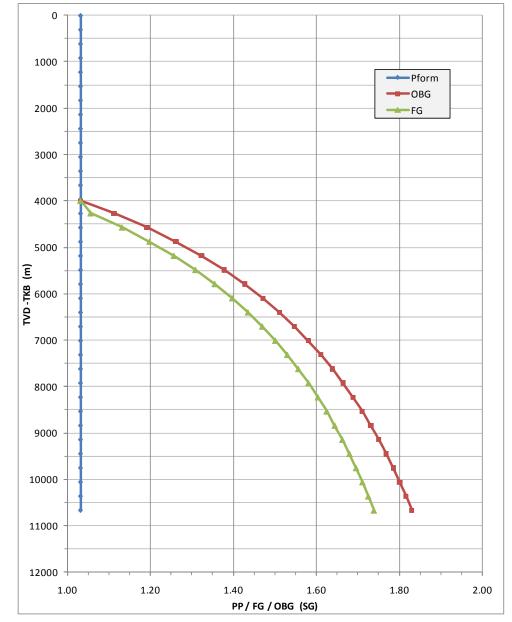


Figure 9. Assumed Down Hole Formation Pressure Profile

The other key assumptions that were used in developing the operational time and costs estimates are shown below.



• Coring and drilling rate of penetration (ROP) assumptions which were based largely on the experience at the 1256D site.

Stratigraphy	Coring	Drilling	
Sediments	3.0	15.2	m/hr
Lava	1.5	3.0	m/hr
Dikes	1.5	3.0	m/hr
Textured Gabbros	1.2	2.4	m/hr
Foliated Gabbros	1.2	2.4	m/hr
Layered Gabbros	0.9	1.5	m/hr
Mantle	0.9	0.0	m/hr

- An average bit life is 50 hours in the "upper" part of the well and 35 hours in the "lower" part of well was assumed.
- The bit trip time was assumed to be 305 m/hr (1,000 ft/hr) which is an oilfield rule of thumb and probably somewhat conservative for the Chikyu.
- The RCB wire-line trip time was estimated using the following historical data provided by IODP.

Depth	W/L Ops Time for One Core Barrel
(mBRT)	(hr)
4000	2.45
5000	3.05
6000	3.65
7000	4.25
8000	4.85
9000	5.45
10000	6.05

• Based on previous IODP experience, an average of 5% non-productive time (NPT) or trouble time is assumed to account for unexpected down-hole related problems when developing operational time estimates. This excludes weather or rig equipment related NPT.

2.1.4 Base Case Well Design Development

In most deepwater wells the presence of abnormal pressure is a fundamental criteria for determining casing points and the drilling mud density required to reach total depth (TD). Because abnormal pressure is not an issue for a Mantle well, the selection of casing points and mud weights will be based on wellbore stability considerations. In other words, a safe operating mud weight window needs to be defined that will offset the stress concentrations that are generated in the surrounding rock as it is drilled which can cause mechanical instability of the rock. If the mud weight is too low, the hole will essentially collapse due to a compressive shear failure in the rock. Too high a mud weight will cause lost circulation due to a tensile fracturing of



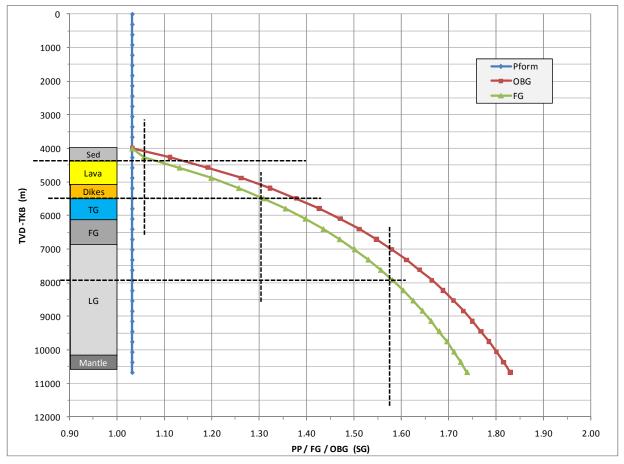
the rock. The formation pressure estimate previously discussed was be used to provide some initial insight around possible mud weights that could be used and the selection of casing points.

In general, higher mud weights are needed to prevent the hole from collapsing so casing points need to be selected that maximize the fracture pressure of the formation allowing higher mud weights to be used. However a trade-off must be made between the allowable mud weights and the number of casing strings that are used. There are only so many casing strings that can fit in a well, and running multiple strings is time consuming, costly, and complicates the geometry of the well.

The casing points assumed for this study are shown in Figure 10. The basic logic is that the surface casing needs to be set near the base of the sediments in order to help provide structural support for the well. Furthermore, experience from IODP's operations on the 1256D hole has shown that the lava and dikes interval can be successfully drilled / cored with seawater so arguably, there is no need to set casing in this interval. Therefore, setting the second string of casing at the base of the dikes would allow the subsequent interval to be drilled with a higher mud weight. The depth needed for the next casing string is speculative, but arguably, at least a third string would be need to be set into the Layered Gabbros section in order to case off and protect the upper part of the hole, and to allow a higher mud weight to be used to reach the total depth (TD) of the hole.

Note that the point where the horizontal dashed lines intersect the FG curve represents the maximum allowable mud weight for the subsequent borehole interval. Exceeding this maximum would result in a risk of lost circulation, so the actual mud weight used to drill/core with would be somewhat less than the maximum.





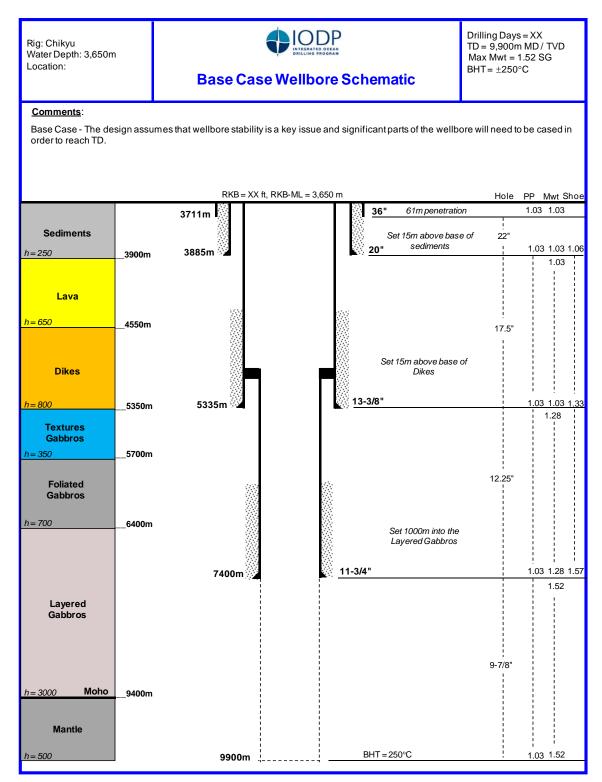
Implementation Plan for the BEAM - "Borehole into the Earth's Mantle" Program

Figure 10. Casing Point Selection Assumption for the Base Case

While the casing points selected seemed reasonable at this stage, there are any number of permutations of casing points and mud weights. As such, the mud weight requirements are probably the single most important variable impacting the well design. Mud weight also has a significant impact on the riser design as was discussed previously

After selecting the casing points, a base case wellbore configuration was developed as shown below. Standard size casing diameters are used and the well is "TD'd" with a 9-7/8" hole size.







2.1.5 Operations Time and Cost Estimate

Operational time estimates for four different scientific drilling cases were developed for each of the candidate locations. The cases are similar to the IODP's options A, B and C as described in their 2011 Mohole workshop report.

- <u>Case 1:</u> Assumes that the hole is continuously cored to TD. This would be the ideal situation as it would maximize the amount of scientific information obtained from the hole. It is also the most expensive.
- <u>Case 2</u>: Assumes that long sections of continuous core are taken across the major lithologic and geophysical transition intervals of key sections. For the time estimate it was assumed that the upper third of each main stratigraphic interval was cored, the middle third was drilled and the lower third was cored.
- <u>Case 3</u>: Assumes that only spot coring is done during the last 10m of hole before each bit trip.
- <u>Case 4</u>: Assumes that the hole is drilled to the Moho and that the mantle is cored. This was done as a comparison to Case 1 since it represents the least expensive case.

Candidate	Water	Total	TD		Operation	al Time ((days)		Ops	Project
Location	Depth	Depth	BSF	Core/Drill	Bit Trip	W/L	Flat	NPT	Time	Time
Cocos Location										
Case 1	3650	9900	6250	216	261	186	33	34	696	756
Case 2	3650	9900	6250	184	234	112	34	28	564	617
Case 3	3650	9900	6250	155	187	51	40	21	433	480
Case 4	3650	9900	6250	144	172	26	33	18	374	418
Baja Location										
Case 1	4300	10400	6100	236	300	238	33	40	807	866
Case 2	4300	10400	6100	197	259	147	38	32	642	693
Case 3	4300	10400	6100	157	160	58	31	20	405	445
Case 4	4300	10400	6100	143	183	27	33	19	386	425
Hawaii Location										
Case 1	4050	10750	6700	260	319	264	33	43	876	934
Case 2	4050	10750	6700	214	285	155	34	34	688	737
Case 3	4050	10750	6700	172	177	63	36	22	448	485
Case 4	4050	10750	6700	157	204	28	33	21	422	443

The following table shows a summary of the operational time estimates for each of the 12 cases that were prepared.

Figure 12. Initial Operational Time Estimates Summary for the 3 Locations

The order of magnitude costs for the various cases that were evaluated for the three candidate locations are shown in the table below. It was assumed that the intangible daily operating cost



for a typical commercial drill-ship are \$1 million/day. An estimate of the tangible cost which range between \$7 to \$10 million for a high-pressure deepwater well in the Gulf of Mexico requiring multiple casing strings were not considered for this study.

Candidate	Water	Total	TD	Ops	Project	Project
Location	Depth	Depth	BSF	Time	Time	Cost
Cocos Location						
Case 1	3650	9900	6250	696	756	\$756,000,000
Case 2	3650	9900	6250	564	617	\$617,000,000
Case 3	3650	9900	6250	433	480	\$480,000,000
Case 4	3650	9900	6250	374	418	\$418,000,000
Baja Location						
Case 1	4300	10400	6100	807	866	\$866,000,000
Case 2	4300	10400	6100	642	693	\$693,000,000
Case 3	4300	10400	6100	405	445	\$445,000,000
Case 4	4300	10400	6100	386	425	\$425,000,000
Hawaii Location						
Case 1	4050	10750	6700	876	934	\$934,000,000
Case 2	4050	10750	6700	688	737	\$737,000,000
Case 3	4050	10750	6700	448	485	\$485,000,000
Case 4	4050	10750	6700	422	443	\$443,000,000

Figure 13. Project Cost for Each Case and Each Location

<u>Note</u>: For accounting purposes (depreciation and taxes), the cost for oil and gas wells are classified as being either intangible or tangible. Intangible costs are basically for non-salvageable items such as labor, drilling rig time, drilling fluids, services, etc. These costs, which are typically charged on a daily basis, account for some 70 to 80% of the total well cost. Tangible costs are basically salvageable items such as the wellhead and tubulars.

2.2 High Impact Systems Study Overview - 2012

In February 2012, IODP-MI requested that Blade conduct a study to identify and investigate equipment and services that could substantially decrease drilling time and risk when drilling to earth's mantle. The objectives of this study were to identify the original equipment manufacturers and service companies that provide rock drill bits and coring, and investigate the status of their technologies today, what technological improvements they may reveal for mantle quest application by 2017, and what suggestions they offer to accelerate technological development between now and 2017.

More specifically, the goals of study were to address the following:

- Review the mechanics of hard rock drilling.
- Identify current rock drill bit equipment and services.
- Investigate potential technological gaps and improvements that will enable rock drill bits to stay on-bottom longer, decreasing drilling time and risk.
- Identify current rock coring systems and services.
- Investigate possible development of new rock coring systems to improve the quality and quantity of cores recovered in order to satisfy the scientific objectives.
- Provide a recommendation of the most efficient and most viable drill bits and rock coring systems for a possible mantle drilling project start date in 2017-2018.
- Provide an estimate of how the designers, manufacturers, and service companies of such equipment and services may accelerate their technological offerings, including an estimate of the technological improvement costs to IODP and the scientific community.
- Identify additional high-impact equipment and services where technological improvements will also reduce project time and risks.

Blade had extensive discussions with 19 different service companies that provide a wide range of services to the oil and gas industry. The study investigated hard rock drilling failure mechanisms, and how hard rock drilling performance is optimized in the oil and gas business. This included discussions with the major oil and gas provider of bits, coring services, and down hole tools to evaluate the hard rock drilling and coring technology that currently exists within the oil and gas industry and to understand where and how the technology will be trending in the future. Discussions were also held with the various marine raiser manufacturers to investigate the various riser options in more detail.



			Roa	u IVI	ар				
	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	
	program year 6	program yr 7	pgm yr 8	pqm yr 9	pqm yr 10	NEW IODP yr 1	pgm yr 2	pqm yr 3	
	Si	te characterization: c	rust/mantle scale		Site decision	D	etailed site surve	eys	
TODD			and person of the second s	Scoping Group		· · · · · · · · · · · · · · · · · · ·	anagement Team	600 CC	
IODP	Community-wide international workshop on scientific drilling in 2013-23	INVEST Report; International Workshop MoHole, Japan	Initial feasibility study		Conceptual Design Detailed Design		Project Management		
Sloan Foundation- IODP-DCO		Mantle Frontier International Workshop	Initiate Project Scoping Office; prepare for conceptual design	Project Scopin	g Office	e Project Management Office			
	Domestic efforts for h	l yper-deep water deep	o drilling technology	development	Forma start	Platform operators' preparations	Operation procure		
Project executioin						-		V 8	
Project executioin	EV2017	FV2018	EV2010	EV2020	EV2021	FY2022	EV2023	FV2024	
Project executioin	FY2017	FY2018	FY2019	FY2020 Preparatio	FY2021	FY2022 Observatory	FY2023	FY2024	

Figure 14. Mantle Project Road Map

The key conclusions and recommendations from this study were as follows.

- The major bit and coring system service providers have a great deal of experience with difficult hard rock drilling environments in the oil and gas industry. They currently all have products that could improve current IODP drilling performance. Perhaps more importantly, they all have the design, testing, manufacturing, analysis, and technical support capabilities needed to develop optimized solutions for difficult drilling conditions.
- It was not practical to recommend a specific bit type or coring system for a mantle hole mainly because optimizing performance is more than just selecting a bit. Optimizing performance requires a systems level approach that considers bit design, drill string mechanics, bottom hole assembly and drill string design, hydraulics, drilling fluids and so on. In addition, there are a variety of potentially viable options that need to be considered that, for example, range from conventional drilling, to using a bit and a down hole motor, to using a diamond impreg bit and a down hole turbine, and so on.
- Achieving success on a mantle hole will involve more than just selecting a promising looking bit and running it. It was felt that IODP should partner with 1 or 2 of these service companies in order to take advantage of the full range of experience and services they can provide during both the planning and operational phases of the project.

BEAM Project - Implemetation Plan Final Report, Rev 001, 14July2013



Blade further recommends that NOV be one the companies because they have the most familiarity and understanding of the technical issues and have expressed the most interest in the project.

• Working closely with a service company to develop an optimized solution to the mantle hole challenges can significantly reduce both the operational time and risk associated with the project.

The following sections summarize some of the key topics that were addressed in the study.

2.2.1 Review of Hard Rock O&G Drilling Services

The main focus of Blade's work for this project was to evaluate the hard rock drilling and coring technology that currently exists within the oil and gas industry and to understand where and how the technology will be trending in the future. Meetings were held with the major oil and gas service providers to introduce the BEAM project, get information about their current product offerings and their technical development efforts, and to identify their ability and willingness to provide technical support to the BEAM project. Meetings were held with the following service companies:

- National Oilwell Varco (NOV) who provides Reed and Hycalog bits
- Baker Hughes provides Hughes Christensen bits
- Halliburton who provides Security and DBS bits
- Schlumberger who provides Smith bits
- Ulterra who provides their own Ulterra bit product line

The key highlights from these meetings are as follows:

- All the companies were generally interested in the BEAM project, NOV and Ulterra in particular.
- Not surprisingly, each company also expressed concerns over "what's in it for me" to some degree.
- All the companies believe that they have current products that would improve performance by 30 to 50% compared to current scientific drilling practices and results.
- All the companies have active ongoing technology development programs that will result in new products on the market well before the nominal 2018 start date for the BEAM project.
- All the companies have extensive experience with hard rock, and high temperature drilling and coring applications within the oil and gas industry including basalt.

A summary of the products and services that each of these service companies can provide is provided in the following table.



Capabilities	NOV	Baker Hughes	Halliburton	Schlumberger	Ulterra
Roller Cone Bits	Yes	Yes	Yes	Yes	No
Fixed Cutter Bits	Yes	Yes	Yes	Yes	Yes
Conventional Coring	Yes	Yes	Yes	Yes	No
Wireline Retrievable Coring	Yes	Yes	Yes	Yes	No
Down-Hole Tools	Yes	Yes	Yes	Yes	No
High-Temperature Tools	Yes	Yes	Yes	Yes	No
Hard Rock Drilling Experience	Yes	Yes	Yes	Yes	Yes
Hard Rock Coring Experience	Yes	Yes	Yes	Yes	No
Performance Modeling Software	Yes	Yes	Yes	Yes	Yes
Bit Testing/Development Facility	Yes	Yes	Yes	Yes	No

Figure 15 - Service Company Capability Summary

The overall results of Blade's investigations show that the major oil and gas industry bit and coring service providers have extensive hard rock experience that includes drilling in basalt. In addition, they currently offer products and services that would provide an improvement in bit and coring performance compared to current scientific drilling practices and results. It is also important to remember that drilling performance is more than just bit selection. Optimizing performance involves a systems view approach that includes the bit, the bottom hole assembly and drill string design, drilling parameters selection, drilling fluids system and so on. As such, these companies also have the technical expertise and support capabilities to develop custom drilling systems solutions to optimize drilling and coring performance.

Bit performance is characterized by the interaction between the bit design and the associated rock failure mechanism, type of rock being drilled, the bottom hole assembly (BHA) design, and the drilling practices being used (i.e. weight on bit, rotational speed, hydraulics, etc...). If one assumes that the optimum drilling practices are being utilized, then drilling efficiency becomes a function of the following bit performance characteristics.

- Durability defined as the bit's ability to resist abrasive wear, teeth or cutter wear, body erosion, and thermal damage. Improving durability typically tends to reduce the bit's performance or rate of penetration.
- Stability defined as the bit's ability to either resist or initiate BHA initiated lateral, torsional, and axial vibrations which can cause severe damage to the bit.
- Steerability defined as the bit's tendency to drill in the desired direction, or conversely, the bit's tendency not to "walk" or deviate the direction of the wellbore in an undesired lateral direction, or cause an undesired deviation of the hole angle.
- Aggressivity is defined as the rate of penetration (ROP) or how fast the bit drills based on the bit's response to an externally applied axial force, or the weight on bit (WOB).

Each of the parameters can be adjusted through modifications to the bit design. For example, stability and durability in a PDC bit can be improved with the addition of more blades. Vibration can be reduced by adjusting the number of cutters that are in contact with the formation at any one time. However, maximizing the effectiveness of one parameter can adversely impact the other parameters. For example, increasing the number of blades complicates the positioning of

the nozzles which is critical for keeping the blades clean. Also, maximizing the bit's durability will usually reduce its performance or ROP.

The parameters are therefore interdependent from the standpoint that changing one parameter will impact the others sometimes unfavorably. The key to optimizing bit performance is the to determine which parameter(s) is the most important to achieve the goals of the hole interval to be drilled, and then to adjust the bit design to maximize that effectiveness of that parameter, while at the same time, minimizing the potential adverse effects on the other parameters.

As has been noted, the types of bits used today to drill hard rock formations are roller cone bits, diamond impregnated bit and PDC bits. Roller cone bits fail the rock through compression and generally have good steerability and aggressivity. However, high bit weights are needed to overcome the high compressive strengths found in hard rock formations. High bit weights and the rotation of the bit's cones can severely limit the life of the bearings, cause brittle fracture of the cutters, and result in an overall decrease in durability.

Diamond impregnated bits fail the rock by shearing a very fine layer of the formation which is known as "plowing", and generally have good steerability, durability, and stability. However, because only a fine layer of formation is cut at one time, these bits have a significantly lower ROP than the other two types. These bits are typically run with high RPM down-hole turbines in order to compensate for the low efficiency of the cutting elements and increase the ROP. However the inclusion of a turbine in the BHA increases the risk of an unplanned trip in the event of a failure of the turbine.

PDC bits fail the rock through shearing relatively large sections of the rock. This is the most efficient method of mechanically failing rock because the shear strength of the rock is roughly half of its compressive strength. However, PDC bits can have poor stability and be very susceptible to brittle fracture under high loads as well as thermal fatigue at high temperature when instability is present. In addition, their performance is sensitive to improper drilling practices. Conversely, the very nature of these bits allows a great deal of flexibility for adjusting or modifying the performance characteristics parameters so that the above limitations can be designed out of a particular PDC bit used for a particular application. With proper cutter selection, cutting structure design, torque control component design, and hydraulic design, PDC bits can provide the optimum balance between durability, stability, steerability and aggressivity thereby maximizing bit performance. It can be argued that roller cone and diamond impregnated bits need to be used only when a PDC cannot be properly designed.

2.2.2 Revised Operational Time Estimate

Based on the results of these discussions, which included NOV's unconfined compressive strength (UCS) testing on a core sample from 1256D, Blade was able to revise the mantle hole drilling time estimates that were initially provided in 2011 feasibility study to reflect what is possible using the technology currently available in the oil and gas industry.

From the UCS testing results and NOV's experience in drilling basalts and hard carbonate formations with UCS values greater than 50,000 ksi, NOV provided the following estimates of drilling penetration rates and bit life that would be ideally achievable for a mantle hole using a fixed cutter PDC bit and a PDC bit run on a down hole motor.



Hole Section	Rate of Pe	netration (ft/hr)	Rate of Per	Bit Life		
Hole Section	Ideal Bit	Ideal Bit/Motor	Ideal Bit	Ideal Bit/Motor	(hours)	
Upper part of the hole :	70.0	100.0	21.3	30.5	110	
Lower part of the hole :	50.0	70.0	15.2	21.3	70	

	Estimated Ideal ROP's	Based on Current	Technology
Figure 10.	Estimated lucal NOP S	Daseu on Current	recimology

NOV further estimated that the coring penetration rates assumed in the 2011 feasibility study could be improved by around 30%. Note that these values are broadly consistent with the statements made by the other service companies.

In order to account for the uncertainties that remain about the drilling conditions in a mantle hole and the fact that more detailed work on the bit designs will be needed, Blade has used ROP values that are more conservative than the "ideal bit" values noted above. Despite this, the revised operational time estimates still demonstrate the significant improvement even relatively modest increases in ROP can have on the overall operational time. The bit life estimates provided by NOV were still used because there is less uncertainty around the durability of today's bits than what the actual ROP might be. A comparison between the revised ROP's used for this project compared to the ones used for the 2011 feasibility study is shown below.

Stratigraphy	2011 Feas	ibilty Study	2012 BE		
Stratigraphy	Coring	Drilling	Coring	Drilling	
Sediments	3.0	15.2	4.0	21.3	m/hr
Lava	1.5	3.0	2.1	9.1	m/hr
Dikes	1.5	3.0	2.1	9.1	m/hr
Textured Gabbros	1.2	2.4	1.5	9.1	m/hr
Foliated Gabbros	1.2	2.4	1.5	3.0	m/hr
Layered Gabbros	0.9	1.5	1.2	3.0	m/hr
Mantle	0.9	0.0	1.2	0.0	m/hr
Upper Hole Bit Life	50	hours	110	hours	
Lower Hole Bit Life	35	hours	70	hours	

Figure 17: 2012 Operational ROP's Assumptions

Revised operational time estimate were done for Cases 2 and 4 for the Hawaii location since this location will require the most drilling/coring time. Cases 2 and 4 adequately illustrate the philosophical differences between the amounts of time spent coring versus time spent drilling.

The following table compares the operational time estimates from the two studies. The overall project includes the mobilization and demobilization to and from the location. Note the significant reduction in time using the revised estimates of ROP.

Location	Case	2011 Feas	ibity Study	2012 High Im	pact Study	Difference		
LOCATION	Case	Core/Drill	Project	Core/Drill	Project	Core/Drill	Project	
Hawaii	2	688	737	460	497	228	240	
	4	422	458	224	234	198	224	

Figure 18. Operational Time Comparison 2011 vs. 2012 Study F	Results (days)
--	----------------



Hawaii Location **Case 4 Drilling Curve** 2012 BEAM Project Time Estimate MSL Moho 2011 Feasibility Study Time Estimate Measured Depth (m) Total Project Time = 458 days Total Drill/Core Time = 422 days Project Days

This difference is further illustrated in the following drilling curve comparison for the Case 4 example.

Figure 19. Case 4 Drilling Curve Comparison 2011 vs. 2012 Study Results



2.2.3 High Temperature Downhole Tools

Currently, the temperature rating for high temperature MWD and LWD tools is around 180°C (300°F). The bottom-hole temperature for Hawaii location is estimated to be around 150°C (300°F). The temperature at the other two locations are expected to be as high as 250°C (480°F). This exceeds the temperature ratings of most of the down hole tools that are presently commercially available. The industry is, however, focusing on developing tools with higher operating temperatures in response to trends towards drilling in higher temperature environments. The rate of improvement in down hole component temperature rating in the next 3-4 years may see a next generation of tools that are capable of operating in temperatures as high as 250°C.

Figure 20 shows Weatherford and Halliburton's current selection of high temperature tools. Figure 21 shows a list of high temperature tools that are currently under development.

			HIGH PRES	SURE / TEI	MPERATU	RE TOOLS	5	
	9-1	/2"	8-1	8-1/4"		/4"	4-3/4"	
TOOL	Pressure (psi)	Temp (°F / °C)						
RSS Systems	25,000	350°F 180°C	25,000	350°F 180°C	30,000	350°F 180°C	30,000	350°F 180°C
MWD / Pulser	25,000	350°F 180°C	25,000	350°F 180°C	30,000	350°F 180°C	30,000	350°F 180°C
Bore / Annular Pressure	25,000	350°F 180°C	25,000	350°F 180°C	30,000	350°F 180°C	30,000	350°F 180°C
Spectral Azimuthal Gamma Ray					20,000	330°F 165°C	20,000	330°F 165°C
Azimuthal Gamma Ray	25,000	350°F 180°C	25,000	330°F 165°C	30,000	350°F 180°C	30,000	350°F 180°C
Multi Frequency Resistivity	25,000	350°F 180°C	25,000	350°F 180°C	30,000	350°F 180°C	30,000	350°F 180°C
Azimuthal Density			25,000	330°F 165°C	30,000	330°F 165°C	30,000	330°F 165°C
Thermal Neutron Porosity			25,000	330°F 165°C	30,000	330°F 165°C	30,000	330°F 165°C
Sonic	25,000	330°F 165°C	25,000	330°F 165°C	30,000	330°F 165°C	30,000	330°F 165°C
Formation Pressure Tester			25,000	330°F 165°C	30,000	330°F 165°C	30,000	330°F 165°C

Figure 20. Current High Pressure / Temperature Down-hole Tool Ratings



	XHIGH PI	RESSURE / T	EMPERATU	RE TOOLS	
	6-3	/4"	4-3/4"		
TOOL	Pressure (psi)	Temp (°F / °C)	Pressure (psi)	Temp (°F / °C)	
RSS Systems					
MWD / Pulser	30,000	375°F 190°C	30,000	440°F 230°C	
Bore / Annular Pressure	30,000	375°F 190°C	30,000	375°F 190°C	
Spectral Azimuthal Gamma Ray					
Azimuthal Gamma Ray	30,000	375°F 190°C	30,000	440°F 230°C	
Multi Frequency Resistivity	30,000	390°F 200°C	25,000	390°F 200°C	
Azimuthal Density	30,000	390°F 200°C	25,000	390°F 200°C	
Thermal Neutron Porosity	30,000	390°F 200°C	25,000	390°F 200°C	
Sonic					
Formation Pressure Tester					
True Vibration Monitor	30,000	375°F 190°C	30,000	375°F 190°C	

Figure 21. High Temperature Tools Under Development

2.2.4 Marine Drilling Riser

High strength steel (i.e. 80 ksi) is currently the most widely used material for deepwater drilling and drilling riser systems. However, when drilling in water depths around 3,000m with relatively high drilling fluid densities (i.e. 1.7 to 2.1 SG), the technical limit of existing high strength riser systems commonly manufactured with 80 ksi steel material for the riser tube, auxiliary lines, and connectors is reached.

As water depths increase beyond 3,000m and the true vertical depth of borehole below the mudline increase beyond 4500m, the external pressure due to seawater and the internal pressure due to the mud weight required to balance the deep formation pressure that are acting on the marine drilling riser may become too large. Therefore stronger materials such as X-100 steel, or titanium or composite materials may be required. Also, since stronger drilling risers will often produce heavier risers (i.e. because of the increase in the main tube wall thickness), aluminum may also be considered as an alternative to be used for the design of auxiliary lines such as hydraulic, booster, choke, and kill lines thus reduce the overall weight of the drilling riser.

Nevertheless, even though both aluminum and titanium drilling risers have been already been developed and tested, they have rarely been applied but still show great potential. Moreover, as



of today, composite materials have still not been tested or field deployed for deepwater drilling riser but has already had success for smaller diameter (i.e. 5.0 to 8.0 inches) production risers in the North Sea. Therefore, it is believed that, at least, for auxiliary lines, and because of high strength and weight saving associated with carbon fiber or carbon epoxy, composite materials may be a cost-effective solution for ultra-deepwater marine drilling riser systems. The following figure shows the different riser configurations that may be suitable for ultra-deepwater operations.

	MATERIALS	THAT MAY BE USED	FOR MARINE DRILL	ING RISERS
CONFIG	RISER MAIN TUBE	CHOKE AND KILL LINES	BOOSTER LINE	HYDRAULIC LINE
Config #1	Steel	Steel	Steel	Steel
Config #2	Aluminum	Aluminum	Aluminum	Aluminum
Config #3	Titanium	Titanium	Titanium	Titanium
Config #4	Steel	Aluminum	Aluminum	Aluminum
Config #5	Steel	Steel	Aluminum	Aluminum
Config #6	Steel	Titanium	Titanium	Titanium
Config #7	Steel	Titanium	Steel	Steel
Config #8	Steel	Carbon Fiber	Carbon Fiber	Carbon Fiber
Config #9	Steel / Carbon Fiber	Steel	Steel	Steel

Figure 22. Possible Riser Configurations for Ultra-Deepwater Operations

Figure 23 shows the advantages and drawbacks of all the riser options that are either currently available to the ultra-deepwater drilling industry or at a conceptual stage development within service companies or material science department in universities.

	MATERIALS THAT MAY BE USED	FOR MARINE DRILLING RISERS			
CONFIG	PROS	CONS			
	Easy to Design and Construct	Limited to about 10,000 feet Water Depth			
Config #1	Technology is Very Mature				
	Relatively Low Capital Cost				
	Can Drilled Through Ultra-deep Waters	Medium Capital Cost			
Config #2		Potential Corrosion and Strength Issues			
Conng #2		More Difficult to Design and Construct			
		Technology is Just Mature			
	Can Significantly Push the Limits (> 15,000 feet)	High Capital Cost			
Config #3	Can Withstand High Loads and Rough Environments	More Difficult to Design and Construct			
comig #3		Technology is Emerging			
Config #4	Lower Capital Cost Than Full Aluminum Riser	More Difficult to Design and Construct			
	Can Push the Limits (> 12,000 feet)	Technology is at a Conceptual Level			
Config #5	Lower Capital Cost Than Full Aluminum Riser	More Difficult to Design and Construct			
Conng #3	Can Push the Limits (> 12,000 feet)	Technology is at a Conceptual Level			
Config #6	Lower Capital Cost Than Full Titanium Riser	More Difficult to Design and Construct			
Conng #0	Can Significantly Push the Limits (> 12,000 feet)	Technology is also at a Conceptual Level			
Config #7	Lower Capital Cost Than Full Titanium Riser	More Difficult to Design and Construct			
Conng #7	Can Significantly Push the Limits (> 12,000 feet)	Technology is also at a Conceptual Level			
Config #8	Lower Capital Cost Than Other Hybrid Solutions	Very Difficult to Design and Construct			
Coming #0	Can Significantly Push the Limits (> 12,000 feet)	Technology is also at a Conceptual Level			
Config #9	Lowest Capital Cost Than Other Hybrid Solutions	Very Difficult to Design and Construct			
Comig #9	Can Significantly Push the Limits (> 12,000 feet)	Technology is also at a Conceptual Level			



3 Wellbore Design Revisited

In retrospect, it would seem that the Base Case wellbore configuration developed during the Feasibility Study may be overly optimistic in terms of the number of casing strings that may be needed to get to TD.

In April 2011, Expedition 335 at the 1256D Cocos Plate site had problems reentering the hole due to a washed out interval and associated ledges at around 920 mbsf. The problems included excessive drag, high torque, and 3 incidents of stuck pipe. A cement plug had to be set across the washed out section to stabilize the hole. It took 16 days to resolve the problems before being able to get back to bottom at 1,507 mbsf which took up a significant part of the time allocated for the expedition. A summary of these events is provided below.

0	HLDS 33	35 50	Expedit	ion 3	335 Op	peratio	ons					12 Apr to 1 June, 2011	
*** F	1	11	Report		De	pth	MW	m per	Hrs	Avg	Hole	Expedition 335	
ł	i	i)†	Date	Days	mbrf	mbsf	(ppg)	Day	Drlg	ROP	Size	Operations Summary	3, 313
10-}		{	19-Apr-11	1	4,570.4	925.0	8.6	0	-	_	9-7/8"	Arrive location. Position rig. PU bit (Smith F9) and BHA. TIH, Re-enter hole. TIH, tag at 925 mbsf. Work pipe f/920-925 mbsf	
15		12	20-Apr-11	2	4,568.4	923.0	8.6	0	-	-	9-7/8"	Cont work pipe on ledge. Erratic torque. W&R f/891.5-923.0 mbsf. Work stuck pipe. Pump 600 bbls total of hi-vis pills	
20		X	21-Apr-11	3	4,568.7	923.3	8.6	0	-	-	9-7/8"	Cont work pipe to 923.3 mbsf. Unable to get deeper. Pump 150 bbl hi-vis pill. POOH for more aggressive bit. PU new bit (Reed 517) and 2 JB, and TIH	
	Caliper Log		22-Apr-11	4	4,565.4	920.0	8.6	0	-	-	9-7/8"	Cont TIH. W&R from 892.1. Att to work past bridge at ~920 mbsf. Work stuck pipe. Pump 150 bbl hi-vis pill. POOH	
80 h		1	23-Apr-11	5	4,567.4	922.0	8.6	0	-	-	9-7/8"	Fin POOH. Exp 312 logs show washed out section f/920-935 mbsf. TIH w/ cementing BHA to 922 mbsf. M&P 5 bbls 16# cmt. POOH	
		Į	24-Apr-11	6	4,567.4	922.0	8.6	0	-	-	9-7/8"	Fin POOH. PU bit (Atlas HP61) and BHA and TIH. Tag bridge at 922 mbsf - no cmt. Att to W&R thru bridge. POOH	1000
²⁴⁰			25-Apr-11	7	4,567.4	922.0	8.6	0	-	-	9-7/8"	Fin POOH. PU cementing BHA. TIH to 922 mbsf. M&P 50 bbls of 15 ppg cmt. POOH	10 10
×===			26-Apr-11	8	4,567.4	922.0	8.6	0	-	-	9-7/8"	Fin POOH. PU bit (Atlas HP61) and BHA with 2 JB and TIH. Tag cmt at 882 mbsf. Drill cmt to 922 mbsf. Pumping hi-vis sweeps.	6 0 0 . 6 0 0 .
1		11	27-Apr-11	9	4,567.4	922.0	8.6	0	-	-	9-7/8"	Cont to W&R at 922 mbsf. Work stuck pipe. Cont W&R, pumping hi-vis pills	0001
- [{	1	1) I	28-Apr-11	10	4,567.4	922.0	8.6	0	-	-	9-7/8"	Cont W&R at 922 mbsf. POOH. PU new bit (Smith Q7JS-735) and TIH.	0410
∞}}			29-Apr-11	11	4,586.9	941.5	8.6	0	-	-	9-7/8"	Fin TIH to 861.4. W&R to 921.9 mbsf. Tag obstruction. Cont W&R to 941.5 mbsf. Pump 100 bbl hi-vis sweep	10000
70		}	30-Apr-11	12	5,009.3	1,363.9	8.6	0	-	-	9-7/8"	Cont W&R to 1143.2 mbsf. Had hi-torq and pump press increase. PU to 1113.6 mbsf, pump 50 bbl hi-vis pill. W&R to 1162.4 mbsf. Work stuck pipe. W&R to 1363.9 mbsg.	000
		ľ	1-May-11	13	5,152.8	1,507.4	8.6	0	-	-	9-7/8"	Cont to W&R to bottom at 1507.1 mbsf. Had 6m of hard fill. Pump 100 bbl hi- vis sweep. POOH to 890.5 mbsf. RIH to 967.3 mbsf with no drag. Spot 60 bbls 10.5 ppg mud. POOH.	0000
X90 -		1	2-May-11	14	5,152.8	1,507.4	8.6	0	-	-	9-7/8"	Fin POOH. PU cementing BHA. TIH to 960.5 mbsf. M&P 60 bbls 15# cement. POOH	Affect of
100-1			3-May-11	15	4,587.9	942.5	8.6	0	-	-	9-7/8"	Fin POOH. PU RCB assy (C-9 CB). TIH and tag at 924.0 mbsf. Cut cement cores to 942.5 mbsf	Ledges
13		Ιξŧ	4-May-11	16	5,152.5	1,507.1	8.6	0	-	-	9-7/8"	Cont coring cement to 980.9 mbsf. Drop wash barrel and wash to bottom at 1507.1 mbsf. Hole tight from 1499.6 to 1501.1. Pump 50 bbl hi-vis sweep.	
15		10	5-May-11	17	5,163.6	1,518.2	8.6	10.8	11.4	0.95	9-7/8"	Cont coring from 1507.1 to 1518.2 mbsf (new formation)]

Figure 24. Expedition 335: Summary of Reentry Problems

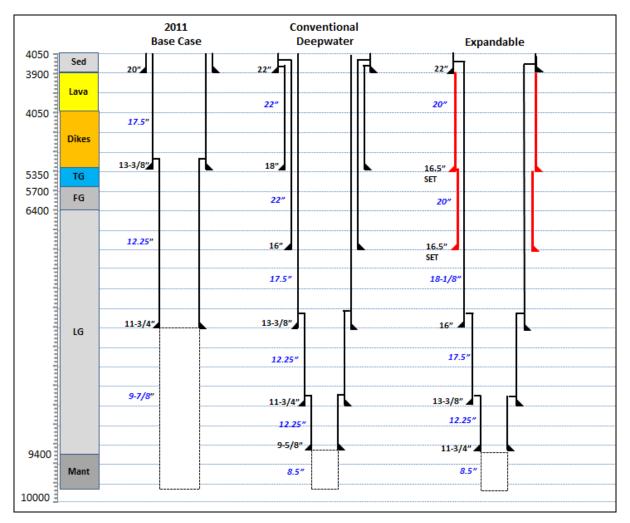
This type of hole stability problem suggests that the wellbore configuration needs to be able to accommodate additional contingency casing strings to allow for unexpected wellbore stability problems. The 1256D hole has been deepened to 1,522 mbsf, so if the kind of problems noted above can occur in the upper part of the hole, one must assume that they can also occur deeper in the hole. Additional strings may therefore be needed to case off problematic hole sections, and it would likely be prudent to be able to case off and protect sections of the hole that have been successfully cored/drilled in order to prevent the occurrence of stability problems that may evolve over time. The objective of incorporating additional casing strings into the wellbore configuration would therefore be to reduce the risk of not getting to TD by providing the means to react to wellbore stability problems or by preventing their occurrence.



The original Base Case wellbore configuration consisted of three casing strings: 20" set at the base of the sediments, 13-3/8" set at the base of the Dikes, and 11-3/4" set at about a third of the way into the layered gabbros. As such, only one casing string is set in the roughly 5,000m interval between the base of the dikes and the mantle. If, for example, the 11-3/4" string has to be set high because of down hole problems the risk of not getting to the mantle is higher because the length of the open hole below the 11-3/4" is larger. There are also a limited number of contingency casing options available to fit inside the 11-3/4" in the event that there are additional problems later in the hole and another casing string (or strings) is required.

3.1 Wellbore Configuration Options

As discussed above, it is clear that a mantle wellbore configuration should include a robust contingency design. However, at this stage, it is still difficult to define the exact number of casing strings that would be needed and where they should be set. Nevertheless, there are oilfield wells that require 6-8 casing strings to reach TD that can be used as a guide. Two examples are provided below that are intended to serve as a basis for further discussion.







Because of the telescoping nature of well designs, planning a well for multiple casing strings means that the large diameter strings run at the top of the hole must be set deeper than is normally the case. This allows the subsequent intermediate strings also to be set progressively deeper in the hole as is illustrated in the "Conventional Deepwater" and "Expandable" options in Figure 25.

The Conventional Deepwater option has a 6 string casing program that is commonly used today in deepwater Gulf of Mexico oil and gas wells. Note that running the 22", 18" and 16" strings in the upper part of the hole allows the 13-3/8" to be pushed to the 11-3/4" casing point in the Base Case design, which in turn allows the 11-3/4" to be set deeper in the layered gabbros interval. Note also that this configuration allows large portion of the hole to be cased off.

The Expandable option is a variation of the Deepwater option except that it uses solid expandable tubulars (SET) in the upper part of the hole to allow even larger hole sizes deeper in the hole which in turn allows larger diameter casing strings to be run deeper in the hole. Note, for example, that this option uses "nested" 16.5" diameter expandables which allows the 13-3/8" to be set where the 11-3/4" is set on the Deepwater option.

Expandable casing has been used in the oil and gas industry since late 1999 to mitigate the impact of unexpected hole problems. It involves running a special type of casing in the hole and cementing it conventionally, after which the internal diameter (ID) is expanded out to almost the internal diameter of the previous casing string. This allows a larger hole to be drilled below the expandable than would otherwise be the case if a conventional string had been run. For example, when the first 16.5" SET from Figure 25 is run in the hole it has a OD of 16" and an ID of 15.010". After expansion, the ID is increased to 17.125" and the OD to 18.188".

New developments in expandables have improved the reliability, and increased the applicable uses of this technology. For example, large diameter tubulars have been developed for applications higher in the wellbore (as shown above), and expandables are now being developed in diameters ranging from 3.5" to 20". The three major companies currently providing this technology are Baker Hughes, Weatherford, and particularly Enventure.

The most prevalent expansion process involves running an expansion cone and launcher at the bottom of the casing. After the string is run and cemented, a plug is pumped down the casing, past the cone, and latches in the launcher. The volume below the cone, within the casing, and sealed by the plug is then pressurized. The pressure drives the cone upward, expanding the casing. The cone is also pulled axially; this steadies the process, enables extra force to be applied in case of a stuck cone, and allows mechanical expansion in the rare event that pressure is lost due to the casing splitting or connection failure. The seal between the expandable casing and the previous casing is provided by a series of elastomeric seals that isolate the annular space between the two strings. Enventure's elastomers are currently rated at 224°C (435°F) and they are currently developing ones rated to 232°C (450°F).

Another expandable technology that is currently available is the "Open Hole Clad System". This system is designed to isolate and seal off specific problematic sections of the wellbore. This involves drilling through the problem section and then running a length of expandable casing that covers just the problem area. Anchor joints are run on either end of the casing which is then expanded against the sides of the open hole with the anchor joints providing the seal. The clad system is another contingency option that may be beneficial for the mantle hole because it

isolates a particular problem interval and does not require the entire open hole section to be cased off.

Revised wellbore schematics were developed for each of the 3 configuration cases for each of the 3 locations. As with the feasibility study, it was assumed that casing would be set at the base of the sediments and at the base of the dikes. Since the deeper casing points are speculative at this point, the distance between the Moho and the dikes was divided into equal intervals based on the number of casing strings that are available, and it was assumed that a casing string would be set at the base of each interval. These revised wellbore schematics are provided in Sections 3.3 to 3.5.

3.1.1 Wellbore Configuration Pros and Cons

The main pros and cons of each of the options shown in Figure 25 are as follows:

Base Case

- Pros:
 - It is a simple 3 string design using standard casing sizes and hole sizes.
 - It is the least expensive option.
 - It is the ideal option if the chances of having wellbore stability problems can somehow be ruled out.
- Cons:
 - It provides the least flexibility for reacting to unexpected hole problems
 - It allows for only two contingency strings. For example, if another casing string is needed below the 11-3/4", or the 11-3/4" has to be set high and another casing string(s) is required deeper in the hole, the contingency options are 9-5/8" and 7.0" casing.
 - The risk of not being able to get to TD is higher.

Conventional Deepwater Case

- Pros:
 - It allows for significant parts of the hole to be cased off since it involves running 6 strings instead of 3.
 - It provides increased flexibility in the event of unexpected hole problems.
 - A 7.0" contingency option is still available below the 9-5/8".
 - The risk of not being able to get to TD is reduced.
- Cons:
 - It requires non-standard casing sizes and non-standard hole sizes. Bit selection will be more complicated and hole opening tools (concentric reamers, hole openers) will be needed. Note, for example, the 13-3/8" casing is typically run in a 17.5" hole which is larger than the 16" casing previously run. Therefore the 13-3/8" interval would be drilled with a bit that fits inside the 16", but that another hole opening tool would need to be run to open the hole below the 16" out to 17.5". However, although the casing and bits are non-standard, wells having this kind of configuration are routinely drilled in the Gulf of Mexico, and the required tools and techniques have been developed to become de facto standards. So while the design issues are more complicated, they are not insurmountable.



- Clearances are tighter and casing strings are heavier. Again these are not insurmountable problems or ones that exceed the capabilities of the Chikyu.
- The costs will be higher in terms of the higher tangible costs and the time required to run all of the casing strings.

Expandable Case

- Pros:
 - The pros are basically the same as those for the Deepwater Case.
 - 9-5/8" and 7.0" contingency strings are still available below the 11-3/4" and therefore this case offers the maximum amount of flexibility in the event of unexpected problems by allowing 8 strings of casing to be run compared to 7 or 5.
- Cons:
 - Likewise, the cons are basically the same as this for the Deepwater Case.
 - The cost of the expandable casing is higher than that of conventional casing.
 - Expandable casing has a low collapse rating which can be problematic in an oil and gas well, but should be less of an issue in a mantle hole because the design loads will be much lower.
 - There is an added risk dealing with the expandables. The installation process is more complicated and although the chance of failure is relatively low, there still is a chance which doesn't exist with conventional casing.

3.2 Risk Discussion

It is important to realize that the wellbore configuration options discussed above are not necessarily the only options. They do however represent the extremes. The Base Case represents the most simple configuration and arguably most risky in terms of being able to get to TD and accomplish the goals of the project. The Expandable Case represents the most complex/expensive but least risky option in terms of being able to get to TD. As was the case with the initial feasibility study, the intent here is to show that there are existing solutions to the technical issues associated with a mantle hole, and to provide a foundation for further discussion and design work.

Although there are a multitude of technical issues and their associated risks that will need to be studied and addressed, there are arguably two main risks that impact the entire project. The first is the overall uncertainty with respect to the down hole conditions which impacts the ability to actually get to the mantle. The second involves time and cost which impacts the ability to accomplish the objectives within a reasonable cost and within a reasonable amount of time.

- Down hole conditions uncertainty:
 - Developing an effective well design involves accounting for and designing around the expected down hole conditions such as stratigraphy, lithology, formation pressure, temperature, the existence of unstable zones or zones prone to lost circulation, etc., and then building in a degree of flexibility to deal with unexpected problems. These issues dictate the mud weight requirements, the number of casing strings needed, what size the casing needs to be, and where they need to be set. Setting casing in the wrong places or not being able to set them in the right places will severely jeopardize the ability to



accomplish the objectives of any well. The obvious problem here is that no one has ever drilled a hole to the mantle, and the down hole conditions won't be known until it is done. For example, discussions with Geomechanical International (GMI) identified some of the risks which will need to be addressed in order to develop the final wellbore configuration:

- No Overpressure Assumption Are we Sure?
 - Could fluids trapped in fractures or cavities in mafic igneous rocks be over pressured due to stress or other thermal processes?
- Wellbore Instability Risk
 - Shear failure if stress concentration exceeds rock strength
 - Failure of naturally fractured rock
 - Failure of induced fractures due to cooling
- Lost Circulation Risk
 - Hydraulic Fracturing if Mud Weight exceeds Fracture Gradient
 - Losses into natural and/or induced fractures
- Creeping Risk
 - Hole closure due to creeping rocks under high temperature and pressure
- Fault Reactivation Risk
 - Hole deformation due to reactivation of pre-existing faults

This does not, however, mean that the risks cannot be mitigated and managed. Mitigating these risks will require a concerted joint effort between the science community, industry subject matter experts, and the well design engineers to define the most likely down hole conditions that can be expected, and which aspects have the most uncertainty. The results of this effort can then serve as the basis for developing an appropriate wellbore configuration.

• <u>Time and cost uncertainty</u>:

The time required to drill a mantle hole must fall within the limits of the Chikyu's yearly scientific drilling vs. commercial endeavor schedule, and the cost of the project must be "reasonable". Preliminary estimates of the time and cost for a Mantle hole were developed during the feasibility study and were based largely on data from the 1256D location expeditions. The estimated time ranged from 400 to 900 days at a cost between \$400 to \$900 million, which are arguably not reasonable. The High Impact System study in 2012 looked at current and trending bit technology to determine if the drilling time could be reduced. It was concluded that the major oilfield bit and coring system service providers have a great deal of experience with difficult hard rock drilling environments, and the time required to drill a mantle hole could be significantly reduced by incorporating the bit selection and design practices currently being used in oil and gas industry.

As will be discussed in Section 5, the number of days needed to drill the hole has the biggest impact on the cost of the mantle hole, and the other cost components are almost insignificant by comparison. The number of days is in turn effected by uncertainties around bit performance and rate of penetration. These uncertainties can be reduced by partnering



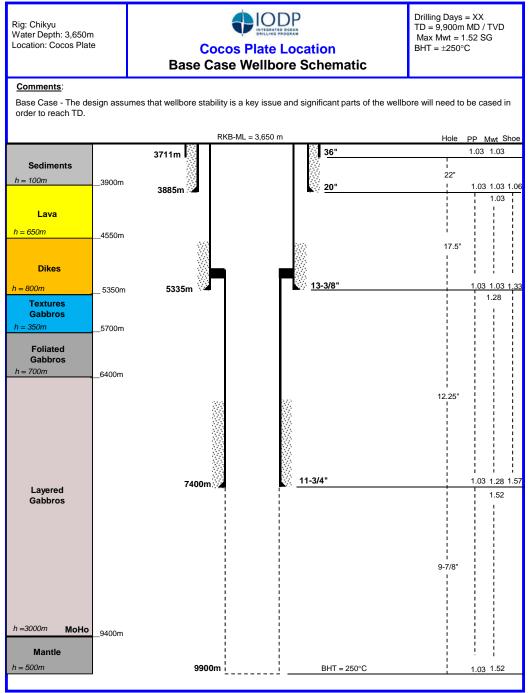
with 1 or 2 of these service companies in order to take advantage of the full range of experience and services they can provide during both the planning and operational phases of the project in order to optimize the bit selection and drilling practices.



3.3 Cocos Location Wellbore Diagrams

3.3.1 Base Case Wellbore Configuration:

Below is the Base Case wellbore schematic for a hole drilled at the Cocos location.

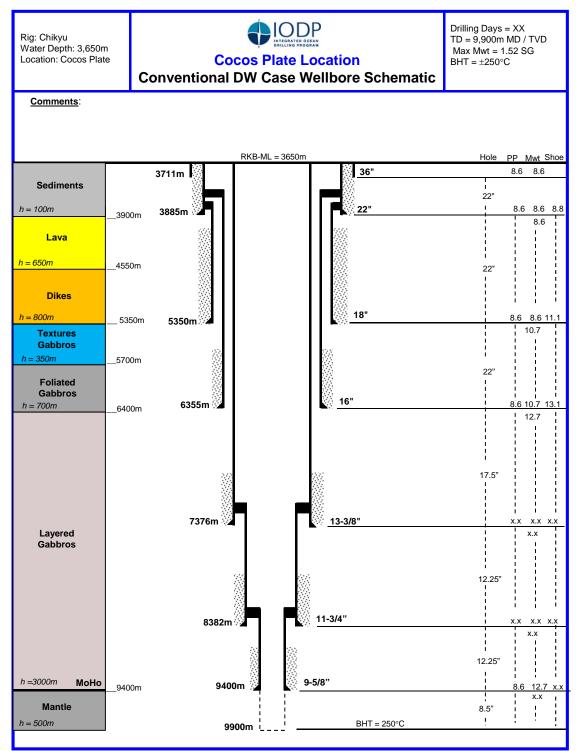






3.3.2 Deepwater Wellbore Configuration:

Below is the Deepwater Case wellbore schematic for a hole drilled at the Cocos location.







3.3.3 Expandable Wellbore Configuration:

Below is the Expandable Case wellbore schematic for a hole drilled at the Cocos location.

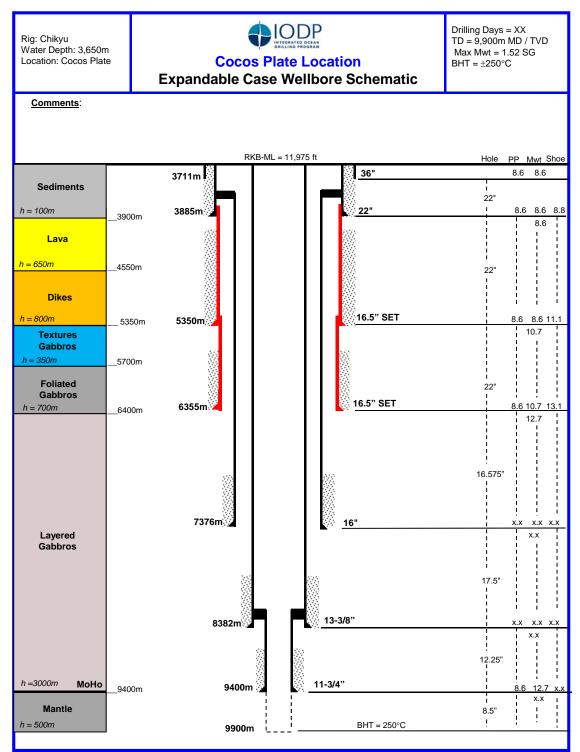


Figure 28. Cocos Location Well Configuration – Expandable Case



3.4 Hawaii Location Wellbore Diagrams

3.4.1 Base Case Wellbore Configuration:

Below is the Base Case wellbore schematic for a hole drilled at the Hawaii location.

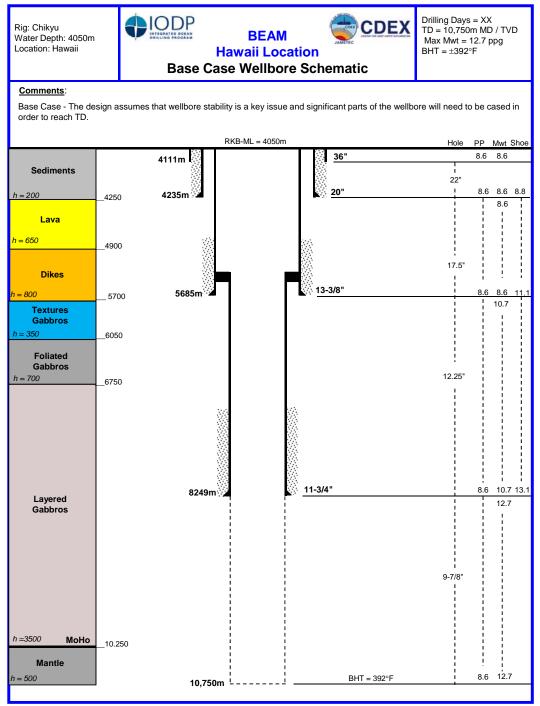
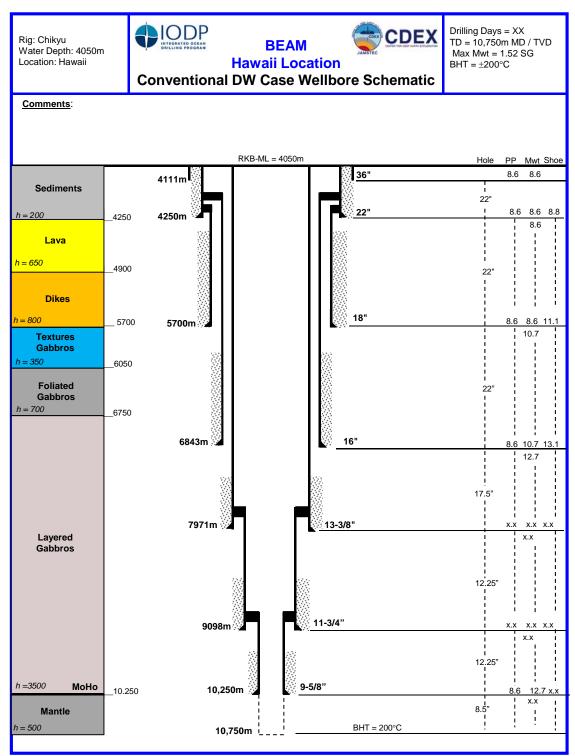


Figure 29 - Hawaii Location Well Configuration – Base Case



3.4.2 Deepwater Wellbore Configuration:

Below is the Deepwater Case wellbore schematic for a hole drilled at the Hawaii location.







3.4.3 Expandable Wellbore Configuration:

Below is the Expandable Case wellbore schematic for a hole drilled at the Hawaii location.

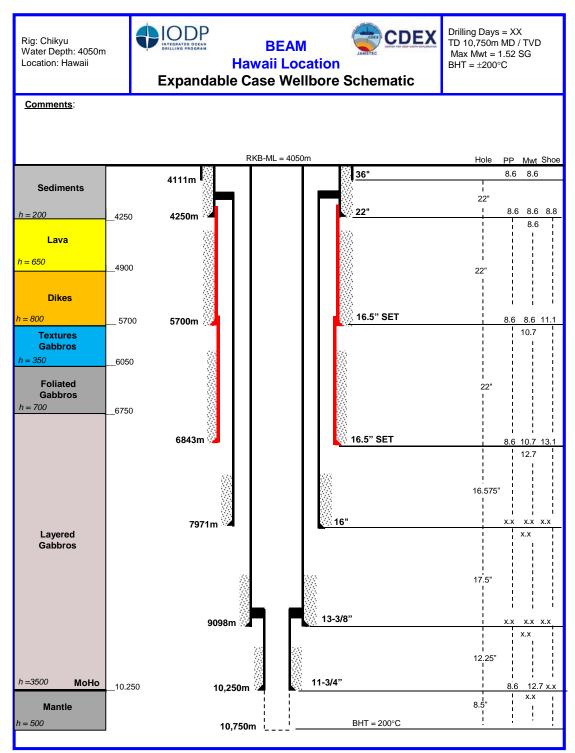


Figure 31 - Hawaii Location Well Configuration – Expandable Case



3.5 Baja Location Wellbore Diagrams

3.5.1 Base Case Wellbore Configuration:

Below is the Base Case wellbore schematic for a hole drilled at the Baja location.

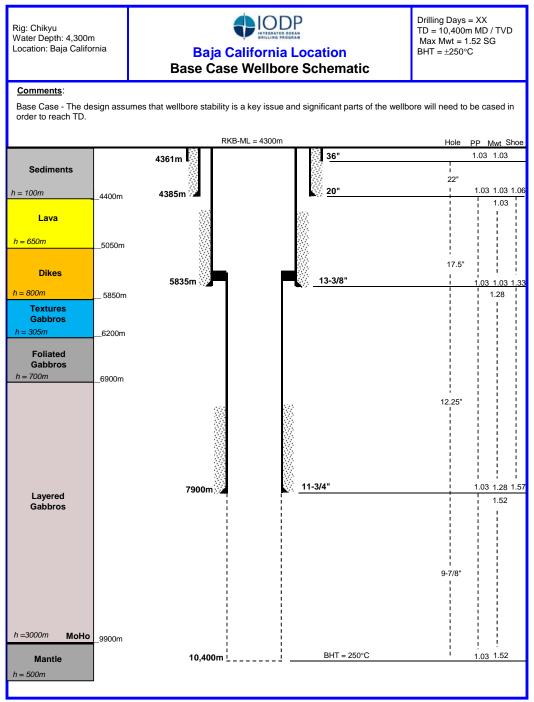


Figure 32 - Baja Location Well Configuration – Base Case



3.5.2 Deepwater Wellbore Configuration:

Below is the Deepwater Case wellbore schematic for a hole drilled at the Baja location.

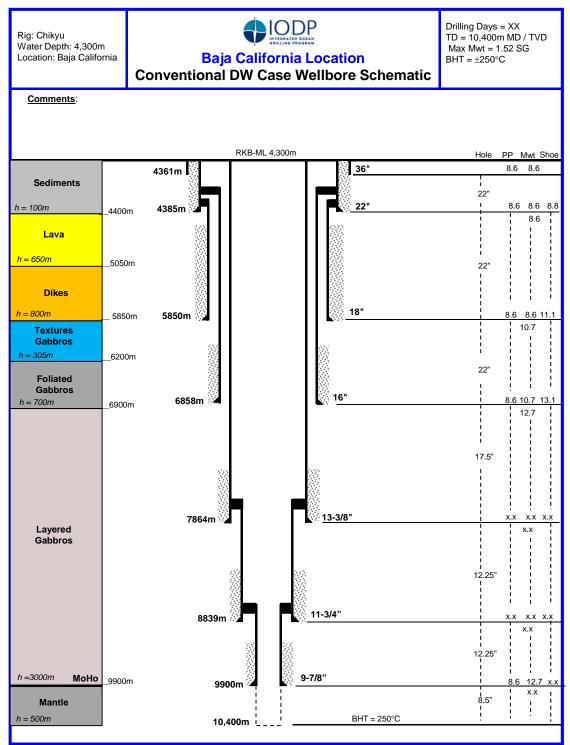


Figure 33 - Baja Location Well Configuration – Deepwater Case



3.5.3 Expandable Wellbore Configuration:

Below is the Expandable Case wellbore schematic for a hole drilled at the Baja location.

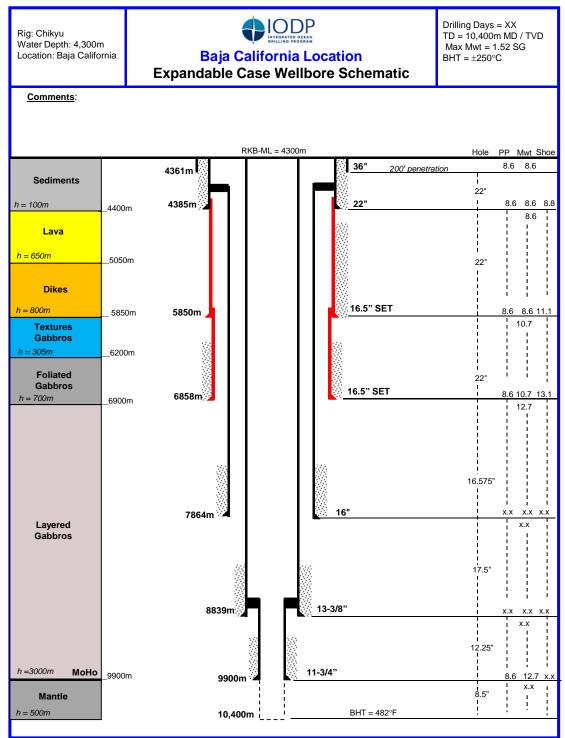


Figure 34 - Baja Location Well Configuration – Expandable Case



4 Marine Riser Design Discussion

This section details the main results for marine drilling riser feasibility analyses. The design premise for this analysis has been obtained from CDEX (i.e. Chikyu vessel and drilling riser specifications, subsea equipment, etc.).

The design process for the marine drilling riser analysis has been divided in the following subsections:

- Static analysis (i.e. Chikyu connected and disconnected at the LMRP connector);
- Dynamic analysis (i.e. Chikyu connected and disconnected at the LMRP connector);
 - Frequency domain analysis
 - Time domain analysis
- Chikyu operability analysis while on location in the Pacific Ocean;
- Riser hang-off analysis (i.e. soft and hard hang-off);
- Riser modal analysis;
- Vortex Induced Vibrations (VIV) screening and riser fatigue assessment.

Each of these analyses is investigated in detail with the pertinent response characteristics plotted in this chapter.

4.1 Introduction and Data

Figure 35 provides a picture from the Chikyu drill-ship vessel and Figure 36 illustrates the marine drilling riser configuration with slick and buoyed joints and with the main tube plus the auxiliary lines (i.e. choke and kill, booster and 2 hydraulic lines). Note that the maximum tensioning capacity of the Chikyu is 6×363 tons = 6×800 kips = 4,800,000 lbs.

The ability for the Chikyu to drill an ultra-deepwater well in the Pacific Ocean is mainly dependent on the riser drilling capacity of the vessel and the specifications of the riser components (i.e. riser tensioning system, buoyed and slick riser joints). In order to achieve this goal, several options or configurations can be considered and are discussed in the following sections.





Figure 35. Chikyu Drill-ship

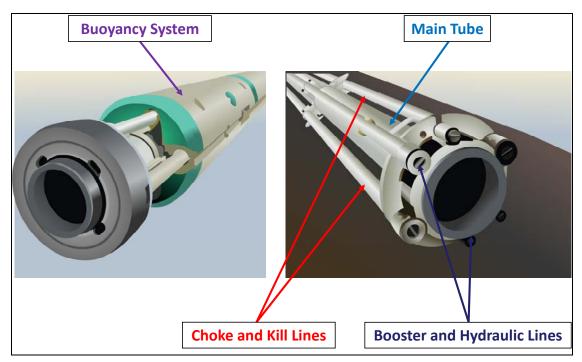


Figure 36. Marine Drilling Riser Schematic

4.2 Marine Drilling Riser Options

- 1. *High strength steel: X-100* (i.e. 100,000 psi yield strength) material line pipe is now available to manufacture the drilling riser main tube. Until recently, the highest steel grade that was available to manufacture riser joints was X-80 (i.e. 80,000 psi) but the impact of this technical improvement could be rather important on the design and application for ultra-deepwater riser drilling. X-100 material enables a thinner wall (i.e. weight reduction per riser joint) in order to achieve the same performance for a given field application. As a result, a thinner walled drilling riser would allow deploying greater lengths of riser joints for the same floating drilling structure tensioning system (i.e. 4,800 kips on the Chikyu). Note also that since the maximum VME in the drilling riser tubes cannot exceed 67% of the minimum yield strength, X-100 material will enable higher stresses in the riser tubes which implies that either higher mud weight could be used or greater water depths could be drilled using riser drilling technology.
- 2. Titanium: because of the drastic weight reduction associated with titanium (i.e. 40% lighter than steel) and much higher yield strength (i.e. 120-130 ksi), titanium drilling risers can be used for weight reduction for the entire drilling riser (i.e. main tube and/or auxiliary lines). Thus, similarly to X-100 material, titanium drilling risers could be used to drill through ultra-deepwater depths that have never been reached before with steel material and could also be utilized for harsh environments with high pressure reservoirs (high mud weight). Note that two grades of titanium: ASTM 23 and ASTM 29 would be readily suitable for deepwater titanium drilling risers. An additional benefit is titanium's high resistance to fatigue damage, which could be used for high current environment and very long drilling campaigns such as the one planned for the mantle hole. Obviously, the main disadvantage of titanium products is their relatively high cost in comparison to steel, which therefore make the concept of hybrid risers (i.e. the main tube made of steel and the auxiliary lines made of advanced materials) more attractive.
- 3. *Aluminum:* because of the large weight reduction associated with aluminum material (i.e. 60% lighter than steel) but generally lower yield strength (i.e. 40-60 ksi), aluminum drilling risers can be used for weight reduction for the entire drilling riser (i.e. main tube and/or auxiliary lines) but would be better suited for auxiliary lines keeping the riser main tube with a high yield strength material (X-80, X-100 or titanium); hence, illustrating the concept of hybrid drilling risers. Thus, aluminum drilling risers could be used to drill through ultradeepwater depths with existing floaters. However, active work and studies are currently conducted to investigate the potential corrosion issues that are associated with using aluminum in seawater (i.e. chloride content) and the fatigue behavior of aluminum joints and the welding process for 75-foot and 90-foot long riser tubes.
- 4. Composite materials: the oil and gas industry (i.e. Aker Solutions, Lincoln Composite) is also currently investigating composite materials (i.e. carbon fiber) or hybrid risers that would use a coating layer on a thin matrix made of high strength steel. Again, because of the drastic weight reduction associated with composite materials (i.e. up to 75% lighter than steel) and much higher yield strength (i.e. 250-500 ksi), composite drilling risers can be used for weight reduction for the entire drilling riser (i.e. main tube and/or auxiliary lines). Thus, similarly to X-100 material and titanium, drilling risers made of composite materials could be used to drill through ultra-deepwater depths that have never been reached before with steel material and also utilized for harsh environments with high pressure reservoirs (high mud



weight). However, the main disadvantage of composite products for the offshore industry is that neither their performance nor their reliability have been field tested, and they have never been deployed for deepwater applications. Also, great challenges need to be overcome for welds and connectors when manufacturing 75-ft or 90-ft long riser joints.

5. **Buoyancy systems:** currently capable of equipping riser joints in up to 4572m (15,000 ft) of water. Note that the greater the water depth, the larger the buoyancy systems become because of the increased density of foam per volume that need to be employed to provide a good uplift force to the riser joint. Recent progress has enabled the buoyancy systems to provide a much reduced buoyed weight in comparison with the riser joint's dry weight. The foam material performance properties have improved also, and therefore do not always require a larger diameter.

Keep in mind that high strength steel (i.e. 80 ksi) is currently the most widely used material for deepwater drilling and drilling riser systems and is the material equipping the Chikyu riser joints and riser systems. However, because the target would be to drill with a marine drilling riser in water depths averaging greater than 3658m (12,000 ft) with drilling fluids up to 1.68 SG (14.0 ppg), the technical limit of existing riser systems may be reached and therefore other configurations have to be considered.

Figure 37 through Figure 40 shown below provide detailed calculations for the drilling riser weight for four different configurations:

- 1. Current Cameron LoadKing drilling riser with 4,000,000 lbf tension capacity made of steel with X-80 material;
- 2. Hydrid riser with aluminum auxiliary lines;
- 3. Hybrid riser with titanium auxiliary lines;
- 4. Hybrid riser with composite auxiliary lines.

Note that the dry weight of the Cameron LoadKing 4.0 drilling riser in 4267m (14,000 ft) of water is slightly greater than 4,500,000 lbs and that the five auxiliary lines account for almost half of the total weight of the drilling riser. In addition, advanced materials such as aluminum, titanium and composite can significantly reduce the dry weight of the drilling riser by changing the material on the auxiliary lines from steel to aluminum, titanium or composite. In 4267m (14,000 ft) of water, the aluminum hybrid configuration has a dry weight of slightly greater than 3,000,000 lbs, the titanium hybrid configuration has a dry weight of slightly greater than 2,800,000 lbs.



	Cam	eron L	oadKing 4.0		
RISER MAIN	TUBE		CHOKE AND KILL LINES		
P _{API} (with 1.25 Factor of Safety) =	5000.0	psi	P _{API} (with 1.25 Factor of Safety) =	16961.5	psi
σ _v =	80	ksi	σ _v =	56	ksi
, t =	0.75	in	, t =	1.125	in
OD =	21	in	OD =	6.5	in
OD =	1.750	ft	OD =	0.542	ft
ID =	19.5	in	ID =	4.25	in
ID =	1.63	ft	ID =	0.354167	ft
Water Column =	14,000	ft	Water Column =	14,000	ft
A _{s,fluid} =	2.07	ft ²	A _{s,fluid} =	0.10	ft ²
V _{fluid} =	29035.2	ft ³	V _{fluid} =	1379.2	ft ³
				10317.3	
V _{fluid} =	217198.3	-	V _{fluid} =		
V _{fluid} =	5171.4		V _{fluid} =	245.6	
Fluid Weight =		ppg	Fluid Weight =		ppg
Total Weight of Mud in 14,000 ft =	1,867,905.2		Total Weight of Mud in 14,000 ft =	0.0	
A _{s,steel} =	0.33		A _{s,steel} =	0.13	
V _{steel} =	4638.8	ft ³	V _{steel} =	1846.9	ft ³
Steel Weight =	490	lb/ft ³	Steel Weight =	490	lb/ft ³
Total Weight of Steel in 14,000 ft =	2,272,991.4	-	Total Weight of Steel in 14,000 ft =		
TOTAL WEIGHT =	4,140,896.6		TOTAL WEIGHT =	904,987.3	
P _{API} (with 1.25 Factor of Safety) =	9800.0	nci	HYDRAULIC L P _{API} (with 1.25 Factor of Safety) =	8448.3	nci
		ksi			ksi
σ _γ =		-	σ _γ =		
t = OD =	0.5	in in	t = OD =	0.3125	
OD = OD =	0.417		OD = OD =	0.302	
ID =	4.0		ID =		in
ID =	0.3333333333		ID =	0.25	
Water Column =	14,000		Water Column =	14,000	
	0.09			0.05	
A _{s,fluid} =	1221.7		A _{s,fluid} =	687.2	
V _{fluid} =			V _{fluid} =		
V _{fluid} =	9139.2	gallons	V _{fluid} =	5140.8	gallon
V _{fluid} =	217.6	bbl	V _{fluid} =	122.4	bbl
Fluid Weight =	0	ppg	Fluid Weight =	0	ppg
Total Weight of Mud in 14,000 ft =		lbs	Total Weight of Mud in 14,000 ft =		lbs
A _{s,steel} =	0.05	ft ²	A _{s,steel} =	0.02	ft ²
V _{steel} =	687.2	ft ³	V _{steel} =	316.2	ft ³
Steel Weight =		lb/ft ³	Steel Weight =		lb/ft ³
Total Weight of Steel in 14,000 ft =	336,739.5		Total Weight of Steel in 14,000 ft =		-
TOTAL WEIGHT =	336,739.5	1	TOTAL WEIGHT =	154,923.5	
TOTAL WEIGHT = RISER + A	·				
Total Weight of Steel in 14,000 ft =	4,574,629.0	lbs			
Ratio Lines / Total Weight =	50.31%				

Figure 37. Cameron LoadKing Drilling Riser Dry Weight in 4267m of Water



Cameron Lo	adKing 4	Aluminum Auxiliary Li	nes			
RISER MAIN TUBE			CHOKE AND KILL LINES			
σ _γ =	80	ksi		σ _γ =	70	ksi
Steel Weight =	490	lb/ft ³		Aluminum Weight =	170	lb/ft ³
Total Weight of Steel in 14,000 ft =	2,272,991.4	lbs		Total Weight of Aluminum in 14,00	313,975.2	lbs
TOTAL WEIGHT =	4,140,896.6	lbs		TOTAL WEIGHT =	313,975.2	lbs
BOOSTER LINE			HYDRAULIC LINE			
σ _γ =	70	ksi		σ _γ =	70	ksi
Aluminum Weight =	170	lb/ft ³		Aluminum Weight =	170	lb/ft ³
Total Weight of Aluminum in 14,00	116,828.0	lbs		Total Weight of Aluminum in 14,00	53,749.0	lbs
TOTAL WEIGHT =	116,828.0	lbs		TOTAL WEIGHT =	53,749.0	lbs
TOTAL WEIGHT = RISER + AUXILIARY LINES						
Total Weight of Metal in 14,000 ft =	3,071,518.7	lbs				
Ratio Lines / Total Weight =	26.00%					

Figure 38. Cameron LoadKing and Aluminum Lines Drilling Riser Dry Weight in 4267m of Water

Cameron Lo	adKing 4	4.0 wi	th	Titanium Auxiliary Lir	ies	
RISER MAIN 1	TUBE			CHOKE AND KILL LINES		
σ _y = Steel Weight =	80 490	ksi Ib/ft ³		σ _y = Titanium Weight =	130 ksi 280 lb/ft ³	
Total Weight of Steel in 14,000 ft = TOTAL WEIGHT =	2,272,991.4 4,140,896.6	lbs		Total Weight of Titanium in 14,000 TOTAL WEIGHT =		
BOOSTER LINE				HYDRAULIC LINE		
σ _γ =	130	ksi		σ _γ =	130 ksi	
Titanium Weight =	280	lb/ft ³		Titanium Weight =	280 lb/ft ³	
Total Weight of Titanium in 14,000	192,422.6	lbs		Total Weight of Titanium in 14,000	88,527.7 Ibs	
TOTAL WEIGHT =	192,422.6	lbs		TOTAL WEIGHT =	88,527.7 lbs	
TOTAL WEIGHT = RISER + A	UXILIARY LIN	NES				
Total Weight of Metal in 14,000 ft =	3,588,212.9	lbs				
Ratio Lines / Total Weight =	36.65%					

Figure 39. Cameron LoadKing and Titanium Lines Drilling Riser Dry Weight in 4267m of Water



Cameron Lo	adKing 4	Composite Auxiliary Li	nes				
RISER MAIN TUBE			CHOKE AND KILL LINES				
σ _y =	80	ksi		σ _y =	580	ksi	
Steel Weight =	490	lb/ft ³		Composite Weight =	115	lb/ft ³	
Total Weight of Steel in 14,000 ft =	2,272,991.4	lbs		Total Weight of Composite in 14,00	212,395.0	lbs	
TOTAL WEIGHT =	4,140,896.6	lbs		TOTAL WEIGHT =	212,395.0	lbs	
BOOSTER LINE			HYDRAULIC LINE				
σ _y =	580	ksi		σ _y =	580	ksi	
Composite Weight =	115	lb/ft ³		Composite Weight =	115	lb/ft ³	
Total Weight of Composite in 14,00	79,030.7	lbs		Total Weight of Composite in 14,00	36,359.6	lbs	
TOTAL WEIGHT =	79,030.7	lbs		TOTAL WEIGHT =	36,359.6	lbs	
TOTAL WEIGHT = RISER + A	TOTAL WEIGHT = RISER + AUXILIARY LINES						
Total Weight of Material in 14,000 (2,813,171.6	lbs					
Ratio Lines / Total Weight =	19.20%						

Figure 40. Cameron LoadKing and Composite Lines Drilling Riser Dry Weight in 4267m of Water

The figure below is a screenshot from *DeepRiser* software showing the input and specifications for drilling riser joints with buoyancy foam that have been used to run the drilling riser analysis.



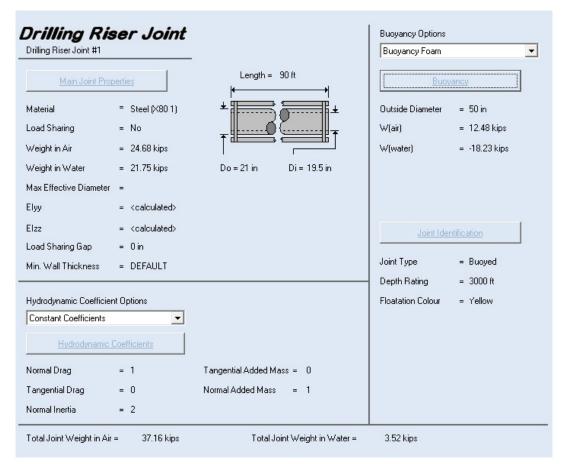


Figure 41. Example of a Typical 90-ft Long Drilling Riser Joint with Buoyancy Modules Input

4.3 Hydrodynamics in Ultra-deepwater

Wave and currents moving past the marine drilling riser place forces upon the riser causing it to displace, rotate, and stress. The force loadings are calculated using the industry standard Morison's equation. This equation calculates the force per unit length along a cylindrical member. Note that Morrison's Equation is nonlinear. The marine drilling riser is a drag-dominated structure (riser diameter is very small as compared to the wave length); therefore, the first half of Morison's equation will dominate the load calculation. The second half of the equation will govern inertia-dominated structures, i.e., gravity base structures, whereby the base structure is large as compared to the wavelength. Since a marine drilling riser is drag dominated, the velocity variable is the dominant term because the force is proportional to velocity squared.

Environmental Criteria

The significant wave height and period used in the analyses and tied to the return period are summarized in Figure 42 and Figure 43 below. Significant wave height is the average of the highest one-third of the waves and is an industry used value. Since the drilling campaign should last for about 6-12 months, the 10 year return period is sufficient to assess the maximum loads that the vessel will most likely experience during the duration of the drilling campaign.



WAVE	WAVE DATA (NMRI : 1974-1988)									
LOCATION	OCATION Significant Wave Height (m)		Peak Period (s)							
Cocos Plate	1.0	1.7	7.0							
Hawaii	4.0	6.8	9.0							
Baja California	3.0	5.1	8.0							

Figure 42. Wave Data for the 10 Year Return Period

	LOCATION										
Cocos Plate Hawaii						В	aja Ca	liforni	ia		
Depth (meters)											
1	500	1,000	3,650	1	500	1,000	4,000	1	500	1,000	4,300
2.5	1.00	0.50	0.25	2	0.75	0.50	0.25	3	1.25	0.60	0.25

Figure 43. Current Data for the 10 Year Return Period

Note that the current profile is not uniform and has a triangular or parabolic shape. This is of importance because experience and field studies have shown that usually, the more linear the current profile is, the more prone to severe vortex-induced vibrations (VIV)0 the structural members are (i.e. drilling riser for instance). Additionally, the wave spectrum that has been used to model more complex random seas for the dynamic analysis has been chosen to be Pierson-Moskowitz, which is usually a good choice for fully developed seas.

Drilling Riser Models

The connected and disconnected analyses (i.e. static and dynamic) are illustrated respectively in Figure 44 and Figure 45. Figure 44 covers the scenario when the marine drilling riser is installed and connected to the BOP system in 3,650 - 4,300 meters of water (i.e. 12,000 - 14,000 feet). The Chikyu vessel and marine drilling riser are exposed from rather benign to more extreme (i.e. 10 Year Return) environmental loadings.

The most critical variables in the analyses are waves, current, top tension, mud weight and vessel offset. Vessel offset is expressed as a percentage of water depth and says if the vessel is upstream or downstream of the well. A value of -10% offset in 4267m (14,000 ft) of water signifies the vessel is upstream 427m (1,400 ft) from the well. A value of +10% signifies the vessel is downstream 427m.



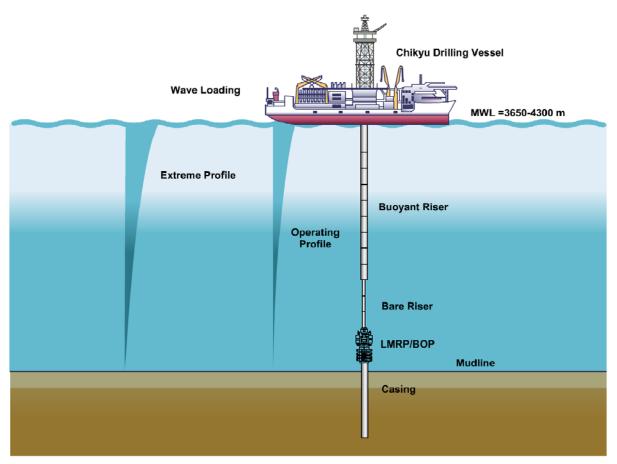


Figure 44. Schematic of Connected Riser Analysis Model

Figure 45 below illustrates two different disconnected scenarios:

- Soft hang-off analysis which covers the scenario when the drilling riser is still connected to (i.e. hanging on) the tensioning system and where the telescopic joint supports the weight of the drilling riser;
- Hard hang-off analysis which covers the case when the drilling riser is locked in the riser spider and gimbal components at the rig floor with the tensioning system being disconnected and also where the telescopic joint is collapsed.



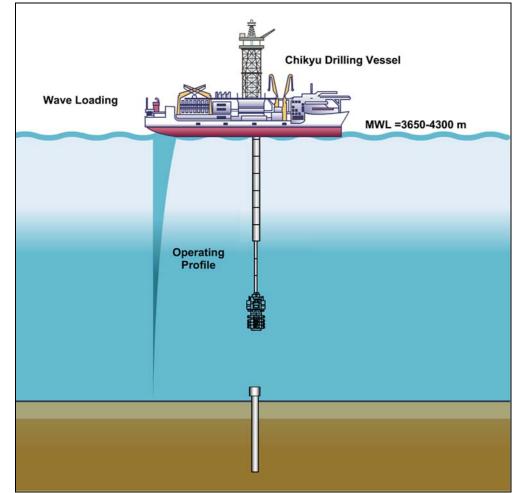


Figure 45. Schematic of Disconnected Riser Analysis Model

Figure 46 and Figure 46 illustrate the finite element models created to model the complex Chikyu drilling vessel and its riser components interaction, the drilling riser joints (i.e. pup joints, slick joint and buoyed joints), the subsea components (LMRP, BOP and wellhead), and the non-linear soil interaction.



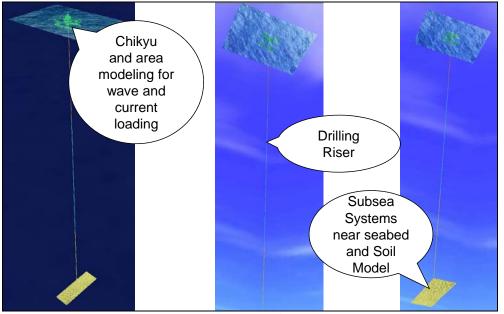


Figure 46. Finite Element Software Models

Joint N				nemove a	loint	Joint Pro	operties		
	ame	Quantity	Top Elev.	Bottom Elev.	Vessel Con.	Con. Type	Tension	Tensioner	
👌 UF	:J	1	14072	14070	Тор	Fixed	None	-	
] Te	lescopic Joint	1	14048	13970	None	-	At Slip Ring	Tensioner	
	mination Joint	1	13970	13925	None	-	None	-	
	p Joint #2 - 10ft	4	13925	13885	None	-	None	-	
	p Joint #3 - 15ft	1	13885	13870	None	-	None	-	
Î Pu	p Joint #4 - 40ft	1	13870	13830	None	-	None	-	
Î Dri	lling Riser Joint #1	33	13830	10860	None	-	None	-	
Î Dri	lling Riser Joint #2	33	10860	7890	None	-	None	-	
1 Dri	lling Riser Joint #3	33	7890	4920	None	-	None	-	
1 Dri	lling Riser Joint #4	33	4920	1950	None	-	None	-	
1 Dri	lling Riser Joint #5	21	1950	60	None	-	None	-	
🖡 LF.	J	1	60	58	None	-	None	-	
🛃 LM	IRP	1	58	42	None	-	None	-	
🛊 BO)P	1	42	15	None	-	None	-	
We	ellhead	1	15	12	None	-	None	-	
36	Inch Casing 2.0 in thickness	1	12	-100	None	-	None	-	

Figure 47. Example of Riser Stack-up in 4267m of Water for the Baja Location

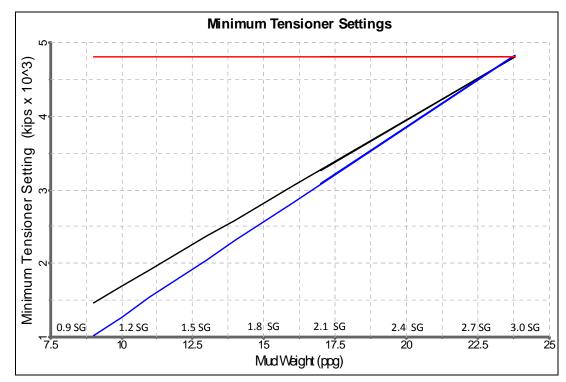
Effective Tension And Minimum Tension Required For Drilling Operations

One very important characteristic of a marine drilling riser is the fact that the riser can buckle even when the vessel is pulling on the riser with a force greater than the weight of the riser (i.e. total buoyed riser weight). Because of internal pressure, it is effective tension and not actual or real tension that controls buckling of a marine drilling riser.

Effective tension is a mathematically derived expression contained in the equation of motion for a marine drilling riser. Effective tension must always be a positive value to keep the riser from buckling. The effective tension is a function of real tension (as calculated by statics), riser ID (i.e. internal diameter) and OD (i.e. outside diameter), internal pressure, and external pressure. Note that internal pressure multiplied by the internal riser ID area decreases the effective tension value, while external pressure multiplied by the external riser OD area increases the effective tension value. The problem is that the external pressure on a marine drilling riser is fixed (i.e. seawater = 1.03 SG / 8.6 ppg) while the internal pressure is variable based on drilling conditions (i.e. mud weight = 1.03 - 1.68 SG). Thus, the Chikyu tension must support not only the marine drilling riser weight but also must support the weight of the riser contents (i.e. mud). Based on the maximum mud density of about 1.44 SG (12.0 ppg), water depth ranging between 3658m and 4267m (12,000 - 14,000 ft), and the connected riser configuration, the minimum tension for stability per API RP 16Q has been calculated using *DeepRiser* built-for-purpose finite element analysis riser program. Note that the minimum tension calculated assumes one tensioner failure and 95% tensioner efficiency.

Figure 48 through Figure 50 shown below illustrate the static analysis results for a range of mud weight (0.9 SG to over 2.4 SG) with the 4,800,000 lbs tensioning system located on top of the Chikyu moon-pool (i.e. red line). Both the minimum tensioner setting for stability when connected per API RP 16Q (i.e. blue line) and the minimum tensioner setting for a disconnect scenario (i.e. black line) are displayed. Even though applying API 90% of maximum capacity which yields a total tensioning capability of 4,320,000 lbs, static analysis show that even steel riser can be used to drill in 4267m (14,000 ft) of water. Thus, from a buckling and minimum tension required standpoint the Chikyu tension capacity and drilling riser tension capacity are sufficient enough to prevent any type of buckling during the drilling operations. Note that the minimum tension required to drill in 3657m (12,000 ft) of water (i.e. Cocos Plate) ranges between 1,000 kips when drilling with seawater to 2,800 kips when drilling with 1.92 SG (16.0 ppg) mud. Also, the minimum tension required to drill in 3962m (13,000 ft) of water (i.e. Hawaii) ranges between 1,100 kips when drilling with seawater to 3,200 kips when drilling with 1.92 SG (16.0 ppg) mud. In addition, the minimum tension required to drill in 4267m (14,000 ft) of water (i.e. Baja) ranges between 1.200 kips when drilling with seawater to 3.400 kips when drilling with 1.92 SG mud.





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Figure 48. Minimum Tensioner Settings for 3,657 meters (12,000 feet) - Cocos Plate

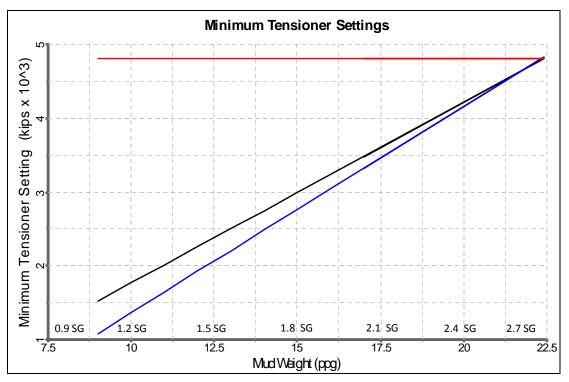
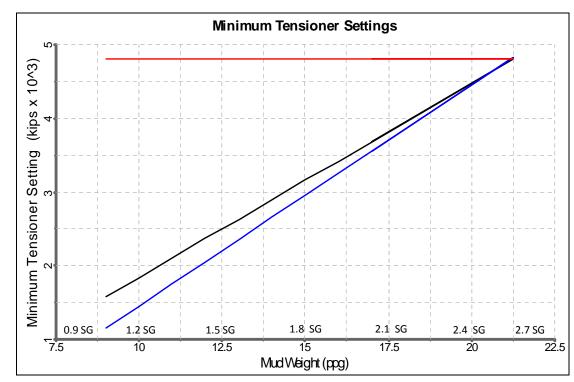


Figure 49. Minimum Tensioner Settings for 3962 meters (13,000 feet) – Hawaii





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Figure 50. Minimum Tensioner Settings for 4,267 meters (14,000 feet) - Baja

However, the limitations of steel drilling riser and ultra-deepwater drilling capability are controlled by the different operating limits of critical riser drilling components. Indeed, API 16Q - *Recommended Practice for Design, Selection, Operation and Maintenance of Marine Drilling Riser Systems* details the operating limits for a given marine drilling riser and for deepwater locations. The following figures summarize these limits as a function of materials used for the riser joints. The critical parameters are notably the amount of flex/ball joint rotation, maximum stress and vessel tension. Note that the operating limits are divided between the riser connected and riser disconnected configurations, and furthermore the riser connected configuration can also be divided between the drilling mode and the non-drilling mode.



DRILLING RISER - STEEL - X-80 MATERIAL								
DESIGN PARAMETER	RISER CO	RISER						
	DRILLING	NON-DRILLING	DISCONNECTED					
Mean Flex / Ball Joint Angle	Mean 2.0 degrees	N/A	N/A					
Maximum Floy (Dall Joint Angle	Max 4 0 de ave e e	90% available	90% available					
Maximum Flex / Ball Joint Angle	Max 4.0 degrees	(9.0 degrees)	(9.0 degrees)					
Maximum VME Stress (METH "B") Deepwater Well	0.67*minimum yield point (53.6 ksi)	0.67*minimum yield point (53.6 ksi)	0.67*minimum yield point (53.6 ksi)					
Maximum Tension Setting	90% of capacity (4,320 kips)	90% of capacity (4,320 kips)	N/A					

Figure 51. Design and Operating Limits for Marine Drilling Risers – Steel – X-80

DRILLING RISER - STEEL - X-100 MATERIAL							
	RISER CO	RISER					
DESIGN PARAMETER	DRILLING	NON-DRILLING	DISCONNECTED				
Maximum VME Stress (METH "B") Deepwater Well	0.67*minimum yield point (67 ksi)	0.67*minimum yield point (67 ksi)	0.67*minimum yield point (67 ksi)				

Figure 52. Design and Operating Limits for Marine Drilling Risers – Steel – X-100

DRILLING RISER - ALUMINUM AUXILIARY LINES							
	RISER CO	RISER					
DESIGN PARAMETER	DRILLING	NON-DRILLING	DISCONNECTED				
Maximum VME Stress (METH "B") Deepwater Well	0.67*minimum yield point (46.9 ksi)	0.67*minimum yield point (46.9 ksi)	0.67*minimum yield point (46.9 ksi)				

Figure 53. Design and Operating Limits for Marine Drilling Risers – Aluminum



DRILLING RISER - TITANIUM AUXILIARY LINES							
DESIGN PARAMETER	RISER CO	RISER					
DESIGN PARAIVIETER	DRILLING	NON-DRILLING	DISCONNECTED				
Maximum VME Stress (METH "B") Deepwater Well	0.67*minimum yield point (87.1 ksi)	0.67*minimum yield point (87.1 ksi)	0.67*minimum yield point (87.1 ksi)				

Figure 54. Design and Operating Limits for Marine Drilling Risers – Titanium

DRILLING RISER - COMPOSITE AUXILIARY LINES			
DESIGN PARAMETER	RISER CONNECTED		RISER
	DRILLING	NON-DRILLING	DISCONNECTED
Maximum VME Stress (METH "B") Deepwater Well	0.67*minimum yield point (388.6 ksi)	0.67*minimum yield point (388.6 ksi)	0.67*minimum yield point (388.6 ksi)

Figure 55. Design and Operating Limits for Marine Drilling Risers – Composite Materials

4.4 Dynamic Analyses – Frequency and Time Domain

Maximum VME Stress in Drilling Riser

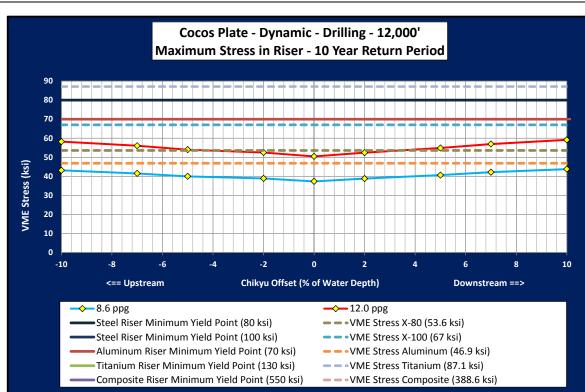
As with most marine structures the maximum Von Mises (VME) stress must be controlled. Depending on the material being used, the marine drilling riser has a minimum yield point of 70 ksi for aluminum, 80 ksi for steel, 130 ksi for titanium and 550 ksi for composite materials.

The maximum VME stresses are summarized in figures 56 to 58. The maximum allowable stress depends on the material being used. Note that the non-drilling mode covers operations such as circulating and tripping the drill-pipe. However, rotating the drill-pipe is covered by the drilling mode. These figures plot the VME stress as a function of the Chikyu vessel offset for the following cases:

- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Cocos Plate;
- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Hawaii;
- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Baja

One can note that when drilling with seawater, the stresses in the riser are just below the maximum allowable. However, when using a fluid to drill that is heavier than seawater, the Chikyu operating envelope is greatly reduced for the Cocos Plate (i.e. 3657m of water) and shows the limits of steel riser in water depths greater than 3657m where API maximum allowable stresses criteria in the drilling riser cannot be satisfied. However, when using titanium or composite materials, this criteria is satisfied for a wide range of vessel offset.





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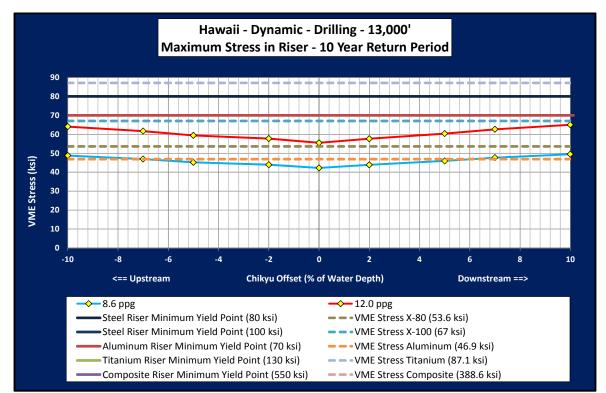


Figure 57. VME Stress – Hawaii – 10 Year Return



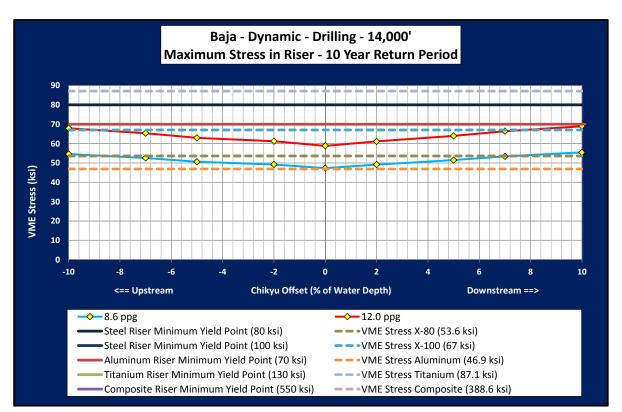


Figure 58. VME Stress – Time Domain – 10 Year Return

Maximum Slip Joint Stroke

As the vessel heaves and moves off location the slip joint (i.e. telescopic joint) strokes in and out to maintain a connection with the marine drilling riser and the Chikyu while keeping the tension constant at the top of the riser. The slip joint on the Chikyu has a limitation of about 60-foot stroke.

Figure 59 plots the telescopic joint stroke as a function of vessel offset for the following cases:

- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Cocos Plate;
- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Hawaii;
- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Baja

One can note that for the different dynamic analyses, the maximum stroke of the telescopic joint remains below the maximum allowable stroke of the slip joint present onboard the Chikyu vessel when the vessel offset is ranging between -9% to -7% and +7% to +9% depending on the water depths (i.e. 3657m - 4267m) and drilling fluid (i.e. 1.03-1.44 SG).



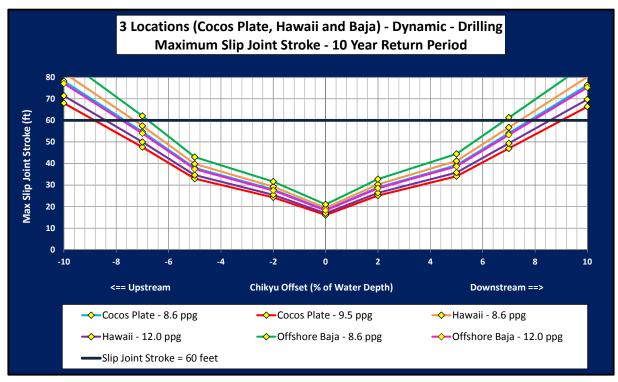


Figure 59. Maximum Slip Joint Stroke – 3 Offshore Locations – 10 Year Return

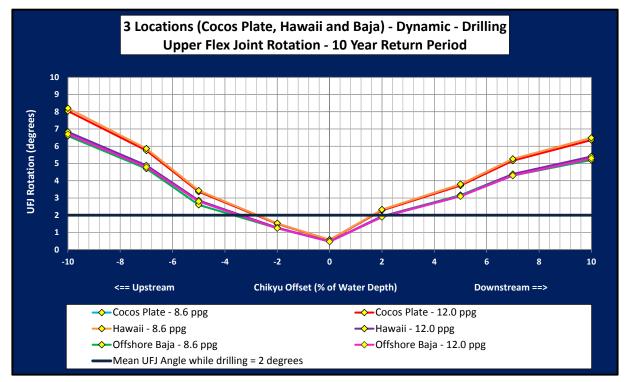
Rotation at Top of Riser (Upper Flex Joint)

This is the rotation which occurs at the top of the marine drilling riser. During the non-drilling period of 10 year return, the maximum riser angle should not exceed 9 degrees and the mean angle should not exceed 4 degrees to prevent the flex / ball joint from severe damage. Figure 60 summarizes respectively the mean rotation at the top of the riser for the following cases:

- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Cocos Plate;
- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Hawaii;
- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Baja

As one can see, because of the maximum allowable rotation at the upper flex joint, the vessel operating window is comprised between -3.5% and +2%.





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Figure 60. Mean Upper Flex Joint Rotation – 3 Offshore Locations – 10 Year Return

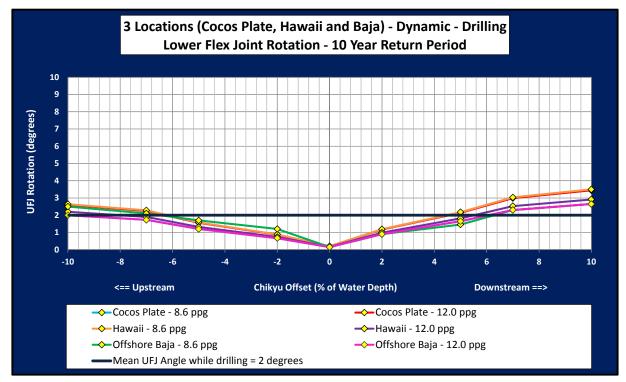
Rotation at BOP Flex Joint (Lower Flex Joint)

This is the rotation which occurs at the top of the BOP (flex joint). Figure 61 summarizes respectively the mean rotation at the top of the BOP for the following cases:

- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Cocos Plate;
- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Hawaii;
- Drilling with seawater (1.03 SG/8.6 ppg) and mud (1.44 SG/12.0 ppg) at Baja

As one can see, because of the maximum allowable rotation at the upper flex joint, the vessel operating window is comprised between -7% and +5%.





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Figure 61. Mean Lower Flex Joint Rotation – 3 Offshore Locations – 10 Year Return

Hang-Off Analysis Results

Hang-off analysis can be divided into two sub-analysis:

- Drilling riser soft hang-off;
- Drilling riser hard hang-off

Soft hang-off analysis covers the scenario when the drilling riser is still connected to (i.e. hanging on) the tensioning system and where the telescopic joint supports the weight of the drilling riser.

Hard hang-off analysis covers the case when the drilling riser is locked in the riser spider and gimbal components at the rig floor with the tensioning system being disconnected and also where the telescopic joint is collapsed.

From both frequency domain and time domain dynamic analyses, the rotation of the upper flex joint for either soft hang-off or hard hang-off (0.5 degrees) remains well below the allowable mean upper flex joint rotation (2.0 degrees). In addition, the minimum moon-pool clearance has been calculated at about 3.57m (11.7 ft) which is also well within the Chikyu moon-pool usable opening.

In conclusion, during the disconnected mode, riser hang-off will not be an issue even during the 10 year return period for wave and current.

Chikyu Operating Window

Figure 62 summarizes the operating window for the Chikyu drill-ship following API RP 16Q operating envelope. Note that the operating window is mainly limited by the VME stress. However, the rotation of the flex joints and telescopic joint stroke while drifting off location are somehow a limiting factor as well.

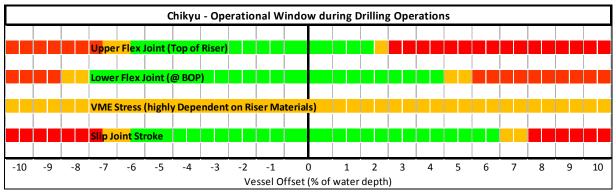


Figure 62. Chikyu Operating Window – Drilling Mode

Modal Analysis

Modal analysis is run to identify the dynamic behavior of a structural member when submitted to a given loading condition. Periodic loadings usually are of the most interest for the structural dynamic engineer and therefore are often a mandatory check for drilling risers that are submitted to periodic loadings such as wave and current. The main responses from a modal analysis are the natural frequencies associated to the Eigenvalues and also the deformed shaped of the Eigen modes (i.e. mode shapes).

Theoretically, an infinite number of modes for a vibrating structural member such as a drilling riser are possible. The contribution of higher modes towards the response is usually considered to be more negligible than the first modes. Note that in computation and for this VIV study, the first 50 modes have been calculated and are listed in Figure 63



Eigenpair No.	Period (s)	Frequency (Hz)	Eigenpair No.	Period (s)	Frequency (Hz)
1	157.5926	0.0063	26	11.6622	0.0857
2	157.565	0.0063	27	10.8248	0.0924
3	75.8509	0.0132	28	10.8179	0.0924
4	75.7952	0.0132	29	10.1071	0.0989
5	50.934	0.0196	30	10.1005	0.099
6	50.8989	0.0196	31	9.4675	0.1056
7	37.939	0.0264	32	9.4617	0.1057
8	37.9114	0.0264	33	8.909	0.1122
9	30.4521	0.0328	34	8.9032	0.1123
10	30.4307	0.0329	35	8.4126	0.1189
11	25.286	0.0395	36	8.4075	0.1189
12	25.2678	0.0396	37	7.966	0.1255
13	21.7361	0.046	38	7.961	0.1256
14	21.7209	0.046	39	7.568	0.1321
15	18.9602	0.0527	40	7.5634	0.1322
16	18.9471	0.0528	41	7.2018	0.1389
17	16.8851	0.0592	42	7.1973	0.1389
18	16.8734	0.0593	43	6.8781	0.1454
19	15.1648	0.0659	44	6.874	0.1455
20	15.1545	0.066	45	6.5738	0.1521
21	13.807	0.0724	46	6.5697	0.1522
22	13.7976	0.0725	47	6.3041	0.1586
23	12.6327	0.0792	48	6.3003	0.1587
24	12.6245	0.0792	49	6.0481	0.1653
25	11.6701	0.0857	50	6.0444	0.1654

Figure 63. Modal Analysis – Modes from 1 to 50 – 8.6 ppg mud – 14,000 feet Water Depth

The figure shown above lists the first 50 Eigenvalues and their associated periods and frequencies. Note that for the 1st mode, the Eigen period is about 157 seconds and thus the Eigen frequency is 0.006 Hertz.

4.5 Vortex Induced Vibrations Screening

Introduction

When any fluid flow passes through a structural member such as a drilling riser, it may cause an unsteady flow pattern due to vortex shedding. The current state of laboratory work is mainly focused on the interaction of a circular cylinder with only one degree of freedom (i.e. transverse motion) under a two or three dimensional flow.



Vortex Induced Oscillations

When the vortex shedding frequency $f_{shedding}$ of the drilling riser coincides with one of the natural frequencies f_n of the structural member (i.e. drilling riser) for a given critical current velocity, resonance vibrations occur (i.e. VIV). The phenomenon of lock-in mechanism takes place when the vortex shedding frequency approaches the natural frequency of the drilling riser. As discussed previously, the vortex shedding frequency follows the Strouhal number and current velocity relationship. Lock-in to one of the casing Eigen frequencies can be divided into two types of VIV:

- 1. In-line VIV which is a vibration mode where the casing vibrates in a pattern parallel with the incident current flow.
- 2. Cross-flow VIV which is a vibration mode where the casing moves perpendicularly to the fluid flow.

The results of the VIV analysis using SHEAR7 are shown below.

VIV Analysis - Response Parameters - Generic Case - 14,000 Feet
Fundamental natural frequency = 0.00635 (Hz)
Maximum flow velocity = 3.000 ft/s
Minimum flow velocity = 0.2500 ft/s
The highest Strouhal frequency is: 0.18758 (Hz)
The lowest Strouhal frequency is: 0.01066 (Hz)
Minimum wavelength corresponding to the maximum flow velocity = 800 (ft)

Figure 64. VIV Analysis – Main Parameters Calculations

Riser Fatigue Assessment

Figure 65 below presents the fatigue damage and fatigue life in years for the drilling riser calculated at eleven different locations along the entire water column (i.e. 4267m). It appears that the fatigue life (i.e. unfactored without any factor if safety) ranges from 22 years to infinite (i.e. greater than a thousand years).



	VI	V Analysis - F	atigue D	amage Calc	ulations		
x/L	Depth below MSL (ft)	Displacement	A/D	Acceleration	Stress	Damage (1/years)	Fatigue (years)
0	Mean Sea Level	0.032	0.01	2.89E-02	3.86E-02	1.50E-07	6.67E+06
0.1	1,400	0.34	0.107	2.55E-01	1.92E-01	8.62E-05	1.16E+04
0.2	280	0.428	0.135	2.95E-01	2.18E-01	1.04E-04	9.62E+03
0.3	420	0.507	0.16	3.46E-01	2.49E-01	1.63E-04	6.13E+03
0.4	5,600	0.598	0.189	4.03E-01	2.86E-01	2.60E-04	3.85E+03
0.5	7,000	0.722	0.228	4.93E-01	3.42E-01	4.82E-04	2.07E+03
0.6	8,400	0.861	0.272	6.02E-01	3.94E-01	8.34E-04	1.20E+03
0.7	9,800	1.041	0.329	7.49E-01	5.56E-01	3.01E-03	3.32E+02
0.8	11,200	1.303	0.412	9.58E-01	8.20E-01	1.31E-02	7.63E+01
0.9	12,600	1.3081	0.436	1.11E+00	1.10E+00	4.51E-02	2.22E+01
1	Seabed	N/A	N/A	N/A	N/A	N/A	N/A

Figure 65. VIV Analysis – Fatigue Damage Calculations

4.6 Conclusions for the Drilling Riser Analysis

A detailed riser analysis using the most recent industry standards and software (*DeepRiser* and *SHEAR7*) has been carried out on the Chikyu drilling riser with extended buoyed joints to cover the ultra-deepwater depths of Cocos Plate, Hawaii or Baja locations. In addition, calculations and analyses were performed for hybrid configurations with aluminum, titanium and composite materials in order to show the limitations and benefits of advanced materials.

From this new set of analyses and sensitivity studies, it appears that steel riser can be used without changing current industry practices to a maximum of 3657m (12,000 ft) water depth and for certain drilling conditions (i.e. mud weight and metocean data). Beyond this water depth, some critical response from the drilling riser (i.e. VME stress) and riser components (i.e. rotation of the upper and lower joints) are violated per API 16Q criteria if steel riser is employed to drill an ultra-deepwater well. In order to push the envelope using steel material, the maximum allowable VME will have to be increased from 67% of minimum yield to a higher ratio. Note that API 16Q currently does not address riser response criteria for ultra-deepwater wells with water depth greater than 3048m (10,000 ft), and note also that the VME criteria is limited to 67% of minimum yield to avoid accounting for and tracking riser joint fatigue during the life of the riser. To push the envelope, and to be able to use steel riser for water depth greater than 3657m, a new set of riser response criteria will have to be develop internal and a design/operational risk assessment will have to be conducted. Regarding the VME maximum limit, this could very well be increased from 67% to 80% or 90% but the fatigue damage of the riser joints will also have to be monitored during the entire life of the drilling riser. This is feasible for drilling operations conducted with the Chikyu since it currently uses a riser monitoring system which is capable of tracking stress and fatigue in the drilling riser. Also, tests to increase the mean rotation angle that can be allowed at the two flex joints will have be performed. Again, this does not constitute a real problem and can be achieved when working closely with the riser component manufacturer and a testing facility.



However, the technical solution that would follow current API 16Q riser response criteria and that will enable to drill in water depths up to 4267m (i.e. Hawaii and Baja) will be to use hybrid riser joints or riser joints with advanced materials such as titanium or composite. The high minimum yield and strength to weight ratio of titanium and composite materials relative to steel would not require any adjustment to API 16Q recommended practices criteria, or a need for riser component limits, or even risk assessments. Nonetheless, the high cost associated with titanium and lack of experience with composite materials for ultra-deepwater offshore applications can be seen as a different technical limitation for conducting drilling operations in water depths greater than 3657m (12,000 ft). Composite materials seem very attractive, but composite materials have not been tested or field deployed for deepwater drilling riser systems. Indeed, the ability to keep the same weight and strength for a given riser joint made of composite material as well as maintaining the structural integrity of the drilling riser connectors remain a great challenge to be resolved.



5 Revised Operational Time Estimates

The High Impact System study included a revised operational time estimate for the Base Case wellbore configuration at the Hawaii location to demonstrate how the overall operational time can be reduced using the technology currently available in the oil and gas industry. This report expands on that work to include nominal time estimates for the three wellbore configuration options discussed in Section 3.1 at all three candidate locations. In addition, a probabilistic methodology for estimating operational time was also used to gain a better understanding of the effect of the uncertainty around bit performance. As shown in the following table (and detailed in Appendix 1), Minimum, Most Likely, and Maximum values of ROP and bit life were assigned, and the operational time for each of the 18 cases was calculated using a Monte Carlo simulator to provide P10, P50, and P90 values in addition to the nominal time estimate. Finally, the operations options were expanded from RCB Core and Drill to include Conventional Coring and Underreaming or Hole Opening.

Rate of Penetration		RCB Core			Drill			Conv Core			UR/HO		
by Formation (m/hr)	Low	ML	High	Low	ML	High	Low	ML	High	Low	ML	High	
Sediments	2.4	4.0	15.2	9.1	21.3	30.5	3.0	12.2	15.2	9.1	12.2	24.4	
Lava	1.2	2.1	6.1	3.0	9.1	21.3	1.5	4.6	6.1	3.0	7.6	9.1	
Dikes	1.2	2.1	6.1	3.0	9.1	21.3	1.5	4.6	6.1	3.0	7.6	9.1	
Textured Gabbros	1.2	2.1	6.1	3.0	9.1	21.3	1.5	4.6	6.1	3.0	7.6	9.1	
Foliated Gabbros	0.9	1.5	2.4	1.5	3.0	9.1	1.5	2.4	4.6	1.5	2.4	6.1	
Layered Gabbros	0.9	1.5	2.4	1.5	3.0	9.1	1.5	2.4	4.6	1.5	2.4	6.1	
Mantle	0.9	1.2	2.1	1.5	1.8	6.1	0.9	1.5	3.0	0.9	1.5	4.6	
Bit Life (hrs)		Bit Life											
bit life (iiis)	Low	ML	High										
<= 6706m	30	110	150										
> 6706m	20	70	110										

Figure 66. Stochastic ROP Variable Ranges

Note that the operational estimates were done only for drill/core options B and D as previously described in Section 2.1.3 since these adequately illustrate the philosophical differences between the amount of time spent coring versus time spent drilling.

Key Assumptions

- The assumptions used to develop the operational sequences for each case are consistent with what was done during the Feasibility Study in order to allow a meaningful comparison between the two. As such, they are not necessarily optimized. For example, a hole opening run after a core run could be done while drilling the next section, but for this exercise, they are considered to be separate operations.
- Operational time is defined as the time spent on location drilling/coring to the mantle. The overall project time includes the operational time and the time required to mobilize the Chikyu to and from the location.



• It is assumed that the Chikyu would be mobilized from Japan to the site and then be demobilized back to Japan at the conclusion of the project. Note that this transit time is considered to be a set number of days and is not considered in the probabilistic calculations.

Location	Mobiliz	ation	De-Mobi	ization	Total
LOCATION	Distance (km)	Time (days)	Distance (km)	Time (days)	Time
Cocos	10,622	23.9	10,622	23.9	47.8
Hawaii	5,955	13.4	5,955	13.4	26.8
Baja	8,047	18.1	8,047	18.1	36.2

Figure 67. Mob / De-Mob Assumptions

- To simplify the calculations, it is assumed that a bit trip is made at each stratigraphic transition. This will tend to slightly overestimate the number of bit trips that are required. In addition, conventional core barrel runs are treated like bit runs. This will tend to slightly underestimate the number of trips required since the length of the core barrel is not considered over the cored interval.
- It is assumed that the largest hole size that can be conventionally cored without having to open the hole after coring is 14-3/4". The maximum hole size that can be rotary cored with having to open the hole is 9-7/8".
- It is assumed that 2 days are spent running wireline logs at each casing point, and 3 days at TD.
- The RCB wireline trip time and bit trip time assumptions are the same as what was used during the Feasibility Study.
- The nominal time is determined using the most likely values of ROP and bit life. The P10, P50, and P90 values are determined only for the operational time estimate using the full range of possible ROP's using the Monte Carlo simulator.
- 5% non-productive time (NPT) is assumed to account for down-hole related problems based on previous IODP experience. This does not include weather or rig equipment related NPT.

5.1 Results Summary

A summary of the revised operational time estimates for all three locations is provided below. Figure 68 is a tabular listing of results for all 18 cases. Figures 69 through 71 graphically compare the results of each case by location, and Figures 72 through 74 compare the drilling curves for each case by location. The detailed results for each case are provided in the subsequent sections.

Recall that:

• <u>Case 2</u>: Assumes that long sections of continuous core are taken across the major lithologic and geophysical transition intervals of key sections. For the time estimate it was assumed



that the upper third of each main stratigraphic interval was cored, the middle third was drilled and the lower third was cored.

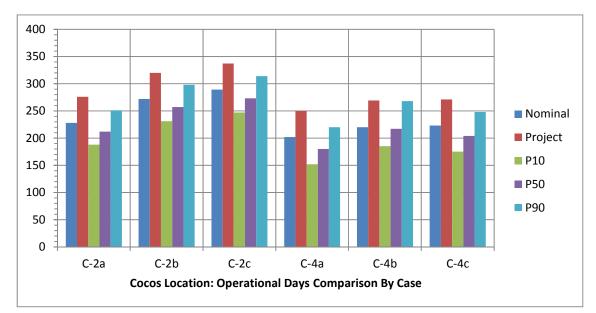
- <u>Case 4</u>: Assumes that the hole is drilled to the Moho and that just the mantle is cored.
- Subcategory "a" is the Base Case wellbore configuration.
- Subcategory "b' is the Deepwater wellbore configuration
- Subcategory "c' is the Expandable wellbore configuration.

Location	Water	Total	Cons	F	Revised Op	erational	Time (days)	Feasibil	ity Study
Location	Depth (m)	Depth (m)	Case	Nominal	Project	P10	P50	P90	Nominal	Project
Cocos	3,650	9,900	2a	228	276	188	212	251	564	617
			2b	272	320	231	257	298		
			2c	289	337	247	273	314		
			4a	202	250	152	180	220	374	418
			4b	220	269	185	217	268		
			4c	223	271	175	204	248		
Hawaii	4,050	10,750	2a	271	298	232	260	303	688	737
			2b	319	346	280	310	362		
			2c	341	368	294	324	375		
			4a	221	248	165	198	252	422	443
			4b	242	239	185	217	268		
			4c	244	271	188	223	275		
Baja	4,300	10,400	2a	251	287	221	247	284	807	866
			2b	308	345	269	299	342		
			2c	327	363	283	313	364		
			4a	208	244	158	188	232	386	425
			4b	229	265	179	207	257		
			4c	231	267	178	207	259		

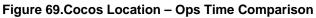
Figure 68. Operations Time Results for all Cases

Note that there has been a significant decrease in the latest time estimates compared to those of the original feasibility study. The average time for all the cases is 258 days. The lowest estimate is 152 days and the highest is 375 days.





<u>Case comparison by location</u>



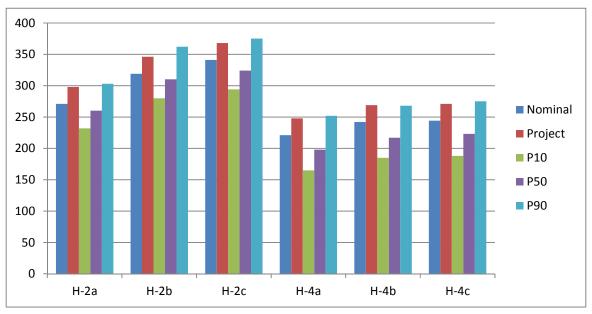
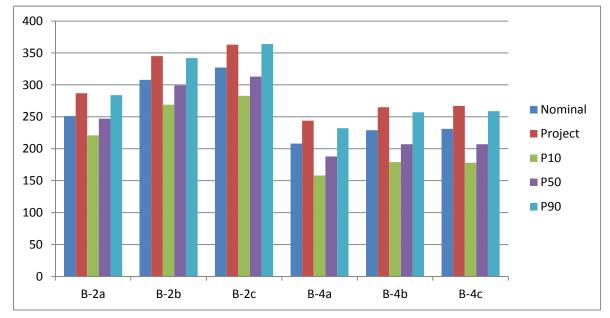


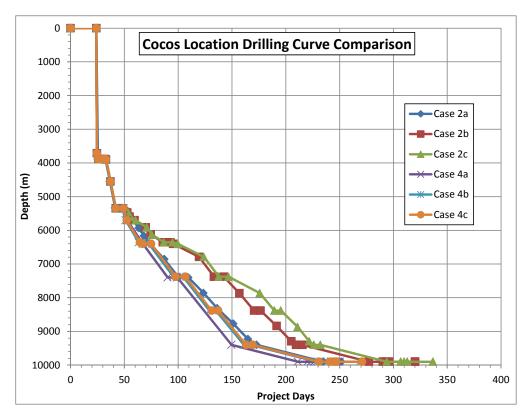
Figure 70. Hawaii Location – Ops Time Comparison





Implementation Plan for the BEAM - "Borehole into the Earth's Mantle" Program

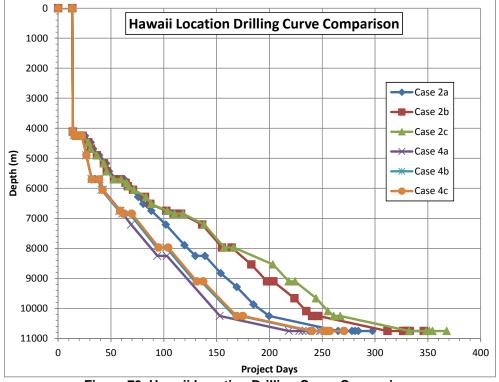
Figure 71. Baja Location – Ops Time Comparison



Drilling curve comparison by location

Figure 72. Cocos Location Drilling Curve Comparison





Implementation Plan for the BEAM - "Borehole into the Earth's Mantle" Program

Figure 73. Hawaii Location Drilling Curve Comparison

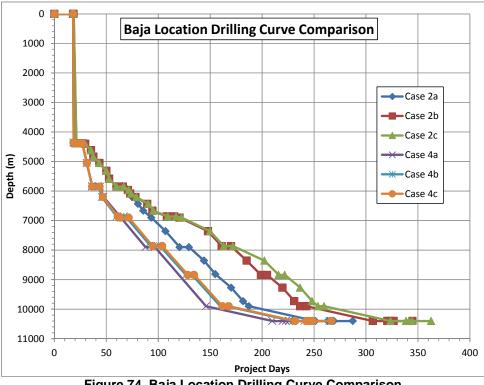


Figure 74. Baja Location Drilling Curve Comparison



5.2 Cocos Location Operational Time Estimates

5.2.1 Case 2a Operations Time:

This case assumes the original Base Case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. However for the Cocos location it is assumed that the sediments, lava and dike intervals do not need to be cored because of previous IODP experience on the 1256D hole. A summary of the time estimate for this case is shown below.

PhaseDaysMove in rig24.0Jet 30"0.5DRill Sediments1.4Set 20" casing3.0Run BOP & Riser3.0Drill Sediments1.1Drill Sediments1.1Drill Lava4.1Drill Dikes4.9Set 13-3/8" Casing6.0Core/UR Dikes3.2Core Textured Gabbros2.6Drill Textured Gabbros2.6Core Foliated Gabbros5.6Drill Foliated Gabbros5.6Drill Foliated Gabbros5.7Core Layered Gabbros13.2Drill Layered Gabbros13.3Run 11-3/4" Liner9.0Core Layered Gabbros12.8Core Layered Gabbros13.6Core Mantle61.8<	Days 0.5 0.5 0.9 0.9 0.0 0.13.1 0.24.0 0.27.2 0.29.8 31.8 34.4 0.0 0.44.8 50.5 63.7 77.0	(m) 3,650 3,711 3,885 3,900 4,550 5,335 5,350 5,467 5,583 5,583 5,700 5,933 6,166 6,400	(m) 3,711 3,885 3,900 4,550 5,335 5,350 5,467 5,583 5,700 5,933 6,166 6,400	(m) 61 174 15 650 785 15 117 117 117 233 233 233	m/day 121.92 124 124 14 159 160 5 5 45 58 45 45 45 42 49 41						
Jet 30"0.5DRill Sediments1.4Set 20" casing3.0Run BOP & Riser3.0Drill Sediments1.1Drill Sediments1.1Drill Lava4.1Drill Dikes4.9Set 13-3/8" Casing6.0Core/UR Dikes3.2Core Textured Gabbros2.6Drill Textured Gabbros2.6Core Foliated Gabbros5.6Drill Foliated Gabbros5.6Drill Foliated Gabbros5.7Core Layered Gabbros13.2Drill Layered Gabbros13.3Run 11-3/4" Liner9.0Core Layered Gabbros12.8Core Layered Gabbros13.6Core Layered Gabbros13.6Core Layered Gabbros13.6Core Layered Gabbros13.6	1.9 4.9 7.9 9.0 13.1 18.0 24.0 27.2 29.8 31.8 34.4 40.0 44.8 50.5 63.7	3,711 3,885 3,900 4,550 5,335 5,350 5,467 5,583 5,700 5,933 6,166	3,885 3,900 4,550 5,335 5,350 5,467 5,583 5,700 5,933 6,166 6,400	174 15 650 785 15 117 117 117 233 233	124 14 159 160 5 45 58 45 45 42 49						
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Drill Dikes4.9Set 13-3/8" Casing6.0Core/UR Dikes3.2Core Textured Gabbros2.6Drill Textured Gabbros2.0Core Textured Gabbros2.6Core Textured Gabbros2.6Core Foliated Gabbros5.6Drill Foliated Gabbros4.8Core Foliated Gabbros5.7Core Layered Gabbros13.2Drill Layered Gabbros13.3Run 11-3/4" Liner9.0Core Layered Gabbros14.1Drill Layered Gabbros14.2Drill Layered Gabbros14.3Core Layered Gabbros14.9Drill Layered Gabbros13.6Core Layered Gabbros8.0	18.0 24.0 27.2 29.8 31.8 34.4 40.0 44.8 50.5 63.7	4,550 5,335 5,350 5,467 5,583 5,700 5,933 6,166	5,335 5,350 5,467 5,583 5,700 5,933 6,166 6,400	785 15 117 117 117 233 233	160 5 45 58 45 42 49						
Set 13-3/8" Casing Core/UR Dikes6.0Core/UR Dikes3.2Core Textured Gabbros2.6Drill Textured Gabbros2.0Core Textured Gabbros2.6Core Foliated Gabbros5.6Drill Foliated Gabbros4.8Core Foliated Gabbros5.7Core Layered Gabbros13.2Drill Layered Gabbros13.3Run 11-3/4" Liner9.0Core Layered Gabbros12.8Core Layered Gabbros14.1Drill Layered Gabbros14.9Drill Layered Gabbros13.6Core Layered Gabbros8.0	24.0 27.2 29.8 31.8 34.4 40.0 44.8 50.5 63.7	5,335 5,350 5,467 5,583 5,700 5,933 6,166	5,350 5,467 5,583 5,700 5,933 6,166 6,400	15 117 117 117 233 233	5 45 58 45 42 49						
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Core Foliated Gabbros5.7Core Layered Gabbros13.2Drill Layered Gabbros13.3Run 11-3/4" Liner9.0Core Layered Gabbros14.1Drill Layered Gabbros12.8Core Layered Gabbros14.9Drill Layered Gabbros13.6Core Layered Gabbros8.0	50.5 63.7	6,166	6,400								
Core Layered Gabbros13.2Drill Layered Gabbros13.3Run 11-3/4" Liner9.0Core Layered Gabbros14.1Drill Layered Gabbros12.8Core Layered Gabbros14.9Drill Layered Gabbros13.6Core Layered Gabbros8.0	63.7		-	233	41						
Drill Layered Gabbros13.3Run 11-3/4" Liner9.0Core Layered Gabbros14.1Drill Layered Gabbros12.8Core Layered Gabbros14.9Drill Layered Gabbros13.6Core Layered Gabbros8.0		6,400									
Run 11-3/4" Liner9.0Core Layered Gabbros14.1Drill Layered Gabbros12.8Core Layered Gabbros14.9Drill Layered Gabbros13.6Core Layered Gabbros8.0	77.0		6,857	457	35						
Core Layered Gabbros14.1Drill Layered Gabbros12.8Core Layered Gabbros14.9Drill Layered Gabbros13.6Core Layered Gabbros8.0		6,857	7,400	543	41						
Drill Layered Gabbros12.8Core Layered Gabbros14.9Drill Layered Gabbros13.6Core Layered Gabbros8.0	86.0										
Core Layered Gabbros14.9Drill Layered Gabbros13.6Core Layered Gabbros8.0	100.1	7,400	7,860	460	33						
Drill Layered Gabbros13.6Core Layered Gabbros8.0	112.9	7,860	8,314	454	35						
Core Layered Gabbros 8.0	127.8	8,314	8,772	457	31						
-	141.4	8,772	9,229	457	34						
Core Mantle 61.8	149.4	9,229	9,400	171	21						
	211.2	9,400	9,900	500	8						
5% Operational NPT 11.0	222.2										
TA hole 3.0	225.2										
Pull BOP/Riser 3.0	228.2										
De-Mobilize Rig 24.0											
_											
Total Core/Drill Days =											
Total Project Days =											

Figure 75. Cocos Location - Case 2a: Operational Phase Summary



44% of the hole is cored, and 56% is drilled as shown below.

	Interval	%	Days
Coring =	2,761	44.2%	54
Drilling =	3,489	55.8%	31
	6,250	100%	85

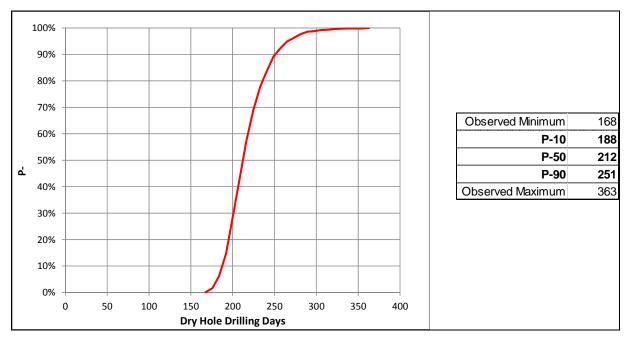
The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

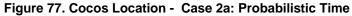
Section	Summary						Section Time (days)				Section	Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	3650	3711	61	Jetting		0.5	0	0	0	0.5	0.5
1	Sediments	3711	3885	174	Drill	21.3	0.3	1.0	0.0	6.0	7.4	7.9
2	Sediments	3885	3900	15	Drill	21.3	0.0	1.1	0.0	0.0	1.1	9.0
3	Lava	3900	4550	650	Drill	9.1	3.0	1.2	0.0	0.0	4.1	13.1
4	Dikes	4550	5335	785	Drill	9.1	3.6	1.4	0.0	6.0	10.9	24.0
5	Dikes	5335	5350	15	Conv Core	4.6	0.1	1.5	0.0	0.0	1.6	25.6
6	Dikes	5335	5350	15	UR	7.6	0.1	1.5	0.0	0.0	1.5	27.2
7	Textured Gabbros	5350	5467	117	Conv Core	4.6	1.1	1.5	0.0	0.0	2.5	29.7
8	Textured Gabbros	5467	5583	117	Drill	9.1	0.5	1.5	0.0	0.0	2.0	31.7
9	Textured Gabbros	5583	5700	117	Conv Core	4.6	1.1	1.5	0.0	0.0	2.6	34.4
10	Foliated Gabbros	5700	5933	233	Conv Core	2.4	4.0	1.6	0.0	0.0	5.6	39.9
11	Foliated Gabbros	5933	6166	233	Drill	3.0	3.2	1.7	0.0	0.0	4.8	44.8
12	Foliated Gabbros	6166	6400	233	Conv Core	2.4	4.0	1.7	0.0	0.0	5.7	50.5
13	Layered Gabbros	6400	6857	457	Conv Core	2.4	7.8	5.4	0.0	0.0	13.2	63.7
14	Layered Gabbros	6857	7400	543	Drill	3.0	7.4	5.8	0.0	9.0	22.3	86.0
15	Layered Gabbros	7400	7860	460	Conv Core	2.4	7.9	6.3	0.0	0.0	14.1	100.1
16	Layered Gabbros	7860	8314	454	Drill	3.0	6.2	6.6	0.0	0.0	12.8	113.0
17	Layered Gabbros	8314	8772	457	Conv Core	2.4	7.8	7.0	0.0	0.0	14.8	127.8
18	Layered Gabbros	8772	9229	457	Drill	3.0	6.3	7.4	0.0	0.0	13.6	141.4
19	Layered Gabbros	9229	9400	171	Conv Core	2.4	2.9	5.1	0.0	0.0	8.0	149.4
20	Mantle	9400	9900	500	RCB Core	1.2	17.1	15.8	25.8	3.0	61.7	211.2
					Sub-Tot	al days =	85	77	26	24	211	
					Sub-1	Fotal % =	40%	36%	12%	11%	100%	

Figure 76. Cocos Location - Case 2a: Operations Time Breakdown

Below are the results of the probabilistic estimate of operational time including the P10, P50 and P90 values and a chart showing the cumulative probability of time.











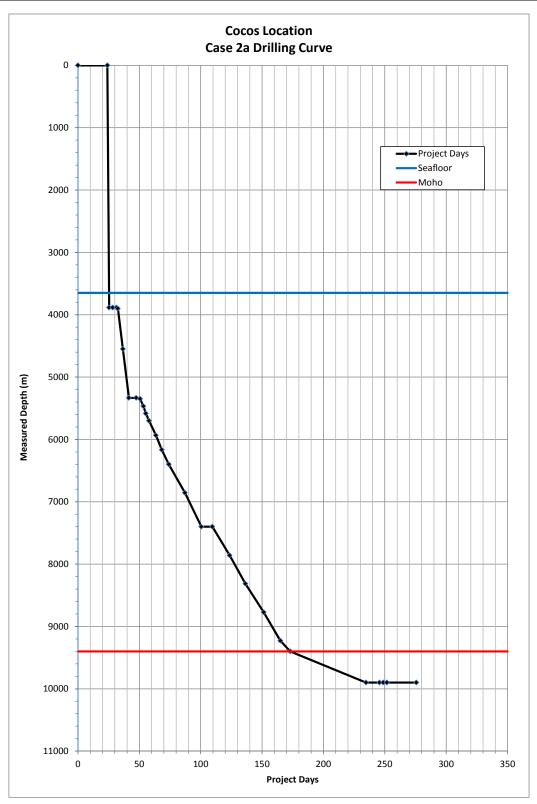


Figure 78. Cocos Location – Case 2a Drilling Curve



5.2.2 Case 2b Operations Time:

This case assumes the Deepwater case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. However for the Cocos location it is assumed that the sediments, lava and dike intervals do not need to be cored because of previous IODP experience on the 1256D hole. A summary of the time estimate for this case is shown below.

	Interval	Cum	From	То	Interval	Avg
Phase	Days	Days	(m)	(m)	(m)	m/day
Move in rig	24.0					
Jet 36"	0.5	0.5	3,650	3,711	61	122
Drill Sediments	1.4	1.9	3,711	3,885	174	124
Set 20" casing	3.0	4.9	0	0	0	0
Run BOP & Riser	3.0	7.9	0	0	0	0
Drill Sediments	1.1	9.0	3,885	3,900	15	14
Drill Lava	4.1	13.1	3,900	4,550	650	159
Drill Dikes	5.0	18.1	4,550	5,350	800	160
Set 18" Casing	6.0	24.1				
Core/UR Textured Gabbros	4.7	28.8	5,350	5,471	121	26
Drill Textured Gabbros	2.1	30.9	5,471	5,593	122	58
Core/UR Textured Gabbros	4.6	35.5	5,593	5,700	107	23
Core/UR Foliated Gabbros	10.5	46.0	5,700	5,913	213	20
Drill Foliated Gabbros	4.6	50.6	5,913	6,127	213	46
Core/UR Foliated Gabbros	11.2	61.8	6,127	6,355	229	20
Set 16" Casing	7.0	68.8				
Core/UR Foliated Gabbros	2.5	71.3	6,355	6,400	45	18
Core/UR Layered Gabbros	24.2	95.5	6,400	6,790	390	16
Drill Layered Gabbros	13.8	109.3	6,790	7,376	586	42
Run 13-3/8" Casing	9.0	118.3				
Core Layered Gabbros	14.6	132.9	7,376	7,864	488	33
Drill Layered Gabbros	13.7	146.6	7,864	8,382	518	38
Run 11-3/4" Liner	6.0	152.6				
Core Layered Gabbros	14.9	167.5	8,382	8,839	457	31
Drill Layered Gabbros	13.7	181.2	8,839	9,297	457	33
Core Layered Gabbros	4.3	185.5	9,297	9,400	104	24
Run 9-5/8" Liner	6.0	191.5				
Core Mantle	61.7	253.2	9,400	9,900	500	8
5% Operational NPT	13.0	266.2				
TA hole	3.0	269.2				
Pull BOP/Riser	3.0	272.2				
De-Mobilize Rig	24.0					
Total Core/Drill Days =	272					
Total Project Days =	320					

Figure 79. Cocos Location - Case 2b: Operational Phase Summary



43% of the hole is cored, and 56% is drilled as shown below.

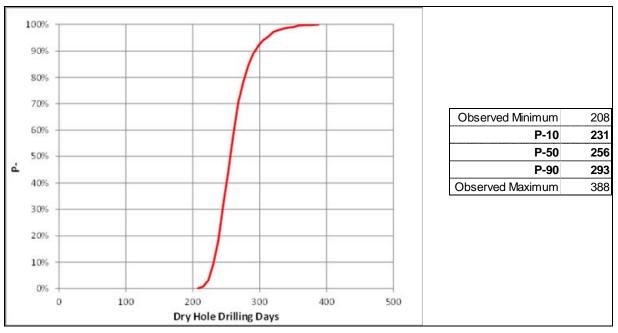
	Interval	%	Days
Coring =	2,654	42.5%	68
Drilling =	3,596	57.5%	32
	6,250	100%	100

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	Summary						Se	ection Tim	ne (days))	Section	Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	3650	3711	61	Jetting		0.5	0	0	0	0.5	0.5
1	Sediments	3711	3885	174	Drill	17.4	0.4	1.0	0.0	0.0	1.5	2.0
2	Sediments	3885	3900	15	Drill	17.4	0.0	1.1	0.0	6.0	7.1	9.1
3	Lava	3900	4550	650	Drill	11.7	2.3	1.2	0.0	0.0	3.5	12.5
4	Dikes	4550	5350	800	Drill	15.4	2.2	1.4	0.0	6.0	9.5	22.0
5	Textured Gabbros	5350	5471	121	Conv Core	4.2	1.2	1.5	0.0	0.0	2.7	24.7
6	Textured Gabbros	5350	5471	121	UR	5.7	0.9	1.5	0.0	0.0	2.4	27.1
7	Textured Gabbros	5471	5593	122	Drill	18.3	0.3	1.5	0.0	0.0	1.8	28.9
8	Textured Gabbros	5593	5700	107	Conv Core	4.2	1.1	1.5	0.0	0.0	2.6	31.5
9	Textured Gabbros	5593	5700	107	UR	5.7	0.8	1.5	0.0	0.0	2.3	33.8
10	Foliated Gabbros	5700	5913	213	Conv Core	2.9	3.1	1.6	0.0	0.0	4.6	38.5
11	Foliated Gabbros	5700	5913	213	UR	1.9	4.7	3.2	0.0	0.0	7.8	46.3
12	Foliated Gabbros	5913	6127	213	Drill	3.4	2.6	1.6	0.0	0.0	4.2	50.5
13	Foliated Gabbros	6127	6355	229	Conv Core	2.9	3.3	1.7	0.0	0.0	5.0	55.5
14	Foliated Gabbros	6127	6355	229	UR	1.9	5.0	3.4	0.0	7.0	15.4	70.9
15	Foliated Gabbros	6355	6400	45	Conv Core	2.9	0.6	1.7	0.0	0.0	2.4	73.3
16	Layered Gabbros	6400	6790	390	Conv Core	3.4	4.7	3.6	0.0	0.0	8.3	81.7
17	Layered Gabbros	6400	6790	390	UR	4.1	4.0	3.6	0.0	0.0	7.6	89.2
18	Layered Gabbros	6790	7376	586	Drill	4.0	6.1	3.9	0.0	9.0	19.0	108.2
19	Layered Gabbros	7376	7864	488	Conv Core	3.4	5.9	4.2	0.0	0.0	10.1	118.3
20	Layered Gabbros	7864	8382	518	Drill	4.0	5.4	4.4	0.0	6.0	15.8	134.1
21	Layered Gabbros	8382	8839	457	Conv Core	3.4	5.6	4.7	0.0	0.0	10.3	144.4
22	Layered Gabbros	8839	9297	457	Drill	4.0	4.8	5.0	0.0	0.0	9.7	154.1
23	Layered Gabbros	9297	9400	104	Conv Core	3.4	1.3	2.6	0.0	6.0	9.8	163.9
24	Mantle	9400	9900	500	RCB Core	1.7	12.1	10.6	25.8	3.0	51.5	215.4
					Sub-Tot	al days =	79	68	26	43	215	
					Sub-1	Fotal % =	37%	32%	12%	20%	100%	

Figure 80. Cocos Location - Case 2b: Operations Time Breakkdown





Below are the results of the probabilistic estimate of operational time including the P10, P50 and P90 values and a chart showing the cumulative probability of time.

Figure 81. Cocos Location - Case 2b: Probabilistic Time



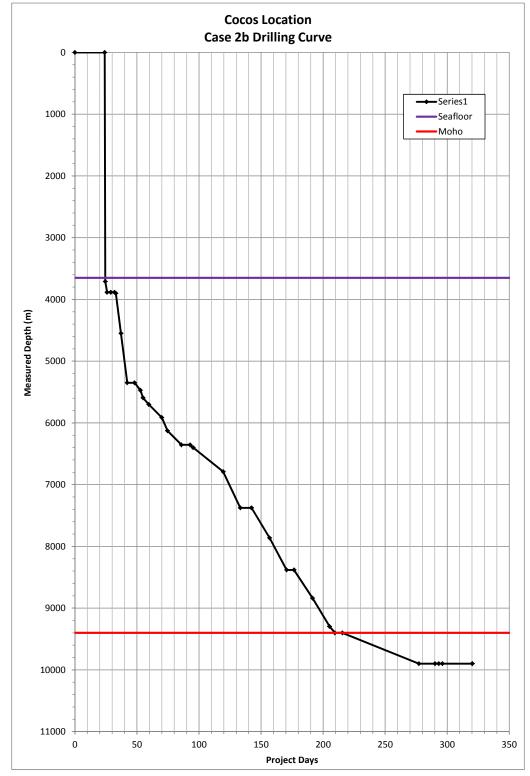


Figure 82. Cocos Location – Case 2b Drilling Curve



5.2.3 Case 2c Operations Time:

This case assumes the Expandable Case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. However for the Cocos location it is assumed that the sediments, lava and dike intervals do not need to be cored because of previous IODP experience on the 1256D hole. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	То	Interval	Avg
	Days	Days	(m)	(m)	(m)	m/day
Move in rig	24.0					
Jet 36"	0.5	0.5	3,650	3,711	61	122
Drill Sediments	1.4	1.9	3,711	3,885	174	124
Set 20" casing	3.0	4.9				
Run BOP & Riser	3.0	7.9				
Drill Sediments	1.1	9.0	3,885	3,900	15	14
Drill Lava	4.1	13.1	3,900	4,550	650	159
Drill Dikes	5.0	18.1	4,550	5,350	800	160
Run 16.5" SET Casing	7.0	25.1				
Core/UR Textured Gabbros	4.7	29.8	5,350	5,471	121	26
Drill Textured Gabbros	2.1	31.9	5,471	5,593	122	58
Core/UR Textured Gabbros	4.6	36.5	5,593	5,700	107	23
Core/UR Foliated Gabbros	10.5	47.0	5,700	5,913	213	20
Drill Foliated Gabbros	4.6	51.6	5,913	6,127	213	46
Core/UR Foliated Gabbros	11.2	62.8	6,127	6,355	229	20
Run 16.5" SET Casing	8.0	70.8				
Core/UR Foliated Gabbros	5.0	75.8	6,355	6,400	45	9
Core/UR Layered Gabbros	24.2	100.0	6,400	6,790	390	16
Drill Layered Gabbros	13.8	113.8	6,790	7,376	586	42
Run 16" Casing	9.0	122.8				
Core/UR Layered Gabbros	29.1	151.9	7,376	7,864	488	17
Drill Layered Gabbros	13.6	165.5	7,864	8,382	518	38
Run 13-3/8" Liner	6.0	171.5				0
Core Layered Gabbros	15.6	187.1				31
Drill Layered Gabbros	10.8	197.9	8,870	9,297	427	40
Core Layered Gabbros	4.3	202.2	9,297	9,400	104	24
Run 11-3/4" Liner	6.0	208.2				
Core Mantle	61.7	269.9	9,400	9,900	500	8
5% Operational NPT	13.0	282.9				
TA hole	3.0	285.9				
Pull BOP/Riser	3.0	288.9				
De-Mobilize Rig	24.0					
Total Core/Drill Days =	289					
Total Project Days =	337					

Figure 83. Cocos Location - Case 2c: Project Time to Reach TD



43% of the hole is cored, and 57% is drilled as shown below.

	Interval	%	Days
Coring =	2,684	42.9%	77
Drilling =	3,566	57.1%	32
	6,250	100%	109

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underrearning the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section Summary						Se	ection Tim	e (days)		Section	Cum	
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	3650	3711	61	Jetting		0.5	0	0	0	0.5	0.5
1	Sediments	3711	3885	174	Drill	21.3	0.3	1.0	0.0	6.0	7.4	7.9
2	Sediments	3885	3900	15	Drill	21.3	0.0	1.1	0.0	0.0	1.1	9.0
3	Lava	3900	4550	650	Drill	9.1	3.0	1.2	0.0	0.0	4.1	13.1
4	Dikes	4550	5350	800	Drill	9.1	3.6	1.4	0.0	7.0	12.0	25.1
5	Textured Gabbros	5350	5471	121	Conv Core	4.6	1.1	1.5	0.0	0.0	2.6	27.7
6	Textured Gabbros	5350	5471	121	UR	7.6	0.7	1.5	0.0	0.0	2.1	29.8
7	Textured Gabbros	5471	5593	122	Drill	9.1	0.6	1.5	0.0	0.0	2.1	31.9
8	Textured Gabbros	5593	5700	107	Conv Core	4.6	1.0	1.5	0.0	0.0	2.5	34.4
9	Textured Gabbros	5593	5700	107	UR	7.6	0.6	1.5	0.0	0.0	2.1	36.5
10	Foliated Gabbros	5700	5913	213	Conv Core	2.4	3.6	1.6	0.0	0.0	5.2	41.8
11	Foliated Gabbros	5700	5913	213	UR	2.4	3.6	1.6	0.0	0.0	5.2	47.0
12	Foliated Gabbros	5913	6127	213	Drill	3.0	2.9	1.6	0.0	0.0	4.6	51.5
13	Foliated Gabbros	6127	6355	229	Conv Core	2.4	3.9	1.7	0.0	0.0	5.6	57.2
14	Foliated Gabbros	6127	6355	229	UR	2.4	3.9	1.7	0.0	8.0	13.6	70.8
15	Foliated Gabbros	6355	6400	45	Conv Core	2.4	0.8	1.7	0.0	0.0	2.5	73.3
16	Foliated Gabbros	6355	6400	45	UR	2.4	0.8	1.7	0.0	0.0	2.5	75.8
17	Layered Gabbros	6400	6790	390	Conv Core	2.4	6.7	5.4	0.0	0.0	12.1	87.9
18	Layered Gabbros	6400	6790	390	UR	2.4	6.7	5.4	0.0	0.0	12.1	100.0
19	Layered Gabbros	6790	7376	586	Drill	3.0	8.0	5.8	0.0	9.0	22.8	122.8
20	Layered Gabbros	7376	7864	488	Conv Core	2.4	8.3	6.3	0.0	0.0	14.6	137.4
21	Layered Gabbros	7376	7864	488	UR	2.4	8.3	6.3	0.0	0.0	14.6	151.9
22	Layered Gabbros	7864	8382	518	Drill	3.0	7.1	6.7	0.0	6.0	19.7	171.7
23	Layered Gabbros	8382	8870	488	Conv Core	2.4	8.3	7.1	0.0	0.0	15.4	187.1
24	Layered Gabbros	8870	9297	427	Drill	3.0	5.8	5.0	0.0	0.0	10.8	197.9
25	Layered Gabbros	9297	9400	104	Conv Core	2.4	1.8	2.6	0.0	6.0	10.3	208.2
26	Mantle	9400	9900	500	RCB Core	1.2	17.1	15.8	25.8	3.0	61.7	269.9
					Sub-Tot	al days =	109	90	26	45	270	
					Sub-1	otal % =	40%	33%	10%	17%	100%	

Figure 84. Cocos Location - Case 2c: Operations Time Breakkdown



Below are the results of the probabilistic estimate of operational time including the P10, P50 and P90 values and a chart showing the cumulative probability of time.

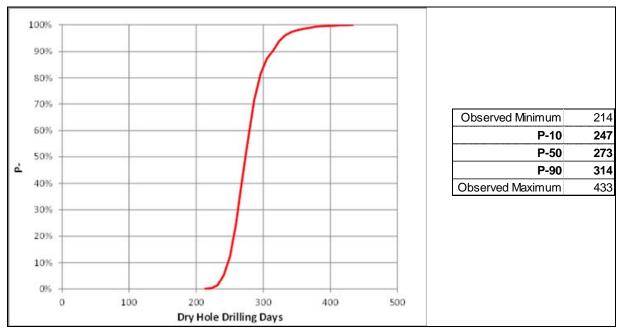
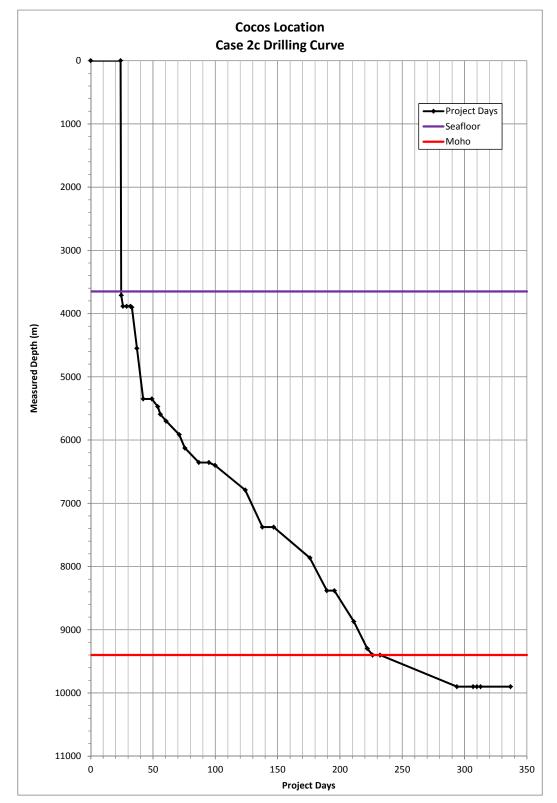


Figure 85. Cocos Location - Case 2c: Probabilistic Time









5.2.4 Case 4a Operations Time:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the time estimate for this case is shown below.

Phase	Interval Days	Cum Days	From (m)	To (m)	Interval (m)	Avg m/day
Mobilize Rig	24.0	24,5	(,	(,	(,	, uuy
Jet 36"	0.5	0.5	3,650	3,711	61	0
Drill Sediments	1.4	1.9	3,711	3,885	174	126
Set 20" casing	3.0	4.9				
Run BOP & Riser	3.0	7.9				
Drill Sediments	1.1	9.0	3,885	3,900	15	14
Drill Lava	4.1	13.1	3,900	4,550	650	158
Drill Dikes	4.9	18.0	4,550	5,335	785	159
Set 13-3/8" Casing	6.0	24.0				
Drill Dikes	1.5	25.5	5,335	5,350	15	10
Drill Textured Gabbros	3.1	28.7	5,350	5,700	350	113
Drill Foliated Gabbros	14.5	43.2	5,700	6,400	700	48
Drill Layered Gabbros	23.1	66.3	6,400	7,400	1,000	43
Run 11-3/4" Liner	9.0	75.3				
Drill Layered Gabbros	50.3	125.6	7,400	9,400	2,000	40
Core Mantle	61.7	187.3	9,400	9,900	500	8
5% Operational NPT	9.0	196.3				
TA hole	3.0	199.3				
Pull BOP/Riser	3.0	202.3				
De-Mobilize Rig	24.0					
Total Operational Days =	202					
Total Project Days =	250					

Figure 87. Cocos Location - Case 4a: Operational Phase Summary

8% of the hole is cored, and 92% is drilled as shown below.

	Interval	%	Days
Coring =	500	8.0%	17
Drilling =	5,750	92.0%	60
	6,250	100%	77

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L"



time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	Summary						Se	ction Tin	ne (days)		Section	Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	3,650	3,711	61	Jetting		0.5	0.0	0.0	0.0	0.5	0.5
1	Sediments	3,711	3,885	174	Drill	21.3	0.3	1.0	0.0	6.0	7.4	7.9
2	Sediments	3,885	3,900	15	Drill	21.3	0.0	1.06	0.0	0.0	1.1	9.0
3	Lava	3,900	4,550	650	Drill	9.1	3.0	1.2	0.0	0.0	4.1	13.1
4	Dikes	4,550	5,335	785	Drill	9.1	3.6	1.4	0.0	6.0	10.9	24.0
5	Dikes	5,335	5,350	15	Drill	9.1	0.07	1.46	0.00	0.00	1.53	25.5
6	Textured Gabbros	5,350	5,700	350	Drill	9.1	1.60	1.51	0.00	0.00	3.11	28.7
7	Foliated Gabbros	5,700	6,400	700	Drill	3.0	9.6	5.0	0.0	0.0	14.53	43.2
8	Layered Gabbros	6,400	7,400	1000	Drill	3.0	13.7	9.4	0.0	9.0	32.1	75.3
9	Layered Gabbros	7,400	9,400	2000	Drill	3.0	27.3	23.0	0.0	0.0	50.3	125.6
10	Mantle	9,400	9,900	500	RCB Core	1.2	17.1	15.8	25.8	3.0	61.7	187.3
	Sub-Total Days =							61	26	24	187	
					Sub-1	Fotal % =	41%	32%	14%	13%	100%	

Figure 88. Cocos Location - Case 4a: Operations Time Breakdown

Below are the results of the probabilistic estimate of operational time including the P10, P50 and P90 values and a chart showing the cumulative probability of time.

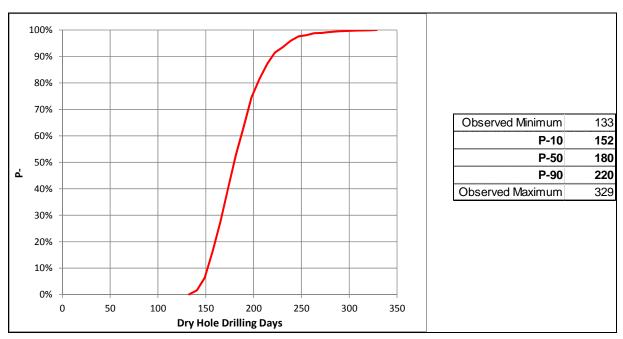


Figure 89. Cocos Location - Case 4a: Probabilistic Time



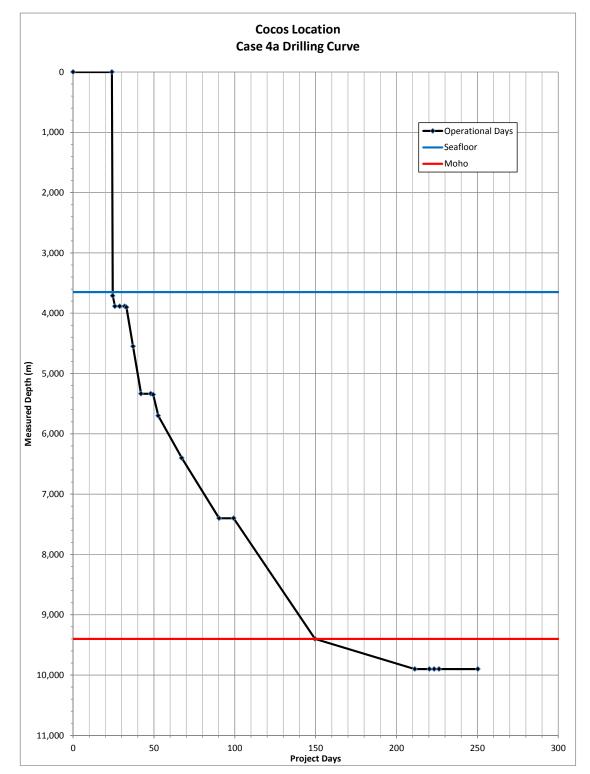


Figure 90. Cocos Location: Case 4a Drilling Curve



5.2.5 Case 4b Operations Time:

This case assumes the Deepwater Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	То	Interval	Avg
Flidse	Days	Days	(m)	(m)	(m)	m/day
Mobilize Rig	23.9					
Jet 36"	0.5	0.5	3,650	3,711	61	121.9215
Drill Sediments	1.3	1.8	3,711	3,885	174	130
Set 22" casing	3.0	4.9				
Run BOP & Riser	3.0	7.9				
Drill Sediments	1.1	9.0	3,885	3,900	15	13.9
Drill Lava	4.1	13.1	3,900	4,550	650	158.6
Drill Dikes	5.0	18.1	4,550	5,350	800	
Set 18" Casing	6.0	24.1				
Drill Textured Gabbros	3.1	27.2	5,350	5,700	350	113.0
Drill Foliated Gabbros	12.2	39.4	5,700	6,355	655	53.7
Set 16" Casing	7.0	46.4				
Drill Foliated Gabbros	2.4	48.8	6,355	6,400	45	18.7
Drill Layered Gabbros	22.8	71.6	6,400	7,376	976	42.8
Run 13-3/8" Liner	9.0	80.6				
Drill Layered Gabbros	24.5	105.1	7,376	8,382		
Run 11-3/4" Liner	6.0	111.1				
Drill Layered Gabbros	26.1	137.2	8,382	9,400		
Run 9-5/8" Liner	6.0	143.2				
Core Mantle	61.7	204.9	9,400	9,900	500	8.1
5% Operational NPT	10.0	214.9				
TA hole	3.0	217.9				
Pull BOP/Riser	3.0	220.9				
De-Mobilize Rig	23.9					
Total Operational Days =	221					
Total Project Days =	269					
	205					

Figure 91. Cocos Location - Case 4b: Operational Phase Summary

8% of the hole is cored, and 92% is drilled as shown below.



	Interval	%	Days
Coring =	500	8.0%	17
Drilling =	5,750	92.0%	60
	6,250	100%	77

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	Section Summary								ne (days)		Section	Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	3650	3711	61	Jetting		0.5	0.0	0.0	0.0	0.5	0.5
1	Sediments	3711	3885	174	Drill	21.3	0.3	1.0	0.0	6.0	7.4	7.9
2	Sediments	3885	3900	15	Drill	21.3	0.0	1.1	0.0	0.0	1.1	9.0
3	Lava	3900	4550	650	Drill	9.1	3.0	1.2	0.0	0.0	4.1	13.1
4	Dikes	4550	5350	800	Drill	9.1	3.6	1.4	0.0	6.0	11.0	24.1
5	Textured Gabbros	5350	5700	350	Drill	9.1	1.6	1.5	0.0	0.0	3.1	27.2
6	Foliated Gabbros	5700	6355	655	Drill	3.0	9.0	3.3	0.0	7.0	19.3	46.4
7	Foliated Gabbros	6355	6400	45	Drill	3.0	0.6	1.7	0.0	0.0	2.4	48.8
8	Layered Gabbros	6400	7376	976	Drill	3.0	13.3	9.4	0.0	9.0	31.8	80.6
9	Layered Gabbros	7376	8382	1006	Drill	3.0	13.8	10.8	0.0	6.0	30.5	111.1
10	Layered Gabbros	8382	9400	1018	Drill	3.0	13.9	12.2	0.0	6.0	32.1	143.2
11	Mantle	9400	9900	500	RCB Core	1.2	17.1	15.8	25.8	3.0	61.7	204.9
		77	59	26	43	205						
					Sub-1	otal % =	37%	29%	13%	21%	100%	

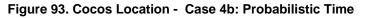
Figure 92. Cocos Location - Case 4a: Operations Time Breakdown

Below are the results of the probabilistic estimate of operational time including the P10, P50 and P90 values and a chart showing the cumulative probability of time.

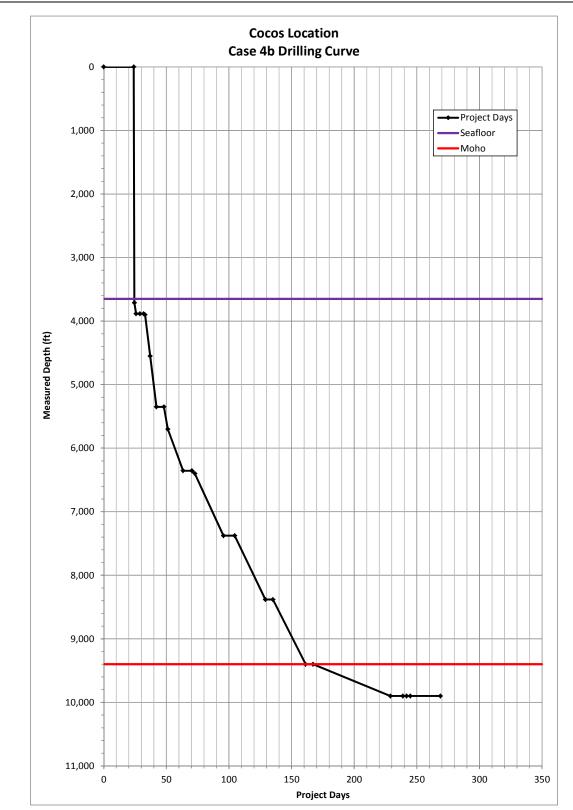


100% 90% 80% 70% Observed Minimum 161 60% P-10 185 P-50 217 50% 4 P-90 268 40% Observed Maximum 396 30% 20% 10% 0% 0 100 200 300 400 500 Dry Hole Drilling Days

Implementation Plan for the BEAM – "Borehole into the Earth's Mantle" Program











5.2.6 Case 4c Operations Time:

This case assumes the Expandable Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	To (m)	Interval	Avg
Mahiliza Dia	Days	Days	(m)	(m)	(m)	m/day
Mobilize Rig	24.0			_		
Jet 36"	0.5	0.5	3,650	3,711	61	121.9
Drill Sediments	1.4	1.9	3,711	3,885	174	126
Set 22" casing	3.0	4.9				
Run BOP & Riser	3.0	7.9				
Drill Sediments	1.1	9.0	3,885	3,900	15	13.9
Drill Lava	4.1	13.1	3,900	4,550	650	157.9
Drill Dikes	5.0	18.1	4,550	5,350	800	0.0
Set 16.5" SET Casing	7.0	25.1				
Drill Textured Gabbros	3.1	28.2	5,350	5,700	350	112.7
Drill Foliated Gabbros	12.3	40.5	5,700	6,355	655	53.5
Drill Foliated Gabbros	2.4	42.8	6,355	6,400	45	19.0
Set 16.5 SET" Casing	8.0	50.8				
Drill Layered Gabbros	22.8	73.6	6,400	7,376	976	42.9
Run 16" Liner	9.0	82.6				
Drill Layered Gabbros	24.5	107.1	7,376	8,382		
Run 13-3/8" Liner	6.0	113.1				
Drill Layered Gabbros	26.1	139.2	8,382	9,400		
Run 11-3/4" Liner	6.0	145.2				
Core Mantle	61.7	206.9	9,400	9,900	500	8.1
5% Operational NPT	10.0	216.9				
TA hole	3.0	219.9				
Pull BOP/Riser	3.0	222.9				
De-Mobilize Rig	24.0					
Total Operational Days = Total Project Days =	223 271					

Figure 95. Cocos Location - Case 4b: Operational Phase Summary

8% of the hole is cored, and 92% is drilled as shown below.



	Interval	%	Days
Coring =	500	8.0%	17
Drilling =	5,750	92.0%	60
	6,250	100%	77

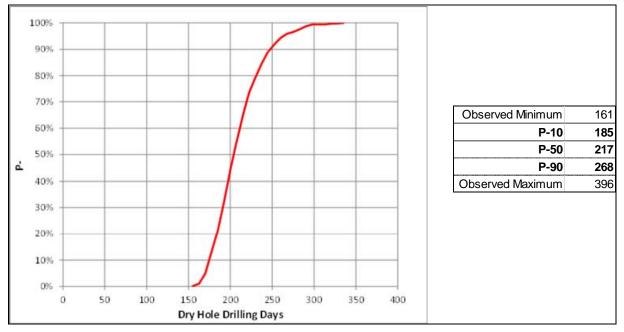
The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

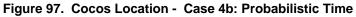
Section	Section Summary								ne (days)		Section	Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	3650	3711	61	Jetting		0.5	0.0	0.0	0.0	0.5	0.5
1	Sediments	3711	3885	174	Drill	21.3	0.3	1.0	0.0	6.0	7.4	7.9
2	Sediments	3885	3900	15	Drill	21.3	0.0	1.1	0.0	0.0	1.1	9.0
3	Lava	3900	4550	650	Drill	9.1	3.0	1.2	0.0	0.0	4.1	13.1
4	Dikes	4550	5350	800	Drill	9.1	3.6	1.4	0.0	7.0	12.0	25.1
5	Textured Gabbros	5350	5700	350	Drill	9.1	1.6	1.5	0.0	0.0	3.1	28.2
6	Foliated Gabbros	5700	6355	655	Drill	3.0	9.0	3.3	0.0	8.0	20.3	48.4
7	Foliated Gabbros	6355	6400	45	Drill	3.0	0.6	1.7	0.0	0.0	2.4	50.8
8	Layered Gabbros	6400	7376	976	Drill	3.0	13.3	9.4	0.0	9.0	31.8	82.6
9	Layered Gabbros	7376	8382	1006	Drill	3.0	13.8	10.8	0.0	6.0	30.5	113.1
10	Layered Gabbros	8382	9400	1018	Drill	3.0	13.9	12.2	0.0	6.0	32.1	145.2
11	Mantle	9400	9900	500	RCB Core	1.2	17.1	15.8	25.8	3.0	61.7	206.9
	Sub-Total Days =								26	45	207	
		fotal % =	37%	29%	12%	22%	100%					

Figure 96. Cocos Location - Case 4a: Operations Time Breakdown

Below are the results of the probabilistic estimate of operational time including the P10, P50 and P90 values and a chart showing the cumulative probability of time.











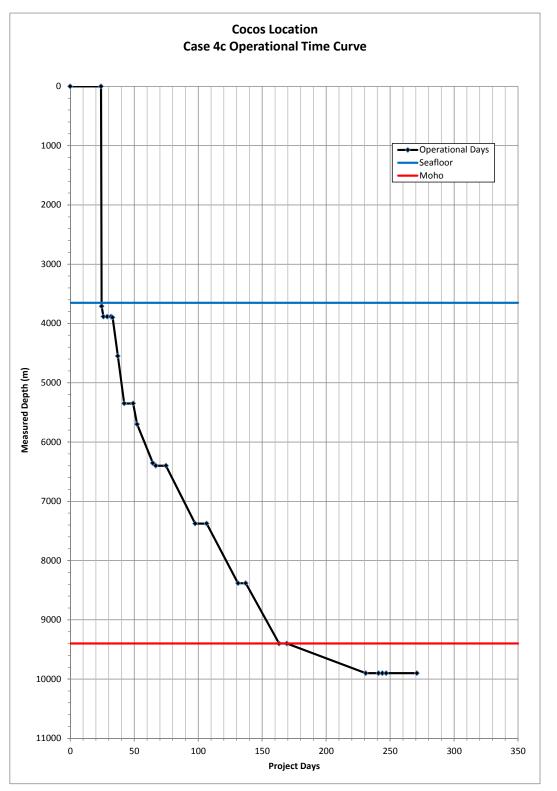


Figure 98. Cocos Location: Case 4c Drilling Curve

5.3 Hawaii Location Operational Time Estimates

5.3.1 Case 2a Operations Time:

This case assumes the original Base Case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	То	Interval	Avg
Phase	Days	Days	(m)	(m)	(m)	m/day
Move in rig	13.4					
Jet 30"	0.5	0.5	4,050	4,111	61	122
Core/UR Sediments	3.1	3.6	4,111	4,235	124	40
Set 20" casing	3.0	6.6				
Run BOP & Riser	3.0	9.6				
Core/UR Sediments	2.5	12.1	4,235	4,250	15	6
Core/UR Lava	5.5	17.6	4,250	4,467	217	39
Drill Lava	2.2	19.8	4,467	4,683		
Core/UR Lava	5.8	25.6	4,683	4,900	217	37
Core/UR Dikes	6.6	32.2	4,900	5,167	267	40
Drill Dikes	2.7	34.9	5,167	5,433	267	99
Core/UR Dikes	6.7	41.6	5,433	5,685	251	38
Set 13-3/8" Casing	6.0	47.6				
Core Dikes	1.7	49.3	5,685	5,700	15	9
Core Textured Gabbros	2.7	52.0	5,700	5,817	116	43
Drill Textured Gabbros	2.1	54.1	5,817	5,933	116	55
Core Textured Gabbros	2.7	56.8	5,933	6,050	117	43
Core Foliated Gabbros	5.7	62.5	6,050	6,284	233	41
Drill Foliated Gabbros	4.9	67.4	6,284	6,517	233	48
Core Foliated Gabbros	7.6	75.0	6,517	6,750	233	31
Core Layered Gabbros	13.6	88.6	6,750	7,207	457	34
Drill Layered Gabbros	17.7	106.3	7,207	7,894	687	39
Core Layered Gabbros	10.4	116.7	7,894	8,250	355	34
Run 11-3/4" Liner	9.0	125.7				
Drill Layered Gabbros	14.9	140.6	8,250	8,829	579	39
Core Layered Gabbros	15.2	155.8	8,829	9,286	457	30
Drill Layered Gabbros	15.8	171.6	9,286	9,865	579	37
Core Layered Gabbros	14.8	186.4	9,865	10,250	385	26
Core Mantle	65.4	251.8	10,250	10,750	500	8
5% Operational NPT	13.0	264.8				
TA hole	3.0	267.8				
Pull BOP/Riser	3.0	270.8				
De-Mobilize Rig	13.4	284.2				
		1				
Total Operational Days =	271					
Total Project Days =	298					

Figure 99. Hawaii Location - Case 2a: Operational Phase Summary



59% of the hole is cored, and 41% is drilled as shown below.

	Interval	%	Days		
Coring =	3,960	59.1%	70		
Drilling =	2,740	40.9%	32		
	6,700	100%	102		

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section Summary							Section Time (days)				Section	Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4050	4111	61	Jetting		0.5	0	0	0	0.5	0.5
1	Sediments	4111	4235	124	Conv Core	12.2	0.4	1.1	0.0	0.0	1.6	2.1
2	Sediments	4111	4235	124	UR	12.2	0.4	1.1	0.0	6.0	7.6	9.6
3	Sediments	4235	4250	15	Conv Core	12.2	0.1	1.2	0.0	0.0	1.2	10.8
4	Sediments	4235	4250	15	UR	12.2	0.1	1.2	0.0	0.0	1.2	12.1
5	Lava	4250	4467	217	Conv Core	4.6	2.0	1.2	0.0	0.0	3.2	15.2
6	Lava	4250	4467	217	UR	7.6	1.2	1.2	0.0	0.0	2.4	17.6
7	Lava	4467	4683	217	Drill	9.1	1.0	1.3	0.0	0.0	2.2	19.8
8	Lava	4683	4900	217	Conv Core	4.6	2.0	1.3	0.0	0.0	3.3	23.1
9	Lava	4683	4900	217	UR	7.6	1.2	1.3	0.0	0.0	2.5	25.6
10	Dikes	4900	5167	267	Conv Core	4.6	2.4	1.4	0.0	0.0	3.8	29.4
11	Dikes	4900	5167	267	UR	7.6	1.5	1.4	0.0	0.0	2.8	32.3
12	Dikes	5167	5433	267	Drill	9.1	1.2	1.4	0.0	0.0	2.7	34.9
13	Dikes	5433	5685	251	Conv Core	4.6	2.3	1.5	0.0	0.0	3.8	38.7
14	Dikes	5433	5685	251	UR	7.6	1.4	1.5	0.0	6.0	8.9	47.6
15	Dikes	5685	5700	15	Conv Core	4.6	0.1	1.6	0.0	0.0	1.7	49.3
16	Textured Gabbros	5700	5817	116	Conv Core	4.6	1.1	1.6	0.0	0.0	2.6	52.0
17	Textured Gabbros	5817	5933	116	Drill	9.1	0.5	1.6	0.0	0.0	2.1	54.1
18	Textured Gabbros	5933	6050	117	Conv Core	4.6	1.1	1.6	0.0	0.0	2.7	56.8
19	Foliated Gabbros	6050	6284	233	Conv Core	2.4	4.0	1.7	0.0	0.0	5.7	62.5
20	Foliated Gabbros	6284	6517	233	Drill	3.0	3.2	1.7	0.0	0.0	4.9	67.4
21	Foliated Gabbros	6517	6750	233	Conv Core	2.4	4.0	3.6	0.0	0.0	7.6	75.0
22	Layered Gabbros	6750	7207	457	Conv Core	2.4	7.8	5.7	0.0	0.0	13.5	88.6
23	Layered Gabbros	7207	7894	687	Drill	3.0	9.4	8.3	0.0	0.0	17.7	106.2
24	Layered Gabbros	7894	8250	355	Conv Core	2.4	6.1	4.4	0.0	9.0	19.5	125.7
25	Layered Gabbros	8250	8829	579	Drill	3.0	7.9	7.0	0.0	0.0	14.9	140.6
26	Layered Gabbros	8829	9286	457	Conv Core	2.4	7.8	7.4	0.0	0.0	15.2	155.9
27	Layered Gabbros	9286	9865	579	Drill	3.0	7.9	7.9	0.0	0.0	15.8	171.6
28	Layered Gabbros	9865	10250	385	Conv Core	2.4	6.6	8.2	0.0	0.0	14.8	186.5
29	Mantle	10250	10750	500	RCB Core	1.2	17.1	17.2	28.1	3.0	65.4	251.8
Sub-Total days =					102	98	28	24	252			
Sub-Total % =								39%	11%	10%	100%	

Figure 100. Hawaii Location - Case 2a: Operations Time Breakdown



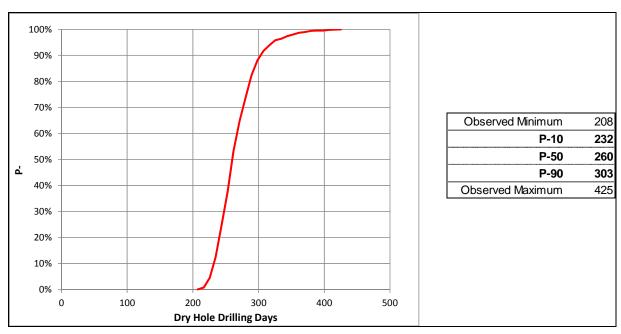


Figure 101. Hawaii Location - Case 2a: Probabilistic Time



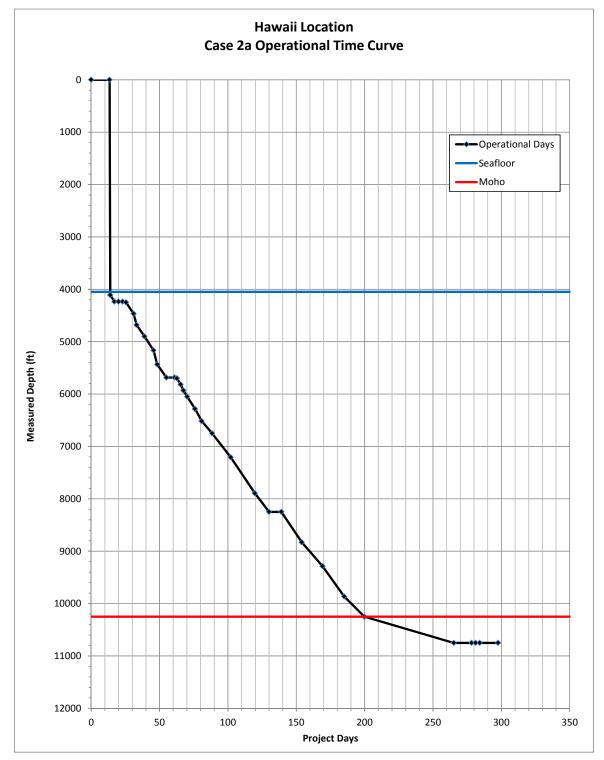


Figure 102. Hawaii Location: Case 2a Drilling Curve



5.3.2 Case 2b Operations Time:

This case assumes the Deepwater case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	То	Interval	Avg
	Days	Days	(m)	(m)	(m)	m/day
Move in rig	13.4					
Jet 36"	0.5	0.5	4,050	4,111	61	122
Core/UR Sediments	3.2	3.7	4,111	4,250	139	43
Set 20" casing	3.0	6.7				
Run BOP & Riser	3.0	9.7				
Core/UR Lava	5.5	15.2	4,250	4,467	217	39
Drill Lava	2.3	17.5	4,467	4,683	217	94
Core/UR Lava	5.8	23.3	4,683	4,900	217	37
Core/UR Dikes	6.6	29.9	4,900	5,167	267	40.4
Drill Dikes	2.7	32.6	5,167	5,433	267	98.8
Core/UR Dikes	6.9	39.5	5,433	5,700	267	38.7
Set 18" Casing	6.0	45.5				
Core/UR Textured Gabbros	4.9	50.4	5,700	5,817	116	24
Drill Textured Gabbros	2.1	52.5	5,817	5,933	116	55
Core/UR Textured Gabbros	5.0	57.5	5,933	6,050	117	23
Core/UR Foliated Gabbros	11.4	68.9	6,050	6,284	233	20
Drill Foliated Gabbros	4.9	73.8	6,284	6,517	233	48
Core/UR Foliated Gabbros	15.2	89.0	6,517	6,750	233	15
Core/UR Layered Gabbros	6.9	95.9	6,750	6,843	93	13.5
Set 16" Casing	7.0	102.9				
Core/UR Layered Gabbros	20.1	123.0	6,843	7,207	364	18
Drill Layered Gabbros	18.8	141.8	7,207	7,971	764	41
Run 13-3/8" Casing	9.0	150.8				
Core Layered Gabbros	18.7	169.5	7,971	8,535	564	30
Drill Layered Gabbros	14.9	184.4	8,535	9,098	564	38
Run 11-3/4" Liner	6.0	190.4				
Core Layered Gabbros	19.9	210.3	9,098	9,662	564	28
Drill Layered Gabbros	11.2	221.5	9,662	10,089	427	38
Core Layered Gabbros	5.5	227.0	10,089	10,250	161	29
Run 9-5/8" Liner	6.0	233.0				
Core Mantle	65.4	298.4	10,250	10,750	500	8
5% Operational NPT	15.0	313.4				
TA hole	3.0	316.4				
Pull BOP/Riser	3.0	319.4				
De-Mobilize Rig	13.4					
Total Core/Drill Days =	319					
Total Project Days =	346					
Figure 103. Hawaii		Case 2b	: Operatio	onal Phas	se Summa	ary



61% of the hole is cored, and 39% is drilled as shown below.

	Interval	%	Days
Coring =	4,052	60.5%	89
Drilling =	2,648	39.5%	30
	6,700	100%	120

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	n Summary						Se	ction Tim	ne (days)		Section	Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4050	4111	61	Jetting		0.5	0	0	0	0.5	0.5
1	Sediments	4111	4250	139	Conv Core	12.2	0.5	1.1	0.0	0.0	1.6	2.1
2	Sediments	4111	4250	139	UR	12.2	0.5	1.1	0.0	6.0	7.6	9.7
3	Lava	4250	4467	217	Conv Core	4.6	2.0	1.2	0.0	0.0	3.2	12.9
4	Lava	4250	4467	217	UR	7.6	1.2	1.2	0.0	0.0	2.4	15.3
5	Lava	4467	4683	217	Drill	9.1	1.0	1.3	0.0	0.0	2.2	17.5
6	Lava	4683	4900	217	Conv Core	4.6	2.0	1.3	0.0	0.0	3.3	20.8
7	Lava	4683	4900	217	UR	7.6	1.2	1.3	0.0	0.0	2.5	23.3
8	Dikes	4900	5167	267	Conv Core	4.6	2.4	1.4	0.0	0.0	3.8	27.1
9	Dikes	4900	5167	267	UR	7.6	1.5	1.4	0.0	0.0	2.8	29.9
10	Dikes	5167	5433	267	Drill	9.1	1.2	1.4	0.0	0.0	2.7	32.6
11	Dikes	5433	5700	267	Conv Core	4.6	2.4	1.5	0.0	0.0	4.0	36.6
12	Dikes	5433	5700	267	UR	7.6	1.5	1.5	0.0	6.0	9.0	45.5
13	Textured Gabbros	5700	5817	116	Conv Core	4.6	1.1	1.6	0.0	0.0	2.6	48.2
14	Textured Gabbros	5700	5817	116	UR	7.6	0.6	1.6	0.0	0.0	2.2	50.4
15	Textured Gabbros	5817	5933	116	Drill	9.1	0.5	1.6	0.0	0.0	2.1	52.5
16	Textured Gabbros	5933	6050	117	Conv Core	4.6	1.1	1.6	0.0	0.0	2.7	55.2
17	Textured Gabbros	5933	6050	117	UR	7.6	0.6	1.6	0.0	0.0	2.3	57.5
18	Foliated Gabbros	6050	6284	233	Conv Core	2.4	4.0	1.7	0.0	0.0	5.7	63.2
19	Foliated Gabbros	6050	6284	233	UR	2.4	4.0	1.7	0.0	0.0	5.7	68.9
20	Foliated Gabbros	6284	6517	233	Drill	3.0	3.2	1.7	0.0	0.0	4.9	73.8
21	Foliated Gabbros	6517	6750	233	Conv Core	2.4	4.0	3.6	0.0	0.0	7.6	81.4
22	Foliated Gabbros	6517	6750	233	UR	2.4	4.0	3.6	0.0	0.0	7.6	89.0
23	Layered Gabbros	6750	6843	93	Conv Core	2.4	1.6	1.9	0.0	0.0	3.4	92.5
24	Layered Gabbros	6750	6843	93	UR	2.4	1.6	1.9	0.0	7.0	10.4	102.9
25	Layered Gabbros	6843	7207	364	Conv Core	2.4	6.2	3.8	0.0	0.0	10.1	113.0
26	Layered Gabbros	6843	7207	364	UR	2.4	6.2	3.8	0.0	0.0	10.1	123.0
27	Layered Gabbros	7207	7971	764	Drill	3.0	10.4	8.3	0.0	9.0	27.7	150.8
28	Layered Gabbros	7971	8535	564	Conv Core	2.4	9.6	9.0	0.0	0.0	18.7	169.4
29	Layered Gabbros	8535	9098	564	Drill	3.0	7.7	7.2	0.0	6.0	20.9	190.4
30	Layered Gabbros	9098	9662	564	Conv Core	2.4	9.6	10.3	0.0	0.0	19.9	210.3
31	Foliated Gabbros	9662	10089	427	Drill	3.0	5.8	5.4	0.0	0.0	11.2	221.5
32	Foliated Gabbros	10089	10250	161	Conv Core	2.4	2.8	2.8	0.0	6.0	11.5	233.0
33	Mantle	10250	10750	500	RCB Core	1.2	17.1	17.2	28.1	3.0	65.4	298.4
					Sub-Tot	al days =	120	108	28	43	298	
					Sub-1	rotal % =	40%	36%	9%	14%	100%	

Figure 104. Hawaii Location - Case 2a: Operations Time Breakdown



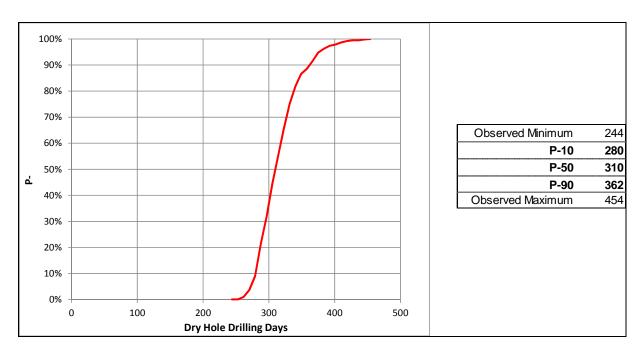


Figure 105. Hawaii Location - Case 2b: Probabilistic Time



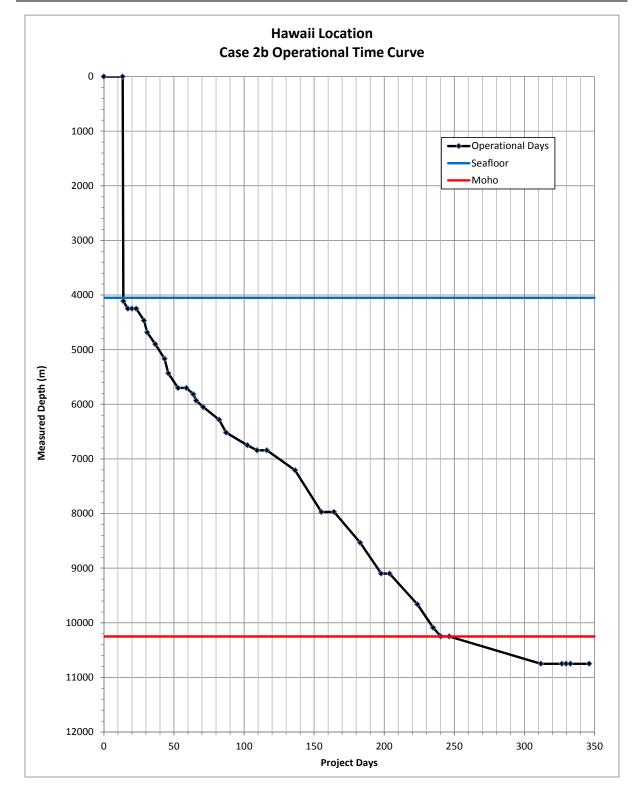


Figure 106. Hawaii Location: Case 2b Drilling Curve



5.3.3 Case 2c Operations Time:

This case assumes the Expandable Case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	То	Interval	Avg
Filase	Days	Days	(m)	(m)	(m)	m/day
Move in rig	13.4					
Jet 36"	0.5	0.5	4,050	4,111	61	122
Core/UR Sediments	3.2	3.7	4,111	4,250	139	43
Set 22" casing	3.0	6.7	0	0	0	0
Run BOP & Riser	3.0	9.7	0	0	0	0
Core/UR Lava	5.6	15.3	4,250	4,467	217	39
Drill Lava	2.2	17.5	4,467	4,683	217	99
Core/UR Lava	5.8	23.3	4,683	4,900	217	37
Core/UR Dikes	6.6	29.9	4,900	5,167	267	40
Drill Dikes	2.7	32.6	5,167	5,433	267	99
Core/UR Dikes	6.9	39.5	5,433	5,700	267	39
Run 16.5" SET Casing	7.0	46.5	0	0	0	0.0
Core/UR Textured Gabbros	4.9	51.4	5,700	5,817	116	24
Drill Textured Gabbros	2.1	53.5	5,817	5,933	116	55
Core/UR Textured Gabbros	5.0	58.5	5,933	6,050	117	23
Core/UR Foliated Gabbros	11.4	69.9	6,050	6,284	233	20
Drill Foliated Gabbros	4.9	74.8	6,284	6,517	233	48
Core/UR Foliated Gabbros	15.2	90.0	6,517	6,750	233	15
Core/UR Layered Gabbros	6.9	96.9	6,750	6,843	93	13
Run 16.5" SET Casing	8.0	104.9	0	0	0	0.0
Core/UR Layered Gabbros	20.1	125.0	6,843	7,207	364	18
Drill Layered Gabbros	18.8	143.8	7,207	7,971	764	41
Run 16" Casing	9.0	152.8	0	0	0	0
Core Layered Gabbros	37.3	190.1	7,971	8,535	564	15
Drill Layered Gabbros	14.9	205.0	8,535	9,098	564	38
Run 13-3/8" Liner	6.0	211.0	0	0	0	0
Core Layered Gabbros	19.9	230.9	9,098	9,662	564	28
Drill Layered Gabbros	11.2	242.1	9,662	10,089	427	38
Core Layered Gabbros	5.6	247.7	10,089	10,250	161	29
Run 11-3/4" Liner	6.0	253.7	0	0	0	0
Core Mantle	65.4	319.1	10,250	10,750	500	8
5% Operational NPT	16.0	335.1				
TA hole	3.0	338.1				
Pull BOP/Riser	3.0	341.1				
De-Mobilize Rig	13.4					
Total Core/Drill Days =	341					
Total Project Days =	368					
			Oporatio		-	

Figure 107. Hawaii Location - Case 2c: Operational Phase Summary



61% of the hole is cored, and 39% is drilled as shown below.

	Interval	%	Days
Coring =	4,052	60.5%	99
Drilling =	2,648	39.5%	30
	6,700	100%	129

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underrearning the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	Summary						Se	ction Tin	ne (days))	Section	Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4050	4111	61	Jetting		0.5	0	0	0	0.5	0.5
1	Sediments	4111	4250	139	Conv Core	12.2	0.5	1.1	0.0	0.0	1.6	2.1
2	Sediments	4111	4250	139	UR	12.2	0.5	1.1	0.0	6.0	7.6	9.7
3	Lava	4250	4467	217	Conv Core	4.6	2.0	1.2	0.0	0.0	3.2	12.9
4	Lava	4250	4467	217	UR	7.6	1.2	1.2	0.0	0.0	2.4	15.3
5	Lava	4467	4683	217	Drill	9.1	1.0	1.3	0.0	0.0	2.2	17.5
6	Lava	4683	4900	217	Conv Core	4.6	2.0	1.3	0.0	0.0	3.3	20.8
7	Lava	4683	4900	217	UR	7.6	1.2	1.3	0.0	0.0	2.5	23.3
8	Dikes	4900	5167	267	Conv Core	4.6	2.4	1.4	0.0	0.0	3.8	27.1
9	Dikes	4900	5167	267	UR	7.6	1.5	1.4	0.0	0.0	2.8	29.9
10	Dikes	5167	5433	267	Drill	9.1	1.2	1.4	0.0	0.0	2.7	32.6
11	Dikes	5433	5700	267	Conv Core	4.6	2.4	1.5	0.0	0.0	4.0	36.6
12	Dikes	5433	5700	267	UR	7.6	1.5	1.5	0.0	7.0	10.0	46.5
13	Textured Gabbros	5700	5817	116	Conv Core	4.6	1.1	1.6	0.0	0.0	2.6	49.2
14	Textured Gabbros	5700	5817	116	UR	7.6	0.6	1.6	0.0	0.0	2.2	51.4
15	Textured Gabbros	5817	5933	116	Drill	9.1	0.5	1.6	0.0	0.0	2.1	53.5
16	Textured Gabbros	5933	6050	117	Conv Core	4.6	1.1	1.6	0.0	0.0	2.7	56.2
17	Textured Gabbros	5933	6050	117	UR	7.6	0.6	1.6	0.0	0.0	2.3	58.5
18	Foliated Gabbros	6050	6284	233	Conv Core	2.4	4.0	1.7	0.0	0.0	5.7	64.2
19	Foliated Gabbros	6050	6284	233	UR	2.4	4.0	1.7	0.0	0.0	5.7	69.9
20	Foliated Gabbros	6284	6517	233	Drill	3.0	3.2	1.7	0.0	0.0	4.9	74.8
21	Foliated Gabbros	6517	6750	233	Conv Core	2.4	4.0	3.6	0.0	0.0	7.6	82.4
22	Foliated Gabbros	6517	6750	233	UR	2.4	4.0	3.6	0.0	0.0	7.6	90.0
23	Layered Gabbros	6750	6843	93	Conv Core	2.4	1.6	1.9	0.0	0.0	3.4	93.5
24	Layered Gabbros	6750	6843	93	UR	2.4	1.6	1.9	0.0	8.0	11.4	104.9
25	Layered Gabbros	6843	7207	364	Conv Core	2.4	6.2	3.8	0.0	0.0	10.1	115.0
26	Layered Gabbros	6843	7207	364	UR	2.4	6.2	3.8	0.0	0.0	10.1	125.0
27	Layered Gabbros	7207	7971	764	Drill	3.0	10.4	8.3	0.0	9.0	27.7	152.8
28	Layered Gabbros	7971	8535	564	Conv Core	2.4	9.6	9.0	0.0	0.0	18.7	171.4
29	Layered Gabbros	7971	8535	564	UR	2.4	9.6	9.0	0.0	0.0	18.7	190.1
30	Layered Gabbros	8535	9098	564	Drill	3.0	7.7	7.2	0.0	6.0	20.9	211.0
31	Layered Gabbros	9098	9662	564	Conv Core	2.4	9.6	10.3	0.0	0.0	19.9	230.9
32	Foliated Gabbros	9662	10089	427	Drill	3.0	5.8	5.4	0.0	0.0	11.2	242.2
33	Foliated Gabbros	10089	10250	161	Conv Core	2.4	2.8	2.8	0.0	6.0	11.5	253.7
34	Mantle	10250	10750	500	RCB Core	1.2	17.1	17.2	28.1	3.0	65.4	319.1
Sub-Total days =								117	28	45	319	
					Sub-1	Fotal % =	40%	37%	9%	14%	100%	

Figure 108. Hawaii Location - Case 2c: Operations Time Breakdown



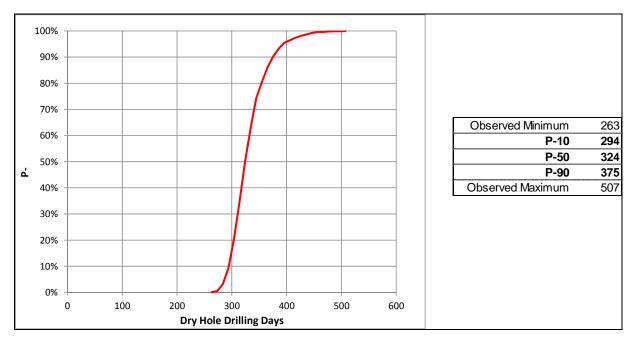


Figure 109. Hawaii Location - Case 2c: Probabilistic Time



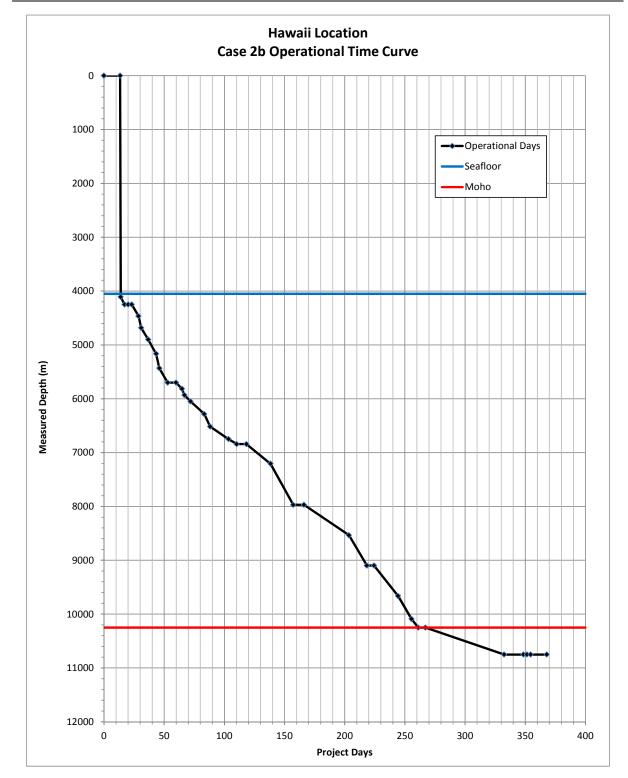


Figure 110. Hawaii Location: Case 2c Drilling Curve



5.3.4 Case 4a Operations Time:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the time estimate for this case is shown below.

Phase	Interval Days	Cum Days	From (ft)	To (ft)	Interval (ft)	Avg ft/day
Move in rig	13.4	Days	(10)	(10)	(10)	Tyday
Jet 36"	0.5	0.5	4,050	4,111	61	0
Drill Sediments	1.4	1.9	4,111	4,235	124	90
Set 20" casing	3.0	4.9	0	0	0	0
Run BOP & Riser	3.0	7.9	0	0	0	0
Drill Sediments	1.2	9.1	4,235	4,250	15	13
Drill Lava	4.2	13.3	4,250	4,900	650	154
Drill Dikes	5.0	18.3	4,900	5,685	785	156
Set 13-3/8" Casing	6.0	24.3	0	0	0	0
Drill Dikes	1.6	25.9	5,685	5,700	15	9
Drill Textured Gabb	3.2	29.1	5,700	6,050	350	109
Drill Foliated Gabbro	16.6	45.7	6,050	6,750	700	42
Drill Layered Gabbro	10.1	55.8	6,750	7,207	457	45
Drill Layered Gabbro	24.8	80.6	7,207	8,250	1,043	42
Run 11-3/4" Liner	9.0	89.6	0	0	0	0
Drill Layered Gabbro	50.1	139.7	8,250	10,250	2,000	40
Core Mantle	65.4	205.1	10,250	10,750	500	8
5% Operational NPT	10.0	215.1				
TA hole	3.0	218.1				
Pull BOP/Riser	3.0	221.1				
De-Mobilize Rig	13.4					
Il Operational Days =	221					
Total Project Days =	248					

Figure 111. Hawaii Location - Case 4a: Operational Phase Summary

8% of the hole is cored, and 92% is drilled as shown below.

	Interval	%	Days
Coring =	500	7.5%	17
Drilling =	6,200	92.5%	66
	6,700	100%	83

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L"



time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	n Summary	Se	ction Tin	ne (days)		Section	Cum					
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4050	4111	61	Jetting		0.5	0	0	0	0.5	0.5
1	Sediments	4111	4235	124	Drill	21.3	0.2	1.1	0.0	6.0	7.4	7.9
2	Sediments	4235	4250	15	Drill	21.3	0.0	1.2	0.0	0.0	1.2	9.1
3	Lava	4250	4900	650	Drill	9.1	3.0	1.3	0.0	0.0	4.2	13.3
4	Dikes	4900	5685	785	Drill	9.1	3.6	1.4	0.0	6.0	11.0	24.3
5	Dikes	5685	5700	15	Drill	9.1	0.1	1.6	0.0	0.0	1.6	25.9
6	Textured Gabbros	5700	6050	350	Drill	9.1	1.6	1.6	0.0	0.0	3.2	29.1
7	Foliated Gabbros	6050	6750	700	Drill	3.0	9.6	7.0	0.0	0.0	16.6	45.7
8	Layered Gabbros	6750	7207	457	Drill	3.0	6.3	3.8	0.0	0.0	10.1	55.8
9	Layered Gabbros	7207	8250	1043	Drill	3.0	14.3	10.6	0.0	9.0	33.8	89.6
10	Layered Gabbros	8250	10250	2000	Drill	3.0	27.3	22.8	0.0	0.0	50.1	139.7
11	Mantle	10250	10750	500	RCB Core	1.2	17.1	17.2	28.1	3.0	65.4	205.1
Sub-Total days :								70	28	24	205	
Sub-Total % :								34%	14%	12%	100%	
										-		

Figure 112. Hawaii Location - Case 4a: Operations Time Breakdown

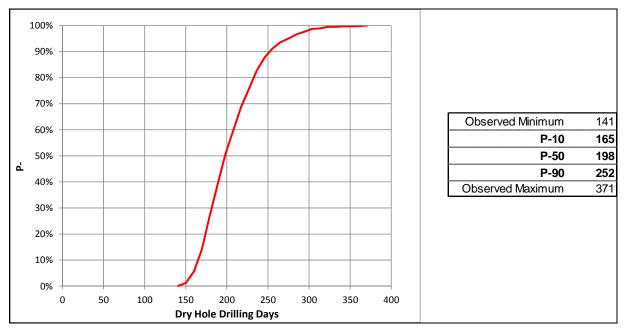


Figure 113. Hawaii Location - Case 4a: Probabilistic Time



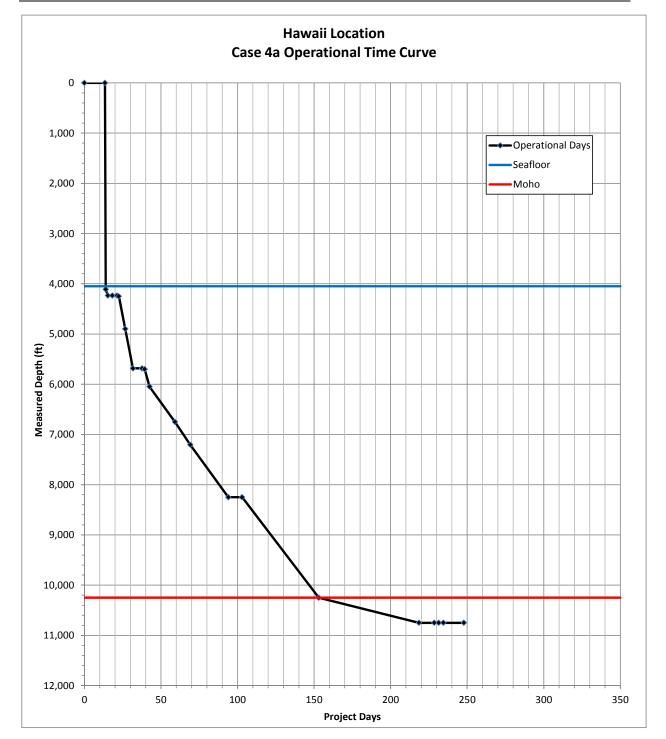


Figure 114. Hawaii Location: Case 4a Drilling Curve



5.3.5 Case 4b Operations Time:

This case assumes the Deepwater Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the time estimate for this case is shown below.

Phase	Interval Days	Cum Days	From (m)	To (m)	Interval (m)	Avg m/day
Mobilize Rig	13.4			. ,	. ,	
Jet 36"	0.5	0.5	4,050	4,111	61	122
Drill Sediments	1.4	1.9	4,111	4,235	124	90
Set 22" casing	3.0	4.9				
Run BOP & Riser	3.0	7.9				
Drill Sediments	1.2	9.1	4,235	4,250	15	13
Drill Lava	4.2	13.3	4,250	4,900	650	154
Drill Dikes	5.1	18.4	4,900	5,700	800	0
Set 18" Casing	6.0	24.4				
Drill Textured Gabbros	3.2	27.6	5,700	6,050	350	109
Drill Foliated Gabbros	16.6	44.2	6,050	6,750	700	42
Drill Layered Gabbros	3.1	47.3	6,750	6,843	93	30
Set 16" Casing	7.0	54.3				
Drill Layered Gabbros	25.5	79.9	6,843	7,971	1,128	44
Run 13-3/8" Liner	9.0	88.9				
Drill Layered Gabbros	27.1	115.9	7,971	9,098	1,128	44
Run 11-3/4" Liner	6.0	121.9				
Drill Layered Gabbros	31.6	153.6	9,098	10,250	1,128	44
Run 9-5/8" Liner	6.0	159.6				
Core Mantle	65.4	224.9	10,250	10,750	500	8
5% Operational NPT	11.0	235.9				
TA hole	3.0	238.9				
Pull BOP/Riser	3.0	241.9				
De-Mobilize Rig	13.4					
Total Core/Drill Days = Total Project Days =	242 269					

Figure 115. Hawaii Location - Case 4b: Operational Phase Summary

8% of the hole is cored, and 92% is drilled as shown below.

	Interval	%	Days
Coring =	500	7.5%	17
Drilling =	6,200	92.5%	66
	6,700	100%	83



The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underrearning the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	n Summary	Se	ction Tin	ne (days)		Section	Cum					
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4050	4111	61	Jetting		0.5	0	0	0	0.5	0.5
1	Sediments	4111	4235	124	Drill	21.3	0.2	1.1	0.0	6.0	7.4	7.9
2	Sediments	4235	4250	15	Drill	21.3	0.0	1.2	0.0	0.0	1.2	9.1
3	Lava	4250	4900	650	Drill	9.1	3.0	1.3	0.0	0.0	4.2	13.3
4	Dikes	4900	5700	800	Drill	9.1	3.6	1.4	0.0	6.0	11.1	24.4
5	Textured Gabbros	5700	6050	350	Drill	9.1	1.6	1.6	0.0	0.0	3.2	27.6
6	Foliated Gabbros	6050	6750	700	Drill	3.0	9.6	7.0	0.0	0.0	16.6	44.1
7	Layered Gabbros	6750	6843	93	Drill	3.0	1.3	1.9	0.0	7.0	10.1	54.3
8	Layered Gabbros	6843	7971	1128	Drill	3.0	15.4	10.1	0.0	9.0	34.5	88.8
9	Layered Gabbros	7971	9098	1128	Drill	3.0	15.4	11.7	0.0	6.0	33.1	121.9
10	Layered Gabbros	9098	10250	1152	Drill	3.0	15.7	15.9	0.0	6.0	37.6	159.5
11	Mantle	10250	10750	500	RCB Core	1.2	17.1	17.2	28.1	3.0	65.4	224.9
Sub-Total days =							83	70	28	43	225	
Sub-Total % =								31%	12%	19%	100%	
Sub-Total % =								31%	12%	19%	100%	

Figure 116. Hawaii Location - Case 4b: Operations Time Breakdown

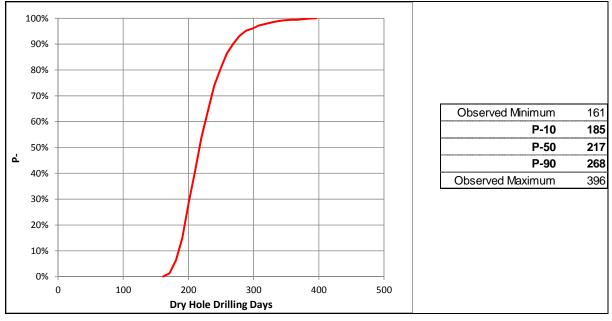


Figure 117. Hawaii Location - Case 4b: Probabilistic Time



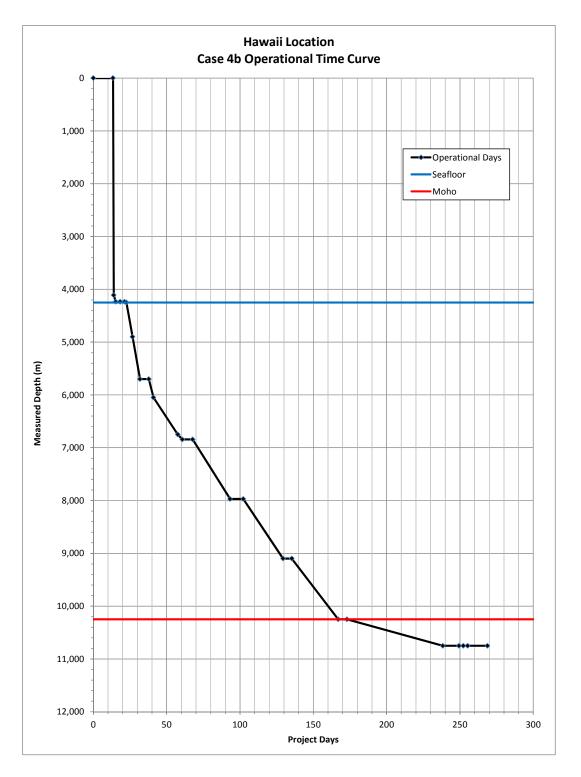


Figure 118. Hawaii Location: Case 4b Drilling Curve



5.3.6 Case 4c Operations Time:

This case assumes the Expandable Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	То	Interval	Avg
	Days	Days	(m)	(m)	(m)	m/day
Mobilize Rig	13.4					
Jet 36"	0.5	0.5	4,050	4,111	61	122
Drill Sediments	1.4	1.9	4,111	4,235	124	90
Set 22" casing	3.0	4.9				
Run BOP & Riser	3.0	7.9				
Drill Sediments	1.2	9.1	4,235	4,250	15	13
Drill Lava	4.2	13.3	4,250	4,900	650	154
Drill Dikes	5.1	18.4	4,900	5,700	800	0
Set 16.5" SET Casing	7.0	25.4				
Drill Textured Gabbros	3.2	28.6	5,700	6,050	350	109
Drill Foliated Gabbros	16.6	45.2	6,050	6,750	700	42
Drill Layered Gabbros	3.1	48.3	6,750	6,843	93	30
Set 16.5" SET Casing	8.0	56.3				
Drill Layered Gabbros	25.5	81.9	6,843	7,971	1,128	44
Run 16" Liner	9.0	90.9				
Drill Layered Gabbros	27.1	117.9	7,971	9,098		
Run 13-3/8" Liner	6.0	123.9				
Drill Layered Gabbros	31.6	155.6	9,098	10,250		
Run 11-3/4" Liner	6.0	161.6				
Core Mantle	65.4	226.9	10,250	10,750	500	8
5% Operational NPT	11.0	237.9				
TA hole	3.0	240.9				
Pull BOP/Riser	3.0	243.9				
De-Mobilize Rig	13.4					
Total Core/Drill Days =	244					
Total Project Days =	271					

Figure 119. Hawaii Location - Case 4c: Operational Phase Summary

8% of the hole is cored, and 92% is drilled as shown below.

	Interval	%	Days
Coring =	500	7.5%	17
Drilling =	6200	92.5%	66
	6700	100%	83



The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underrearning the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	Section Summary Section Time (days)									Section	Cum	
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4,050	4,111	61	Jetting		0.5	0.0	0.0	0.0	0.5	0.5
1	Sediments	4,111	4,235	124	Drill	70	0.2	1.1	0.0	6.0	7.4	7.9
2	Sediments	4,235	4,250	15	Drill	70	0.0	1.2	0.0	0.0	1.2	9.1
3	Lava	4,250	4,900	650	Drill	30	3.0	1.3	0.0	0.0	4.2	13.3
4	Dikes	4,900	5,700	800	Drill	30	3.6	1.4	0.0	7.0	12.1	25.4
5	Textured Gabbros	5,700	6,050	350	Drill	30	1.6	1.6	0.0	0.0	3.2	28.6
6	Foliated Gabbros	6,050	6,750	700	Drill	10	9.6	7.0	0.0	0.0	16.6	45.1
7	Layered Gabbros	6,750	6,843	93	Drill	10	1.3	1.9	0.0	8.0	11.1	56.3
8	Layered Gabbros	6,843	7,971	1128	Drill	10	15.4	10.1	0.0	9.0	34.5	90.8
9	Layered Gabbros	7,971	9,098	1128	Drill	10	15.4	11.7	0.0	6.0	33.1	123.9
10	Layered Gabbros	9,098	10,250	1152	Drill	10	15.7	15.9	0.0	6.0	37.6	161.5
11	Mantle	10,250	10,750	500	RCB Core	4	17.1	17.2	28.1	3.0	65.4	226.9
	Sub-Total days =							70	28	45	227	
Sub-Total % = 37% 31% 12							12%	20%	100%			

Figure 120. Hawaii Location - Case 4c: Operations Time Breakdown

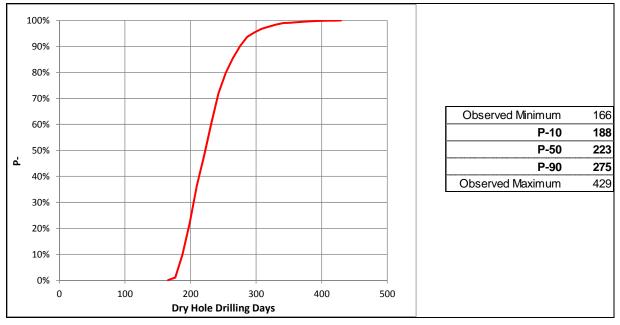


Figure 121. Hawaii Location - Case 4c: Probabilistic Time



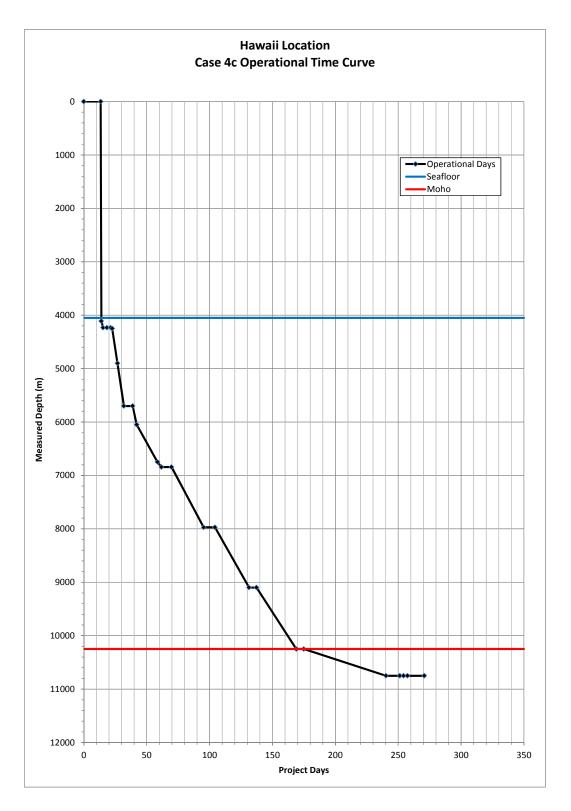


Figure 122. Hawaii Location: Case 4c Drilling Curve

5.4 Baja Location Operational Time Estimates

5.4.1 Case 2a Operations Time:

This case assumes the original Base Case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	То	Interval	Avg
Phase	Days	Days	(ft)	(ft)	(ft)	ft/day
Move in rig	18.1					
Jet 36"	0.5	0.5	4,300	4,361	61	122
Core/UR Sediments	2.6	3.1	4,361	4,385	24	9
Set 20" casing	3.0	6.1				
Run BOP & Riser	3.0	9.1				
Core/UR Sediments	2.6	11.7	4,385	4,400	15	6
Core/UR Lava	5.5	17.2	4,400	4,617	217	39
Drill Lava	2.3	19.5	4,617	4,834	217	94
Core/UR Lava	5.8	25.3	4,834	5,050	216	37
Core/UR Dikes	6.7	32.0	5,050	5,317	267	40
Drill Dikes	2.7	34.7	5,317	5,580	264	98
Core/UR Dikes	6.9	41.6	5,580	5,835	255	37
Set 13-3/8" Casing	6.0	47.6				
Core/UR Dikes	1.7	49.3	5,835	5,850	15	9
Core Textured Gabbros	2.7	52.0	5,850	5,967	116	43
Drill Textured Gabbros	2.2	54.2	5,967	6,083	116	53
Core Textured Gabbros	2.7	56.9	6,083	6,200	117	43
Core Foliated Gabbros	5.7	62.6	6,200	6,433	233	41
Drill Foliated Gabbros	5.0	67.6	6,433	6,667	233	47
Core Foliated Gabbros	7.7	75.3	6,667	6,900	233	30
Core Layered Gabbros	13.7	89.0	6,900	7,357	457	33
Drill Layered Gabbros	13.6	102.6	7,357	7,900	543	40
Run 11-3/4" Liner	9.0	111.6				
Core Layered Gabbros	14.5	126.1	7,900	8,357	457	32
Drill Layered Gabbros	10.9	137.0	8,357	8,815	457	42
Core Layered Gabbros	15.2	152.2	8,815	9,272	457	30
Drill Layered Gabbros	11.5	163.7	9,272	9,729	457	40
Core Layered Gabbros	5.6	169.3	9,729	9,900	171	31
Core Mantle	63.9	233.2	9,900	10,400	500	8
5% Operational NPT	12.0	245.2				
TA hole	3.0	248.2				
Pull BOP/Riser	3.0	251.2				
De-Mobilize Rig	18.1					
Total Operational Days =	251					
Total Project Days =	287					

Figure 123. Baja Location - Case 2a: Operational Phase Summary



61% of the hole is cored, and 39% is drilled as shown below.

	Interval	%	Days
Coring =	3,752	61.5%	68
Drilling =	2,349	38.5%	26
	6,100	100%	94

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underrearning the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section Summary							Section Time (days)				Section	Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4300	4361	61	Jetting		0.5	0	0	0	0.5	0.5
1	Sediments	4361	4385	24	Conv Core	12.2	0.1	1.2	0.0	0.0	1.3	1.8
2	Sediments	4361	4385	24	UR	12.2	0.1	1.2	0.0	6.0	7.3	9.1
3	Sediments	4385	4400	15	Conv Core	12.2	0.1	1.2	0.0	0.0	1.3	10.3
4	Sediments	4385	4400	15	UR	12.2	0.1	1.2	0.0	0.0	1.3	11.6
5	Lava	4400	4617	217	Conv Core	4.6	2.0	1.2	0.0	0.0	3.2	14.8
6	Lava	4400	4617	217	UR	7.6	1.2	1.2	0.0	0.0	2.4	17.2
7	Lava	4617	4834	217	Drill	9.1	1.0	1.3	0.0	0.0	2.3	19.5
8	Lava	4834	5050	216	Conv Core	4.6	2.0	1.4	0.0	0.0	3.3	22.8
9	Lava	4834	5050	216	UR	7.6	1.2	1.4	0.0	0.0	2.5	25.3
10	Dikes	5050	5317	267	Conv Core	4.6	2.4	1.4	0.0	0.0	3.8	29.2
11	Dikes	5050	5317	267	UR	7.6	1.5	1.4	0.0	0.0	2.9	32.0
12	Dikes	5317	5580	264	Drill	9.1	1.2	1.5	0.0	0.0	2.7	34.7
13	Dikes	5580	5835	255	Conv Core	4.6	2.3	1.6	0.0	0.0	3.9	38.6
14	Dikes	5580	5835	255	UR	7.6	1.4	1.6	0.0	6.0	9.0	47.6
15	Dikes	5835	5850	15	Conv Core	4.6	0.1	1.6	0.0	0.0	1.7	49.3
16	Textured Gabbros	5850	5967	116	Conv Core	4.6	1.1	1.6	0.0	0.0	2.7	52.0
17	Textured Gabbros	5967	6083	116	Drill	9.1	0.5	1.6	0.0	0.0	2.2	54.2
18	Textured Gabbros	6083	6200	117	Conv Core	4.6	1.1	1.7	0.0	0.0	2.7	56.9
19	Foliated Gabbros	6200	6433	233	Conv Core	2.4	4.0	1.7	0.0	0.0	5.7	62.6
20	Foliated Gabbros	6433	6667	233	Drill	3.0	3.2	1.8	0.0	0.0	5.0	67.6
21	Foliated Gabbros	6667	6900	233	Conv Core	2.4	4.0	3.7	0.0	0.0	7.7	75.3
22	Layered Gabbros	6900	7357	457	Conv Core	2.4	7.8	5.8	0.0	0.0	13.7	89.0
23	Layered Gabbros	7357	7900	543	Drill	3.0	7.4	6.3	0.0	9.0	22.7	111.6
24	Layered Gabbros	7900	8357	457	Conv Core	2.4	7.8	6.7	0.0	0.0	14.5	126.1
25	Layered Gabbros	8357	8815	457	Drill	3.0	6.3	4.7	0.0	0.0	10.9	137.1
26	Layered Gabbros	8815	9272	457	Conv Core	2.4	7.8	7.4	0.0	0.0	15.2	152.3
27	Layered Gabbros	9272	9729	457	Drill	3.0	6.3	5.2	0.0	0.0	11.4	163.7
28	Layered Gabbros	9729	9900	171	Conv Core	2.4	2.9	2.7	0.0	0.0	5.6	169.3
29	Mantle	9900	10400	500	RCB Core	1.2	17.1	16.7	27.1	3.0	63.9	233.2
					Sub-Tot	al days =	94	88	27	24	233	
					Sub-1	Fotal % =	40%	38%	12%	10%	100%	

Figure 124. Baja Location - Case 2a: Operations Time Breakdown



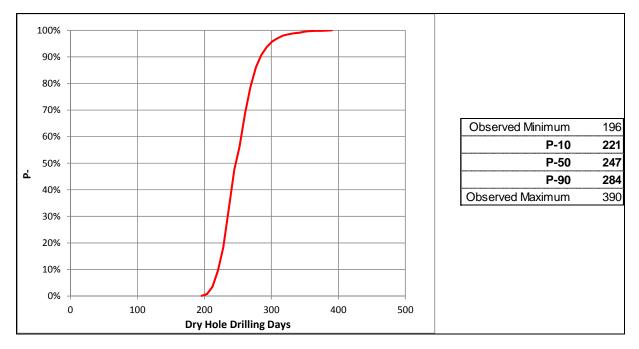
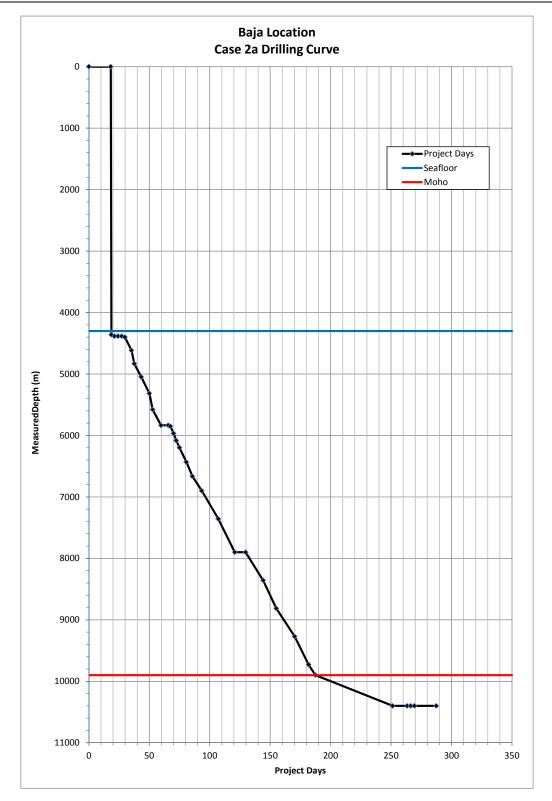
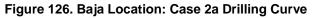


Figure 125. Baja Location - Case 2a: Probabilistic Time





Implementation Plan for the BEAM - "Borehole into the Earth's Mantle" Program





5.4.2 Case 2b Operations Time:

This case assumes the Deepwater case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	То	Interval	Avg
Flidse	Days	Days	(m)	(m)	(m)	m/day
Move in rig	18.1					
Jet 36"	0.5	0.5	4,300	4,361	61	122
Core/UR Sediments	2.6	3.1	4,361	4,385	24	9
Set 20" casing	3.0	6.1				
Run BOP & Riser	3.0	9.1				
Core/UR Sediments	2.5	11.6	4,385	4,400	15	6
Core/UR Lava	5.6	17.2	4,400	4,617	217	39
Drill Lava	2.3	19.5	4,617	4,834	217	94
Core/UR Lava	5.8	25.3	4,834	5,050	216	37
Core/UR Dikes	6.7	32.0	5,050	5,317	267	40
Drill Dikes	2.7	34.7	5,317	5,580	264	98
Core/UR Dikes	7.1	41.8	5,580	5,850	270	38
Set 18" Casing	6.0	47.8				
Core/UR Textured Gabbros	4.9	52.7	5,850	5,967	116	24
Drill Textured Gabbros	2.2	54.9	5,967	6,083	116	53
Core/UR Textured Gabbros	5.1	60.0	6,083	6,200	117	23
Core/UR Foliated Gabbros	11.4	71.4	6,200	6,433	233	20
Drill Foliated Gabbros	5.0	76.4	6,433	6,667	233	47
Core/UR Foliated Gabbros	13.9	90.3	6,667	6,858	191	14
Set 16" Casing	7.0	97.3				
Core/UR Foliated Gabbros	5.2	102.5	6,858	6,900	42	8
Core/UR Layered Gabbros	27.3	129.8	6,900	7,357	457	17
Drill Layered Gabbros	13.2	143.0	7,357	7,864	507	38
Run 13-3/8" Casing	9.0	152.0				
Core Layered Gabbros	15.1	167.1	7,864	8,357	493	33
Drill Layered Gabbros	13.6	180.7	8,357	8,839	482	35
Run 11-3/4" Liner	6.0	186.7				
Core Layered Gabbros	14.8	201.5	8,839	9,272	433	29
Drill Layered Gabbros	11.4	212.9	9,272	9,726	454	40
Core Layered Gabbros	5.7	218.6	9,726	9,900	174	31
Run 9-5/8" Liner	6.0	224.6	0	0	0	0
Core Mantle	63.9	288.5	9,900	10,400	500	8
5% Operational NPT	14.0	302.5				
TA hole	3.0	305.5				
Pull BOP/Riser	3.0	308.5				
De-Mobilize Rig	18.1					
Total Core/Drill Days =	309					
Total Project Days =	345					
iotai rioject Days –	<u> </u>	I				

Figure 127. Baja Location - Case 2b: Operational Phase Summary



62% of the hole is cored, and 38% is drilled as shown below.

	Interval	%	Days
Coring =	3,766	61.7%	85
Drilling =	2,334	38.3%	26
	6,100	100%	111

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	n Summary						Se	ection Tin	ne (days)		Section	Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4300	4361	61	Jetting		0.5	0	0	0	0.5	0.5
1	Sediments	4361	4385	24	Conv Core	12.2	0.1	1.2	0.0	0.0	1.3	1.8
2	Sediments	4361	4385	24	UR	12.2	0.1	1.2	0.0	6.0	7.3	9.1
3	Sediments	4385	4400	15	Conv Core	12.2	0.1	1.2	0.0	0.0	1.3	10.3
4	Sediments	4385	4400	15	UR	12.2	0.1	1.2	0.0	0.0	1.3	11.6
5	Lava	4400	4617	217	Conv Core	4.6	2.0	1.2	0.0	0.0	3.2	14.8
6	Lava	4400	4617	217	UR	7.6	1.2	1.2	0.0	0.0	2.4	17.2
7	Lava	4617	4834	217	Drill	9.1	1.0	1.3	0.0	0.0	2.3	19.5
8	Lava	4834	5050	216	Conv Core	4.6	2.0	1.4	0.0	0.0	3.3	22.8
9	Lava	4834	5050	216	UR	7.6	1.2	1.4	0.0	0.0	2.5	25.3
10	Dikes	5050	5317	267	Conv Core	4.6	2.4	1.4	0.0	0.0	3.8	29.2
11	Dikes	5050	5317	267	UR	7.6	1.5	1.4	0.0	0.0	2.9	32.0
12	Dikes	5317	5580	264	Drill	9.1	1.2	1.5	0.0	0.0	2.7	34.7
13	Dikes	5580	5850	270	Conv Core	4.6	2.5	1.6	0.0	0.0	4.0	38.8
14	Dikes	5580	5850	270	UR	7.6	1.5	1.6	0.0	6.0	9.0	47.8
15	Textured Gabbros	5850	5967	116	Conv Core	4.6	1.1	1.6	0.0	0.0	2.7	50.5
16	Textured Gabbros	5850	5967	116	UR	7.6	0.6	1.6	0.0	0.0	2.3	52.7
17	Textured Gabbros	5967	6083	116	Drill	9.1	0.5	1.6	0.0	0.0	2.2	54.9
18	Textured Gabbros	6083	6200	117	Conv Core	4.6	1.1	1.7	0.0	0.0	2.7	57.6
19	Textured Gabbros	6083	6200	117	UR	7.6	0.6	1.7	0.0	0.0	2.3	60.0
20	Foliated Gabbros	6200	6433	233	Conv Core	2.4	4.0	1.7	0.0	0.0	5.7	65.7
21	Foliated Gabbros	6200	6433	233	UR	2.4	4.0	1.7	0.0	0.0	5.7	71.4
22	Foliated Gabbros	6433	6667	233	Drill	3.0	3.2	1.8	0.0	0.0	5.0	76.4
23	Foliated Gabbros	6667	6858	191	Conv Core	2.4	3.3	3.7	0.0	0.0	7.0	83.3
24	Foliated Gabbros	6667	6858	191	UR	2.4	3.3	3.7	0.0	7.0	14.0	97.3
25	Foliated Gabbros	6858	6900	42	Conv Core	2.4	0.7	1.9	0.0	0.0	2.6	99.9
26	Foliated Gabbros	6858	6900	42	UR	2.4	0.7	1.9	0.0	0.0	2.6	102.5
27	Layered Gabbros	6900	7357	457	Conv Core	2.4	7.8	5.8	0.0	0.0	13.7	116.2
28	Layered Gabbros	6900	7357	457	UR	2.4	7.8	5.8	0.0	0.0	13.7	129.8
29	Layered Gabbros	7357	7864	507	Drill	3.0	6.9	6.2	0.0	9.0	22.2	152.0
30	Layered Gabbros	7864	8357	493	Conv Core	2.4	8.4	6.7	0.0	0.0	15.1	167.1
31	Layered Gabbros	8357	8839	482	Drill	3.0	6.6	7.1	0.0	6.0	19.6	186.7
32	Layered Gabbros	8839	9272	433	Conv Core	2.4	7.4	7.4	0.0	0.0	14.8	201.5
33	Layered Gabbros	9272	9726	454	Drill	3.0	6.2	5.2	0.0	0.0	11.4	212.9
34	Layered Gabbros	9726	9900	174	Conv Core	2.4	3.0	2.7	0.0	6.0	11.7	224.6
35	Mantle	9900	10400	500	RCB Core	1.2	17.1	16.7	27.1	3.0	63.9	288.5
·				-		al days =	111	107	27	43	288	
Sub-Total % = 39% 37% 9% 15% 100%									1			



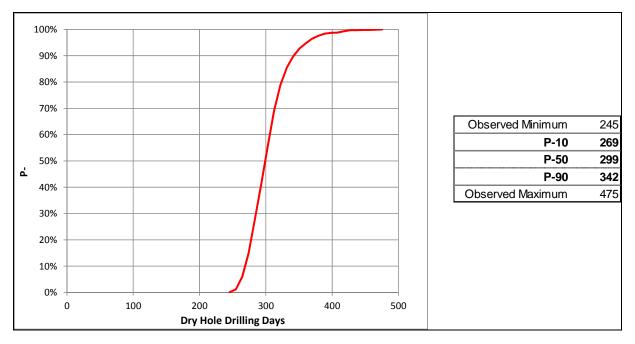
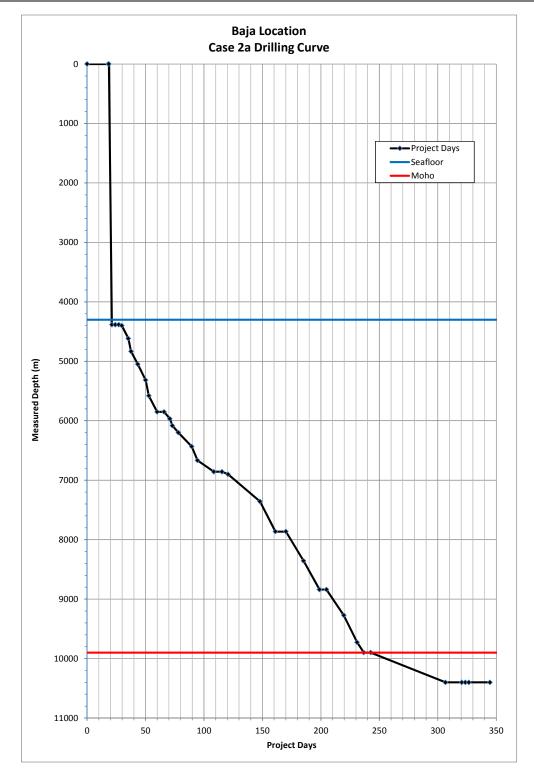


Figure 129. Baja Location - Case 2b: Probabilistic Time





Implementation Plan for the BEAM – "Borehole into the Earth's Mantle" Program

Figure 130. Baja Location: Case 2b Drilling Curve



5.4.3 Case 2c Operations Time:

This case assumes the Expandable Case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	То	Interval	Avg
	Days	Days	(m)	(m)	(m)	m/day
Move in rig	18.1					
Jet 36"	0.5	0.5	4,300	4,361	61	122
Core/UR Sediments	2.6	3.1	4,361	4,385	24	9
Set 20" casing	3.0	6.1				
Run BOP & Riser	3.0	9.1				
Core/UR Sediments	2.5	11.6	4,385	4,400	15	6
Core/UR Lava	5.6	17.2	4,400	4,617	217	39
Drill Lava	2.3	19.5	4,617	4,834	217	94
Core/UR Lava	5.8	25.3	4,834	5,050	216	37
Core/UR Dikes	6.7	32.0	5,050	5,317	267	40
Drill Dikes	2.7	34.7	5,317	5,580	264	98
Core/UR Dikes	7.1	41.8	5,580	5,850	270	38
Run 16.5" SET Casing	7.0	48.8				
Core/UR Textured Gabbros	4.9	53.7	5,850	5,967	116	24
Drill Textured Gabbros	2.2	55.9	5,967	6,083	116	53
Core/UR Textured Gabbros	5.1	61.0	6,083	6,200	117	23
Core/UR Foliated Gabbros	11.4	72.4	6,200	6,433	233	20
Drill Foliated Gabbros	5.0	77.4	6,433	6,667	233	47
Core/UR Foliated Gabbros	13.9	91.3	6,667	6,858	191	14
Run 16.5" SET Casing	8.0	99.3				
Core/UR Foliated Gabbros	5.2	104.5	6,858	6,900	42	8
Core/UR Layered Gabbros	27.3	131.8	6,900	7,357	457	17
Drill Layered Gabbros	13.2	145.0	7,357	7,864	507	38
Run 16" Casing	9.0	154.0				
Core Layered Gabbros	30.2	184.2	7,864	8,357	493	16
Drill Layered Gabbros	13.6	197.8	8,357	8,839	482	35
Run 13-3/8" Liner	6.0	203.8				
Core Layered Gabbros	14.8	218.6	8,839	9,272	433	29
Drill Layered Gabbros	11.4	230.0	9,272	9,726	454	40
Core Layered Gabbros	5.7	235.7	9,726	9,900	174	31
Run 9-5/8" Liner	6.0	241.7				
Core Mantle	63.9	305.6	9,900	10,400	500	8
5% Operational NPT	15.0	320.6				
TA hole	3.0	323.6				
Pull BOP/Riser	3.0	326.6				
De-Mobilize Rig	18.1					
Total Core/Drill Days =	327					
Total Project Days =	363					
	505	l				

Figure 131. Baja Location - Case 2c Operational Phase Summary



62% of the hole is cored, and 38% is drilled as shown below.

	Interval	%	Days
Coring =	3,766	61.7%	94
Drilling =	2,334	38.3%	26
	6,100	100%	120

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	n Summary						Se	ction Tim	ne (days)		Section	Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4300	4361	61	Jetting		0.5	0	0	0	0.5	0.5
1	Sediments	4361	4385	24	Conv Core	12.2	0.1	1.2	0.0	0.0	1.3	1.8
2	Sediments	4361	4385	24	UR	12.2	0.1	1.2	0.0	6.0	7.3	9.1
3	Sediments	4385	4400	15	Conv Core	12.2	0.1	1.2	0.0	0.0	1.3	10.3
4	Sediments	4385	4400	15	UR	12.2	0.1	1.2	0.0	0.0	1.3	11.6
5	Lava	4400	4617	217	Conv Core	4.6	2.0	1.2	0.0	0.0	3.2	14.8
6	Lava	4400	4617	217	UR	7.6	1.2	1.2	0.0	0.0	2.4	17.2
7	Lava	4617	4834	217	Drill	9.1	1.0	1.3	0.0	0.0	2.3	19.5
8	Lava	4834	5050	216	Conv Core	4.6	2.0	1.4	0.0	0.0	3.3	22.8
9	Lava	4834	5050	216	UR	7.6	1.2	1.4	0.0	0.0	2.5	25.3
10	Dikes	5050	5317	267	Conv Core	4.6	2.4	1.4	0.0	0.0	3.8	29.2
11	Dikes	5050	5317	267	UR	7.6	1.5	1.4	0.0	0.0	2.9	32.0
12	Dikes	5317	5580	264	Drill	9.1	1.2	1.5	0.0	0.0	2.7	34.7
13	Dikes	5580	5850	270	Conv Core	4.6	2.5	1.6	0.0	0.0	4.0	38.8
14	Dikes	5580	5850	270	UR	7.6	1.5	1.6	0.0	7.0	10.0	48.8
15	Textured Gabbros	5850	5967	116	Conv Core	4.6	1.1	1.6	0.0	0.0	2.7	51.5
16	Textured Gabbros	5850	5967	116	UR	7.6	0.6	1.6	0.0	0.0	2.3	53.7
17	Textured Gabbros	5967	6083	116	Drill	9.1	0.5	1.6	0.0	0.0	2.2	55.9
18	Textured Gabbros	6083	6200	117	Conv Core	4.6	1.1	1.7	0.0	0.0	2.7	58.6
19	Textured Gabbros	6083	6200	117	UR	7.6	0.6	1.7	0.0	0.0	2.3	61.0
20	Foliated Gabbros	6200	6433	233	Conv Core	2.4	4.0	1.7	0.0	0.0	5.7	66.7
21	Foliated Gabbros	6200	6433	233	UR	2.4	4.0	1.7	0.0	0.0	5.7	72.4
22	Foliated Gabbros	6433	6667	233	Drill	3.0	3.2	1.8	0.0	0.0	5.0	77.4
23	Foliated Gabbros	6667	6858	191	Conv Core	2.4	3.3	3.7	0.0	0.0	7.0	84.3
24	Foliated Gabbros	6667	6858	191	UR	2.4	3.3	3.7	0.0	8.0	15.0	99.3
25	Foliated Gabbros	6858	6900	42	Conv Core	2.4	0.7	1.9	0.0	0.0	2.6	101.9
26	Foliated Gabbros	6858	6900	42	UR	2.4	0.7	1.9	0.0	0.0	2.6	104.5
27	Layered Gabbros	6900	7357	457	Conv Core	2.4	7.8	5.8	0.0	0.0	13.7	118.2
28	Layered Gabbros	6900	7357	457	UR	2.4	7.8	5.8	0.0	0.0	13.7	131.8
29	Layered Gabbros	7357	7864	507	Drill	3.0	6.9	6.2	0.0	9.0	22.2	154.0
30	Layered Gabbros	7864	8357	493	Conv Core	2.4	8.4	6.7	0.0	0.0	15.1	169.1
31	Layered Gabbros	7864	8357	493	UR	2.4	8.4	6.7	0.0	0.0	15.1	184.2
32	Layered Gabbros	8357	8839	482	Drill	3.0	6.6	7.1	0.0	6.0	19.6	203.8
33	Layered Gabbros	8839	9272	433	Conv Core	2.4	7.4	7.4	0.0	0.0	14.8	218.6
34	Layered Gabbros	9272	9726	454	Drill	3.0	6.2	5.2	0.0	0.0	11.4	230.0
35	Layered Gabbros	9726	9900	174	Conv Core	2.4	3.0	2.7	0.0	6.0	11.7	241.7
36	Mantle	9900	10400	500		1.2	17.1	16.7	27.1	3.0	63.9	305.6
					Sub-Tot	al days =	120	114	27	45	306	
					Sub-1	rotal % =	39%	37%	9%	15%	100%	

Figure 132. Baja Location - Case 2b: Operations Time Breakdown



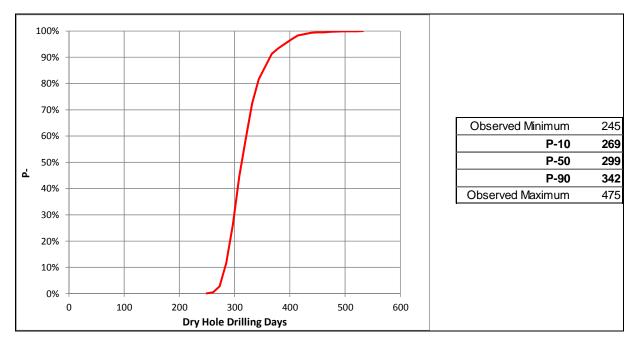
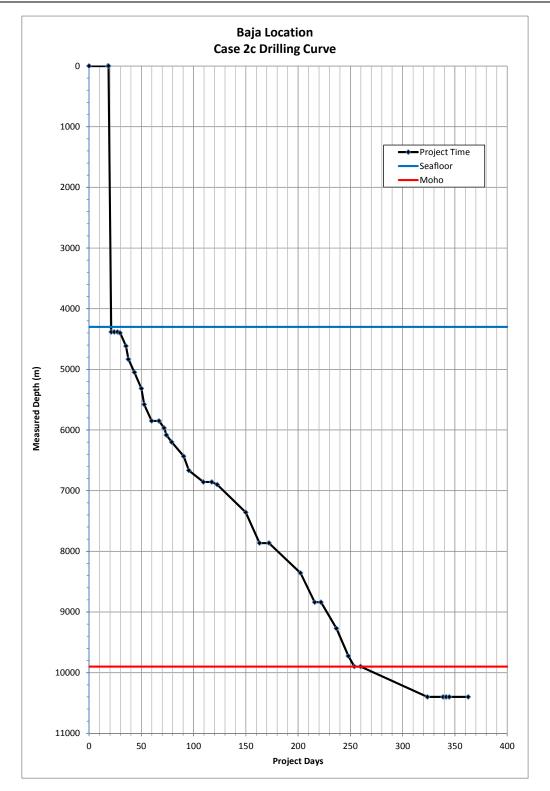
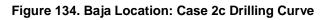


Figure 133. Baja Location - Case 2c: Probabilistic Time





Implementation Plan for the BEAM – "Borehole into the Earth's Mantle" Program





5.4.4 Case 4a Operations Time:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the time estimate for this case is shown below.

Phase	Interval Days	Cum Days	From (m)	To (m)	Interval (m)	Avg m/day
Move in rig	18.1					
Jet 36"	0.5	0.5	4,300	4,361	61	
Drill Sediments	1.2	1.7	4,361	4,385	24	19
Set 20" casing	3.0	4.7				
Run BOP & Riser	3.0	7.7				
Drill Sediments	1.2	9.0	4,385	4,400	15	12
Drill Lava	4.3	13.2	4,400	5,050	650	153
Drill Dikes	5.1	18.3	5,050	5,835	785	155
Set 13-3/8" Casing	6.0	24.3				
Drill Dikes	1.7	26.0	5,835	5,850	15	9
Drill Textured Gabbros	3.2	29.2	5,850	6,200	350	108
Drill Foliated Gabbros	16.7	45.9	6,200	6,900	700	42
Drill Layered Gabbros	23.8	69.7	6,900	7,900	1,000	42
Run 11-3/4" Liner	9.0	78.7				
Drill Layered Gabbros	49.2	128.0	7,900	9,900	2,000	41
Core Mantle	63.9	191.8	9,900	10,400	500	8
5% Operational NPT	10.0	201.8				
TA hole	3.0	204.8				
Pull BOP/Riser	3.0	207.8				
De-Mobilize Rig	18.1					
Total Operational Days =	208					
Total Project Days =	244					

Figure 135. Baja Location - Case 4a Operational Phase Summary

8% of the hole is cored, and 92% is drilled as shown below.

	Interval	%	Days
Coring =	500	8.2%	17
Drilling =	5600	91.8%	59
	6100	100%	76

The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L"



time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	Section Summary							Section Time (days)				Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4300	4361	61	Jetting		0.5	0.0	0.0	0.0	0.5	0.5
1	Sediments	4361	4385	24	Drill	21.3	0.0	1.2	0.0	6.0	7.2	7.7
2	Sediments	4385	4400	15	Drill	21.3	0.0	1.2	0.0	0.0	1.2	9.0
3	Lava	4400	5050	650	Drill	9.1	3.0	1.3	0.0	0.0	4.3	13.2
4	Dikes	5050	5835	785	Drill	9.1	3.6	1.5	0.0	6.0	11.1	24.3
5	Dikes	5835	5850	15	Drill	9.1	0.1	1.6	0.0	0.0	1.7	26.0
6	Textured Gabbros	5850	6200	350	Drill	9.1	1.6	1.6	0.0	0.0	3.2	29.2
7	Foliated Gabbros	6200	6900	700	Drill	3.0	9.6	7.2	0.0	0.0	16.7	45.9
8	Layered Gabbros	6900	7900	1000	Drill	3.0	13.7	10.1	0.0	9.0	32.8	78.7
9	Layered Gabbros	7900	9900	2000	Drill	3.0	27.3	21.9	0.0	0.0	49.2	128.0
10	Mantle	9900	10400	500	RCB Core	1.2	17.1	16.7	27.1	3.0	63.9	191.8
	Sub-Total days =							64	27	24	192	
Sub-Total % = 40% 33% 14% 13% 100%									100%			

Figure 136. Baja Location - Case 4a: Operations Time Breakdown

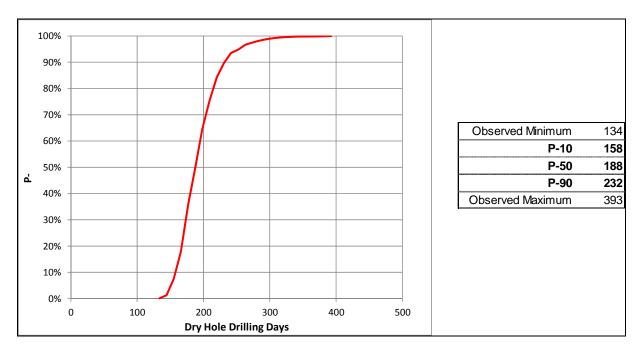


Figure 137. Baja Location - Case 4a: Probabilistic Time



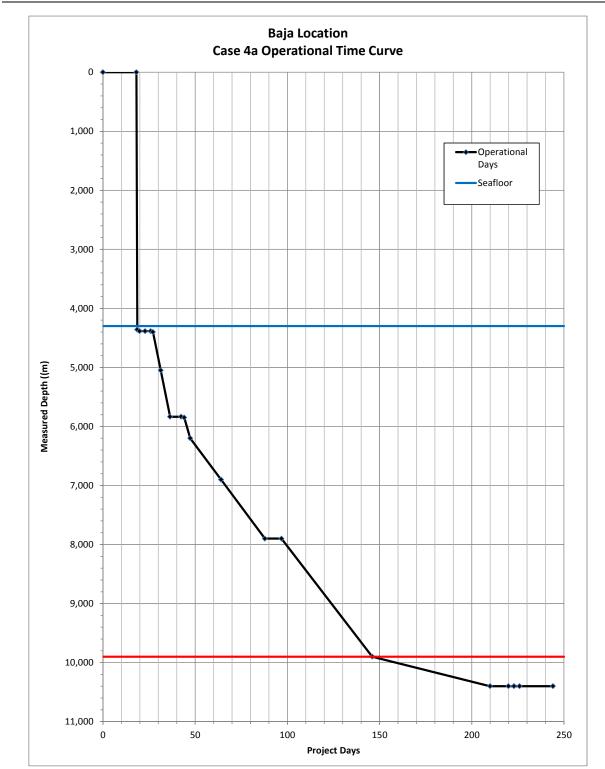


Figure 138. Baja Location: Case 4a Drilling Curve



5.4.5 Case 4b Operations Time:

This case assumes the Deepwater Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	То	Interval	Avg
Phase	Days	Days	(m)	(m)	(m)	m/day
Mobilize Rig	18.1					
Jet 36"	0.5	0.5	4,300	4,361	61	121.92
Drill Sediments	1.2	1.7	4,361	4,385	24	19
Set 22" casing	3.0	4.8				
Run BOP & Riser	3.0	7.8				
Drill Sediments	1.2	9.0	4,385	4,400	15	12.4
Drill Lava	4.3	13.3	4,400	5,050	650	152.8
Drill Dikes	5.1	18.4	5,050	5,850	800	
Set 18" Casing	6.0	24.4				
Drill Textured Gabbros	3.2	27.6	5,850	6,200	350	107.9
Drill Foliated Gabbros	14.4	42.0	6,200	6,858	658	45.9
Set 16" Casing	7.0	49.0				
Drill Foliated Gabbros	2.5	51.5	6,858	6,900	42	17.1
Drill Layered Gabbros	23.3	74.7	6,900	7,864	964	41.4
Run 13-3/8" Liner	9.0	83.7				
Drill Layered Gabbros	24.8	108.5	7,864	8,839		
Run 11-3/4" Liner	6.0	114.5				
Drill Layered Gabbros	27.3	141.8	8,839	9,900		
Run 9-5/8" Liner	6.0	147.8				
Core Mantle	63.9	211.6	9,900	10,400	500	7.8
5% Operational NPT	11.0	222.6				
TA hole	3.0	225.6				
Pull BOP/Riser	3.0	228.6				
De-Mobilize Rig	18.1	0.0				
Total Operational Days =	229					
Total Project Days =	265					

Figure 139. Baja Location - Case 4b Operational Phase Summary

8% of the hole is cored, and 92% is drilled as shown below.

	Interval	%	Days
Coring =	500	8.2%	17
Drilling =	5600	91.8%	59
	6100	100%	76



The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	Section Summary							Section Time (days)				Cum
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4300	4361	61	Jetting		0.5	0.0	0.0	0.0	0.5	0.5
1	Sediments	4361	4385	24	Drill	21.3	0.0	1.2	0.0	6.0	7.2	7.7
2	Sediments	4385	4400	15	Drill	21.3	0.0	1.2	0.0	0.0	1.2	9.0
3	Lava	4400	5050	650	Drill	9.1	3.0	1.3	0.0	0.0	4.3	13.2
4	Dikes	5050	5850	800	Drill	9.1	3.6	1.5	0.0	6.0	11.1	24.4
5	Textured Gabbros	5850	6200	350	Drill	9.1	1.6	1.6	0.0	0.0	3.2	27.6
6	Foliated Gabbros	6200	6858	658	Drill	3.0	9.0	5.4	0.0	7.0	21.4	49.0
7	Foliated Gabbros	6858	6900	42	Drill	3.0	0.6	1.9	0.0	0.0	2.5	51.4
8	Layered Gabbros	6900	7864	964	Drill	3.0	13.2	10.1	0.0	9.0	32.3	83.7
9	Layered Gabbros	7864	8839	975	Drill	3.0	13.3	11.4	0.0	6.0	30.8	114.4
10	Layered Gabbros	8839	9900	1061	Drill	3.0	14.5	12.8	0.0	6.0	33.3	147.7
11	Mantle	9900	10400	500	RCB Core	1.2	17.1	16.7	27.1	3.0	63.9	211.6
	Sub-Total days =						76	65	27	43	212	
	Sub-Total %							31%	13%	20%	100%	

Figure 140. Baja Location - Case 4b: Operations Time Breakdown

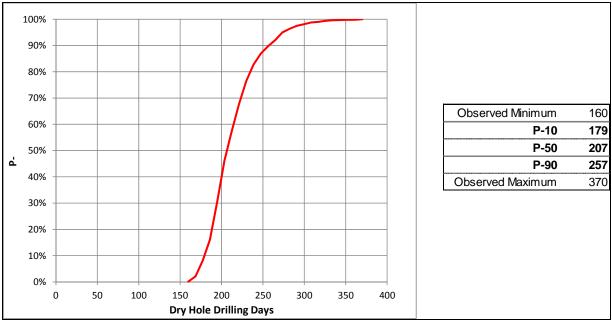


Figure 141. Baja Location - Case 4b: Probabilistic Time



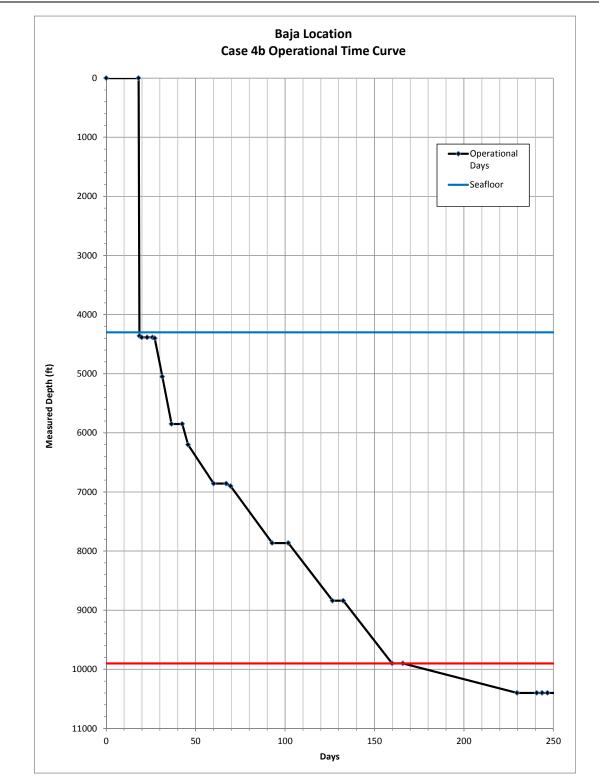


Figure 142. Baja Location: Case 4b Drilling Curve



5.4.6 Case 4c Operations Time:

This case assumes the Expandable Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the time estimate for this case is shown below.

Phase	Interval	Cum	From	То	Interval	Avg
	Days	Days	(m)	(m)	(m)	m/day
Mobilize Rig	18.1					
Jet 36"	0.5	0.5	4,300	4,361	61	121.92
Drill Sediments	1.2	1.7	4,361	4,385	24	19
Set 22" casing	3.0	4.8				
Run BOP & Riser	3.0	7.8				
Drill Sediments	1.2	9.0	4,385	4,400	15	12.4
Drill Lava	4.3	13.3	4,400	5,050	650	152.8
Drill Dikes	5.1	18.4	5,050	5,850	800	0.0
Set 16.5" SET Casing	7.0	25.4				
Drill Textured Gabbros	3.2	28.6	5,850	6,200	350	107.9
Drill Foliated Gabbros	14.4	43.0	6,200	6,858	658	45.9
Drill Foliated Gabbros	2.5	45.5	6,858	6,900	42	17.1
Set 16.5 SET" Casing	8.0	53.5				
Drill Layered Gabbros	23.3	76.7	6,900	7,864	964	41.4
Run 16" Liner	9.0	85.7				
Drill Layered Gabbros	24.8	110.5	7,864	8,839		
Run 13-3/8" Liner	6.0	116.5				
Drill Layered Gabbros	27.3	143.8	8,839	9,900		
Run 11-3/4" Liner	6.0	149.8				
Core Mantle	63.9	213.6	9,900	10,400	500	7.8
5% Operational NPT	11.0	224.6				
TA hole	3.0	227.6				
Pull BOP/Riser	3.0	230.6				
De-Mobilize Rig	18.1	0.0				
Total Operational Days =	231					
Total Project Days =	267					

8% of the hole is cored, and 92% is drilled as shown below.

	Interval	%	Days
Coring =	500	8.2%	17
Drilling =	5600	91.8%	59
	6100	100%	76



The following table shows a detailed breakdown for the key operations in terms of total days and percentage of the total time for the operations time estimate. "Ops Time" includes the time spent, drilling, coring and underreaming the hole. "Bit Trip" is the time spent on bit trips. "W/L" time is the time spent making RCB wireline trips. "Flat" time is the time running BOP's, running wire-line logs and casing.

Section	ection Summary								Section Time (days)			
Section	Stratigraphy	From	То	Interval	Operation	ROP	Ops Time	Bit Trip	W/L	Flat	Days	Days
0.1	Sediments	4300	4361	61	Jetting		0.5	0.0	0.0	0.0	0.5	0.5
1	Sediments	4361	4385	24	Drill	21.3	0.0	1.2	0.0	6.0	7.2	7.7
2	Sediments	4385	4400	15	Drill	21.3	0.0	1.2	0.0	0.0	1.2	9.0
3	Lava	4400	5050	650	Drill	9.1	3.0	1.3	0.0	0.0	4.3	13.2
4	Dikes	5050	5850	800	Drill	9.1	3.6	1.5	0.0	7.0	12.1	25.4
5	Textured Gabbros	5850	6200	350	Drill	9.1	1.6	1.6	0.0	0.0	3.2	28.6
6	Foliated Gabbros	6200	6858	658	Drill	3.0	9.0	5.4	0.0	8.0	22.4	51.0
7	Foliated Gabbros	6858	6900	42	Drill	3.0	0.6	1.9	0.0	0.0	2.5	53.4
8	Layered Gabbros	6900	7864	964	Drill	3.0	13.2	10.1	0.0	9.0	32.3	85.7
9	Layered Gabbros	7864	8839	975	Drill	3.0	13.3	11.4	0.0	6.0	30.8	116.4
10	Layered Gabbros	8839	9900	1061	Drill	3.0	14.5	12.8	0.0	6.0	33.3	149.7
11	Mantle	9900	10400	500	RCB Core	1.2	17.1	16.7	27.1	3.0	63.9	213.6
Sub-Total days = 76 65 27 45										214		
	Sub-Total % = 36% 30% 13% 21% 100%											

Figure 144. Baja Location - Case 4c: Operations Time Breakdown

Below are the results of the probabilistic estimate of operational time including the P10, P50 and P90 values and a chart showing the cumulative probability of time.

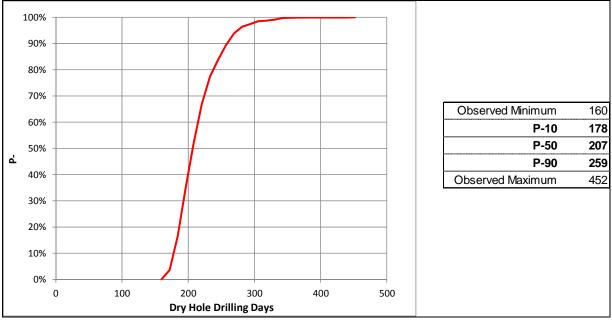


Figure 145. Baja Location - Case 4c: Probabilistic Time



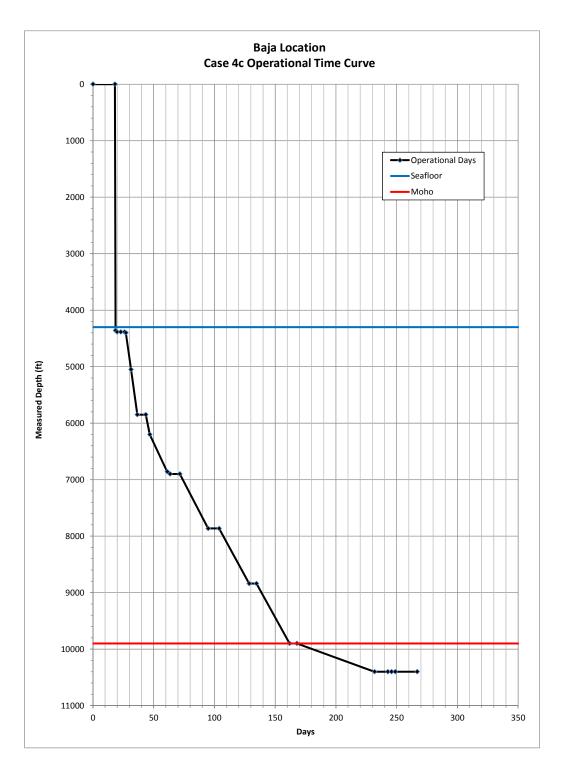


Figure 146. Baja Location: Case 4c Drilling Curve



6 Revised Operational Cost Estimates

The Feasibility System study included a rough cost estimate for each case that assumed a daily operating cost of \$1,000,000 per day, which is typical for complex oil and gas deepwater wells. For this report, a more detailed cost estimate was prepared for the three wellbore configuration options discussed in Section 3.1 at all three candidate locations. In addition, a probabilistic methodology for estimating costs was also used to gain a better understanding of the effect of the uncertainty around the time required to drill the hole to TD. A Monte Carlo simulator was used to determine the P10, P50, and P90 costs in addition using the ROP distribution discussed in Section 4 in addition to the nominal cost estimate

The cost estimate considered the following major cost categories. Recall that for accounting purposes the costs for oil and gas wells are classified as being either intangible or tangible. Intangible costs are basically for non-salvageable items such as labor, drilling rig time, drilling fluids, services and so on. Intangible costs are typically charged on a daily basis. Tangible costs are technically salvageable items such as the wellhead and tubulars, but are typically permanently installed in the well.

Intangible Cost Categories	Tangible Cost Categories
Location/ Regulatory Costs	Drive Pipe
Rig Mobilization, Demobilization	Conductor Casing
Drilling Rig - Day Rate	Surface Casing
Bits, Drill Collars & Stabilizers	Intermediate Casing
Directional & Downhole Services	Intermediate Casing
Fuel, Water & Lube	Intermediate Casing
Drilling Fluids Services	Intermediate Casing
Electric Logging & Cased Hole Logs	Production Liner
Cementing	Production Tie-back
Mud Logging and Geological Services	Tubing
Land Transportation	Liner Equipment
Boat Transportation	Whipstock Equipment
Helicopter Transportation	Subsurface Completion Equipment
Tubular Services	Wellheads
Shorebase / Dock Services	Miscellaneous/Other
Communications	Tangible Contingency
Miscellaneous Rental Equipment	
Miscellaneous Special Services	
Other Services / Costs	
Intangible Contingency	

Figure 147. List of Cost Estimate Categories

Some of the individual cost element assumptions with each category like fuel usage were based on known Chikyu data. Estimates for such things as MWD and LWD tools, cement, and tubulars were based on representative oilfield analogs. The cost estimates therefore represent scoping, or order of magnitude costs. An example of the detailed cost estimating assumptions is provided in Appendix 2.

Key Assumptions:

- The location cost category includes a lump sum estimate for a conventional metocean study and a site survey assuming a third party contractor does the work. It is recognized that, for example, IODP typically conducts its own site surveys, but an estimate of the location related costs has been included in the cost estimate because arguably the money would only be spent if a mantle hole is drilled. The cost estimate of \$3,000,000 is based on previous discussions with two companies that do this kind of work for the oil and gas industry, RPS Evans-Hamilton and Fugro Geos, during the High Impact Systems project in 2012.
- The costs of mobilizing the Chikyu from Japan to the location, and then demobilizing the rig back to Japan is included as a lump sum. The cost is based on the distance travelled, fuel consumption during transit, and the Chikyu's day rate.
- Chikyu Day Rate is estimated to be \$300,000 per day. The assumption was based on taking the published average day rate for oil and gas drill ships during 2012 (\$438,000/day) and then reducing the cost to account for the fact that this is a non-commercial project and things like market conditions, profit and depreciation do not apply.
- At present, the Chikyu does not have enough marine drilling riser to drill in the water depths found at any of the three candidate locations. The cost of purchasing an additional ±1524m (5,000 ft) of conventional steel riser (similar to what is being used now) and additional buoyancy modules needed is included in the cost estimate as a lump sum. The cost estimate of \$61,000,000 is based on a quote provided by NOV during the High Impact Systems project in 2012.
- A 15% contingency was assumed for the intangible costs, and a 10% contingency was assumed for the tangible costs to account for uncertainty in the estimates for the various individual cost elements. The intangible contingency percentage used for deep water oil and gas wells ranges between 10-35% and 0-15% for tangibles items depending on the complexity of the well and its location.
- The nominal project cost estimate is determined based on the nominal days required to drill the hole which in turn was determined using the most likely ROP values as discussed in Section 4. The probabilistic costs were determined by re-calculating the cost each time a new value for days was generated by the Monte Carlo simulator. In other words, the probabilistic costs are based on the distribution of time required to drill/core the hole and not on distributions of the individual cost elements.

6.1 Results Summary

A summary of the revised cost estimates for all three locations is provided below. Figure 148 is a tabular listing of results for all 18 cases. Figures 149 through 151 graphically compare the results of each case by location. The detailed results for each case are provided in the subsequent sections.

Recall that:

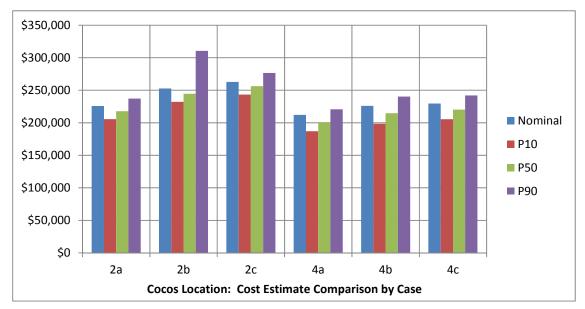
- <u>Case 2</u>: Assumes that long sections of continuous core are taken across the major lithologic and geophysical transition intervals of key sections. For the time estimate it was assumed that the upper third of each main stratigraphic interval was cored, the middle third was drilled, and the lower third was cored.
- <u>Case 4</u>: Assumes that the hole is drilled to the Moho and that just the mantle is cored.
- Subcategory "a" is the Base Case wellbore configuration.
- Subcategory "b' is the Deepwater wellbore configuration
- Subcategory "c' is the Expandable wellbore configuration.

Location	Water	Total	Project	Casa	Estir	nated Tota	l Cost (MN	/1\$)	Feasibility
Location	Depth (m)	Depth (m)	Days	Case	Project	P10	P50	P90	Study
Cocos	3,650	9,900	276	2a	\$226	\$206	\$218	\$237	\$617
			320	2b	\$253	\$232	\$245	\$311	
			337	2c	\$264	\$243	\$256	\$276	
			250	4a	\$212	\$187	\$201	\$221	\$418
			268	4b	\$226	\$199	\$215	\$240	
			271	4c	\$230	\$205	\$220	\$242	
Hawaii	4,050	10,750	298	2a	\$238	\$219	\$233	\$254	\$737
			346	2b	\$267	\$248	\$263	\$289	
			368	2c	\$282	\$258	\$273	\$299	
			248	4a	\$212	\$184	\$200	\$228	\$443
			239	4b	\$227	\$199	\$215	\$240	
			271	4c	\$231	\$203	\$220	\$247	
Baja	4,300	10,400	287	2a	\$232	\$217	\$230	\$248	\$693
			345	2b	\$266	\$246	\$261	\$283	
			363	2c	\$278	\$256	\$271	\$297	
			244	4a	\$209	\$184	\$199	\$221	\$425
			265	4b	\$224	\$199	\$213	\$238	
			267	4c	\$230	\$204	\$218	\$244	

Figure 148. Cost Estimate Results for all Cases

Note again that there has been a significant decrease in the latest cost estimates compared to those of the original feasibility study. The average cost of all the cases is \$236 million. The lowest estimate is \$184 million and the highest is \$315 million.





<u>Case comparison by location</u>

Figure 149. Cocos Location – Cost Estimate Comparison

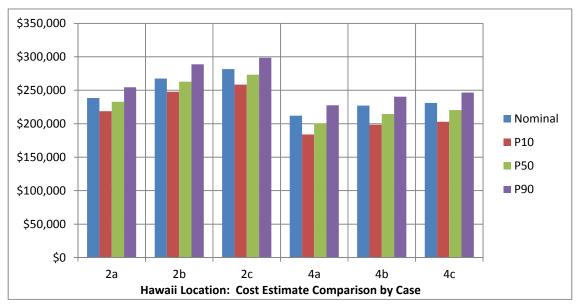
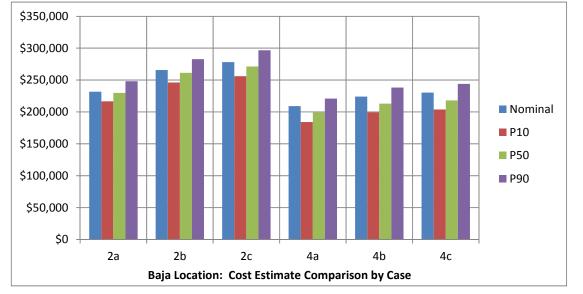


Figure 150. Hawaii Location – Cost Estimate Comparison





Implementation Plan for the BEAM – "Borehole into the Earth's Mantle" Program

Figure 151. Baja Location – Cost Estimate Comparison

The following table compares the average project costs and the average P-50 costs between the candidate locations in order to provide a simplified look at the differences between the locations. The P-50 value is shown because it is typically used in oil and gas project economics calculations.

Location	Water Depth (m)	Total Depth (m)	Avg Project Case		Avg Est Total	Cost (MM\$)
	Deptil (III)	Depth (III)	Days		Project	P50
Cocos	3,650	9,900	311	2a-2b	\$247	\$240
			263	4a-4b	\$223	\$212
Hawaii	4,050	10,750	337	2a-2b	\$262	\$256
			253	4a-4b	\$212	\$212
Baja	4,300	10,400	332	2a-2b	\$259	\$254
			259	4a-4b	\$221	\$210

Figure 152. Average Cost Comparisons – Three Locations

6.1.1 Cost Sensitivity

As illustrated below using Cocos Case 4c as an example, the single biggest cost driver accounting for over 50% of the total cost is the Chikyu's day rate costs, which are purely a function of the amount of time it takes to drill the hole. This is followed by the intangible contingency cost (13%), the mobilization and demobilization cost (8%), and the fuel cost (6%). This means that the drilling and coring days required have the largest influence on the overall project cost, and that the costs of the individual cost elements are almost irrelevant.



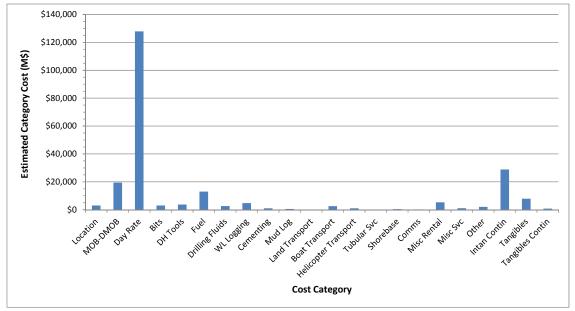


Figure 153. Cost Element Comparison

6.1.2 Cost of Drilling vs. Coring

As previously noted, the operational estimates were done only for two drill/core cases since these adequately illustrate the philosophical differences between the amount of time spent coring versus time spent drilling. Case 2 for the Hawaii and Baja locations assume that approximately 61% of the hole is cored compared to around 8% for Case 4. The Cocos location is slightly different since it is assumed that the interval from sediments through the base of the dikes does not need to be cored since this has already been done during the various expeditions at the 1256D site. Therefore the Case 2 at the Cocos location assumes that around 44% of the hole is cored. The wellbore configurations are the same for the "a", "b" and 'c' subcases, so the main difference is the amount of time spent coring or drilling. Therefore, as shown below, the "cost" of coring can be estimated by comparing the difference in total cost between the two like cases.

Location	Total De	epth (m)	High Core	Nominal		Low Core	Nominal		Cost
LOCATION	mbrf	mbsf	Case	Ops Days	Cost	Case	Ops Days	Cost	Difference
Cocos	9,900	6,250	2a	228	\$225,672	4a	202	\$211,997	\$1 <mark>3,675</mark>
			2b	272	\$252,600	4b	220	\$225,985	\$26,615
			2c	289	\$264,129	4c	223	\$229,649	\$34,480

Figure 154. Cocos Location	- Coring vs. Drilling	Cost Comparison
----------------------------	-----------------------	-----------------

Location	Total De	epth (m)	High Core	Nominal		Low Core	Nominal		Cost
LOCATION	mbrf	mbsf	Case	Ops Days	Cost	Case	Ops Days	Cost	Difference
Hawaii	10,750	6,700	2a	271	\$238,340	4a	221	\$211,970	\$26,370
			2b	319	\$267,445	4b	242	\$227,067	\$40,378
			2c	341	\$281,703	4c	244	\$230,963	<mark>\$50,740</mark>



Location	Total Depth (m)		High Core	Nominal		Low Core	Nominal		Cost
Location	mbrf	mbsf	Case	Ops Days	Cost	Case	Ops Days	Cost	Difference
Baja	10,400	6,100	2a	251	\$231,907	4a	208	\$209,195	\$22,712
			2b	308	\$265,799	4b	229	\$224,193	\$41,606
			2c	327	\$278,213	4c	231	\$230,274	\$47,939

Figure 156. Baja Location - Coring vs. Drilling Cost Comparison

The additional coring costs comparing Case 4 to Case 2 averages \$25,000M at the Cocos location, \$39,000M at the Hawaii location and \$37,000 at the Baja location.

6.2 Cocos Location Cost Estimates

6.2.1 Case 2a Cost Estimate:

This case assumes the original Base Case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. However for the Cocos location it is assumed that the sediments, lava and dike intervals do not need to be cored because of previous IODP experience on the 1256D hole. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Tan Total		P10 P50		P90	
276	\$223,109	\$2,563	\$225,672	\$205,546	\$217,945	\$237,169	

Figure 157. Cocos Location: Case 2a – Cost Estimate

The following chart shows the cumulative probability of cost.

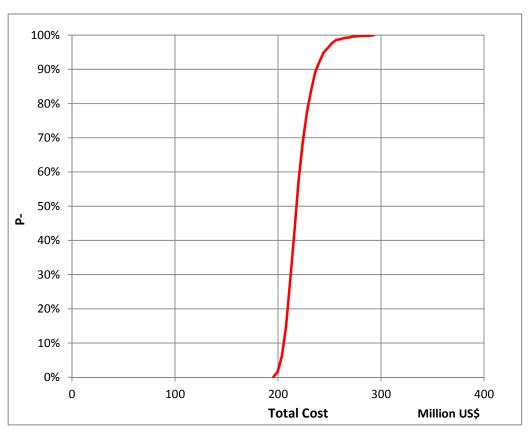


Figure 158. Cocos Location – Case 2a Probabilistic Cost



		SCOPING C	OST ESTIMAT	E SUMMARY			Rev
		BEAM	- Cocos C	ase 2a			
BLAD	Pi	repared For:	IODP / JAI	MSTEC/C	DEX		Exploratory _X
NERGY PARTN		-					Development
FE# XXX	Operator: CDEX /	JAMSTEC		Revision No.	1	Date:	30-Jun-13
ospector Field antle Hole	Lease Name N/A		<u>Case No.</u> #2a	Water Depth 3650m	Proposed TD 9900m	Formation Moho / Mantle	
			<i>"2</i> 4	11,975 ft	32,480 ft	monio / manuo	
ocation	Surface Location:		/ Long: 89.5 - 91.				
DCOS		n: Lat: 6.7 - 8.7°N	/ Long: 89.5 - 91.	9°W			
irpose of Expendi ientific Drilling to t	the Mantle. Assume						
•	e Case Well Configura	ation					
illing Rig :	Chikyu INTANGIBLE ITEN		Directional Plan: V	ertical Hole	Day Hala Dala	Comulate	TOTAL
	INTANGIBLETTEN	//5			Dry Hole Drig 228 Days	Complete	TOTAL 228 Days
Location/Re	egulatory Costs				\$3,020,000	\$0	\$3,020,0
Rig Mobiliza	tion, Demobilization				\$19,400,000	\$0	\$19,400,0
	- Day Work at \$300,00	00 / Day			\$129,400,000		\$129,400,0
	ollars & Stabilizers				\$3,707,000	\$0	\$3,707,0 \$3,790,0
Fuel, Water	& Downhole Services & Lube				\$3,790,000 \$13,338,000		\$3,790,0
Drilling Fluid					\$2,653,000	\$0	\$2,653,0
	ging & Cased Hole Lo	ogs			\$4,784,000	\$0	\$4,784,0
Cementing					\$685,000		\$685,0
	g and Geological Serv	vices			\$559,000	\$0	\$559,0
Land Transp					\$103,000	\$0 \$0	\$103,0
Boat Transp Helicopter T	ransportation				\$2,622,000 \$1,026,000	\$0	\$2,622,0 \$1,026,0
Tubular Ser					\$100,000		\$100,0
	/ Dock Services				\$456,000		\$456,0
Communica					\$228,000	\$0	\$228,0
	us Rental Equipment				\$5,234,000		\$5,234,0
Miscellaneo Other Servic	us Special Services				\$1,135,000 \$1,767,000	\$0 \$0	\$1,135,0 \$1,767,0
Intan Contin					\$29,102,000	\$0	\$29,102,0
					·····		·····
			TOTAL INT	ANGIBLE	<mark>\$223,109,228</mark>	\$0	\$223,109,2
	TANGIBLE ITEMS	OD	Footage	\$/ft			
Drive Pipe		30"	200	\$500.00	\$100,000	\$0	\$100,0
Conductor		20"	770	\$180.00	\$139,000	\$0	\$139,0
Surface		13-3/8"	5,527	\$140.00	\$774,000	\$0	\$774,0
Intermediate	e	11-3/4"	7,076	\$80.00	\$567,000	\$0	\$567,0
Intermediate		0	0	\$0.00	\$0	\$0	
Intermediate	e	0	0	\$0.00	\$0	\$0	
Intermediate		0	0	\$0.00	\$0	\$0	
Production L	_iner	0	0	\$0.00	\$0	\$0	
Production 7	Tie-back	0	0	\$0.00	\$0	\$0	
Tubing		0	0	\$0.00	\$0	\$0	
Liner Equip					\$150,000	\$0	\$150,0
					\$0		
Whipstock E	Completion				\$0		
Subsurface					\$500,000	\$0	\$500,0
Subsurface Wellheads		1			\$100,000 \$233,000	\$0 \$0	\$100,0 \$233,0
Subsurface Wellheads Miscellaneo						-φU	φ∠33,0
Subsurface Wellheads							
Subsurface Wellheads Miscellaneo			TOTAL T		\$2,563,000	\$0	
Subsurface Wellheads Miscellaneo				ANGIBLE		\$0	\$2,563,0 \$225,672,2
Subsurface Wellheads Miscellaneo			Tota		\$2,563,000	<mark>\$0</mark> \$0	



	1	SCOPING C	OST ESTI	MATE DETA	ILS				Rev4
				s Case 2					
BLAD ENERGY PARTN		Prepared Fo	r: IODP/	JAMSTEC	/ CDEX				Exploratory _X
AFE# XXX	Operator:	CDEX / JAMSTEC				Revision No.	1	Date:	Development 30-Jun-13
Prospect or Field	Lease Name			Case No.		Water Depth	Proposed TD	Objective	
Mantle Hole	N/A			#2a		3650m	9900m 32,480 ft	Moho / Mantle	
Location	Surface Loca	tion: Lat: 6.7 - 8.7°N / Long: 89.5 -	91 9°W			11,975 ft	32,400 It		
Cocos	Btm. Hole Lo								
Purpose of Expend	liture:								
Scientific Drilling									
Case 4a: Orig Ba	ase Case Well	Configuration							Avg Intan \$/day \$978,548
Drilling Rig	: Chikvu		Dir	ectional Plan:	Vertical Ho	e			\$ 570,340
	INTANGIBLE	ITEMS					Dry Hole Drlg	Complete	TOTAL
					Ор	erational Time =	228 Days		228 Days
Location/ R	legulatory Costs						\$3,020,000	\$0	\$3,020,000
		Metocean Study (desktop study, data collect	ion/processir	ng)	Lump Sum				
		Site Survey (desktop study, bathymetry) Regulatory			Lump Sum				
					- camp our	φ20,000			
Rig Mobiliza	ation, Demobiliz	ation					\$19,400,000		\$19,400,000
		Mobilization (from Japan)			Lump Sum				
		Demobilization (to Japan)			Lump Sum	\$9,700,000			
Drilling Rig	- Day Work	Drilling Day Rate	228 Dove	\$300.000 /dev		CC0 400 000	\$129,400,000	\$0	\$129,400,000
		Drilling Day Rate Existing Riser System Modifications	ZZ6 Days	\$300,000 /day	Lump Sum	\$68,400,000 \$14,000,000			
		Additional Riser			Lump Sum				
Bits, Drill Co	ollars & Stabiliz						\$3,707,000	\$0	\$3,707,000
		Drill Bits Drill String Rentals: DC's, Jars, Stab, HWT	16 No. 228 Days	\$70,000 /bit \$4,000 /day		\$1,120,000 \$912,000			
		Core Bits	220 Days 22 No.	\$60,000 /bit		\$1,320,000			
		Coring Services	142 Days	\$2,500 /day		\$355,000			
Directional	& Downhole Se					000.000	\$3,790,000	\$0	\$3,790,000
		Surveys/Gyros/Single & Multi-Shots MWD / LWD Mob / De-mob			Lump Sum Lump Sum				
		Standard MWD Rental	114 Days	\$3,000 /day	Lump Our	\$342,000			
		Standard LWD Rental	114 Days	\$7,000 /day		\$798,000			
		MWD / LWD Engineers (2)	228 Days	\$2,000 /day		\$456,000			
		Mud Motors & Associated Tools High Temp MWD Rental	182 Days 114 Days	\$3,000 /day \$4,000 /day		\$547,200 \$456,000			
		High temp LWD Rental	114 Days	\$10,000 /day		\$1,140,000			
Fuel, Water	r & Lube						\$13,338,000	\$0	\$13,338,000
		Rig Fuel	228 Days	\$53,000 /day		\$12,084,000			
		Boat Fuel Helicopter Fuel	114 Days 114 Days	\$4,000 /day \$3,000 /day		\$456,000 \$342,000			
		Lubricants	228 Days	\$1,300 /day		\$296,400			
		Fresh Water	228 Days	\$700 /day		\$159,600			
Drilling Fluid	ds Services	Drilling Fluids - WBM			Lump Sum	\$1,900,000	\$2,653,000	\$0	\$2,653,000
		Mud Engineer	228 Days	\$800 /day	Lump Sun	\$182,400			
		Cuttings Disposal	228 Days	\$2,500 /day		\$570,000			
Electric Log	gging & Cased H	_	000 Dava	\$2,000 (day)		\$co.4.000	\$4,784,000		\$4,784,000
		Wireline Unit and Personnel Standard Open Hole Logging	228 Days	\$3,000 /day	Lump Sum	\$684,000 \$1,500,000			
		High Temp Open Hole Logging			Lump Sum				
		Cased Hole Logging			Lump Sum				
Cementing							\$685,000	\$0	\$685,000
Sementing		20"			Lump Sum	\$100,000	\$665,000	\$0	\$000,000
_		13-3/8"			Lump Sum	\$150,000			
		11-3/4"			Lump Sum	\$100,000			
		Retainers, Service Man, Manifold, Etc.			Lump Sum				
		Unit Charge	228 Days	\$1,250 /day		\$285,000			
							1	1	



	al Services					\$559,000	\$0	\$5
	Logging Unit Operating rate	228 Days	\$1,250 /day		\$285,000			
	Personnel Charges	228 Days	\$1,200 /day		\$273,600			
Land Transportation						\$103,000	\$0	\$1
	Trucking	114 Days	\$900 /day		\$102,600	\$100,000		*.
Boat Transportation			A		04 500 000	\$2,622,000	\$0	\$2,6
	Work Boat - Spot Hire Crew Boat - Spot Hire	114 Days 114 Days	\$14,000 /day \$9,000 /day		\$1,596,000 \$1,026,000			
	Clew Boat - Spot Fille	114 Days	\$9,0007day		\$1,020,000			
Helicopter Transportation						\$1,026,000	\$0	\$1,0
	Helicopter - spot hire	114 Days	\$9,000 /day		\$1,026,000			
Tubular Services	QAQC			Lump Sum	\$100,000	\$100,000	\$0	\$1
				Lump Oum	φ100,000			
Shorebase / Dock Services						\$456,000	\$0	\$4
	Shorebase /Dispatcher	228 Days	\$2,000 /day		\$456,000			
Communications						\$228,000	\$0	\$2
Johnnahleadons	VSAT	228 Days	\$1,000 /day		\$228,000	\$228,000	\$0	φz
		220 20,0	¢1,0007ddy		Q220,000			
Miscellaneous Rental Equi	-					\$5,234,000	\$0	\$5,2
	Solids Control	228 Days	\$400 /day		\$91,200			
	Fishing Tools Casing Running Equipment	228 Days	\$1,500 /day		\$342,000			
	Other Rentals	40 Days 228 Days	\$6,000 Day \$20,000 Day		\$240,000 \$4,560,000			
		Days	φ20,000 Ddy		ψ-1,000,000			
		Days						
Miscellaneous Special Ser						\$1,135,000	\$0	\$1,1
	Weather Forecasting	228 Days	\$150 /day	Lump Curr	\$34,200			
	Engineering Services - Riser Anal Engineering Services - Drill String			Lump Sum Lump Sum	\$300,000 \$200,000			
	Engineering Services - Casing De			Lump Sum	\$50,000			
	Engineering Services - Wellbore S			Lump Sum	\$100,000			
	Engineering Services - Operationa	al Support		Lump Sum	\$200,000			
	Engineering Services - Risk Asses	ssments		Lump Sum	\$200,000			
	Engineering Services - Other			Lump Sum	\$50,000			
Other Services / Costs						\$1,767,000	\$0	\$1,7
	Misc Contract Labor	228 Days	\$1,500 /day		\$342,000	+1,707,000		•.,.
	Casing Running Service	40 Days	\$10,000 /day		\$400,000			
	Well Insurance			Lump Sum	\$500,000			
	Overhead	228 Days 228 Days	\$1,100 /day \$1,200 /day		\$250,800 \$273,600			
	Catering	220 Days	\$1,2007day		\$273,000			
Intangible Contingency		15%	= Amount	ST Drlg =	\$194,007,000	\$29,102,000	\$0	\$29,1
Intangible Contingency		15%	= Amount	ST Comp =	\$0			\$29,1
Intangible Contingency		15%	= Amount	ST Comp =	\$194,007,000 \$0 NTANGIBLE	\$29,102,000 \$223,109,000	\$0 \$0	
Intangible Contingency		15%	= Amount	ST Comp =	\$0			
Intangible Contingency				ST Comp =	50 NTANGIBLE			\$29,1 \$223, 1
TANGIBLE I	OD	15%	Length	ST Comp =	\$0 NTANGIBLE \$/ft	\$223,109,000	\$0 	\$223, 1
	OD 30"		Length 200	ST Comp =	50 NTANGIBLE \$/ft \$500.00	\$223,109,000 \$100,000	\$0 \$0 \$0	\$223, 1
TANGIBLE I Drive Pipe	OD		Length	ST Comp =	\$0 NTANGIBLE \$/ft	\$223,109,000 \$100,000 \$139,000	\$0 \$0 \$0 \$0	\$223,1 \$1 \$1
TANGIBLE I Drive Pipe Conductor	OD 30" 20"		Length 200 770	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00	\$223,109,000 \$223,109,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0 \$0	\$223,1 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$223,109,000 \$100,000 \$139,000	\$0 \$0 \$0 \$0	\$223,1 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface Intermediate	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$223,109,000 \$223,109,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0 \$0	\$223,1 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$223,109,000 \$223,109,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0 \$0	\$223,1 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$223,109,000 \$223,109,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0 \$0	\$223,1 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Intermediate	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$223,109,000 \$223,109,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0 \$0	
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$223,109,000 \$223,109,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0 \$0	\$223,1 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment	OD 30" 20" 13-38" 11-3/4"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$223,109,000 \$223,109,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0 \$0	\$223,1 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP	OD 30" 20" 13-38" 11-3/4"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$223,109,000 \$100,000 \$139,000 \$774,000 \$567,000	\$0 \$0 \$0 \$0 \$0 \$0	\$223,1 \$1 \$1 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion	OD 30" 20" 13-38" 11-3/4"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$223,109,000 \$100,000 \$139,000 \$774,000 \$567,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0	\$223,1 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tiner Production Tine-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads	OD 30" 20" 13-38" 11-3/4"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$223,109,000 \$100,000 \$139,000 \$774,000 \$567,000	\$0 \$0 \$0 \$0 \$0 \$0	\$223,1 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tiner Production Tine-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads	OD 30" 20" 13-38" 11-3/4"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$223,109,000 \$100,000 \$139,000 \$774,000 \$567,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$223,1 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 30" 20" 13-38" 11-3/4"	4 =# Strings	Length 200 770 5,527 7,076	SI Comp= TOTAL II	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00	\$223,109,000 \$100,000 \$139,000 \$774,000 \$567,000 \$150,000 \$150,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$223, 1 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 30" 20" 13-38" 11-3/4"	4 =# Strings	Length 200 770 5,527	ST Comp = TOTAL II TOTAL II ST Drig =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,330,000	\$223,109,000 \$100,000 \$139,000 \$774,000 \$567,000 \$150,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$223, 1 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 30" 20" 13-38" 11-3/4"	4 =# Strings	Length 200 770 5,527 7,076	ST Comp = TOTAL II ST DrIg = ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,330,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$223,109,000 \$100,000 \$139,000 \$774,000 \$567,000 \$567,000 \$150,000 \$150,000 \$100,000 \$233,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$223,1 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 30" 20" 13-38" 11-3/4"	4 =# Strings	Length 200 770 5,527 7,076	ST Comp = TOTAL II ST DrIg = ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,330,000	\$223,109,000 \$100,000 \$139,000 \$774,000 \$567,000 \$150,000 \$150,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$223,1 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion	OD 30" 20" 13-38" 11-3/4"	4 =#Strings	Length 200 770 5,527 7,076	ST Comp = TOTAL II ST Drlg = ST Comp = TOTAL	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,330,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$223,109,000 \$100,000 \$139,000 \$774,000 \$567,000 \$567,000 \$150,000 \$150,000 \$100,000 \$233,000 \$2,563,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$223,1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$2 \$2 \$2 \$2,\$2,\$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 30" 20" 13-38" 11-3/4"	4 =#Strings	Length 200 770 5,527 7,076	ST Comp = TOTAL II ST Drlg = ST Comp = TOTAL Tota	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,330,000 \$0 TANGIBLE	\$223,109,000 \$100,000 \$139,000 \$774,000 \$567,000 \$567,000 \$150,000 \$150,000 \$100,000 \$233,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$223,1 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$

6.2.2 Case 2b Cost Estimate:

This case assumes the Deepwater wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. However for the Cocos location it is assumed that the sediments, lava and dike intervals do not need to be cored because of previous IODP experience on the 1256D hole. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Tan	Total	P10	P50	P90	
320	\$246,552	\$6,048	\$252,600	\$232,208	\$244,685	\$263,013	

Figure 159. Cocos Location: Case 2c – Cost Estimate

The following chart shows the cumulative probability of cost.

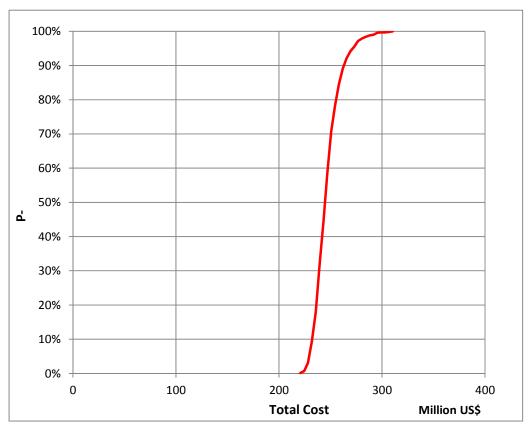


Figure 160. Cocos Location – Case 2b Probabilistic Cost



		<u>SCOPING C</u>	OST ESTIMATE	<u>SUMMARY</u>			Re
			- Cocos C				
					DEV		
BLAD		repared For:	IODP / JAN	ISTEC/C	DEX		Exploratory _X
NERGY PARTN FE# XXX	Operator: CDEX			Revision No.	1	Date:	Development
rospect or Field	Lease Name	JANISTEC	Case No.	Water Depth	Proposed TD	Formation	20-Jun-13
lantle Hole	N/A		#2b	3650m	9900m	Moho / Mantle	
	-			11,975 ft	32,480 ft		
ocation	Surface Location:		/ Long: 89.5 - 91.9				
ocos	Btm. Hole Locatio	n: Lat: 6.7 - 8.7°N	/ Long: 89.5 - 91.9	Ð.M.			
urpose of Expend							
	the Mantle. Assume nal Deepwater Case	Well Configuration					
ase 4b. Conventio	nai Deepwaler Case	Well Conliguration					
rilling Rig :	Chikyu	D	irectional Plan: V	ertical Hole			
0 0	INTANGIBLE ITE	MS			Dry Hole Drig	Complete	TOTAL
		-			272 Days		272 Days
Location/ Re	egulatory Costs				\$3,020,000	\$0	\$3,020,0
	tion, Demobilization				\$19,400,000		\$19,400,0
	- Day Work at \$300,0	00 / Day			\$142,600,000		\$142,600,0
	ollars & Stabilizers				\$4,286,000		\$4,286, \$4,511,
Fuel, Water	& Downhole Services				\$4,511,000 \$15,912,000		\$4,511, \$15,912,
Drilling Fluid					\$2,798.000		\$13,912,
	ging & Cased Hole L	ogs			\$4,916,000		\$4,916,
Cementing					\$1,090,000	\$0	\$1,090,
	g and Geological Ser	vices			\$667,000		\$667,
Land Trans					\$123,000		\$123,
Boat Transp					\$3,128,000	the second se	\$3,128,
Tubular Ser	ransportation				\$1,224,000 \$150,000		\$1,224, \$150,
	Dock Services				\$130,000		\$544,
Communica					\$272,000		\$272,
Miscellaneo	us Rental Equipmen	t			\$6,377,000	\$0	\$6,377,
	us Special Services				\$1,141,000		\$1,141,
Other Servic					\$2,234,000		\$2,234,
Intan Contin	gency at 15%				\$32,159,000	\$0	\$32,159,
			TOTAL INT	ANGIBLE	\$246,552,272	: \$0	\$246,552,2
	TANGIBLE ITEMS	6					
		OD	Footage	\$/ft			
Drive Pipe		36"	200	\$650.00	\$130,000		\$130,
Conductor		22"	770	\$180.00	\$139,000		\$139
Surface		18"	4,907	\$160.00	\$786,000		\$786
Intermediate		16"	8,305	\$155.00			\$1,288
Intermediate		13-3/8"	12,225	\$140.00			\$1,712
Intermediate		11-3/4"	3,600	\$80.00			\$288
Intermediate		9-5/8"	3,640	\$70.00			\$255
Production I		0	0	\$0.00			
Production	lie-back	0	0	\$0.00			
Tubing		0	0	\$0.00			
Liner Equip					\$300,000		\$300
Whipstock E					\$0		
Subsurface	Completion				\$0		A-
Wellheads					\$500,000		\$500
N.6 11					\$100,000 \$550,000		\$100 \$550
Miscellaneo	unuyat 1070	I		1			
Miscellaneo Tan Conting					C 0 4 0 000	0.0	010 33
			TOTAL TA	NGIBLE	\$6,048,000		Ф0,040 ,
				NGIBLE			<mark>\$6,048,0</mark> \$252,600,1
			Tota		\$252,600,272	\$0	



		SCOPING C	OST ESTI	MATE DETA	ILS				Rev4
				S Case 2					
		Prepared For							Exploratory _X
ENERGY PA	ARTNERS	riepared i o		JANISTEC	/ CDEX				Development
AFE# XXX	Operator:	CDEX / JAMSTEC				Revision No.	1	Date:	20-Jun-13
Prospect or F		1	<u>(</u>	Case No.		Water Depth	Proposed TD	Objective	
Mantle Hole	e N/A			#2b		3650m 11,975 ft	9900m 32,480 ft	Moho / Mantle	
Location	Surface Loca	ation: Lat: 6.7 - 8.7°N / Long: 89.5 -	91.9°W						
Cocos	Btm. Hole Lo	ocation: Lat: 6.7 - 8.7°N / Long: 89.5 -	• 91.9°W						
Purpose of E									
	rilling to the Mantle	e. Assume rater Case Well Configuration						n	Avg Intan \$/day
0430 40.00	inventional Deepw	ater case wen configuration							\$906,441
Drilling	g Rig : Chikyu		Dire	ectional Plan:	Vertical Hol	e			
	INTANGIBLI	EITEMS					Dry Hole Drig	Complete	TOTAL
li anat	tion/Domilatory Coot				Оре	erational Time =	272 Days		272 Days
Locat	tion/ Regulatory Cost	s Metocean Study (desktop study, data collect	ion/processin	va)	Lump Sum	\$1,000,000	\$3,020,000	\$0	\$3,020,000
		Site Survey (desktop study, bathymetry)	ion/processin	iy)	Lump Sum	\$2,000,000			
		Regulatory			Lump Sum	\$20,000			
				<u> </u>					
Rig M	lobilization, Demobiliz						\$19,400,000		\$19,400,000
		Mobilization (from Japan)			Lump Sum			Ī	
D.:111:	D' D14/1	Demobilization (to Japan)			Lump Sum	\$9,700,000			
Drillin	ng Rig - Day Work	Drilling Day Rate	272 Dave	\$300,000 /day		\$81,600,000	\$142,600,000	\$0	\$142,600,000
		Existing Riser System Modifications	LIL Duys	4000,000 /day	Lump Sum				
		Additional Riser			Lump Sum				
Bits, D	Drill Collars & Stabiliz		00 NI	670.000 A 1		C4 540 000	\$4,286,000	\$0	\$4,286,000
		Drill Bits Drill String Rentals: DC's, Jars, Stab, HWT	22 No. 272 Days	\$70,000 /bit \$4,000 /day		\$1,540,000 \$1,088,000			
		Core Bits	21 No.	\$60,000 /bit		\$1,260,000			
		Coring Services	159 Days	\$2,500 /day		\$397,500			
Direct	tional & Downhole Se						\$4,511,000	\$0	\$4,511,000
		Surveys/Gyros/Single & Multi-Shots MWD / LWD Mob / De-mob			Lump Sum				
		Standard MWD Rental	136 Days	\$3,000 /day	Lump Sum	\$30,000 \$408,000			
		Standard LWD Rental	136 Days	\$7,000 /day		\$952,000			
		MWD / LWD Engineers (2)	272 Days	\$2,000 /day		\$544,000			
		Mud Motors & Associated Tools	218 Days	\$3,000 /day		\$652,800 \$544,000			
				\$4,000 /day					
		High Temp MWD Rental High temp I WD Rental	136 Days	\$10,000 /day					
		High Temp MWD Rental High temp LWD Rental	136 Days	\$10,000 /day		\$1,360,000			
Fuel, V	Water & Lube			\$10,000 /day			\$15,912,000	\$0	\$15,912,000
Fuel, V	Water & Lube	High temp LWD Rental Rig Fuel	136 Days 272 Days	\$53,000 /day		\$1,360,000	\$15,912,000	\$0	\$15,912,000
Fuel, V	Water & Lube	High temp LWD Rental Rig Fuel Boat Fuel	136 Days 272 Days 136 Days	\$53,000 /day \$4,000 /day		\$1,360,000 \$14,416,000 \$544,000	\$15,912,000	\$0	\$15,912,000
Fuel, V	Water & Lube	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel	136 Days 272 Days 136 Days 136 Days	\$53,000 /day \$4,000 /day \$3,000 /day		\$1,360,000 \$14,416,000 \$544,000 \$408,000	\$15,912,000	\$0	\$15,912,000
Fuel, V	Water & Lube	High temp LWD Rental Rig Fuel Boat Fuel	136 Days 272 Days 136 Days	\$53,000 /day \$4,000 /day		\$1,360,000 \$14,416,000 \$544,000	\$15,912,000	\$0	\$15,912,000
		High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants	136 Days 272 Days 136 Days 136 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day		\$1,360,000 \$14,416,000 \$544,000 \$408,000 \$353,600			
	Water & Lube	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water	136 Days 272 Days 136 Days 136 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day	1	\$1,360,000 \$14,416,000 \$544,000 \$408,000 \$353,600 \$190,400	\$15,912,000 \$2,798,000	\$0 	\$15,912,000 \$2,798,000
		High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day	Lump Sum	\$1,360,000 \$14,416,000 \$544,000 \$353,600 \$190,400 \$1,900,000			
		High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water	136 Days 272 Days 136 Days 136 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day	Lump Sum	\$1,360,000 \$14,416,000 \$544,000 \$408,000 \$353,600 \$190,400			
Drillin	ng Fluids Services	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day	Lump Sum	\$1,360,000 \$14,416,000 \$544,000 \$353,600 \$190,400 \$1,900,000 \$217,600	\$2,798,000	\$0	\$2,798,000
Drillin		High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Wud Engineer Cuttings Disposal Hole Logs	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum	\$1,360,000 \$14,416,000 \$440,000 \$408,000 \$190,400 \$190,000 \$217,600 \$680,000		\$0	\$2,798,000
Drillin	ng Fluids Services	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day		\$1,360,000 \$14,416,000 \$408,000 \$353,600 \$190,400 \$190,000 \$217,600 \$680,000 \$816,000	\$2,798,000	\$0	\$2,798,000
Drillin	ng Fluids Services	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum	\$1,360,000 \$14,416,000 \$44,000 \$408,000 \$190,400 \$1,900,000 \$217,600 \$680,000 \$816,000 \$1,500,000	\$2,798,000	\$0	\$2,798,000
Drillin	ng Fluids Services	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$700 /day \$800 /day \$2,500 /day		\$1,360,000 \$14,416,000 \$408,000 \$408,000 \$190,400 \$190,400 \$217,600 \$680,000 \$8816,000 \$1,500,000 \$1,500,000	\$2,798,000	\$0	\$2,798,000
Drillin Electr	ng Fluids Services ric Logging & Cased I	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum	\$1,360,000 \$14,416,000 \$408,000 \$408,000 \$190,400 \$190,400 \$217,600 \$680,000 \$8816,000 \$1,500,000 \$1,500,000	\$2,798,000 \$4,916,000	\$0	\$2,798,000 \$4,916,000
Drillin Electr	ng Fluids Services	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum	\$1,360,000 \$14,416,000 \$408,000 \$408,000 \$190,400 \$190,400 \$217,600 \$680,000 \$1,500,000 \$1,500,000 \$2,500,000	\$2,798,000	\$0	\$2,798,000
Drillin Electr	ng Fluids Services ric Logging & Cased I	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22 ⁿ	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$1,360,000 \$14,416,000 \$408,000 \$353,600 \$190,400 \$190,400 \$217,600 \$217,600 \$680,000 \$1,500,000 \$1,500,000 \$1,500,000 \$100,000	\$2,798,000 \$4,916,000	\$0	\$2,798,000 \$4,916,000
Drillin Electr	ng Fluids Services ric Logging & Cased I	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum	\$1,360,000 \$14,416,000 \$44,000 \$408,000 \$408,000 \$190,400 \$1,900,000 \$1,900,000 \$816,000 \$1,500,000 \$11,500,000 \$100,000 \$100,000	\$2,798,000 \$4,916,000	\$0	\$2,798,000 \$4,916,000
Drillin Electr	ng Fluids Services ric Logging & Cased I	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 18" 16" 113.375"	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$1,360,000 \$14,416,000 \$408,000 \$353,600 \$190,400 \$190,400 \$217,600 \$217,600 \$680,000 \$1,500,000 \$1,500,000 \$100,000 \$100,000 \$100,000 \$150,000	\$2,798,000 \$4,916,000	\$0	\$2,798,000 \$4,916,000
Drillin Electr	ng Fluids Services ric Logging & Cased I	High temp LWD Rental Rig Fuel Boat Fuel Boat Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logg Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 18" 16" 13.375"	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$1,360,000 \$14,416,000 \$44,000 \$408,000 \$408,000 \$190,400 \$1,900,000 \$217,600 \$680,000 \$1,500,000 \$11,500,000 \$100,	\$2,798,000 \$4,916,000	\$0	\$2,798,000 \$4,916,000
Drillin Electr	ng Fluids Services ric Logging & Cased I	High temp LWD Rental Rig Fuel Boat Fuel Boat Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 18" 16" 13.375" 11.75" 9.625"	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$1,360,000 \$14,416,000 \$408,000 \$408,000 \$190,400 \$1,900,000 \$1,900,000 \$1,500,000 \$1,500,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000	\$2,798,000 \$4,916,000	\$0	\$2,798,000 \$4,916,000
Drillin Electr	ng Fluids Services ric Logging & Cased I	High temp LWD Rental Rig Fuel Boat Fuel Boat Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logg Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 18" 16" 13.375"	136 Days 272 Days 136 Days 136 Days 272 Days 272 Days 272 Days 272 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$1,360,000 \$14,416,000 \$408,000 \$408,000 \$190,400 \$1,900,000 \$217,600 \$680,000 \$1,500,000 \$1,500,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000	\$2,798,000 \$4,916,000	\$0	\$2,798,000 \$4,916,000



Mud Logging and Geologic	al Services						\$667,000	\$0	\$6
widd Logging and Geologic		nit Operating rate	272 Days	\$1,250 /day		\$340,000	\$667,000	\$0	\$ 0
	Personnel (272 Days	\$1,200 /day		\$326,400			
Land Transportation							¢122.000	¢0	¢ 1 '
	Trucking		136 Days	\$900 /day		\$122,400	\$123,000	\$0	\$12
	Tracking		Too Days	\$300 Addy		¢122,100			
Boat Transportation							\$3,128,000	\$0	\$3,12
	Work Boat -		136 Days	\$14,000 /day		\$1,904,000			
	Crew Boat -	- Spot Hire	136 Days	\$9,000 /day		\$1,224,000			
Helicopter Transportation							\$1,224,000	\$0	\$1,22
	Helicopter -	spot hire	136 Days	\$9,000 /day		\$1,224,000			
T I I O I I I									
Tubular Services	QAQC				Lump Sum	\$150,000	\$150,000	\$0	\$15
	QAQU					\$100,000			
Shorebase / Dock Service:		19a1	0.00	AA AAA		0511.000	\$544,000	\$0	\$54
	Shorebase	/Dispatcher	272 Days	\$2,000 /day		\$544,000			
Communications							\$272,000	\$0	\$27
	VSAT		272 Days	\$1,000 /day		\$272,000			
Miscellaneous Rental Equi	Solids Cont	trol	272 Days	\$400 /day		\$108,800	\$6,377,000	\$0	\$6,37
	Fishing Too		272 Days 272 Days	\$400 /day \$1,500 /day		\$108,800			
		nning Equipment	70 Days	\$6,000 Day		\$400,000			
	Other Renta		272 Days	\$20,000 Day		\$5,440,000			
			Days						
Miscellaneous Special Ser	rvices		Days				\$1,141,000	\$0	\$1,14
	Weather Fo	recasting	272 Days	\$150 /day		\$40,800	\$1,141,000	\$0	ψ1,1-
		g Services - Riser Analysis			Lump Sum	\$300,000			
		g Services - Drill String Design			Lump Sum	\$200,000			
		g Services - Casing Design g Services - Wellbore Stability			Lump Sum Lump Sum	\$50,000 \$100,000			
		g Services - Operational Suppor			Lump Sum	\$200,000			
		g Services - Risk Assessments			Lump Sum	\$200,000			
		g Services - Other			Lump Sum	\$50,000			
Other Services / Costs							\$2,234,000	\$0	\$2,23
Other Services / Costs	Misc Contra	act Labor	272 Days	\$1,500 /day		\$408,000	\$2,234,000	\$0	\$2,23
			70 Days	\$10,000 /day		\$700,000			
1	Casing Rur								
	Casing Rur Well Insura				Lump Sum	\$500,000			
	Well Insura Overhead		272 Days	\$1,100 /day	Lump Sum	\$500,000 \$299,200			
	Well Insura				Lump Sum	\$500,000			
	Well Insura Overhead		272 Days	\$1,100 /day	Lump Sum	\$500,000 \$299,200			
Intangible Contingency	Well Insura Overhead		272 Days 272 Days	\$1,100 /day	ST Drlg =	\$500,000 \$299,200 \$326,400 \$214,393,000	\$32,159,000	\$0	\$32,15
Intangible Contingency	Well Insura Overhead		272 Days 272 Days	\$1,100 /day \$1,200 /day		\$500,000 \$299,200 \$326,400	\$32,159,000	\$0	\$32,15
Intangible Contingency	Well Insura Overhead		272 Days 272 Days	\$1,100 /day \$1,200 /day	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000	\$32,159,000 \$246,552,000	\$0 \$0	
Intangible Contingency TANGIBLE I	Well Insura Overhead Catering		272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0			\$32,15 \$246,55
	Well Insura Overhead Catering		272 Days 272 Days	\$1,100 /day \$1,200 /day	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE		\$0	
TANGIBLE I Drive Pipe Conductor	Well Insura Overhead Catering	OD 7 36" 22"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount Length 200 770	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00	\$246,552,000	\$0 \$0	\$246,55
TANGIBLE I Drive Pipe Conductor Surface	Well Insura Overhead Catering	OD 7 36" 22" 18"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount Length 200 770 4,907	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$180.00	\$246,552,000 \$130,000 \$139,000 \$786,000	\$0 \$0 \$0 \$0 \$0 \$0	\$246,55 \$11 \$11 \$12 \$78
TANGIBLE I Drive Pipe Conductor Surface Intermediate	Well Insura Overhead Catering	OD 7 36" 22" 18" 16"	272 Days 272 Days 15%	\$1,100 /day \$1.200 /day Amount Length 200 770 4,907 8,305	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$160.00 \$160.00 \$155.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$246,55 \$11 \$11 \$12 \$17 \$17 \$1,28
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate	Well Insura Overhead Catering	CD 7 36" 22" 18" 16" 13-3/8"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount Length 200 770 4,907 8,305 12,225	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$155.00 \$140.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,712,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$246,55 \$13 \$13 \$13 \$75 \$1,26 \$1,26 \$1,71
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount 200 770 4,907 8,305 12,225 3,600	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,722,000 \$288,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$246,55 \$13 \$13 \$78 \$1,28 \$1,21 \$1,71 \$28
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate	Well Insura Overhead Catering	CD 7 36" 22" 18" 16" 13-3/8"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount Length 200 770 4,907 8,305 12,225	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$155.00 \$140.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,712,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$246,55 \$11 \$11 \$12 \$17 \$17 \$1,28
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount 200 770 4,907 8,305 12,225 3,600	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,722,000 \$288,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$246,55 \$13 \$13 \$78 \$1,28 \$1,21 \$1,71 \$28
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tine-back	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount 200 770 4,907 8,305 12,225 3,600	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,722,000 \$288,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$246,55 \$13 \$13 \$78 \$1,28 \$1,21 \$1,71 \$28
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount 200 770 4,907 8,305 12,225 3,600	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,712,000 \$288,000 \$255,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$246,55 \$13 \$13 \$76 \$1,26 \$1,77 \$22 \$25
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tine-back	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount 200 770 4,907 8,305 12,225 3,600	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,722,000 \$288,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$246,55 \$13 \$13 \$78 \$1,28 \$1,21 \$1,71 \$28
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount 200 770 4,907 8,305 12,225 3,600	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,712,000 \$288,000 \$255,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$246,55 \$13 \$13 \$76 \$1,26 \$1,77 \$22 \$25
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount 200 770 4,907 8,305 12,225 3,600	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,712,000 \$288,000 \$255,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$246,55 \$13 \$11 \$17 \$1,28 \$1,77 \$28 \$21 \$21 \$30 \$30
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount 200 770 4,907 8,305 12,225 3,600	ST Drlg = ST Comp =	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,712,000 \$1,712,000 \$2255,000 \$255,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$246,5! \$11 \$12 \$1,21 \$1,21 \$1,21 \$21 \$22 \$22 \$30 \$30 \$30 \$50
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount Length 200 770 4,907 8,305 12,225 3,600 3,640	ST Drig = ST Comp = TOTAL II	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$180.00 \$160.00 \$140.00 \$155.00 \$140.00 \$170.00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,288,000 \$288,000 \$288,000 \$280,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$246,5: \$1: \$1: \$1: \$1: \$1: \$1: \$1: \$1
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount 200 770 4,907 8,305 12,225 3,600	ST Drig = ST Comp = TOTAL II	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$160.00 \$140.00 \$160.00 \$175.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$155.00 \$140.00 \$160.00 \$1	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,288,000 \$288,000 \$288,000 \$280,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$246,55 \$12 \$13 \$17 \$1,28 \$1,28 \$1,77 \$22 \$21 \$22 \$33 \$33 \$33 \$33 \$34 \$35 \$35 \$36 \$36 \$36 \$36 \$36 \$36 \$36 \$36 \$36 \$36
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount Length 200 770 4,907 8,305 12,225 3,600 3,640	ST Drig = ST Comp = TOTAL II	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$180.00 \$160.00 \$140.00 \$155.00 \$140.00 \$170.00	\$246,552,000 \$130,000 \$139,000 \$1,288,000 \$1,712,000 \$288,000 \$255,000 \$300,000 \$500,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$246,55 \$12 \$13 \$17 \$1,28 \$1,28 \$1,77 \$22 \$21 \$22 \$33 \$33 \$33 \$33 \$34 \$35 \$35 \$36 \$36 \$36 \$36 \$36 \$36 \$36 \$36 \$36 \$36
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount Length 200 770 4,907 8,305 12,225 3,600 3,640	ST DrIg = ST Comp = TOTAL II	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$160.00 \$140.00 \$160.00 \$175.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$155.00 \$140.00 \$160.00 \$1	\$246,552,000 \$130,000 \$139,000 \$1,288,000 \$1,712,000 \$288,000 \$255,000 \$300,000 \$500,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$246,55 \$13 \$11 \$17 \$1,25 \$25 \$30 \$30 \$50 \$10 \$55
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount Length 200 770 4,907 8,305 12,225 3,600 3,640	ST DrIg = ST Comp = TOTAL II ST DrIg = ST DrIg = ST Comp = TOTAL	\$500,000 \$299,200 \$326,400 \$214,393,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$160.00 \$140.00 \$175.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$155.00 \$140.00 \$160.00 \$170.00 \$1	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,288,000 \$288,000 \$285,000 \$300,000 \$500,000 \$100,000 \$550,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$246,55 \$13 \$13 \$76 \$1,26 \$1,77 \$22 \$25
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	Well Insura Overhead Catering	OD 7 36" 22" 18" 16" 13.38" 11.3/4"	272 Days 272 Days 15%	\$1,100 /day \$1,200 /day Amount Length 200 770 4,907 8,305 12,225 3,600 3,640	ST Drig = ST Comp = TOTAL II	\$500,000 \$299,200 \$326,400 \$70 NTANGIBLE \$714,393,000 \$0 NTANGIBLE \$714,393,000 \$100 \$100,00 \$160,00 \$160,00 \$160,00 \$160,00 \$160,00 \$160,00 \$160,00 \$160,00 \$160,00 \$176,000 \$176,0000\$100,000 \$176,00	\$246,552,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$288,000 \$288,000 \$300,000 \$300,000 \$500,000 \$550,000 \$550,000 \$6,048,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$246,55 \$13 \$13 \$17 \$1,22 \$1,71 \$22 \$25 \$30 \$30 \$50 \$10 \$55 \$55 \$55

6.2.3 Case 2c Cost Estimate:

This case assumes the Deepwater wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. However for the Cocos location it is assumed that the sediments, lava and dike intervals do not need to be cored because of previous IODP experience on the 1256D hole. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Tan Total		P10	P50	P90	
337	\$255,250	\$8,879	\$264,129	\$243,306	\$256,370	\$276,480	

Figure 161. Cocos Location: Case 2c – Cost Estimate	Figure 161	. Cocos Loca	tion: Case 2c -	- Cost Estimate
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The following charts shows the cumulative probability of cost.

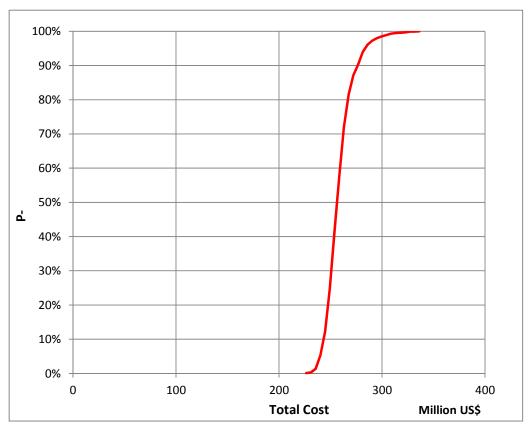


Figure 162. Cocos Location – Case 2c Probabilistic Cost



			SCOPING CO	OST ESTIMATE	SUMMARY			Rev
			-	- Cocos Ca				
		Dro		IODP / JAN				
BLAL		Fie	pareu For.	IODF / JAN	ISTEC/C	DEX		Exploratory _X Development
FE# XXX		CDEX / JA	MSTEC		Revision No.	1	Date:	20-Jun-13
rospect or Field	Lease Nar		NIGTEC .	Case No.	Water Depth	Proposed TD	Formation	20-3uii-13
lantle Hole	N/A			#2b	3650m	9900m	Moho / Mantle	
					11,975 ft	32,480 ft		
ocation	Surface Lo			Long: 89.5 - 91.9			•	
ocos		Location:	Lat: 6.7 - 8.7°N /	Long: 89.5 - 91.9	۳W			
urpose of Expen								
cientific Drilling to								
ase 4b: Convent	ional Deepwat	ter Case Wel	I Configuration					
	Chilagu			rectional Dians V				
rilling Rig :	Chikyu	BLE ITEMS	Di	rectional Plan: Vo	ertical Hole		Commissio	TOTAL
	INTANGE	SLE ITENIS				Dry Hole Drig	Complete	TOTAL 289 Days
Location/I	Regulatory Co:	ete				289 Days \$3,020,000	\$0	\$3,020,0
	zation, Demob					\$19,400,000	\$0	\$3,020,0
	g - Day Work a		/ Day			\$147,700,000	\$0	\$147,700,0
	Collars & Stabi					\$4,531,000	\$0	\$4,531,0
	l & Downhole	Services				\$4,790,000	\$0	\$4,790,0
Fuel, Wate						\$16,907,000	\$0	\$16,907,0
	uids Services	411-1-1				\$2,854,000	\$0	\$2,854,0
Electric Lo Cementine	ogging & Case	a Hole Logs				\$4,967,000 \$1,112,000	\$0 \$0	\$4,967,0 \$1,112,0
	y ing and Geolo	nical Service	s			\$709,000	\$0	\$709,0
	sportation	gioar corrido				\$131.000	\$0	\$131.0
Boat Trans						\$3,324,000	\$0	\$3,324,0
Helicopter	Transportatio	n				\$1,301,000	\$0	\$1,301,0
Tubular Se	ervices					\$150,000	\$0	\$150,0
	e / Dock Servic	ces				\$578,000	\$0	\$578,0
Communi						\$289,000	\$0	\$289,0
	eous Rental Ec eous Special S					\$6,750,000 \$1,144,000	\$0 \$0	\$6,750,0 \$1,144,0
	ices / Costs	services				\$1,144,000 \$2,299,000	\$0	\$1,144,0
	tingency at	15%				\$33,294,000	\$0	\$33,294,0
	5 7					••••		
				TOTAL BUT			* •	*055 050 0
				TOTAL INT	ANGIBLE	<mark>\$255,250,289</mark>	\$0	\$255,250,2
	TANGIBL		00	Fastaria	¢ 151			
			OD	Footage 200	\$/ft	\$130,000	\$0	\$130.0
		1	26"		00000			2130.0
Drive Pipe			36"		\$650.00 \$180.00			· · · · · · · · · · · · · · · · · · ·
Conductor			22"	770	\$180.00	\$139,000	\$0	\$139,0
Conductor Surface	r		22" 16.5" SET	770 5,107	\$180.00 \$300.00	\$139,000 \$1,533,000	\$0 \$0	\$139,(\$1,533,(
Conductor Surface Intermedia	r ate		22" 16.5" SET 16.5" SET	770 5,107 3,598	\$180.00 \$300.00 \$300.00	\$139,000 \$1,533,000 \$1,080,000	\$0 \$0 \$0	\$139, \$1,533, \$1,080,
Conductor Surface Intermedia Intermedia	r ate		22" 16.5" SET 16.5" SET 16"	770 5,107 3,598 11,755	\$180.00 \$300.00 \$300.00 \$155.00	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000	\$0 \$0 \$0 \$0	\$139,0 \$1,533,0 \$1,080,0 \$1,823,0
Conductor Surface Intermedia Intermedia	r ate ate		22" 16.5" SET 16.5" SET 16" 13-3/8"	770 5,107 3,598 11,755 15,525	\$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000	\$0 \$0 \$0 \$0 \$0 \$0	\$139, \$1,533, \$1,080, \$1,823, \$2,174,
Conductor Surface Intermedia Intermedia Intermedia	r ate ate ate ate		22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	770 5,107 3,598 11,755 15,525 3,640	\$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$139,(\$1,533,(\$1,080,(\$1,823,(\$2,174,(
Conductor Surface Intermedia Intermedia Intermedia Intermedia Production	r ate ate ate ate n Liner		22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0	770 5,107 3,598 11,755 15,525 3,640 0	\$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$139, \$1,533, \$1,080, \$1,823, \$2,174,
Conductor Surface Intermedia Intermedia Intermedia Intermedia Production Production	r ate ate ate ate n Liner		22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0	770 5,107 3,598 11,755 15,525 3,640 0 0	\$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$139, \$1,533, \$1,080, \$1,823, \$2,174,
Conductor Surface Intermedia Intermedia Intermedia Intermedia Production Production Tubing	r ate ate ate n Liner n Tie-back		22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0	770 5,107 3,598 11,755 15,525 3,640 0	\$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$139,0 \$1,533,0 \$1,080,0 \$1,823,0 \$2,174,0 \$292,0
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi	r ate ate ate n Liner n Tie-back ipmt		22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0	770 5,107 3,598 11,755 15,525 3,640 0 0	\$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000 \$0 \$0 \$0 \$0 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$139,0 \$1,533,0 \$1,080,0 \$1,823,0 \$2,174,0 \$292,0
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock	r ate ate ate n Liner n Tie-back pmt k Equipment		22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0	770 5,107 3,598 11,755 15,525 3,640 0 0	\$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000 \$0 \$0 \$0 \$0 \$300,000 \$0 \$300,000 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$139,0 \$1,533,0 \$1,080,0 \$1,823,0 \$2,174,0 \$292,0
Conductor Surface Intermedia Intermedia Intermedia Intermedia Productior Productior Tubing Liner Equi Whipstock Subsurfac	r ate ate ate n Liner n Tie-back pmt k Equipment ce Completion		22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0	770 5,107 3,598 11,755 15,525 3,640 0 0	\$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$139,000 \$1,533,000 \$1,823,000 \$2,174,000 \$292,000 \$0 \$0 \$0 \$300,000 \$0 \$300,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$139,0 \$1,533,0 \$1,080,0 \$1,823,0 \$2,174,0 \$292,0 \$292,0 \$300,0
Conductor Surface Intermedia Intermedia Intermedia Production Trubing Liner Equi Whipstock Subsurfac Wellheads	r ate ate ate n Liner n Tie-back pmt k Equipment ee Completion		22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0	770 5,107 3,598 11,755 15,525 3,640 0 0	\$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$139,000 \$1,533,000 \$1,823,000 \$2,174,000 \$292,000 \$0 \$0 \$300,000 \$0 \$300,000 \$0 \$500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$139,(\$1,533,(\$1,080,(\$1,823,(\$2,174,(\$292,(\$300,(\$300,(\$500,(
Conductor Surface Intermedia Intermedia Intermedia Productior Trubing Liner Equi Whipstock Subsurfac Wellheads	r ate ate ate 1 Liner 1 Tie-back pmt k Equipment ce Completion s cous/Other	10%	22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0	770 5,107 3,598 11,755 15,525 3,640 0 0	\$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$139,000 \$1,533,000 \$1,823,000 \$2,174,000 \$292,000 \$0 \$0 \$0 \$300,000 \$0 \$300,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$139, \$1,533, \$1,080, \$1,823, \$2,174, \$292, \$300, \$300, \$300, \$500, \$100,
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock Subsurfac Wellheads Miscellane	r ate ate ate 1 Liner 1 Tie-back pmt k Equipment ce Completion s cous/Other	10%	22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0	770 5,107 3,598 11,755 15,525 3,640 0 0 0 0	\$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00	\$139,000 \$1,533,000 \$1,823,000 \$2,174,000 \$292,000 \$0 \$0 \$300,000 \$100,000 \$100,000 \$808,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$139,(\$1,533,(\$1,080,(\$1,823,(\$22,174,(\$292,(\$292,(\$300,(\$300,(\$300,(\$100,(\$808,(
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock Subsurfac Wellheads Miscellane	r ate ate ate 1 Liner 1 Tie-back pmt k Equipment ce Completion s cous/Other	10%	22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0	770 5,107 3,598 11,755 15,525 3,640 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00	\$139,000 \$1,533,000 \$1,823,000 \$2,174,000 \$292,000 \$0 \$0 \$300,000 \$100,000 \$100,000 \$808,000 \$8,879,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$139,(\$1,533, \$1,080,(\$1,823,(\$2,174,(\$292,(\$300,(\$300,(\$300,(\$100,(\$808,(\$888,879,(
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock Subsurfac Wellheads Miscellane	r ate ate ate 1 Liner 1 Tie-back pmt k Equipment ce Completion s cous/Other	10%	22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0	770 5,107 3,598 11,755 15,525 3,640 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00\$0.00\$0.00\$0.00\$0.00\$0.00\$0.00\$0.00\$0.00\$0.00\$0.00	\$139,000 \$1,533,000 \$1,823,000 \$2,174,000 \$292,000 \$0 \$0 \$300,000 \$100,000 \$100,000 \$808,000 \$8,879,000 \$264,129,289	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$139,(\$139,(\$1,533,(\$1,680,(\$1,823,(\$2,174,(\$292,(\$292,(\$300,(\$300,(\$100,(\$808,(\$500,(\$100,(\$808,(\$4,129,2)
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock Subsurfac Wellheads Miscellane	r ate ate ate 1 Liner 1 Tie-back pmt k Equipment ce Completion s cous/Other	10%	22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0	770 5,107 3,598 11,755 15,525 3,640 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00	\$139,000 \$1,533,000 \$1,823,000 \$2,174,000 \$292,000 \$0 \$0 \$300,000 \$100,000 \$100,000 \$808,000 \$8,879,000 \$264,129,289	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$139,(\$1,533,(\$1,533,(\$1,680,(\$1,823,(\$22,174,(\$292,(\$292,(\$300,(\$300,(\$300,(\$100,(\$808,(\$888,879,(



	SCOP	NG COST E	STIMATE					Rev 4
			Case 20					
								Fuelesstern X
BLAD ENERGY PARTNE		I. IODP/	JAINSTEC	/ CDEX				Exploratory _X Development
AFE# XXX	Operator: CDEX / JAMSTEC				Revision No.	1	Date:	20-Jun-13
Prospect or Field	Lease Name	C	ase No.		Water Depth	Proposed TD	Objective	
Mantle Hole	N/A		#2b		3650m 11,975 ft	9900m 32,480 ft	Moho / Mantle	
Location	Surface Location: Lat: 6.7 - 8.7°N / Long: 89.5	- 91.9°W			11,373 R	52,400 ft		
Cocos	Btm. Hole Location: Lat: 6.7 - 8.7°N / Long: 89.5							
Purpose of Expend								
	to the Mantle. Assume							Ave Inten C/dev
Case 4b: Convent	ional Deepwater Case Well Configuration							Avg Intan \$/day \$883,218
Drilling Rig	Chikyu	Dire	ctional Plan:	Vertical Hol	е		1	\$000,210
	INTANGIBLE ITEMS					Dry Hole Drig	Complete	TOTAL
				Ор	erational Time =	289 Days		289 Days
Location/ Re	gulatory Costs				£1,000,000	\$3,020,000	\$0	\$3,020,000
	Metocean Study (desktop study, data collect Site Survey (desktop study, bathymetry)	ion/processing	3)	Lump Sum Lump Sum	\$1,000,000 \$2,000,000			
	Regulatory			Lump Sum	\$20,000			
	····g······,			0 0011	¢20,000			
Rig Mobiliza	tion, Demobilization					\$19,400,000		\$19,400,000
	Mobilization (from Japan)			Lump Sum				
	Demobilization (to Japan)			Lump Sum	\$9,700,000		┞────┤	
Drilling Rig		2000 Davis	1200 000 /J-		\$00 7 00 000	\$147,700,000	\$0	\$147,700,000
	Drilling Day Rate Existing Riser System Modifications	289 Days	\$300,000 /day	Lump Sum	\$86,700,000 \$14,000,000			
	Additional Riser			Lump Sum				
Bits, Drill Co	llars & Stabilizers					\$4,531,000	\$0	\$4,531,000
	Drill Bits	24 No.	\$70,000 /bit		\$1,680,000			
	Drill String Rentals: DC's, Jars, Stab, HWT Core Bits	289 Days 21 No.	\$4,000 /day \$60,000 /bit		\$1,156,000 \$1,260,000			
	Coring Services	174 Days	\$2,500 /day		\$435,000			
Directional	& Downhole Services					\$4,790,000	\$0	\$4,790,000
	Surveys/Gyros/Single & Multi-Shots			Lump Sum				
	MWD / LWD Mob / De-mob Standard MWD Rental	145 Days	\$3,000 /day	Lump Sum	\$30,000 \$433,500			
	Standard LWD Rental	145 Days 145 Days	\$3,000 /day		\$1,011,500			
	MWD / LWD Engineers (2)	289 Days	\$2,000 /day		\$578,000			
	Mud Motors & Associated Tools	231 Days	\$3,000 /day		\$693,600			
	High Temp MWD Rental	145 Days	\$4,000 /day		\$578,000			
	High temp LWD Rental	145 Days	\$10,000 /day		\$1,445,000			
Fuel, Water	8 Lube					\$16,907,000	\$0	\$16,907,000
	Rig Fuel	289 Days	\$53,000 /day		\$15,317,000	\$10,707,000	\$0	\$10,707,000
	Boat Fuel	145 Days	\$4,000 /day		\$578,000			
	Helicopter Fuel	145 Days 289 Days	\$3,000 /day		\$433,500 \$375,700			
	Lubricants Fresh Water	289 Days 289 Days	\$1,300 /day \$700 /day		\$202,300			
Drilling Fluid						\$2,854,000	\$0	\$2,854,000
	Drilling Fluids - WBM		\$000 (Ja	Lump Sum				
	Mud Engineer Cuttings Disposal	289 Days 289 Days	\$800 /day \$2,500 /day		\$231,200 \$722,500			
	edulige Diopoedi	200 2 4)0	\$2,000 /ddy		¢122,000			
Electric Log	ging & Cased Hole Logs					\$4,967,000		\$4,967,000
	Wireline Unit and Personnel	289 Days	\$3,000 /day		\$867,000			
	Standard Open Hole Logging			Lump Sum			 	
	High Temp Open Hole Logging Cased Hole Logging			Lump Sum Lump Sum				
				Lump Outin	φ100,000			
Cementing						\$1,112,000	\$0	\$1,112,000
	22"			Lump Sum			Ī	
	16.5" SET 16.5" SET			Lump Sum			 	
	16.5 321			Lump Sum				
	13.375"			Lump Sum	\$100,000			
	11.75"			Lump Sum				
	Retainers, Service Man, Manifold, Etc. Unit Charge	289 Days	\$1,250 /day	Lump Sum	\$50,000 \$361,250		 	
	Unit Unarge	209 Days	φ1,200/udy		φ301,230		╂	



	al Services					\$709,000	\$0	\$7
	Logging Unit Operating rate	289 Days	\$1,250 /day		\$361,250			<i>,</i> ,
	Personnel Charges	289 Days	\$1,200 /day		\$346,800			
Land Transportation						\$131,000	\$0	\$1
	Trucking	145 Days	\$900 /day		\$130,050	\$131,000	\$U	\$1
	Trucking	145 Days	\$3007day		φ100,000			
Boat Transportation						\$3,324,000	\$0	\$3,3
	Work Boat - Spot Hire	145 Days	\$14,000 /day		\$2,023,000			
	Crew Boat - Spot Hire	145 Days	\$9,000 /day		\$1,300,500			
Helicopter Transportation						\$1,301,000	\$0	\$1,3
The neopter Transportation	Helicopter - spot hire	145 Days	\$9,000 /day		\$1,300,500	\$1,301,000	\$0	\$1,3
Tubular Services						\$150,000	\$0	\$1
	QAQC			Lump Sum	\$150,000			
Shorebase / Dock Services	\$					\$578,000	\$0	\$5
onorchase / book oct not.	Shorebase /Dispatcher	289 Days	\$2,000 /day		\$578,000	\$378,000	\$0	
Communications						\$289,000	\$0	\$2
	VSAT	289 Days	\$1,000 /day		\$289,000			
Missellenseus Dentel Frui						A/ 750 000		
Miscellaneous Rental Equi	Solids Control	289 Days	\$400 /day		\$115,600	\$6,750,000	\$0	\$6,7
	Fishing Tools	289 Days 289 Days	\$400 /day \$1,500 /day		\$433,500			
	Casing Running Equipment	70 Days	\$6,000 Day		\$420,000			
	Other Rentals	289 Days	\$20,000 Day		\$5,780,000			
		Days						
Niegellen :		Days						
Miscellaneous Special Ser		000 0	0150 (1)		£40.050	\$1,144,000	\$0	\$1,1
	Weather Forecasting Engineering Services - Riser Ana	289 Days	\$150 /day	Lump Sum	\$43,350 \$300,000			
	Engineering Services - Drill Strin			Lump Sum	\$200,000			
	Engineering Services - Casing D			Lump Sum	\$50,000			
	Engineering Services - Wellbore			Lump Sum	\$100,000			
	Engineering Services - Operation			Lump Sum	\$200,000		1	
	Engineering Services - Risk Ass	essments		Lump Sum	\$200,000			
	Engineering Services - Other			Lump Sum	\$50,000			
Other Services / Costs						\$2,299,000	\$0	\$2,2
	Misc Contract Labor	289 Days	\$1,500 /day		\$433,500	\$2,277,000		
	Casing Running	70 Days	\$10,000 /day		\$700,000			
	Well Insurance			Lump Sum	\$500,000		1	
	Overhead	289 Days	\$1,100 /day		\$317,900			
	Catering	289 Days	\$1,200 /day		\$346,800			
Intangible Contingency		15%	Amount	ST Drlg =	\$221,956,000	\$33,294,000	\$0	\$33,2
				ST Comp =	\$0			
				TOTAL IN	ITANGIBLE	\$255,250,000	\$0	\$255,2
TANGIBLE I								,
	OD	7 = # Strings	Length		\$/ft			
Drive Pipe	OD 36"	7 = # Strings	200		650	\$130,000	\$0	\$1
Drive Pipe Conductor	OD 36" 22"	7 = # Strings	200 770		650 180	\$139,000	\$0	\$1
Drive Pipe Conductor Surface	OD 36" 22" 16.5" SET	7 = #Strings	200 770 5,107		650 180 300	\$139,000 \$1,533,000	\$0 \$0	\$1 \$1 \$1,5
Drive Pipe Conductor Surface Intermediate	OD 36" 22" 16.5" SET 16.5" SET	7 =#Strings	200 770 5,107 3,598		650 180 300 300	\$139,000 \$1,533,000 \$1,080,000	\$0 \$0 \$0	\$1 \$1 \$1,5 \$1,0
Drive Pipe Conductor Surface Intermediate Intermediate	OD 36" 22" 16.5" SET 16.5" SET 16"	7 = # Strings	200 770 5,107 3,598 11,755		650 180 300 300 155	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000	\$0 \$0 \$0 \$0	\$1 \$1 \$1,5 \$1,0 \$1,8
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 =#Strings	200 770 5,107 3,598 11,755 15,525		650 180 300 300 155 140	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000	\$0 \$0 \$0 \$0 \$0 \$0	\$1 \$1,5 \$1,5 \$1,0 \$1,8 \$2,1
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate	OD 36" 22" 16.5" SET 16.5" SET 16"	7 =#Strings	200 770 5,107 3,598 11,755		650 180 300 300 155	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000	\$0 \$0 \$0 \$0	\$1 \$1,5 \$1,5 \$1,0 \$1,8 \$2,1
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 =#Strings	200 770 5,107 3,598 11,755 15,525		650 180 300 300 155 140	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000	\$0 \$0 \$0 \$0 \$0 \$0	\$1 \$1,5 \$1,5 \$1,0 \$1,8 \$2,1
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 = # Strings	200 770 5,107 3,598 11,755 15,525		650 180 300 300 155 140	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000	\$0 \$0 \$0 \$0 \$0 \$0	\$1 \$1,5 \$1,5 \$1,0 \$1,8 \$2,1
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tine-back Tubing	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 =#Strings	200 770 5,107 3,598 11,755 15,525		650 180 300 300 155 140	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000	\$0 \$0 \$0 \$0 \$0 \$0	\$1 \$1,5 \$1,0 \$1,8 \$2,1 \$2
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 =#Strings	200 770 5,107 3,598 11,755 15,525		650 180 300 300 155 140	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000	\$0 \$0 \$0 \$0 \$0 \$0	\$1 \$1,5 \$1,0 \$1,8 \$2,1 \$2
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 =#Strings	200 770 5,107 3,598 11,755 15,525		650 180 300 300 155 140	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000	\$0 \$0 \$0 \$0 \$0 \$0	
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 = # Strings	200 770 5,107 3,598 11,755 15,525		650 180 300 300 155 140	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1 \$1,5 \$1,0 \$1,8 \$2,1 \$2 \$3 \$3
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tine-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 =#Strings	200 770 5,107 3,598 11,755 15,525		650 180 300 300 155 140	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000 \$300,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1 \$1,5 \$1,0 \$1,8 \$2,1 \$2 \$3 \$3 \$3 \$5
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 =#Strings	200 770 5,107 3,598 11,755 15,525		650 180 300 300 155 140	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1 \$1,5 \$1,6 \$1,6 \$1,6 \$2,1 \$2 \$2 \$3 \$3 \$3 \$3 \$5
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Weilheads Miscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		200 770 5,107 3,598 11,755 15,525 3,640	ST DrIa =	650 180 300 155 140 80	\$139,000 \$1,533,000 \$1,080,000 \$2,174,000 \$292,000 \$300,000 \$300,000 \$500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1 \$1,5 \$1,6 \$2,1 \$2 \$3 \$3 \$3 \$5 \$5 \$1
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tine-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		200 770 5,107 3,598 11,755 15,525	ST Drig = ST Comp =	650 180 300 300 155 140	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000 \$300,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1 \$1,5 \$1,6 \$2,1 \$2 \$3 \$3 \$3 \$5 \$5 \$1
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Weilheads Miscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		200 770 5,107 3,598 11,755 15,525 3,640	ST Comp =	650 180 300 155 140 80 \$8,071,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000 \$300,000 \$300,000 \$500,000 \$100,000 \$808,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$1 \$1,5 \$1,5 \$1,5 \$2,1 \$2 \$3 \$3 \$5 \$5 \$1 \$1 \$2 \$2 \$2 \$2 \$3 \$3 \$5 \$5 \$5 \$1,5 \$1,5 \$1,5 \$1,5 \$1,5 \$1,5
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Weilheads Miscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		200 770 5,107 3,598 11,755 15,525 3,640	ST Comp = TOTAL	650 180 300 300 155 140 80 \$8,071,000 \$0 TANGIBLE	\$139,000 \$1,533,000 \$1,080,000 \$2,174,000 \$2,174,000 \$292,000 \$300,000 \$300,000 \$100,000 \$808,000 \$8,879,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$1 \$1 \$1,5 \$1,0 \$1,8 \$2,1 \$2 \$3 \$3 \$3 \$3 \$3 \$3 \$3 \$3 \$3 \$3 \$3 \$3 \$3
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		200 770 5,107 3,598 11,755 15,525 3,640	ST Comp = TOTAL Tota	650 180 300 155 140 80 \$8,071,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$139,000 \$1,533,000 \$1,080,000 \$1,823,000 \$2,174,000 \$292,000 \$300,000 \$300,000 \$500,000 \$100,000 \$808,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$1 \$1,5 \$1,0 \$1,8 \$2,1 \$2



6.2.4 Case 4a Cost Estimate:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the cost estimate for this case is shown below.

P	Project	Nom	inal Costs	(M\$)	Stochastic Costs			
	Days	Intan	Tan	Total	P10	P50	P90	
	250	\$209,434	\$2,563	\$211,997	\$186,990	\$200,870	\$220,780	

Figure 163. Cocos Location: Case 4a – Cost Estimate

The following chart shows the cumulative probability of cost.

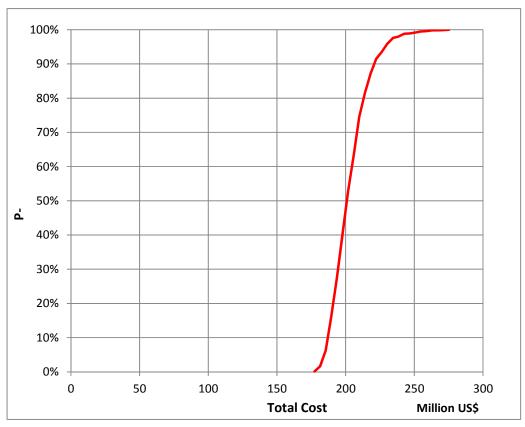


Figure 164. Cocos Location – Case 4a Probabilistic Cost



		<u>SCOPING C</u>	OST ESTIMATE	<u>SUMMARY</u>			Re
		BEAM	- Cocos C	ase 4a		** DRAFT	**
BLADE NERGY PARTNEI		repared For:	IODP / JAN	ISTEC/C	DEX		Exploratory _X Development
FE# XXX (Operator: CDEX /	JAMSTEC		Revision No.	1	Date:	20-Jun-13
	Lease Name		Case No.	Water Depth	Proposed TD	Formation	
antle Hole	N/A		#4a	3650m 11,975 ft	9900m 32,480 ft	Moho / Mantle	
	Surface Location:		/ Long: 89.5 - 91.9	€. No.	,	1	
	Btm. Hole Location	:: Lat: 6.7 - 8.7°N	/ Long: 89.5 - 91.9	9°W			
Irpose of Expenditu		Irilling to the Moho, th	en coring 1640 ft / F	00m of the Mantl	<u>م</u>		
	Case Well Configura				e		
-							
	Chikyu		Directional Plan: V	ertical Hole			
	INTANGIBLE ITEN	IS			Dry Hole Drig 202 Days	Complete	TOTAL 202 Davia
Location/Reg	ulatory Costs				\$3,020,000	\$0	202 Days \$3,020,0
	on, Demobilization				\$19,400,000	\$0	\$19,400,
	00,00 Work at	00 / Day			\$121,600,000	\$0	\$121,600,
,	ars & Stabilizers				\$3,003,000	\$0	\$3,003,
Fuel, Water &	Downhole Services				\$3,363,000 \$11,817,000	\$0 \$0	\$3,363, \$11,817,
Drilling Fluids					\$2,567,000	\$0	\$2,567,
	ng & Cased Hole Lo	gs			\$4,706,000	\$0	\$4,706,
Cementing					\$653,000	\$0	\$653,
Land Transpo	and Geological Serv	ices			\$495,000 \$91,000	\$0 \$0	\$495, \$91,
Boat Transpor					\$2,323,000	\$0	\$2,323,
Helicopter Tra					\$909,000	\$0	\$909,
Tubular Servic					\$100,000	\$0	\$100,
Shorebase / D					\$404,000	\$0	\$404,
Communicatio	ons s Rental Equipment				\$202,000 \$4,664,000	\$0 \$0	\$202, \$4,664,
	s Special Services				\$1,131,000	\$0	\$1,131,
Other Services					\$1,668,000	\$0	\$1,668,
Intan Continge	encyat 15%				\$27,318,000	\$0	\$27,318,
			TOTAL INT		\$209,434,202	\$0	\$209,434,2
-	TANGIBLE ITEMS						
		OD 00"	Footage	\$/ft			\$ 400
Drive Pipe Conductor		30"	200	\$500.00 \$180.00	\$100,000 \$139,000	\$0 \$0	\$100, \$139,
Surface		13-3/8"	5,527	\$180.00	\$139,000	\$0	\$139
Intermediate		11-3/4"	7,076	\$80.00	· · · · · · · · · · · · · · · · · · ·	\$0	\$567
Intermediate		0	0	\$0.00	\$0	\$0	<i>+-01</i>
Intermediate		0	0	\$0.00	\$0	\$0	
Intermediate		0	0	\$0.00	\$0	\$0	
	ner	0	0	\$0.00	\$0	\$0	
Production Lin	-back	0	0	\$0.00	\$0	\$0	
Production Tie		0	0	\$0.00	\$0	\$0	A.c
Production Tie Tubing		1			\$150,000	\$0	\$150,
Production Tie Tubing Liner Equipmt					\$0 \$0	\$0 \$0	
Production Tie Tubing Liner Equipmt Whipstock Equ	uipment						
Production Tie Tubing Liner Equipmt Whipstock Equ Subsurface Co	uipment						\$500
Production Tie Tubing Liner Equipmt Whipstock Equ	uipment ompletion				\$500,000	\$0	
Production Tie Tubing Liner Equipmt Whips tock Equ Subsurface Co Wellheads	uipment ompletion s/Other						\$100,
Production Tie Tubing Liner Equipmt Whipstock Equ Subsurface Co Wellheads Miscellaneous	uipment ompletion s/Other				\$500,000 \$100,000 \$233,000	\$0 \$0 \$0	\$100, \$233,
Production Tie Tubing Liner Equipmt Whipstock Equ Subsurface Co Wellheads Miscellaneous	uipment ompletion s/Other		TOTAL TA Tota		\$500,000 \$100,000 \$233,000 \$2,563,000	\$0 \$0 \$0 \$0	\$500, \$100, \$233, \$2,563,(\$211.997,2
Production Tie Tubing Liner Equipmt Whipstock Equ Subsurface Co Wellheads Miscellaneous	uipment ompletion s/Other		Tota	NGIBLE I Dry Hole Cost	\$500,000 \$100,000 \$233,000 \$2,563,000 \$211,997,202	\$0 \$0 \$0 \$0 \$0	\$100, \$233,



		SCOPING C	OST ESTI	MATE DETA	ILS				F
	×	BEAM	- Cocos	s Case 4	a	*	** DRAFT	**	
	-	Prepared For							Exploratory _X_
GY PARTN	E R S	. roparou ro	. 1001 /	UNINOTEO	, ODLX				Development
XXX	Operator: CDEX / JAMSTE	C				Revision No.	1	Date:	20-Jun-13
ect or Field	Lease Name			Case No.		Water Depth	Proposed TD	Objective	
e Hole	N/A			#4a		3650m 11,975 ft	9900m 32,480 ft	Moho / Mantle	
on	Surface Location: Lat:	6.7 - 8.7°N / Long: 89.5 -	91.9°W			11,375 1	52,400 ft		
5		6.7 - 8.7°N / Long: 89.5 -							
se of Expend		· · · · · ·							
	to the Mantle. Assume drillin	ng to the Moho, then co	ring 1640 ft	/ 500m of the	Mantle				
4a: Orig Ba	se Case Well Configuration								Avg Intan \$/
Drilling Dig	- Chilan		Die	ectional Plan:	Vertical Hel				\$1,036,80
Drilling Rig	INTANGIBLE ITEMS		DII	ectional Plan.	vertical hole	e	Dry Hole Drig	Complete	TOTAL
					Ope	erational Time =	202 Days	Complete	202 Days
Location/ R	egulatory Costs						\$3,020,000	\$0	\$3,020
		desktop study, data collect	on/processir	ng)	Lump Sum	\$1,000,000			
	Site Survey (desk	top study, bathymetry)			Lump Sum	\$2,000,000			
	Regulatory				Lump Sum	\$20,000			
Rig Mobiliz	ation, Demobilization	lage a			1	60 700 675	\$19,400,000		\$19,400
	Mobilization (from Demobilization (to				Lump Sum Lump Sum	\$9,700,000 \$9,700,000			
Drilling Rig		oupan)			Lump Sull	φ 9 ,700,000	\$121,600,000	\$0	\$121,600
	Drilling Day Rate		202 Davs	\$300,000 /day		\$60,600,000	\$121,800,000	⊅ 0	⇒121,600
		stem Modifications			Lump Sum	\$14,000,000		··· ·· ··	
	Additional Riser				Lump Sum	\$47,000,000			
Bits, Drill C	ollars & Stabilizers						\$3,003,000	\$0	\$3,003
	Drill Bits		24 No. 202 Days	\$70,000 /bit \$4,000 /day		\$1,680,000			
	Core Bits	s: DC's, Jars, Stab, HWT	6 No.	\$4,000 /day \$60,000 /bit		\$808,000 \$360,000			
	Coring Services		62 Days	\$2,500 /day		\$155,000			
				,,					
Directional	& Downhole Services						\$3,363,000	\$0	\$3,363
	Surveys/Gyros/Sir	ngle & Multi-Shots			Lump Sum	\$20,000			
	MWD / LWD Mob				Lump Sum	\$30,000			
	Standard MWD R		101 Days	\$3,000 /day		\$303,000			
	Standard LWD Re MWD / LWD Engi		101 Days 202 Days	\$7,000 /day \$2,000 /day		\$707,000			
	Mud Motors & Ass		162 Days	\$2,000 /day		\$404,000 \$484,800			
	High Temp MWD		101 Days	\$4,000 /day		\$404,000			
	High temp LWD F		101 Days	\$10,000 /day		\$1,010,000			
Fuel, Water	& Lube						\$11,817,000	\$0	\$11,817
	Rig Fuel		202 Days	\$53,000 /day		\$10,706,000			
	Boat Fuel Helicoptor Fuel		101 Days	\$4,000 /day		\$404,000 \$303,000			
	Helicopter Fuel Lubricants		101 Days 202 Days	\$3,000 /day \$1,300 /day		\$303,000			
	Fresh Water		202 Days	\$700 /day		\$141,400			
Drilling Flui	ds Services						\$2,567,000	\$0	\$2,567
	Drilling Fluids - W	/BM	000 0	\$000 /U	Lump Sum	\$1,900,000			
	Mud Engineer Cuttings Disposa		202 Days 202 Days	\$800 /day \$2,500 /day		\$161,600 \$505,000			
	Guillings Disposa		ZUZ Days	ψ2,300 /udy		<i>\$</i> 505,000			
Electric Lo	gging & Cased Hole Logs						\$4,706,000		\$4,706
	Wireline Unit and	Personnel	202 Days	\$3,000 /day		\$606,000			
	Standard Open H				Lump Sum				
	High Temp Open				Lump Sum	\$2,500,000			
	Cased Hole Logg	ing			Lump Sum	\$100,000			
							\$653,000	\$0	\$653
Cementing	20"				Lump Sum	\$100,000	<i>\$</i> 053,000	φ	\$003
Cementing					Lump Sum	\$150,000			
Cementing	13-3/8"				Lump Sum	\$100,000		1	
Cementing	13-3/8"								
Cementing									
Cementing									
Cementing	11-3/4*	a Man Manifold Eta			Lump Sum	<u>مەن مەم</u>			
Cementing	11-3/4*	e Man, Manifold, Etc.	202 Days	\$1,250 /day	Lump Sum	\$50,000 \$252,500			



	ical Services					\$495,000	\$0	\$4
	Logging Unit Operating rate Personnel Charges	202 Days 202 Days	\$1,250 /day \$1,200 /day		\$252,500 \$242,400			
	Personner Charges	202 Days	\$1,200/day		\$242,400			
Land Transportation	Trucking	101 Days	\$900 /day		\$90,900	\$91,000	\$0	\$
		TOT Days	\$300 /udy		<i>430,300</i>			
Boat Transportation	Work Boat - Spot Hire	101 Days	\$14,000 /day		\$1,414,000	\$2,323,000	\$0	\$2,3
	Crew Boat - Spot Hire	101 Days	\$9,000 /day		\$909,000			
Helicopter Transportatio	n					\$909,000	\$0	\$9
	Helicopter - spot hire	101 Days	\$9,000 /day		\$909,000	\$707,000		•••
Tubular Services						\$100,000	\$0	\$1
	QAQC			Lump Sum	\$100,000	\$100,000		•
Shorebase / Dock Servic						\$404,000	\$0	\$4
	Shorebase /Dispatcher	202 Days	\$2,000 /day		\$404,000			
Communications						\$202,000	\$0	\$2
	VSAT	202 Days	\$1,000 /day		\$202,000			
Miscellaneous Rental Eq						\$4,664,000	\$0	\$4,6
	Solids Control Fishing Tools	202 Days 202 Days	\$400 /day \$1,500 /day		\$80,800 \$303,000			
	Casing Running Equipment	40 Days	\$6,000 Day		\$240,000			
	Other Rentals	202 Days Days	\$20,000 Day		\$4,040,000			
		Days						
Miscellaneous Special S	ervices Weather Forecasting	202 Days	\$150 /day		\$30,300	\$1,131,000	\$0	\$1,1
	Engineering Services - Riser Analy	<i>i</i> sis	\$1007ddy	Lump Sum	\$300,000			
	Engineering Services - Drill String Engineering Services - Casing De			Lump Sum Lump Sum	\$200,000 \$50,000			
	Engineering Services - Wellbore S			Lump Sum	\$100,000			
	Engineering Services - Operationa			Lump Sum	\$200,000			
	Engineering Services - Risk Asses Engineering Services - Other	sments		Lump Sum Lump Sum	\$200,000 \$50,000			
				Lamp Oam	\$00,000			
Other Services / Costs	Misc Contract Labor	202 Days	\$1,500 /day		\$303,000	\$1,668,000	\$0	\$1,0
	Casing Running Service	40 Days	\$1,500 /day \$10,000 /day		\$400,000			
	Well Insurance			Lump Sum	\$500,000			
	Overhead Catering	202 Days 202 Days	\$1,100 /day \$1,200 /day		\$222,200 \$242,400			
Intangible Contingency								
intangibio contangonoj		15%	= Amount	ST Drlg =	\$182,116,000	\$27,318,000	\$0	\$27,3
		15%	= Amount	ST Comp =	\$0			
		15%	= Amount	ST Comp =		\$27,318,000 \$209,434,000	\$0 \$0	
		15%	= Amount	ST Comp =	\$0			
		15%	= Amount	ST Comp =	\$0			
TANGIBLE				ST Comp =	50 NTANGIBLE			
	: ITEMS OD 30"	15%	= Amount Length 200	ST Comp =	\$0	\$209,434,000		\$209,4
TANGIBLE	OD		Length	ST Comp =	50 NTANGIBLE \$/ft		\$0 <mark>.</mark>	\$209,4 \$209,4
TANGIBLE Drive Pipe Conductor Surface	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$209,434,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0	\$209,4 \$3 \$3 \$3 \$3
TANGIBLE Drive Pipe Conductor Surface Intermediate	OD 30" 20"		Length 200 770	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00	\$209,434,000 \$100,000 \$139,000	\$0 \$0 \$0 \$0	\$209,4 \$3 \$3 \$3 \$3
TANGIBLE Drive Pipe Conductor Surface Intermediate intermediate	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$209,434,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0	\$209,4 \$3 \$3 \$3 \$3
TANGIBLE Drive Pipe Conductor Surface Intermediate	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$209,434,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0	\$209,4 \$3 \$3 \$3 \$3
TANGIBLE Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$209,434,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0	\$209,4 \$3 \$3 \$3 \$3
TANGIBLE Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Tie-back	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$209,434,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0	\$209,4 \$ \$ \$
TANGIBLE Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tire-back Tubing	OD 30" 20" 13-3/8"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$209,434,000 \$100,000 \$139,000 \$774,000 \$567,000	\$0 \$0 \$0 \$0 \$0 \$0	\$209,4 \$ \$ \$ \$ \$ \$ \$
TANGIBLE Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment	OD 30" 20" 13-3/8" 11-3/4"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$209,434,000 \$100,000 \$139,000 \$774,000	\$0 \$0 \$0 \$0 \$0	\$209,4 \$3 \$3 \$3 \$3
TANGIBLE Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & E Subsurface Completion	OD 30" 20" 13-3/8" 11-3/4"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$209,434,000 \$100,000 \$139,000 \$774,000 \$567,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$209,4 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & E Subsurface Completion Wellheads	OD 30" 20" 13-3/8" 11-3/4"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$209,434,000 \$100,000 \$139,000 \$774,000 \$567,000 \$567,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$209, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & E Subsurface Completion	OD 30" 20" 13-3/8" 11-3/4"		Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$209,434,000 \$100,000 \$139,000 \$774,000 \$567,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$209, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & E Subsurface Completion Wellheads	OD 30" 20" 13-3/8" 11-3/4"	4 =#Strings	Length 200 770 5,527	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$209,434,000 \$100,000 \$139,000 \$774,000 \$567,000 \$567,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$209,4 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Wellpeads Wiscellaneous / Other	OD 30" 20" 13-3/8" 11-3/4"	4 =#Strings	Length 200 770 5,527 7,076	ST Comp = TOTAL IN ST Drig = ST Comp =	\$0 SYR SYR \$500.00 \$180.00 \$140.00 \$80.00 \$2,330,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$209,434,000 \$100,000 \$139,000 \$774,000 \$567,000 \$150,000 \$150,000 \$100,000 \$233,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$209, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Wellpeads Wiscellaneous / Other	OD 30" 20" 13-3/8" 11-3/4"	4 =#Strings	Length 200 770 5,527 7,076	ST Comp = TOTAL IN TOTAL IN ST Drig = ST Comp = TOTAL	50 NTANGIBLE \$/ft \$500.00 \$180.00 \$180.00 \$140.00 \$80.00 \$2,330,000 50 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$209,434,000 \$100,000 \$139,000 \$774,000 \$567,000 \$567,000 \$150,000 \$150,000 \$100,000 \$233,000 \$2,563,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$209, \$209, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Wellpeads Wiscellaneous / Other	OD 30" 20" 13-3/8" 11-3/4"	4 =#Strings	Length 200 770 5,527 7,076	ST Comp = TOTAL IN TOTAL IN ST Drig = ST Comp = TOTAL	\$0 SYR SYR \$500.00 \$180.00 \$140.00 \$80.00 \$2,330,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$209,434,000 \$100,000 \$139,000 \$774,000 \$567,000 \$150,000 \$150,000 \$100,000 \$233,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$209, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$



6.2.5 Case 4b Cost Estimate:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Tan	Total	P10	P50	P90	
269	\$219,937	\$6,048	\$225,985	\$198,614	\$214,640	\$240,231	

Eiguro 165	Cocos	Location:	Caso Ab	Cost	Estimato
Figure 165.	COCOS	Location:	Case 4D	- Cost	Estimate

The following chart shows the cumulative probability of cost.

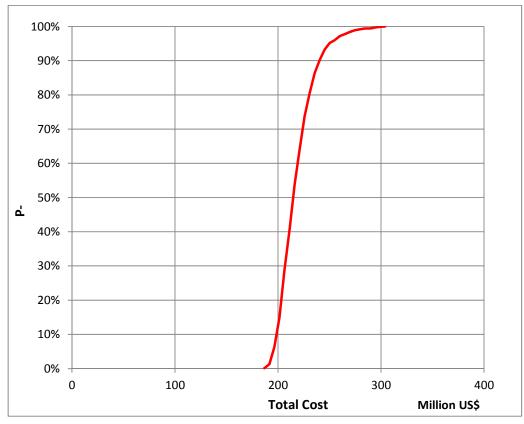


Figure 166. Cocos Location – Case 4b Probabilistic Cost



		<u>SCOP</u>	ING COST ES	TIMATE			Rev
		BEAM	- Cocos (Case 4b		** DRAFT	**
	- P	repared For:					Exploratory _X
ENERGY PARTNER		repared for.					Development
AFE# XXX C	perator: CDEX /	JAMSTEC		Revision No.	1	Date:	20-Jun-13
	ease Name		Case No.	Water Depth	Proposed TD	Formation	
Mantle Hole N	/A		#4b	3650m 11,975 ft	9900m 32,480 ft	Moho / Mantle	
ocation S	urface Location:	Lat: 6.7 - 8.7°N	/ Long: 89.5 - 91	,	52,400 It		
	tm. Hole Location						
Purpose of Expenditur							
Scientific Drilling to the			en coring 1640 ft.	500m of the Mantl	e		
Case 4b: Conventional	Deepwater Case (Well Configuration					
Drilling Rig : C	hikyu	D	irectional Plan:	Vertical Hole			
1	NTANGIBLE ITEN	is			Dry Hole Drig	Complete	TOTAL
					221 Days		221 Days
Location/ Regu					\$3,020,000	\$0 \$0	\$3,020,0
	n, Demobilization ay Work at \$300,00	00 / Dav			\$19,400,000 \$127,300,000	\$0 \$0	\$19,400,0 \$127,300,0
Bits, Drill Colla		, buy			\$3,079,000	\$0	\$3,079,0
	ownhole Services				\$3,675,000	\$0	\$3,675,0
Fuel, Water & L					\$12,929,000	\$0	\$12,929,0
Drilling Fluids S	Services g & Cased Hole Lo				\$2,630,000 \$4,763,000	\$0 \$0	\$2,630,0 \$4,763.0
Cementing	J & Cased Hole Lo	iys			\$1,027,000	\$0 \$0	\$1,027,0
	nd Geological Serv	ices			\$542,000	\$0	\$542,0
Land Transpor					\$100,000	\$0	\$100,0
Boat Transport					\$2,542,000	\$0	\$2,542,0
Helicopter Tran Tubular Service					\$995,000 \$150,000	\$0 \$0	\$995,0 \$150,0
Shorebase / Do					\$442,000	\$0	\$442,0
Communicatio					\$221,000	\$0	\$221,0
	Rental Equipment				\$5,260,000	\$0	\$5,260,0
Other Services	Special Services				\$1,134,000 \$2,040,000	\$0 \$0	\$1,134,0 \$2,040,0
Intan Continger					\$28,688,000	\$0	\$28,688,0
						···· ··· ··· ···	
			TOTAL IN	TANGIBLE	\$219,937,221	\$0	\$219,937,22
	ANGIBLE ITEMS						. , ,
		OD	Footage	\$/ft			
Drive Pipe		36"	200	\$650.00	\$130,000	\$0	\$130,0
Conductor		22"	770	\$180.00		\$0	\$139,0
Surface		18"	4,907	\$160.00			\$786,0
Intermediate		16"	8,305	\$155.00			\$1,288,0
Intermediate		13-3/8"	12,225	\$140.00		\$0	\$1,712,0
Intermediate		<u> </u>	3,600	\$80.00		\$0	\$288,0
Intermediate Production Line		9-5/8	3,640	\$70.00 \$0.00		\$0 \$0	\$255,0
Production Tie-		0	0	\$0.00			
Tubing		0	0	\$0.00			
Liner Equipmt					\$300,000	\$0	\$300,0
Whipstock Equ	ipment				\$0	\$0	
Subsurface Co	mpletion				\$0		
Wellheads					\$500,000	\$0	\$500,0
Miscellaneous					\$100,000	\$0	\$100,0
Tan Contingen	cyat 10%				\$550,000	\$0	\$550,0
			TOTAL 1		\$6,048,000	\$0	\$6,048,0
			Tel	al Dry Hole Cost	\$225,985,221	¢o	\$005 005 C
			101	al Diy Hole Cost	\$ZZJ,90J,ZZI	\$0	\$225,985,2
				Completion Cost			\$225,985,2



	·	SCOPI	NG COST	ESTIMATE					Rev 4
				s Case 4		*	** DRAFT	**	
	_						DRAFT		
ELAD ENERGY PARTNE	E R S	Prepared For	r: IODP	JAMSTEC	/ CDEX				Exploratory _X Development
AFE# XXX	Operator:	CDEX / JAMSTEC				Revision No.	1	Date:	20-Jun-13
Prospect or Field	Lease Name			Case No.		Water Depth	Proposed TD	Objective	
Mantle Hole	N/A			#4b		3650m 11,975 ft	9900m 32,480 ft	Moho / Mantle	
Location	Surface Loca	ation: Lat: 6.7 - 8.7°N / Long: 89.5 -	• 91.9°W			11,375 10	52,400 It		
Cocos	Btm. Hole Lo								
Purpose of Expendi									
		e. Assume drilling to the Moho, then co ater Case Well Configuration	oring 1640 f	t / 500m of the	Mantle			т	Avg Intan \$/day
									\$995,190
Drilling Rig			Dir	ectional Plan:	Vertical Ho	le			
	INTANGIBLE	EITEMS			0.	erational Time =	Dry Hole Drig	Complete	TOTAL
Location/ Re	egulatory Cost	Ş			Ор		221 Days \$3,020,000	\$0	221 Days \$3,020,000
		Metocean Study (desktop study, data collect	ion/processi	ng)	Lump Sum	\$1,000,000	\$0,020,000	**	\$0,020,000
		Site Survey (desktop study, bathymetry)			Lump Sum	\$2,000,000			
		Regulatory			Lump Sum	\$20,000			
Die Mahiling	tion Domobili						<u></u>		<u> </u>
Rig Mobiliza	ation, Demobiliz	Mobilization (from Japan)			Lump Sum	\$9,700,000	\$19,400,000		\$19,400,000
		Demobilization (to Japan)			Lump Sum				
Drilling Rig -	- Day Work						\$127,300,000	\$0	\$127,300,000
		Drilling Day Rate	221 Days	\$300,000 /day		\$66,300,000			
		Existing Riser System Modifications Additional Riser			Lump Sum				
					Lump Sum	\$47,000,000			
Bits, Drill Co	ollars & Stabiliz	zers					\$3,079,000	\$0	\$3,079,000
		Drill Bits	24 No.	\$70,000 /bit		\$1,680,000			
		Drill String Rentals: DC's, Jars, Stab, HWT Core Bits	221 Days 6 No.	\$4,000 /day \$60,000 /bit		\$884,000			
		Coring Services	62 Days	\$2,500 /day		\$360,000 \$155,000			
				,,		\$100,000			
Directional	& Downhole Se	ervices					\$3,675,000	\$0	\$3,675,000
		Surveys/Gyros/Single & Multi-Shots			Lump Sum				
		MWD / LWD Mob / De-mob Standard MWD Rental	111 Days	\$3,000 /day	Lump Sum	1 \$30,000 \$331,500			
		Standard LWD Rental	111 Days	\$3,000 /day		\$773,500			
		MWD / LWD Engineers (2)	221 Days	\$2,000 /day		\$442,000			
		Mud Motors & Associated Tools	177 Days	\$3,000 /day		\$530,400			
		High Temp MWD Rental High temp LWD Rental	111 Days 111 Days	\$4,000 /day \$10,000 /day		\$442,000 \$1,105,000			
			TT Days	\$10,000 /day		\$1,100,000			
Fuel, Water	& Lube						\$12,929,000	\$0	\$12,929,000
		Rig Fuel	221 Days	\$53,000 /day		\$11,713,000			
		Boat Fuel Helicopter Fuel	111 Days 111 Days	\$4,000 /day \$3,000 /day		\$442,000 \$331,500			
		Lubricants	221 Days	\$3,000 /day		\$287,300			
		Fresh Water	221 Days	\$700 /day		\$154,700			
Drilling Fluid	ds Services	Drilling Fluids - WBM			Lump Sum	\$1,900,000	\$2,630,000	\$0	\$2,630,000
		Mud Engineer	221 Days	\$800 /day	Lump Sum	\$176,800			
		Cuttings Disposal	221 Days	\$2,500 /day		\$552,500			
Electric Log	ging & Cased I	Wireline Unit and Personnel	221 Days	\$3,000 /day		\$663,000	\$4,763,000		\$4,763,000
		Standard Open Hole Logging	ZZT Days	\$3,000 /uay	Lump Sum				
		High Temp Open Hole Logging			Lump Sum	\$2,500,000			
		Cased Hole Logging			Lump Sum	\$100,000			
Cementing							\$1,027,000	\$0	\$1,027,000
		22"			Lump Sum		÷.,527,500	*0	÷.,027,000
		18"			Lump Sum				
		16" 13.375"			Lump Sum			∤ Ì	
		13.375			Lump Sum			┠	
		9.625"			Lump Sum	\$100,000			
		Retainers, Service Man, Manifold, Etc.		AL 070 ()	Lump Sum				
		Unit Charge	221 Days	\$1,250 /day		\$276,250		┠	
1 1									



	cal Services					\$542,000	\$0	\$5
	Logging Unit Operating rate	221 Days	\$1,250 /day		\$276,250 \$265,200			
	Personnel Charges	221 Days	\$1,200 /day		\$265,200			
Land Transportation						\$100,000	\$0	\$1
	Trucking	111 Days	\$900 /day		\$99,450			
Boat Transportation						\$2,542,000	\$0	\$2,5
	Work Boat - Spot Hire	111 Days	\$14,000 /day		\$1,547,000			
	Crew Boat - Spot Hire	111 Days	\$9,000 /day		\$994,500			
Helicopter Transportation						\$995,000	\$0	\$9
	Helicopter - spot hire	111 Days	\$9,000 /day		\$994,500			
Tubular Services						\$150,000	\$0	\$1
	QAQC			Lump Sum	\$150,000	\$150,000	\$ 0	φı
Shorebase / Dock Service	1e					\$442,000	\$0	\$4
Shorebase / Dock Service	Shorebase /Dispatcher	221 Days	\$2,000 /day		\$442,000	\$442,000	\$ U	\$4
	· · · · · · · · · · · · · · · · · · ·	.,			, ,			
Communications	VOAT	001 0	64 000 (1)		\$004 000	\$221,000	\$0	\$2
	VSAT	221 Days	\$1,000 /day		\$221,000			
Miscellaneous Rental Equi	ipment					\$5,260,000	\$0	\$5,2
	Solids Control	221 Days	\$400 /day		\$88,400			
	Fishing Tools Casing Running Equipment	221 Days 70 Days	\$1,500 /day \$6,000 Day		\$331,500 \$420,000			
	Other Rentals	221 Days	\$20,000 Day		\$4,420,000			
		Days						
Miscellaneous Special Ser	rvices	Days				\$1,134,000	\$0	\$1,1
vilscenarieous opecial del	Weather Forecasting	221 Days	\$150 /day		\$33,150	\$1,134,000	\$ 0	پ ۱,۱
	Engineering Services - Riser A	nalysis		Lump Sum	\$300,000			
	Engineering Services - Drill Str			Lump Sum Lump Sum	\$200,000 \$50,000			
	Engineering Services - Casing Engineering Services - Wellbor			Lump Sum	\$100,000			
	Engineering Services - Operati			Lump Sum	\$200,000			
	Engineering Services - Risk As	sessments		Lump Sum	\$200,000			
	Engineering Services - Other			Lump Sum	\$50,000			
Other Services / Costs						\$2,040,000	\$0	\$2,0
	Misc Contract Labor	221 Days	\$1,500 /day		\$331,500			
	Casing Running Well Insurance	70 Days	\$10,000 /day	Lump Sum	\$700,000 \$500,000			
	Overhead	221 Days	\$1,100 /day	Lump Oum	\$243,100			
	Catering	221 Days	\$1,200 /day		\$265,200			
			\$1,2007day		\$205,200			
			\$1,2007day		\$205,200			
Intangible Contingency		15%	Amount	ST Drlg =	\$191,249,000	\$28,688,000	\$0	\$28,6
Intangible Contingency		15%		ST Drlg = ST Comp =		\$28,688,000	\$0	\$28,6
Intangible Contingency		15%		ST Comp =	\$191,249,000	\$28,688,000 \$219,937,000	\$0 \$0	
Intangible Contingency TANGIBLE I	ITEMS	15%		ST Comp =	\$191,249,000 \$0			\$28,6 \$219,9
TANGIBLE I	OD	15% 7 =#Strings	Amount	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$/ft	\$219,937,000		\$219,9
TANGIBLE I Drive Pipe	OD 36"		Amount Length 200	ST Comp =	\$191,249,000 \$0 VTANGIBLE \$/ft \$650.00	\$219,937,000 \$130,000	\$0 \$0 \$0	\$219,9 \$219,9 \$1
TANGIBLE I Drive Pipe Conductor	OD 36" 22"		Amount Length 200 770	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00	\$219,937,000 \$130,000 \$139,000	\$0 \$0 \$0 \$0	\$219,9 \$1 \$1 \$1
TANGIBLE I Drive Pipe Conductor Surface	OD 36" 22" 18"		Amount Length 200 770 4,907	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00	\$219,937,000 \$130,000 \$139,000 \$786,000	\$0 \$0 \$0 \$0 \$0 \$0	\$219,9 \$1 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor	OD 36" 22"		Amount Length 200 770	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$/ft \$650.00 \$180.00	\$219,937,000 \$130,000 \$139,000 \$786,000 \$1,288,000	\$0 \$0 \$0 \$0	\$219,9 \$1 \$1 \$7 \$1,2
TANGIBLE I Drive Pipe Conductor Surface Intermediate	OD 36" 22" 18" 16" 13-3/8" 11-3/4"		Amount Length 200 770 4.907 8,305	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$219,937,000 \$130,000 \$139,000 \$786,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$219,9 \$1 \$1 \$1,2 \$1,2 \$1,2 \$1,7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Intermediate	OD 36" 22" 18" 16" 13-3/8"		Amount Length 200 770 4,907 8,305 12,225	ST Comp =	\$191,249,000 \$0 VTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$155.00 \$140.00	\$219,937,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,712,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$219,9 \$1 \$1 \$1
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner	OD 36" 22" 18" 16" 13-3/8" 11-3/4"		Amount 200 770 4,907 8,305 12,225 3,600	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$219,937,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,712,000 \$288,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,\$ \$1 \$1 \$7 \$1,2 \$1,7 \$1,7 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back	OD 36" 22" 18" 16" 13-3/8" 11-3/4"		Amount 200 770 4,907 8,305 12,225 3,600	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$219,937,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,712,000 \$288,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,\$ \$1 \$1 \$7 \$1,2 \$1,7 \$1,7 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tine-back Tubing	OD 36" 22" 18" 16" 13-3/8" 11-3/4"		Amount 200 770 4,907 8,305 12,225 3,600	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$219,937,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,288,000 \$255,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,5 \$1 \$1 \$7 \$1,2 \$1,7 \$2 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tine-back Tubing Liner Equipment	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Amount 200 770 4,907 8,305 12,225 3,600	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$219,937,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,712,000 \$288,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,5 \$1 \$1 \$1,7 \$1,7 \$1,7 \$1,7 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Amount 200 770 4,907 8,305 12,225 3,600	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$219,937,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,288,000 \$255,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,9 \$1 \$1 \$1,7 \$1,7 \$2 \$2 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tine-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Amount 200 770 4,907 8,305 12,225 3,600	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$219,937,000 \$130,000 \$139,000 \$786,000 \$1,288,000 \$1,288,000 \$255,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,5 \$1 \$1,3 \$1,2 \$1,7 \$2 \$2 \$3 \$3 \$3 \$3 \$3 \$3
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tine-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Amount 200 770 4,907 8,305 12,225 3,600	ST Comp =	\$191,249,000 \$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$219,937,000 \$130,000 \$139,000 \$786,000 \$1,712,000 \$1,712,000 \$288,000 \$255,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,5 \$ \$ \$ \$1,7 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Amount Length 200 770 4,907 8,305 12,225 3,600 3,640	ST Comp = TOTAL II	\$191,249,000 \$0 VTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$155.00 \$140.00	\$219,937,000 \$130,000 \$139,000 \$1,288,000 \$1,288,000 \$1,712,000 \$288,000 \$2255,000 \$300,000 \$300,000 \$500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,5 \$219,5 \$1,2 \$1,2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Amount 200 770 4,907 8,305 12,225 3,600	ST Comp = TOTAL II TOTAL II ST Drig =	\$191,249,000 \$0 VTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00 \$140.00 \$170.00 \$70.00 \$70.00 \$70.00	\$219,937,000 \$130,000 \$139,000 \$1,288,000 \$1,288,000 \$255,000 \$300,000 \$5500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,5 \$219,5 \$1,2 \$1,2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Amount Length 200 770 4,907 8,305 12,225 3,600 3,640	ST Comp = TOTAL II ST DrIg = ST Comp =	\$191,249,000 \$0 VTANGIBLE \$/ft \$650,00 \$180,00 \$180,00 \$160,00 \$140,00 \$140,00 \$40,00 \$40,00 \$40,00 \$5,498,000 \$0 \$0	\$219,937,000 \$130,000 \$139,000 \$139,000 \$1,288,000 \$1,288,000 \$1,288,000 \$255,000 \$300,000 \$300,000 \$550,000 \$550,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,5 \$219,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Amount Length 200 770 4,907 8,305 12,225 3,600 3,640	ST Comp = TOTAL II ST Drig = ST Comp = TOTAL	\$191,249,000 \$0 VTANGIBLE \$/ft \$650.00 \$180.00 \$180.00 \$140.00 \$140.00 \$140.00 \$40.	\$219,937,000 \$130,000 \$139,000 \$139,000 \$1,288,000 \$1,288,000 \$1,288,000 \$255,000 \$300,000 \$300,000 \$550,000 \$550,000 \$6,048,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,5 \$219,5 \$1,5 \$1,5 \$2 \$2 \$3 \$3 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tine-back Tubing	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Amount Length 200 770 4,907 8,305 12,225 3,600 3,640	ST Comp = TOTAL II ST Drlg = ST Comp = TOTAL Tota	\$191,249,000 \$0 VTANGIBLE \$/ft \$650,00 \$180,00 \$180,00 \$160,00 \$140,00 \$140,00 \$40,00 \$40,00 \$40,00 \$5,498,000 \$0 \$0	\$219,937,000 \$130,000 \$139,000 \$139,000 \$1,288,000 \$1,288,000 \$1,288,000 \$255,000 \$300,000 \$300,000 \$550,000 \$550,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$219,9 \$1 \$1 \$1,7 \$1,7 \$2 \$2 \$2



6.2.6 Case 4c Cost Estimate:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Tan	Total	P10	P50	P90	
271	\$220,935	\$8,714	\$229,649	\$205,488	\$220,162	\$241,916	

Figure 167. Cocos Location: Case 4c – Cost Estimate

The following chart shows the cumulative probability of cost.

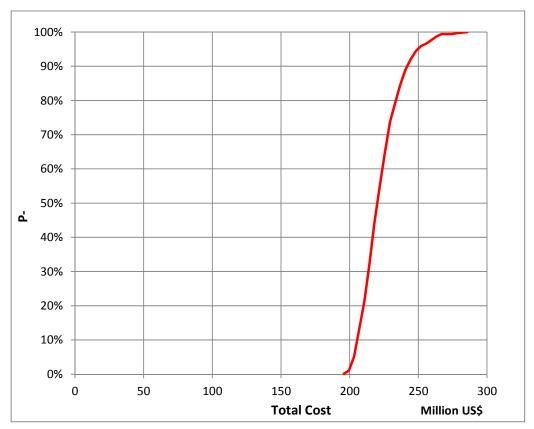


Figure 168. Cocos Location – Case 4b Probabilistic Cost



		<u>SCOPI</u>	NG COST EST	TIMATE			Rev	
		BEAM	- Cocos C	ase 4c		** DRAFT	**	
	Dr	epared For:						
ENERGY PARTNERS	FI FI	epared For.	IODF / JA				Exploratory _X Development	
	perator: CDEX /	JAMSTEC		Revision No.	1	Date:	20-Jun-13	
1	ase Name		Case No.	Water Depth	Proposed TD	Formation	20041110	
Iantle Hole N/			#4c	3650m	9900m	Moho / Mantle		
				11,972 ft	32,480 ft			
	Inface Location:	Lat: 6.7 - 8.7°N /						
lawaii Bt urpose of Expenditure	m. Hole Location:	Lat: 6.7 - 8.7 N/	Long: 89.5 - 91.	.9°W				
cientific Drilling to the I		rilling to the Moho the	en coring 1640 ft/	500m of the Mantl	e			
ase 4c: Expandable C			in coming to to it,		0			
	ng Rig : Chikyu Directional Plan: Vertical							
IN	TANGIBLE ITEM	S			Dry Hole Drig	Complete	TOTAL	
					223 Days		223 Days	
Location/ Regul Rig Mobilization					\$3,020,000		\$3,020,00	
	y Work at \$300,00	0 /Day			\$19,400,000 \$127,900,000		\$19,400,0	
Bits, Drill Collars		, Duy			\$3,087,000		\$3,087,0	
,	wnhole Services				\$3,708,000	\$0	\$3,708,0	
Fuel, Water & Lu					\$13,046,000	\$0	\$13,046,0	
Drilling Fluids S					\$2,636,000	\$0	\$2,636,0	
00 0	& Cased Hole Log	gs			\$4,769,000	\$0	\$4,769,0	
Cementing	d Geological Servi				\$1,029,000 \$547,000	\$0 \$0	\$1,029,0 \$547,0	
Land Transport					\$101,000	\$0	\$101,0	
Boat Transporta					\$2,565,000	\$0	\$2,565,0	
Helicopter Trans		\$1,004,000	\$0	\$1,004,0				
	Tubular Services						\$150,0	
Shorebase / Do		\$446,000	\$0	\$446,0				
Communication					\$223,000	\$0	\$223,0	
Miscellaneous S	Rental Equipment				\$5,304,000 \$1,134,000	\$0 \$0	\$5,304,0 \$1,134,0	
Other Services /	·				\$2,048,000	\$0	\$2,048,0	
Intan Contingen					\$28,818,000	\$0	\$28,818,0	
	· · · · · · · · ·							
			TOTAL IN		\$220,935,223	\$0	\$220,935,22	
ТА	NGIBLE ITEMS							
		OD	Footage	\$/ft				
Drive Pipe		36"	200	\$650.00	\$130,000	\$0	\$130,0	
Conductor		22"	770	\$180.00	· · · · · · · · · · · · · · · · · · ·	\$0	\$139,0	
Surface		16.5" SET	5,107	\$300.00	· · · · · · · · · · · · · · · · · · ·	\$0	\$1,533,0	
Intermediate		16.5" SET	3,598	\$300.00			\$1,080,0	
Intermediate		16"	11,755	\$155.00			\$1,823,0	
Intermediate		13-3/8"	15,525	\$140.00		\$0	\$2,174,0	
Intermediate		11-3/4"	3,640	\$80.00		\$0	\$292,0	
Production Line		0	0	\$0.00		\$0		
	back	0	0	\$0.00				
Production Tie-b	1	0	0	\$0.00			-	
Production Tie-b Tubing					\$150,000	\$0	\$150,0	
Production Tie-b Tubing Liner Equipmt					\$0	\$0		
Production Tie-t Tubing Liner Equipmt Whipstock Equip						* -		
Production Tie-t Tubing Liner Equipmt Whipstock Equi Subsurface Con					\$0		A=2-	
Production Tie-t Tubing Liner Equipmt Whipstock Equij Subsurface Con Wellheads	npletion				\$500,000	\$0	\$500,0	
Production Tie-t Tubing Liner Equipmt Whipstock Equij Subsurface Com Wellheads Miscellaneous/C	npletion Dther				\$500,000 \$100,000	\$0 \$0	\$100,	
Production Tie-t Tubing Liner Equipmt Whipstock Equij Subsurface Con Wellheads	npletion Dther				\$500,000 \$100,000 \$793,000	\$0 \$0 \$0	\$100,0 \$793,0	
Production Tie-t Tubing Liner Equipmt Whipstock Equij Subsurface Con Wellheads Miscellaneous/C	npletion Dther		TOTAL T	ANGIBLE	\$500,000 \$100,000	\$0 \$0 \$0 \$0	\$100, \$793,	
Production Tie-t Tubing Liner Equipmt Whipstock Equi Subsurface Con Wellheads Miscellaneous/C	npletion Dther			ANGIBLE al Dry Hole Cost	\$500,000 \$100,000 \$793,000 \$8,714,000	\$0 \$0 \$0 \$0	\$500,0 \$100,0 \$793,0 \$8,714,0 \$229,649,2	
Production Tie-t Tubing Liner Equipmt Whipstock Equi Subsurface Con Wellheads Miscellaneous/C	npletion Dther		Tota		\$500,000 \$100,000 \$793,000 \$8,714,000 \$229,649,223	\$0 \$0 \$0 \$0 \$0	\$100,0 \$793,0 \$8,714,0	



		NGCOSI	<u>ESTIMATE</u>					R
			s Case 40		*	** DRAFT *	**	
						DRAFT		
	Prepared For	r: IODP	/ JAMSTEC	/ CDEX				Exploratory _X
xxx Operator:	CDEX / JAMSTEC				Revision No.	1	Date:	Development _ 20-Jun-13
bect or Field Lease Name	ODEX / OAMOTEO		Case No.		Water Depth	Proposed TD	Objective	20 000 10
le Hole N/A			#4c		3650m	9900m	Moho / Mantle	r -
ion Surface Locat	ion: Lat: 6.7 - 8.7°N / Long: 89.5 -	01.0%	<u> </u>		11,972 ft	32,480 ft	1	
ion Surface Locat aii Btm. Hole Loc								
ose of Expenditure:								
ntific Drilling to the Mantle	. Assume drilling to the Moho, then co	oring 1640 f	t / 500m of the	Mantle				
4c: Expandable Case Wel	I Configuration							Avg Intan \$/d
Drilling Rig : Chikyu		Dir	rectional Plan:	Vertical Hol	•			\$990,740
INTANGIBLE	ITEMS		cotional r lan.	Vertical fion	-	Dry Hole Drig	Complete	TOTAL
				Ope	erational Time =	223 Days		223 Days
Location/ Regulatory Costs						\$3,020,000	\$0	\$3,020
	Metocean Study (desktop study, data collecti	ion/processi	ng)	Lump Sum	\$1,000,000			
	Site Survey (desktop study, bathymetry)			Lump Sum	\$2,000,000			
	Regulatory			Lump Sum	\$20,000			
Rig Mobilization, Demobiliza	tion					\$19,400,000		\$19,400
in a mobilization, Demobiliza	Mobilization (from Japan)			Lump Sum	\$9,700,000	φ17,400,000		\$17,400
	Demobilization (to Japan)			Lump Sum				
Drilling Rig - Day Work	-					\$127,900,000	\$0	\$127,900
	Drilling Day Rate	223 Days	\$300,000 /day		\$66,900,000			
	Existing Riser System Modifications Additional Riser			Lump Sum			L	
	Audituofial Riser			Lump Sum	\$47,000,000			
Bits, Drill Collars & Stabilize	ers					\$3,087,000	\$0	\$3,087
	Drill Bits	24 No.	\$70,000 /bit		\$1,680,000	+=,501,000	*	\$0,007
	Drill String Rentals: DC's, Jars, Stab, HWT	223 Days	\$4,000 /day		\$892,000			
	Core Bits	6 No.	\$60,000 /bit		\$360,000			
	Coring Services	62 Days	\$2,500 /day		\$155,000			
Directional & Downhole Ser	vices					\$3,708,000	\$0	\$3,708
	Surveys/Gyros/Single & Multi-Shots			Lump Sum	\$20,000	45,705,000		\$3,700
	MWD / LWD Mob / De-mob			Lump Sum	\$30,000			
	Standard MWD Rental	112 Days	\$3,000 /day		\$334,500			
	Standard LWD Rental MWD / LWD Engineers (2)	112 Days 223 Days	\$7,000 /day \$2,000 /day		\$780,500			ļ
	Mud Motors & Associated Tools	178 Days	\$2,000 /day \$3,000 /day		\$446,000 \$535,200			
	High Temp MWD Rental	112 Days	\$4,000 /day		\$446,000			
	High temp LWD Rental	112 Days	\$10,000 /day		\$1,115,000			
Fuel, Water & Lube					644 010 CTT	\$13,046,000	\$0	\$13,046
	Rig Fuel Boat Fuel	223 Days 112 Days	\$53,000 /day \$4,000 /day		\$11,819,000 \$446,000			
	Helicopter Fuel	112 Days	\$3,000 /day		\$334,500			
	Lubricants	223 Days	\$1,300 /day		\$289,900			
	Fresh Water	223 Days	\$700 /day		\$156,100		l	
Drilling Fluids Services						\$2 626 000	\$0	\$2 62/
Draining Ficility Services	Drilling Fluids - WBM			Lump Sum	\$1,900,000	\$2,636,000	\$0	\$2,636
	Mud Engineer	223 Days	\$800 /day		\$178,400			
	Cuttings Disposal	223 Days	\$2,500 /day		\$557,500			
Electric Logging & Cogs du						\$4.7/0.000	1	# 4 7 / O
Electric Logging & Cased H	Wireline Unit and Personnel	223 Days	\$3,000 /day		\$669,000	\$4,769,000		\$4,769
	Standard Open Hole Logging	Days	40,000 /udy	Lump Sum				
	High Temp Open Hole Logging			Lump Sum	\$2,500,000			
	Cased Hole Logging			Lump Sum	\$100,000			
Cementing						\$1,029,000	\$0	\$1,029
	22"			Lump Sum	\$100,000	\$1,029,000	\$0	\$1,029
	16.5" SET			Lump Sum				
	16.5" SET			Lump Sum	\$100,000			
	16"			Lump Sum				
				Lump Sum	\$150,000	1	1	1
	13.375"			Lump Sum	\$100,000			
· · · · · · · · · · · · · · · · · · ·	13.375" 11.75" Retainers, Service Man, Manifold, Etc.			Lump Sum Lump Sum				



	cal Services						\$547,000	\$0	\$5
		t Operating rate	223 Days	\$1,250 /day		\$278,750			
	Personnel C	harges	223 Days	\$1,200 /day		\$267,600			
Land Transportation							\$101,000	\$0	\$1
	Trucking		112 Days	\$900 /day		\$100,350			
Boat Transportation		A				04 504 000	\$2,565,000	\$0	\$2,5
	Work Boat - S Crew Boat - S		112 Days 112 Days	\$14,000 /day \$9,000 /day		\$1,561,000 \$1,003,500			
	Clew Boat - C	эрогние	112 Days	\$9,000 /uay		\$1,003,500			
Helicopter Transportation	i						\$1,004,000	\$0	\$1,0
	Helicopter - s	spot hire	112 Days	\$9,000 /day		\$1,003,500			
Tubular Services					Lump Sum	\$150,000	\$150,000	\$0	\$1
	QAQC				Lump Sum	\$150,000			
Shorebase / Dock Service	s						\$446,000	\$0	\$4
	Shorebase /I	Dispatcher	223 Days	\$2,000 /day		\$446,000			
Communications							* ****	40	
Communications	VSAT		223 Days	\$1,000 /day		\$223,000	\$223,000	\$0	\$2
	VSAT		223 Days	\$1,000/day		\$223,000			
Miscellaneous Rental Equ	ipment						\$5,304,000	\$0	\$5,3
	Solids Contro		223 Days	\$400 /day		\$89,200			
	Fishing Tool		223 Days	\$1,500 /day		\$334,500			
		ning Equipment	70 Days	\$6,000 Day		\$420,000			
	Other Rental	5	223 Days Days	\$20,000 Day		\$4,460,000			
••••••••••••••••••••••••••••••••••••••			Days						
Miscellaneous Special Se	rvices						\$1,134,000	\$0	\$1,1
	Weather Fore		223 Days	\$150 /day		\$33,450			
		Services - Riser Analysis			Lump Sum	\$300,000			
		Services - Drill String Des			Lump Sum Lump Sum	\$200,000			
		Services - Casing Design Services - Wellbore Stabi			Lump Sum	\$50,000 \$100,000			
		Services - Operational Su			Lump Sum	\$200,000			
		Services - Risk Assessm			Lump Sum	\$200,000			
		Services - Other			Lump Sum	\$50,000			
Other Services / Costs				04 500 (1)		\$004 F00	\$2,048,000	\$0	\$2,0
	Misc Contrac Casing Runr		223 Days 70 Days	\$1,500 /day \$10,000 /day		\$334,500 \$700,000			
	Well Insuran		10 Days	\$10,000 /day	Lump Sum	\$500,000			
	Overhead		223 Days	\$1,100 /day		\$245,300			
	Catering		223 Days	\$1,200 /day		\$267,600			
Intangible Contingency				Amount					
			15%		ST Drla =	\$192.117.000	\$28.818.000	\$0	\$28.8
			15%	Allount	ST Drlg = ST Comp =	\$192,117,000 \$0	\$28,818,000	\$0	\$28,8
			15%	Anount	ST Comp =	\$0			
			15%	, mount	ST Comp =		\$28,818,000 \$220,935,000	\$0 \$0	
			15%	, and an	ST Comp =	\$0			
			15%	, mount	ST Comp =	\$0			
TANGIBLE I	ITEMS		15%		ST Comp =	50 NTANGIBLE			
TANGIBLE I	ITEMS	OD	15%. 7 =#Strings	Length	ST Comp =	SO NTANGIBLE \$/ft	\$220,935,000	\$0 \$0	\$220,9
TANGIBLE I Drive Pipe	ITEMS	36"		Length 200	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00	\$220,935,000 \$130,000	\$0 \$0 \$0	\$220,9 \$220,9 \$1
TANGIBLE I Drive Pipe Conductor	ITEMS	36" 22"		Length 200 770	ST Comp =	\$0 VTANGIBLE \$/ft \$650.00 \$180.00	\$220,935,000 \$130,000 \$139,000	\$0 \$0 \$0 \$0	\$220,5 \$1 \$1 \$1
TANGIBLE I Drive Pipe Conductor Surface	ITEMS	36" 22" 16.5" SET		Length 200 770 5,107	ST Comp =	\$0 VTANGIBLE \$/ft \$650.00 \$180.00 \$300.00	\$220,935,000 \$130,000 \$139,000 \$1,533,000	\$0 \$0 \$0 \$0 \$0 \$0	\$220,9 \$1 \$1 \$1,5
TANGIBLE I Drive Pipe Conductor Surface Intermediate	ITEMS	36" 22" 16.5" SET 16.5" SET		Length 200 770 5,107 3,598	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$300.00 \$300.00	\$220,935,000 \$130,000 \$139,000 \$1,533,000 \$1,080,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$220,9 \$1 \$1 \$1,5 \$1,0
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate	ITEMS	36" 22" 16.5" SET 16.5" SET 16"		Length 200 770 5,107 3,598 11,755	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00	\$220,935,000 \$130,000 \$139,000 \$1,533,000 \$1,080,000 \$1,823,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$220,9 \$1 \$1 \$1,5 \$1,0 \$1,8
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate	ITEMS	36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 770 5,107 3,598 11,755 15,525	ST Comp =	50 SYft S 650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$220,935,000 \$130,000 \$139,000 \$1,533,000 \$1,533,000 \$1,823,000 \$2,174,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,\$ \$1 \$1 \$1,5 \$1,0 \$1,6 \$2,1
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Intermediate	ITEMS	36" 22" 16.5" SET 16.5" SET 16"		Length 200 770 5,107 3,598 11,755	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00	\$220,935,000 \$130,000 \$139,000 \$1,533,000 \$1,080,000 \$1,823,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$220,9 \$1 \$1 \$1,5 \$1,0 \$1,8
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 770 5,107 3,598 11,755 15,525	ST Comp =	50 SYft S 650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$220,935,000 \$130,000 \$139,000 \$1,533,000 \$1,533,000 \$1,823,000 \$2,174,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,\$ \$1 \$1 \$1,5 \$1,0 \$1,6 \$2,1
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back	ITEMS	36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 770 5,107 3,598 11,755 15,525	ST Comp =	50 SYft S 650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$220,935,000 \$130,000 \$139,000 \$1,533,000 \$1,533,000 \$1,823,000 \$2,174,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,\$ \$1 \$1 \$1,5 \$1,0 \$1,6 \$2,1
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 770 5,107 3,598 11,755 15,525	ST Comp =	50 SYft S 650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$220,935,000 \$130,000 \$1,533,000 \$1,533,000 \$1,823,000 \$1,823,000 \$2,174,000 \$2,92,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$220,9 \$1 \$1,5 \$1,5 \$1,6 \$1,6 \$2,1 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tine-back Tubing Liner Equipment		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 770 5,107 3,598 11,755 15,525	ST Comp =	50 SYft S 650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$220,935,000 \$130,000 \$139,000 \$1,533,000 \$1,533,000 \$1,823,000 \$2,174,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,\$ \$1 \$1 \$1,5 \$1,0 \$1,6 \$2,1
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 770 5,107 3,598 11,755 15,525	ST Comp =	50 SYft S 650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$220,935,000 \$130,000 \$1,533,000 \$1,533,000 \$1,823,000 \$1,823,000 \$2,174,000 \$2,92,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$220,9 \$1 \$1,5 \$1,5 \$1,6 \$1,6 \$2,1 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 770 5,107 3,598 11,755 15,525	ST Comp =	50 SYft S 650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$220,935,000 \$130,000 \$1,533,000 \$1,533,000 \$1,823,000 \$2,174,000 \$292,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,5 \$ \$1,5 \$1,5 \$1,5 \$2,1 \$2 \$2 \$2 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1 \$1
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tiner Production Tine-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 770 5,107 3,598 11,755 15,525	ST Comp =	50 SYft S 650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$220,935,000 \$130,000 \$1,533,000 \$1,533,000 \$1,823,000 \$1,823,000 \$2,174,000 \$292,000 \$150,000 \$5500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,5 \$220,5 \$1,5 \$1,5 \$2,1,5 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tiner Production Tine-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 770 5,107 3,598 11,755 15,525	ST Comp =	50 SYft S 650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$220,935,000 \$130,000 \$1,533,000 \$1,533,000 \$1,823,000 \$2,174,000 \$292,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,5 \$220,5 \$1,5 \$1,5 \$2,1,5 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Weinstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 =#Strings	Length 200 770 5,107 3,598 11,755 15,525 3,640	ST Comp = TOTAL IN	\$0 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S	\$220,935,000 \$130,000 \$1,533,000 \$1,533,000 \$1,823,000 \$2,174,000 \$292,000 \$150,000 \$150,000 \$500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,5 \$220,5 \$1,5 \$1,5 \$2,7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Weinstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 =#Strings	Length 200 770 5,107 3,598 11,755 15,525	ST Comp = TOTAL IN	50 SYft S 650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$220,935,000 \$130,000 \$1,533,000 \$1,533,000 \$1,823,000 \$1,823,000 \$2,174,000 \$292,000 \$150,000 \$5500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,5 \$220,5 \$1,5 \$1,5 \$2,7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Weinstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 =#Strings	Length 200 770 5,107 3,598 11,755 15,525 3,640	ST Comp = TOTAL IN ST Drig = ST Comp =	\$0 SYNTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$140.00 \$80.00 \$14	\$220,935,000 \$130,000 \$139,000 \$1,533,000 \$1,533,000 \$1,823,000 \$1,823,000 \$2,174,000 \$292,000 \$150,000 \$150,000 \$150,000 \$100,000 \$793,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,5 \$220,5 \$1,5 \$1,5 \$2,5 \$2,5
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Weinstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 =#Strings	Length 200 770 5,107 3,598 11,755 15,525 3,640	ST Comp = TOTAL IN ST Drig = ST Comp = TOTAL	\$0 \$7 \$7 \$650.00 \$180.00 \$300.00 \$300.00 \$140.00	\$220,935,000 \$130,000 \$139,000 \$1,533,000 \$1,533,000 \$1,823,000 \$2,174,000 \$292,000 \$150,000 \$150,000 \$100,000 \$793,000 \$8,714,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,5 \$220,5 \$1,5 \$1,5 \$1,5 \$2,1 \$2,1 \$2,1 \$1,5 \$2,1 \$2,1 \$1,5 \$2,1 \$1,5 \$2,1 \$1,5 \$2,1 \$1,5 \$2,1 \$1,5 \$2,1 \$1,5 \$2,1 \$1,5 \$2,1 \$1,5 \$2,1 \$1,5 \$2,1 \$1,5 \$2,1 \$1,5 \$2,1 \$1,5 \$2,1 \$2,5 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tine-back Tubing Liner Equipment		36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 =#Strings	Length 200 770 5,107 3,598 11,755 15,525 3,640	ST Comp = TOTAL IN ST Drig = ST Drig = ST Comp = TOTAL Tota	\$0 SYNTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$140.00 \$80.00 \$14	\$220,935,000 \$130,000 \$139,000 \$1,533,000 \$1,533,000 \$1,823,000 \$1,823,000 \$2,174,000 \$292,000 \$150,000 \$150,000 \$150,000 \$100,000 \$793,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,9 \$1 \$1,5 \$1,5 \$1,6 \$1,6 \$2,1 \$2

6.3 Hawaii Location Cost Estimates

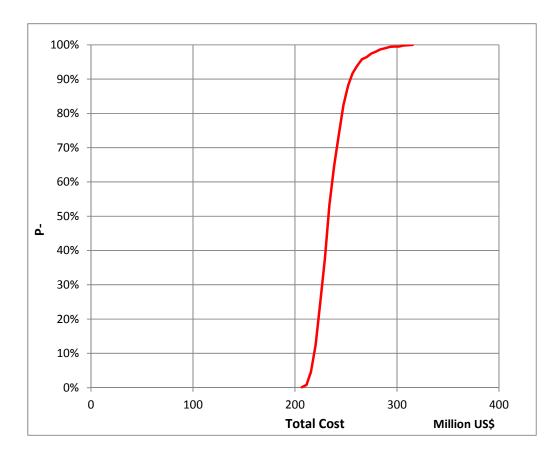
6.3.1 Case 2a Cost Estimate:

This case assumes the original Base Case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Intan Tan		P10	P50	P90	
298	\$235,590	\$2,650	\$238,240	\$218,820	\$232,893	\$254,373	

Figure 169. Hawaii Location: Case 2a – Cost Estimate

The following chart shows the cumulative probability of cost.





		SCOPIN	<u>G COST ESTIMA</u>	TE SUMMARY			Re
	*	BEA	M - Hawaii,	Case 2a		** DRAFT	**
					DEV	DIALI	
		Prepared F	or: IODP/J	AMSTEC/C	DEX		Exploratory _X
NERGY PARTN FE# XXX	Operator: CDEX			Revision No	1	Date:	Development 30-Jun-13
rospect or Field	Lease Name	JAMSTEC	Case No.	Water Depth	Proposed TD	Formation	30-Jun-13
lantle Hole	N/A		#4a	4050m	10,750m	Moho / Mantle	
				13,287 ft	35,269 ft		
ocation	Surface Location:		23.9°N / Long: 154.				
awaii	Btm. Hole Locati	on: Lat: 22.9 - 2	23.9°N / Long: 154.	5 - 155.8°W			
urpose of Expendi							
	Case Well Configu		no, then coring 500m	of the Mantie			
ase 4a. Ony base	Case Well Collingu	ination					
rilling Rig :	Chikyu		Directional Plan:	Vertical Hole			
5 5	INTANGIBLE ITE	EMS			Dry Hole Drig	Complete	TOTAL
					271 Days		271 Days
Location/Re	gulatory Costs				\$3,020,000	\$0	\$3,020,0
Rig Mobilizat	tion, Demobilization				\$10,800,000		\$10,800,0
	Day Work at \$300,	000 / Day			\$142,300,000		\$142,300,0
	Ilars & Stabilizers				\$4,649,000		\$4,649,
Fuel, Water 8	Downhole Service	5			\$4,495,000 \$15,854,000		\$4,495, \$15,854,
Drilling Fluid					\$15,854,000		\$2,895,
	jing & Cased Hole	Logs			\$4,913,000		\$4,913,
Cementing	<u> </u>				\$739,000		\$739,
	g and Geological Se	ervices			\$664,000		\$664,
Land Transp			\$122,000		\$122,		
Boat Transp			\$3,117,000		\$3,117,		
Tubular Serv	ransportation		\$1,220,000 \$100,000		\$1,220 \$100		
	Dock Services				\$100,000		\$100,
Communica					\$271,000		\$271
Miscellaneo	us Rental Equipme	nt			\$6,175,000		\$6,175,
	us Special Services	5			\$1,141,000	\$0	\$1,141,
Other Service					\$1,930,000		\$1,930,
Intan Conting	gencyat 15%				\$30,743,000	\$0	\$30,743,
			TOTAL I	NTANGIBLE	\$235,690,271	\$0	\$235,690,2
	TANGIBLE ITEM						
		OD	Footage	\$/ft			
Drive Pipe		36"	200				\$100,
Conductor		20"	606				\$110
Surface		13-3/8	,				\$751
Intermediate		11-3/4					\$698
Intermediate		0		0.00			
Intermediate		0		0.00 0 \$0.00			
Intermediate Production I		0		5 \$0.00 5 \$0.00			
Production L Production T		0		5 \$0.00 5 \$0.00			
Tubing	IC DOL	0		5 \$0.00 5 \$0.00			
Liner Equipr	ot			φ0.00	\$150,000		\$150
Whipstock E				+ +	\$150,000		φ10U,
Subsurface	· · · · · · · · · · · · · · · · · · ·				\$0		
Wellheads					\$500,000		\$500
Miscellaneo	us/Other			<u>+ - </u>	\$500,000		\$500
Tan Conting				+ +	\$100,000		\$100
conarig	,		TOTAL				
				TANGIBLE	\$2,650,000		\$2,650,
				otal Dry Hole Cos			\$238,340,
			Tota	I Completion Cos	t \$0	\$0	



			MATE DETA					F
	BEAM	- Hawai	i, Case 2	a	*	** DRAFT	**	
	Prepared Fo	r: IODP /	JAMSTEC	/ CDEX				Exploratory _X_
RGY PARTNE	5							Development
XXX	Operator: CDEX / JAMSTEC		0 N		Revision No.	1	Date:	30-Jun-13
ect or Field	Lease Name	-	Case No. #4a		Water Depth 4050m	Proposed TD 10.750m	Objective Moho / Mantle	
					13,287 ft	35,269 ft	wono / wante	
ion	Surface Location: Lat: 22.9 - 23.9°N / Long: 15	4.5 - 155.8°W	/					
uii	Btm. Hole Location: Lat: 22.9 - 23.9°N / Long: 154	4.5 - 155.8°W	/					
se of Expendi								
	the Mantle. Assume drilling to the Moho, then control to the Case Well Configuration	oring 500m	of the Mantle					Avg Intan \$/
Ha. Ony ba	case wen configuration							\$869,705
Drilling Rig :	Chikyu	Dire	ectional Plan:	Vertical Hol	e			
	NTANGIBLE ITEMS					Dry Hole Drig	Complete	TOTAL
				Оре	erational Time =	271 Days		271 Days
Location/ Re	ulatory Costs					\$3,020,000	\$0	\$3,020
	Metocean Study (desktop study, data collect	ion/processir	ng)	Lump Sum	\$1,000,000			
	Site Survey (desktop study, bathymetry)			Lump Sum	\$2,000,000 \$20,000			
	Regulatory			Lump Sum	φ20,000			
Rig Mobiliza	on, Demobilization					\$10,800,000		\$10,800
	Mobilization (from Japan)			Lump Sum	\$5,400,000	÷.0,000,000		÷10,000
	Demobilization (to Japan)			Lump Sum	\$5,400,000			
Drilling Rig -						\$142,300,000	\$0	\$142,300
	Drilling Day Rate	271 Days	\$300,000 /day		\$81,300,000			
	Existing Riser System Modifications Additional Riser			Lump Sum				
				Lump Sum	\$47,000,000			
Bits, Drill Co	nrs & Stabilizers					\$4,649,000	\$0	\$4,649
	Drill Bits	20 No.	\$70,000 /bit		\$1,400,000	1,017,000	*	÷.,547
	Drill String Rentals: DC's, Jars, Stab, HWT	271 Days	\$4,000 /day		\$1,084,000			
	Core Bits	29 No.	\$60,000 /bit		\$1,740,000			
	Coring Services	170 Days	\$2,500 /day		\$425,000			
Diseation	Denumbrala Comuiana					+ +		
Directional	Downhole Services			Lump Curr	£00.000	\$4,495,000	\$0	\$4,495
	Surveys/Gyros/Single & Multi-Shots MWD / LWD Mob / De-mob			Lump Sum Lump Sum	\$20,000 \$30,000			
	Standard MWD Rental	136 Days	\$3,000 /day	Lump Oulli	\$406,500			
	Standard LWD Rental	136 Days	\$7,000 /day		\$948,500			
	MWD / LWD Engineers (2)	271 Days	\$2,000 /day		\$542,000			
	Mud Motors & Associated Tools	217 Days	\$3,000 /day		\$650,400			
	High Temp MWD Rental	136 Days	\$4,000 /day		\$542,000			
	High temp LWD Rental	136 Days	\$10,000 /day		\$1,355,000			
Fuel, Water	Lube					\$15,854,000	\$0	\$15,854
, mater	Rig Fuel	271 Days	\$53,000 /day		\$14,363,000	\$15,85 4 ,000	\$0	÷10,004
	Boat Fuel	136 Days	\$4,000 /day		\$542,000			
	Helicopter Fuel	136 Days	\$3,000 /day		\$406,500			
	Lubricants Fresh Water	271 Days 271 Days	\$1,300 /day \$700 /day		\$352,300 \$189,700			
	1 IC311 Walci	Zi i Days	φr 00 /udy		φ109,700			
Drilling Fluid	Services					\$2,895,000	\$0	\$2,895
	Drilling Fluids - WBM			Lump Sum				,-,-
	Mud Engineer	271 Days	\$800 /day		\$216,800			
	Cuttings Disposal	271 Days	\$2,500 /day		\$677,500			
	ng & Casad Hola Logs					¢4 013 000		¢4.044
Electric I co	ng & Cased Hole Logs Wireline Unit and Personnel	271 Days	\$3,000 /day		\$813,000	\$4,913,000		\$4,913
Electric Log			40,000 /udy	Lump Sum				
Electric Log	Standard Open Hole Logging			Lump Sum				
Electric Log	Standard Open Hole Logging High Temp Open Hole Logging			Lump Sum				
Electric Log							\$0	****
	High Temp Open Hole Logging							\$739
Electric Log	High Temp Open Hole Logging Cased Hole Logging			Lump Sum	\$100.000	\$739,000		<i><i><i></i></i></i>
	High Temp Open Hole Logging Cased Hole Logging 20*			Lump Sum		\$739,000		<i></i>
	High Temp Open Hole Logging Cased Hole Logging				\$150,000	\$739,000	30	
	High Temp Open Hole Logging Cased Hole Logging 20 [#] 13-3/8"			Lump Sum	\$150,000	\$739,000	30 	
	High Temp Open Hole Logging Cased Hole Logging 20 [#] 13-3/8"			Lump Sum	\$150,000	\$739,000		
	High Temp Open Hole Logging Cased Hole Logging 20* 13-3/8* 11-3/4*			Lump Sum Lump Sum	\$150,000 \$100,000	\$739,000		
	High Temp Open Hole Logging Cased Hole Logging 20 [#] 13-3/8"	271 Days	\$1,250 /day	Lump Sum	\$150,000 \$100,000	\$739,000		



	cal Services					\$664,000	\$0	\$6
	Logging Unit Operating rate	271 Days	\$1,250 /day		\$338,750			
	Personnel Charges	271 Days	\$1,200 /day		\$325,200			
Land Transportation						\$122,000	\$0	\$1
	Trucking	136 Days	\$900 /day		\$121,950			
Boat Transportation						\$3,117,000	\$0	\$3,1
	Work Boat - Spot Hire	136 Days	\$14,000 /day		\$1,897,000			
	Crew Boat - Spot Hire	136 Days	\$9,000 /day		\$1,219,500			
Helicopter Transportation						\$1,220,000	\$0	\$1,2
	Helicopter - spot hire	136 Days	\$9,000 /day		\$1,219,500			
Tubular Services						\$100,000	\$0	\$1
	QAQC			Lump Sum	\$100,000	\$100,000		
Shorebase / Dock Service						\$542,000	\$0	\$5
	Shorebase /Dispatcher	271 Days	\$2,000 /day		\$542,000			
Communications						\$271.000	¢o	¢.
Jommunications	VSAT	271 Days	\$1,000 /day		\$271,000	\$271,000	\$0	\$2
		Ziri Days	\$1,0007day		φ271,000			
Miscellaneous Rental Equi		074 D	¢ (00 /)		6400 400	\$6,175,000	\$0	\$6,1
	Solids Control Fishing Tools	271 Days 271 Days	\$400 /day \$1,500 /day		\$108,400 \$406,500			
	Casing Running Equipment	40 Days	\$6,000 Day		\$240,000			
	Other Rentals	271 Days	\$20,000 Day		\$5,420,000			
		Days Days						
Miscellaneous Special Sei	rvices	Days				\$1,141,000	\$0	\$1,1
	Weather Forecasting	271 Days	\$150 /day		\$40,650			
	Engineering Services - Riser Analysis			Lump Sum	\$300,000 \$200,000			
	Engineering Services - Drill String Design Engineering Services - Casing Design			Lump Sum Lump Sum	\$200,000			
	Engineering Services - Wellbore Stability			Lump Sum	\$100,000			
	Engineering Services - Operational Suppo			Lump Sum	\$200,000			
	Engineering Services - Risk Assessments Engineering Services - Other	\$		Lump Sum Lump Sum	\$200,000 \$50,000			
				Lump Oum	400,000			
Other Services / Costs			A		0 400.500	\$1,930,000	\$0	\$1,9
	Misc Contract Labor Casing Running	271 Days 40 Days	\$1,500 /day \$10,000 /day		\$406,500 \$400,000			
	Well Insurance		\$10,0007ddy	Lump Sum	\$500,000			
	Overhead	271 Days	\$1,100 /day		\$298,100			
	Catering	271 Days	\$1,200 /day		\$325,200			
Intangible Contingency		15%	Amount	ST Drlg =	\$204,947,000	\$30,743,000	\$0	\$30,7
Intangible Contingency	·····	15%	Amount	ST Comp =	\$0			
Intangible Contingency		15%	Amount	ST Comp =		\$30,743,000 \$235,690,000	\$0 \$0	
Intangible Contingency		15%	Amount	ST Comp =	\$0			
Intangible Contingency		15%	Amount	ST Comp =	\$0			
Intangible Contingency		15%		ST Comp =	SO NTANGIBLE			\$30,7 \$235,6
TANGIBLE I	OD 4	15% =#Strings	Length	ST Comp =	SO NTANGIBLE \$/ft	\$235,690,000	\$0	\$235,6
TANGIBLE I Drive Pipe	OD 4 36"		Length 200	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00	\$235,690,000 \$100,000	\$0 \$0 \$0	\$235, (
TANGIBLE I	OD 4 36" 20"		Length 200 606	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00	\$235,690,000 \$100,000 \$110,000	\$0 \$0 \$0 \$0	\$235,6
TANGIBLE I Drive Pipe Conductor	OD 4 36"		Length 200	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00	\$235,690,000 \$100,000	\$0 \$0 \$0	\$235,6 \$3 \$3 \$3 \$3
TANGIBLE I Drive Pipe Conductor Surface	OD 4 36" 20" 13-3/8"		Length 200 606 5,364	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$235,690,000 \$100,000 \$110,000 \$751,000	\$0 \$0 \$0 \$0 \$0 \$0	\$235,6 \$3 \$3 \$3 \$3
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate	OD 4 36" 20" 13-3/8"		Length 200 606 5,364	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$235,690,000 \$100,000 \$110,000 \$751,000	\$0 \$0 \$0 \$0 \$0 \$0	\$235,6 \$3 \$3 \$3 \$3
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate	OD 4 36" 20" 13-3/8"		Length 200 606 5,364	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$235,690,000 \$100,000 \$110,000 \$751,000	\$0 \$0 \$0 \$0 \$0 \$0	\$235,6 \$3 \$3 \$3 \$3
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner	OD 4 36" 20" 13-3/8"		Length 200 606 5,364	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$235,690,000 \$100,000 \$110,000 \$751,000	\$0 \$0 \$0 \$0 \$0 \$0	\$235,6 \$3 \$3 \$3 \$3
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back	OD 4 36" 20" 13-3/8"		Length 200 606 5,364	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$235,690,000 \$100,000 \$110,000 \$751,000	\$0 \$0 \$0 \$0 \$0 \$0	\$235,6
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner	OD 4 36" 20" 13-3/8"		Length 200 606 5,364	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$235,690,000 \$100,000 \$110,000 \$751,000	\$0 \$0 \$0 \$0 \$0 \$0	\$235,6 \$3 \$3 \$3 \$3
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF	OD 4 36° 20° 13.3/8° 11-3/4°		Length 200 606 5,364	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$235,690,000 \$100,000 \$110,000 \$751,000 \$698,000	\$0 \$0 \$0 \$0 \$0 \$0	\$235,6 \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion	OD 4 36° 20° 13.3/8° 11-3/4°		Length 200 606 5,364	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$235,690,000 \$100,000 \$110,000 \$751,000 \$698,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$235,6 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tie-back Tubing Liner Equipment Ahipstock Equipment & BF Subsurface Completion Weilheads	OD 4 36° 20° 13.3/8° 11-3/4°		Length 200 606 5,364	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$235,690,000 \$100,000 \$110,000 \$751,000 \$698,000 \$1150,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$235,6 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tie-back Tubing Liner Equipment Ahipstock Equipment & BF Subsurface Completion Weilheads	OD 4 36° 20° 13.3/8° 11-3/4°		Length 200 606 5,364	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$235,690,000 \$100,000 \$110,000 \$751,000 \$698,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$235,6 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Wiscellaneous / Other	OD 4 36° 20° 13.3/8° 11-3/4°	= # Strings	Length 200 606 5,364	ST Comp = TOTAL IN	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$235,690,000 \$100,000 \$110,000 \$751,000 \$698,000 \$150,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$235,6 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Wiscellaneous / Other	OD 4 36° 20° 13.3/8° 11-3/4°	= # Strings	Length 200 606 5,364 8,715	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00	\$235,690,000 \$100,000 \$110,000 \$751,000 \$698,000 \$1150,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$235,6 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion	OD 4 36° 20° 13.3/8° 11-3/4°	= # Strings	Length 200 606 5,364 8,715	ST Comp = TOTAL IN ST Drig = ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,409,000	\$235,690,000 \$100,000 \$110,000 \$751,000 \$698,000 \$150,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$235,6 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Wiscellaneous / Other	OD 4 36° 20° 13.3/8° 11-3/4°	= # Strings	Length 200 606 5,364 8,715	ST Comp = TOTAL IN ST Drig = ST Comp = TOTAL	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$180.00 \$140.00 \$80.00 \$2,409,000 \$0 TANGIBLE	\$235,690,000 \$100,000 \$110,000 \$751,000 \$698,000 \$150,000 \$150,000 \$100,000 \$241,000 \$2,650,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$235,6 \$235,6 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Wiscellaneous / Other	OD 4 36° 20° 13.3/8° 11-3/4°	= # Strings	Length 200 606 5,364 8,715	ST Comp = TOTAL II ST Drlg = ST Comp = TOTAL Tota	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$180.00 \$140.00 \$80.00 \$2,409,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$235,690,000 \$100,000 \$110,000 \$751,000 \$698,000 \$150,000 \$150,000 \$100,000 \$241,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$235,6 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$



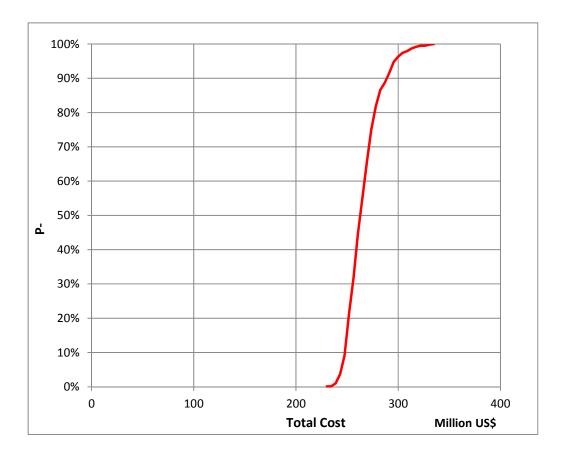
6.3.2 Case 2b Cost Estimate:

This case assumes the Deepwater wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Sto	tochastic Costs		
Days	Intan	Tan			P50	P90	
346	\$261,192	\$6,253	\$267,445	\$247,832	\$262,870	\$288,898	

Figure 170. Hawaii Location: Case 2c - Cost Estimate

The following charts shows the cumulative probability of cost.





			SCOPING (COST ESTIMATE	<u>SUMMARY</u>			Rev
			BEAN	I - Hawaii, C	ase 2b		** DRAFT	**
		Dro		: IODP / JAN		DEX		Funlesster V
SLAD NERGY PARTN	N E R S	Fie	pared For	. IODP/JAN				Exploratory _X Development
FE# XXX	Operator:	CDEX / JA	MSTEC		Revision No.	1	Date:	30-Jun-13
rospect or Field	Lease Nan			Case No.	Water Depth	Proposed TD	Formation	
lantle Hole	N/A			#4b	4050m	10,750m	Moho / Mantle	
					13,287 ft	35,269 ft		
ocation I awaii	Surface Lo Btm. Hole			9°N / Long: 154.5 - 9°N / Long: 154.5 -				
awan urpose of Expend		LUCATION.	Lat: 22.9 - 23.9	7 N / Long: 154.5 -	100.0 W			
		Assume drill	ing to the Moho. t	hen coring 500m of t	the Mantle			
ase 4b: Convention				j.				
			-					
rilling Rig :	Chikyu			Directional Plan: V	ertical Hole			
	INTANGIE	BLE ITEMS				Dry Hole Drig	Complete	TOTAL
						319 Days		319 Days
	Regulatory Cos					\$3,020,000		\$3,020,0
	ation, Demob I - Day Work a		/ Day			\$10,800,000 \$156,700,000		\$10,800,0 \$156,700,0
	ollars & Stabi		/ Day			\$156,700,000 \$5,294,000		\$156,700,0 \$5,294,0
	& Downhole					\$5,282,000		\$5,282,0
Fuel, Water						\$18,662,000		\$18,662,0
~	ids Services					\$3,053,000	\$0	\$3,053,0
	gging & Case	d Hole Logs				\$5,057,000		\$5,057,0
Cementing						\$1,149,000		\$1,149,0
Land Trans	ng and Geolog	gical Service	S			\$782,000 \$144,000	\$0 \$0	\$782,0 \$144,0
Boat Trans					\$3,669,000		\$3,669,0	
	Transportatio	n			\$1,436,000	\$0	\$1,436,0	
Tubular Se	rvices					\$150,000	\$0	\$150,0
	/ Dock Servic	ces 🛛				\$638,000		\$638,0
Communic						\$319,000		\$319,0
	ous Rental Ec ous Special S	· · ·				\$7,407,000 \$1,148,000		\$7,407,0 \$1,148,0
	ces / Costs	services				\$1,148,000		\$2,413,0
Intan Conti		15%				\$34,069,000	\$0	\$34,069,0
						, ,		• - , ,-
				TOTAL INT		<mark>\$261,192,319</mark>	\$0	\$261,192,3
	TANGIBL	E ITEMS						
			OD	Footage	\$/ft			
Drive Pipe			36"	200	\$650.00	\$130,000	\$0	\$130,0
Conductor			22"	656	\$180.00	\$119,000	\$0	\$119,0
Surface			18"	4,858	\$160.00	\$778,000	\$0	\$778,0
Intermedia			16"	8,707	\$155.00	\$1,350,000		\$1,350,0
Intermedia			13-3/8"	12,863	\$140.00	\$1,801,000		\$1,801,0
Intermediat			11-3/4"	4,000	\$80.00	\$320,000		\$320,0
Intermedia			9-5/8"	4,078	\$70.00	\$286,000		\$286,0
Production			0	0	\$0.00	\$0		
Production	Lie-back		0	0	\$0.00	\$0		
Tubing			0	0	\$0.00	\$0		A o.c
						\$300,000		\$300,0
Liner Equip						\$0		
Liner Equip Whipstock	•					\$0		
Liner Equip Whipstock Subsurface						\$500,000		\$500,0
Liner Equip Whipstock Subsurface Wellheads						\$100,000 \$569,000		\$100,0 \$569,0
Liner Equip Whipstock Subsurface Wellheads Miscellane	ous/Other	10%				φ009,000	φU	φ υ υ9,
Liner Equip Whipstock Subsurface Wellheads	ous/Other	10%						A
Liner Equip Whipstock Subsurface Wellheads Miscellane	ous/Other	10%		TOTAL TA		\$6,253,000		
Liner Equip Whipstock Subsurface Wellheads Miscellane	ous/Other	10%			NGIBLE	\$6,253,000 \$267,445,319		\$6,253,0 \$267,445,3
Liner Equip Whipstock Subsurface Wellheads Miscellane	ous/Other	10%		Tota		1	\$0	



		/	SCOPING (COST EST	MATE DETA	A/L				Rev 4
			BEAM	- Hawaii	i, Case 2	b				
BĹ		Ξ	Prepared For							Exploratory _X
ENER	GY PARTNE	RS	CDEX / JAMSTEC				Devision No.		Detei	Development
AFE# Prospe	ct or Field	Operator: Lease Name			Case No.		Revision No. Water Depth	1 Proposed TD	Date: Objective	30-Jun-13
Mantle		N/A		-	#4b		4050m 13,287 ft	10,750m 35,269 ft	Moho / Mantle	
Locatio	on	Surface Loca	ation: Lat: 22.9 - 23.9°N / Long: 154	.5 - 155.8°W	/		13,207 11	55,209 ft		
Hawai		Btm. Hole Lo								
	e of Expendi		Assume drilling to the Mohe then as	ring 500m	of the Mentle					
			e. Assume drilling to the Moho, then co ater Case Well Configuration	oring 500m o	or the Mantie					Avg Intan \$/day
										\$818,784
	orilling Rig	: Chikyu INTANGIBLE	TITEMS	Dire	ectional Plan:	Vertical Hol	e	Dry Hole Drig	Complete	TOTAL
		INTANOIDEL	TIEMS			Оре	erational Time =	319 Days	complete	319 Days
-	Location/ Re	egulatory Costs						\$3,020,000	\$0	\$3,020,000
			Metocean Study (desktop study, data collecti	ion/processir	ng)	Lump Sum	\$1,000,000			
			Site Survey (desktop study, bathymetry) Regulatory			Lump Sum Lump Sum	\$2,000,000 \$20,000			
			regulatory			Eurip Ouri	\$20,000		h	
	Rig Mobiliza	tion, Demobiliz	ation					\$10,800,000		\$10,800,000
			Mobilization (from Japan)			Lump Sum				
	Drilling Rig -	DayWork	Demobilization (to Japan)			Lump Sum	\$5,400,000	\$156,700,000	\$0	\$156,700,000
	Drining Kig-	Day WORK	Drilling Day Rate	319 Days	\$300,000 /day		\$95,700,000	\$158,700,000	30	\$158,700,000
			Existing Riser System Modifications			Lump Sum	\$14,000,000			
			Additional Riser			Lump Sum	\$47,000,000			
	Bits, Drill Co	ollars & Stabiliz	ers					\$5,294,000	\$0	\$5,294,000
			Drill Bits	26 No.	\$70,000 /bit		\$1,820,000			
			Drill String Rentals: DC's, Jars, Stab, HWT	319 Days	\$4,000 /day		\$1,276,000			
			Core Bits Coring Services	28 No. 207 Days	\$60,000 /bit \$2,500 /day		\$1,680,000 \$517,500			
				201 Days	φ2,0007ddy		4017,000		<u> </u>	
	Directional a	& Downhole Se	rvices					\$5,282,000	\$0	\$5,282,000
			Surveys/Gyros/Single & Multi-Shots			Lump Sum				
			MWD / LWD Mob / De-mob Standard MWD Rental	160 Days	\$3,000 /day	Lump Sum	\$30,000 \$478,500			
			Standard LWD Rental	160 Days	\$7,000 /day		\$1,116,500			
			MWD / LWD Engineers (2)	319 Days	\$2,000 /day		\$638,000			
			Mud Motors & Associated Tools High Temp MWD Rental	255 Days 160 Days	\$3,000 /day \$4,000 /day		\$765,600 \$638,000			
			High temp LWD Rental	160 Days	\$10,000 /day		\$1,595,000			
	Fuel, Water	& Lube		040 0	850 000 (1)		¢40.007.000	\$18,662,000	\$0	\$18,662,000
			Rig Fuel Boat Fuel	319 Days 160 Days	\$53,000 /day \$4,000 /day		\$16,907,000 \$638,000			
			Helicopter Fuel	160 Days	\$3,000 /day		\$478,500			
			Lubricants Fresh Water	319 Days 319 Days	\$1,300 /day \$700 /day		\$414,700 \$223,300			
				ono Days	\$1007day		\$220,000			
	Drilling Fluid	ls Services						\$3,053,000	\$0	\$3,053,000
			Drilling Fluids - WBM	319 Days	\$000 /day	Lump Sum	\$2,000,000 \$255,200			
			Mud Engineer Cuttings Disposal	319 Days	\$800 /day \$2,500 /day		\$797,500			
	Electric Log	ging & Cased H						\$5,057,000		\$5,057,000
			Wireline Unit and Personnel Standard Open Hole Logging	319 Days	\$3,000 /day	Lump Sum	\$957,000 \$1,500,000			
			High Temp Open Hole Logging			Lump Sum	\$2,500,000			
						Lump Sum				
			Cased Hole Logging					1		
	Cementina		Cased Hole Logging					\$1,149.000	\$0	\$1.149.000
	Cementing		22"			Lump Sum		\$1,149,000	\$0	\$1,149,000
	Cementing		22" 18"			Lump Sum	100,000	\$1,149,000	\$0	\$1,149,000
	Cementing		22" 18" 16"			Lump Sum Lump Sum	100,000 150,000	\$1,149,000	\$0	\$1,149,000
	Cementing		22" 18"			Lump Sum	100,000 150,000 150,000	\$1,149,000	\$0	\$1,149,000
	Cementing		22" 18" 16" 13.375" 11.75" 9.625"			Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	100,000 150,000 150,000 100,000 100,000	\$1,149,000	\$0	\$1,149,000
	Cementing		22" 18" 16" 13.375" 11.75"	319 Days	\$1,250 /day	Lump Sum Lump Sum Lump Sum Lump Sum	100,000 150,000 150,000 100,000 100,000	\$1,149,000	\$0	\$1,149,000



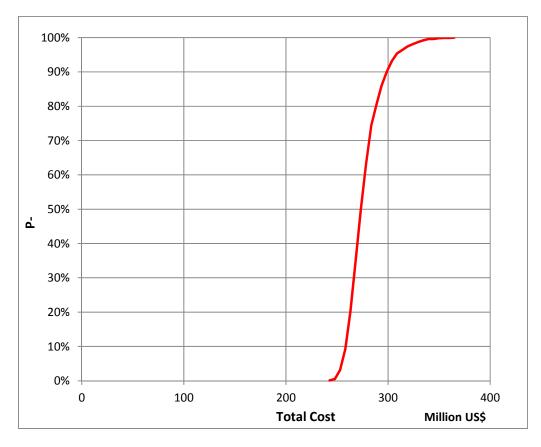
6.3.3 Case 2c Cost Estimate:

This case assumes the Deepwater wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Tan Total		P10	P50	P90	
368	\$272,554	\$9,149	\$281,703	\$258,399	\$273,358	\$298,607	

Figure 171. Hawaii Location: Case 2c – Cost Estimate

The following charts shows the cumulative probability of cost.





		SCOPING CO	<u>OST ESTIMATE</u>	<u>SUMMARY</u>			Rev
		BEAM	- Hawaii, Ca	ase 2c		** DRAFT	**
		Prepared For:	•				
NERGY PARTN		repared For.	IODF / JAW				Exploratory _X Development
FE# XXX		/ JAMSTEC		Revision No.	1	Date:	30-Jun-13
Prospect or Field	Lease Name		Case No.	Water Depth	Proposed TD	Formation	
lantle Hole	N/A		#4b	4050m	10,750m	Moho / Mantle	
antion	Curfo on Longitions	1 - 4: 00 0 00 00		13,287 ft	35,269 ft		
ocation Iawaii	Surface Location: Btm_Hole Location	Dn: Lat: 22.9 - 23.9 M	N / Long: 154.5 - 1				
urpose of Expend		2013 LUL 22.0 20.0 1	17 Long. 104.0	100.0 11			
		drilling to the Moho, the	en coring 500m of the	he Mantle			
ase 4b: Conventio	onal Deepwater Case	Well Configuration					
rilling Rig :	Chikyu		rectional Plan: Ve	ertical Hole	David Late Data	O a man la ta	TOTAL
	INTANGIBLE ITE	.MS			Dry Hole Drig	Complete	TOTAL
Location/P	egulatory Costs				341 Days \$3,020,000	\$0	341 Days \$3,020,0
	ation, Demobilization				\$10,800,000	\$0	\$10,800,0
	- Day Work at \$300,0				\$163,300,000	\$0	\$163,300,0
	ollars & Stabilizers				\$5,709,000	\$0	\$5,709,0
	& Downhole Services	3			\$5,643,000	\$0	\$5,643,0
Fuel, Water	& Lube ds Services				\$19,949,000 \$3,126,000	\$0 \$0	\$19,949,0 \$3,126,0
	iging & Cased Hole L	0gs			\$3,126,000	\$0	\$3,126,0
Cementing					\$1,177,000	\$0	\$1,177,0
	ng and Geological Se	rvices			\$836,000	\$0	\$836,0
Land Trans				\$154,000	\$0	\$154,0	
Boat Trans				\$3,922,000	\$0	\$3,922,0	
Helicopter Tubular Ser	Transportation		\$1,535,000	\$0 \$0	\$1,535,0		
	/ Dock Services				\$150,000 \$682,000	\$0	\$150,0 \$682,0
Communic					\$341,000	\$0	\$341,0
	ous Rental Equipmer	nt			\$7,888,000	\$0	\$7,888,0
	ous Special Services				\$1,152,000	\$0	\$1,152,0
Other Servi					\$2,496,000	\$0	\$2,496,0
Intan Contir	ngencyat 15%				\$35,551,000	\$0	\$35,551,0
			TOTAL INT	ANGIBLE	\$272,554,341	\$0	\$272,554,34
			-				
	TANGIBLE ITEM	s					
	TANGIBLE ITEM	OD	Footage	\$/ft			
Drive Pipe	TANGIBLE ITEM	OD 36"	200	\$650.00	\$130,000	\$0	\$130,0
Conductor		OD 36" 22"	200 656	\$650.00 \$180.00	\$119,000	\$0	\$119,0
·····	TANGIBLE ITEM	OD 36" 22" 16.5" SET	200 656 5,058	\$650.00 \$180.00 \$300.00	\$119,000 \$1,518,000	\$0 \$0	\$119,(\$1,518,(
Conductor Surface Intermediat	ie	OD 36" 22" 16.5" SET 16.5" SET	200 656 5,058 4,049	\$650.00 \$180.00 \$300.00 \$300.00	\$119,000 \$1,518,000 \$1,215,000	\$0 \$0 \$0	\$119,(\$1,518,(\$1,215,(
Conductor Surface Intermediat	le le	OD 36" 22" 16.5" SET 16.5" SET 16.5" SET	200 656 5,058 4,049 12,507	\$650.00 \$180.00 \$300.00 \$300.00 \$155.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000	\$0 \$0 \$0 \$0	\$119, \$1,518, \$1,215, \$1,215, \$1,939,
Conductor Surface Intermediat Intermediat	e e e	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	200 656 5,058 4,049 12,507 16,563	\$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000	\$0 \$0 \$0 \$0 \$0 \$0	\$119, \$1,518, \$1,215, \$1,939, \$2,319,
Conductor Surface Intermediat Intermediat Intermediat	e e e e	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	200 656 5,058 4,049 12,507 16,563 4,078	\$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$119, \$1,518, \$1,215, \$1,939, \$2,319,
Conductor Surface Intermediat Intermediat Intermediat Intermediat Production	ie ie ie ie ie Liner	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0	200 656 5,058 4,049 12,507 16,563 4,078 0	\$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$119, \$1,518, \$1,215, \$1,939, \$2,319,
Conductor Surface Intermediat Intermediat Intermediat Production Production	ie ie ie ie ie Liner	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0 0	200 656 5,058 4,049 12,507 16,563 4,078 0 0	\$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$119,0 \$1,518,0 \$1,215,0 \$1,939,0 \$2,319,0
Conductor Surface Intermediat Intermediat Intermediat Production Production Tubing	e	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0	200 656 5,058 4,049 12,507 16,563 4,078 0	\$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$119,(\$1,518,(\$1,215,(\$1,939,(\$2,319,(\$327,(
Conductor Surface Intermediat Intermediat Intermediat Production Production Tubing Liner Equip	e	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0 0	200 656 5,058 4,049 12,507 16,563 4,078 0 0	\$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000 \$0 \$0 \$0 \$0 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$119, \$1,518, \$1,215, \$1,939, \$2,319, \$327,
Conductor Surface Intermediat Intermediat Intermediat Production Production Tubing Liner Equip Whipstock I	e	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0 0	200 656 5,058 4,049 12,507 16,563 4,078 0 0	\$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$119, \$1,518, \$1,215, \$1,939, \$2,319, \$327,
Conductor Surface Intermediat Intermediat Intermediat Production Production Tubing Liner Equip Whipstock I Subsurface	e	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0 0	200 656 5,058 4,049 12,507 16,563 4,078 0 0	\$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000 \$0 \$0 \$0 \$0 \$150,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$119, \$1,518, \$1,215, \$1,939, \$2,319, \$327, \$327, \$150,
Conductor Surface Intermediat Intermediat Intermediat Intermediat Production Production Tubing Liner Equip Whipstock Subsurface Wellheads	e	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0 0	200 656 5,058 4,049 12,507 16,563 4,078 0 0	\$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000 \$0 \$0 \$0 \$150,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$119, \$1,518, \$1,215, \$1,939, \$2,319, \$327, \$327, \$150, \$150,
Conductor Surface Intermediat Intermediat Intermediat Intermediat Production Production Tubing Liner Equip Whipstock I Subsurface	e	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0 0	200 656 5,058 4,049 12,507 16,563 4,078 0 0	\$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000 \$0 \$0 \$0 \$0 \$150,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$119, \$1,518, \$1,215, \$1,939, \$2,319, \$327, \$327, \$150, \$150, \$100, \$100,
Conductor Surface Intermediat Intermediat Intermediat Intermediat Production Production Tubing Liner Equip Whipstock I Subsurface Wellheads Miscellaned	e	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0 0	200 656 5,058 4,049 12,507 16,563 4,078 0 0 0 0	\$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000 \$0 \$0 \$0 \$150,000 \$0 \$500,000 \$100,000 \$832,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$119, \$1,518, \$1,215, \$1,939, \$2,319, \$327, \$327, \$150, \$150, \$500, \$100, \$832,
Conductor Surface Intermediat Intermediat Intermediat Intermediat Production Production Tubing Liner Equip Whipstock I Subsurface Wellheads Miscellaned	e	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0 0	200 656 5,058 4,049 12,507 16,563 4,078 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00	\$119,000 \$1,518,000 \$1,215,000 \$2,319,000 \$327,000 \$00 \$00 \$150,000 \$150,000 \$100,000 \$832,000 \$9,149,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$119,(\$1,518,(\$1,215,(\$1,939,(\$2,319,(\$327,(\$327,(\$150,(\$100,(\$100,(\$832,(\$9,149,(
Conductor Surface Intermediat Intermediat Intermediat Intermediat Production Production Tubing Liner Equip Whipstock I Subsurface Wellheads Miscellaned	e	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4" 0 0 0	200 656 5,058 4,049 12,507 16,563 4,078 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$0.00 \$0.00	\$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000 \$0 \$0 \$0 \$150,000 \$0 \$500,000 \$100,000 \$832,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	



	SCOPIN	IG COST EST	MATE DETA	A/L				R
	BEA	M - Hawai	i, Case 2	С	*	** DRAFT	**	
	Prepared		-					Exploratory _X_
RGY PARTNE	15							Development
t XXX	Operator: CDEX / JAMSTEC		Conce No	-	Revision No.	1 Dreposed TD	Date:	30-Jun-13
bect or Field	N/A		Case No. #4b		Water Depth 4050m	Proposed TD 10,750m	Objective Moho / Mantle	
					13,287 ft	35,269 ft		
tion	Surface Location: Lat: 22.9 - 23.9°N / Long:							
aii ose of Expendi	Btm. Hole Location: Lat: 22.9 - 23.9°N / Long:	154.5 - 155.8°V	V					
	to the Mantle. Assume drilling to the Moho, the	n coring 500m	of the Mantle					
	onal Deepwater Case Well Configuration	5						Avg Intan \$/
								\$799,279
Drilling Rig		Dir	ectional Plan:	Vertical Hol	e	Devilate Date	O a man la fa	TOTAL
	INTANGIBLE ITEMS			One	erational Time =	Dry Hole Drig 341 Days	Complete	TOTAL 341 Days
Location/ Re	gulatory Costs			Ope		\$3,020,000	\$0	\$3,020
	Metocean Study (desktop study, data co	llection/processi	ng)	Lump Sum	\$1,000,000	<i>+0/020/000</i>		¢0/020
	Site Survey (desktop study, bathymetry)		5/	Lump Sum	\$2,000,000			
	Regulatory			Lump Sum	\$20,000			
Rig Mobiliza	on, Demobilization					\$10,800,000		\$10,800
	Mobilization (from Japan) Demobilization (to Japan)			Lump Sum Lump Sum	\$5,400,000 \$5,400,000			
Drilling Rig -				Lump Sum	ຈວ,400,000	\$162 200 000	\$0	\$143 300
Drinning Kig -	Drilling Day Rate	341 Davs	\$300,000 /day		\$102,300,000	\$163,300,000	\$0	\$163,300
	Existing Riser System Modifications			Lump Sum	\$14,000,000			
	Additional Riser			Lump Sum	\$47,000,000			
Bits, Drill Co	ars & Stabilizers Drill Bits	20 11-	\$70,000 /bit		\$2,100,000	\$5,709,000	\$0	\$5,709
	Drill String Rentals: DC's, Jars, Stab, H	30 No. VT 341 Days	\$70,000 /bit \$4.000 /day		\$2,100,000			
	Core Bits	28 No.	\$60,000 /bit		\$1,680,000			
	Coring Services	226 Days	\$2,500 /day		\$565,000			
Directional	Downhole Services					\$5,643,000	\$0	\$5,643
	Surveys/Gyros/Single & Multi-Shots			Lump Sum				
	MWD / LWD Mob / De-mob Standard MWD Rental	171 Days	\$3,000 /day	Lump Sum	\$30,000 \$511,500			
	Standard LWD Rental	171 Days	\$7,000 /day		\$1,193,500			
	MWD / LWD Engineers (2)	341 Days	\$2,000 /day		\$682,000			
	Mud Motors & Associated Tools	273 Days	\$3,000 /day		\$818,400			
	High Temp MWD Rental	171 Days	\$4,000 /day		\$682,000			
	High temp LWD Rental	171 Days	\$10,000 /day		\$1,705,000			
Fuel, Water	Lubo					\$19,949,000	\$0	¢10.040
i uei, water	Rig Fuel	341 Days	\$53,000 /day		\$18,073,000	\$17,949,000 \$	\$0	\$19,949
	Boat Fuel	171 Days	\$4,000 /day		\$682,000			
	Helicopter Fuel	171 Days	\$3,000 /day		\$511,500			
	Lubricants Fresh Water	341 Days 341 Days	\$1,300 /day \$700 /day		\$443,300 \$238,700			
		2.1. 2.435			\$200,700			
Drilling Fluid	Services					\$3,126,000	\$0	\$3,126
	Drilling Fluids - WBM			Lump Sum	\$2,000,000			
	Mud Engineer Cuttings Disposal	341 Days 341 Days	\$800 /day \$2,500 /day		\$272,800 \$852,500			
	Cuungs Disposa	341 Days	φ2,000/day		φ052,500			
	ing & Cased Hole Logs					\$5,123,000		\$5,123
Electric Loa	Wireline Unit and Personnel	341 Days	\$3,000 /day		\$1,023,000			
Electric Log				Lump Sum	\$1,500,000			
Electric Log	Standard Open Hole Logging			Lump Sum	\$2,500,000 \$100,000			
Electric Log	Standard Open Hole Logging High Temp Open Hole Logging			1		1	1	
Electric Log	Standard Open Hole Logging			Lump Sum	\$100,000			
Electric Log	Standard Open Hole Logging High Temp Open Hole Logging			Lump Sum	\$100,000	\$1,177,000	\$0	\$1,177
	Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22"			Lump Sum	100,000	\$1,177,000	\$0	\$1,177
	Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 16.5" SET			Lump Sum Lump Sum	100,000	\$1,177,000	\$0	\$1,177
	Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 16.5" SET 16.5" SET			Lump Sum Lump Sum Lump Sum	100,000 100,000 150,000	\$1,177,000	\$0	\$1,177
	Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 16.5" SET 16.5" SET 16.5" SET 16"			Lump Sum Lump Sum Lump Sum Lump Sum	100,000 100,000 150,000 150,000	\$1,177,000	\$0	\$1,177
	Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 16.5" SET 16.5" SET 16" 13.375"			Lump Sum Lump Sum Lump Sum	100,000 100,000 150,000	\$1,177,000	\$0	\$1,177
	Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 16.5" SET 16.5" SET 16.5" SET 16"			Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	100,000 100,000 150,000 150,000 150,000 100,000	\$1,177,000	\$0	\$1,177



	cal Services						\$836,000	\$0	\$8
	Logging Unit Operating rate		41 Days	\$1,250 /day		\$426,250			
	Personnel Charges	32	41 Days	\$1,200 /day		\$409,200			
Land Transportation							\$154,000	\$0	\$1
	Trucking	17	71 Days	\$900 /day		\$153,450			
Boat Transportation							\$3,922,000	\$0	\$3,9
	Work Boat - Spot Hire	15	71 Days	\$14,000 /day		\$2,387,000	<i>4011</i> 22 <i>1</i> 000	÷-	4 0/1
	Crew Boat - Spot Hire		71 Days	\$9,000 /day		\$1,534,500			
Helicopter Transportation							\$1,535,000	\$0	\$1,5
	Helicopter - spot hire	1	71 Days	\$9,000 /day		\$1,534,500	\$1,535,000	\$ 0	\$1,5
				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
Tubular Services					Lump Sum	6450.000	\$150,000	\$0	\$1
	QAQC				Lump Sum	\$150,000			
Shorebase / Dock Service							\$682,000	\$0	\$6
	Shorebase /Dispatcher	34	41 Days	\$2,000 /day		\$682,000			
Communications							\$341,000	\$0	\$3
	VSAT	34	41 Days	\$1,000 /day		\$341,000			
Miscellaneous Rental Equ	inmont						¢7.000.000	¢0	¢7.0
movenaneous rientai Equ	Solids Control	3/	41 Days	\$400 /day		\$136,400	\$7,888,000	\$0	\$7,8
	Fishing Tools	34	41 Days	\$1,500 /day		\$511,500			
	Casing Running Equipmer		70 Days	\$6,000 Day		\$420,000			
	Other Rentals	34	41 Days Days	\$20,000 Day		\$6,820,000			
			Days						
Miscellaneous Special Se							\$1,152,000	\$0	\$1,1
	Weather Forecasting		41 Days	\$150 /day	Lump Cum	\$51,150			
	Engineering Services - Ris Engineering Services - Dril				Lump Sum Lump Sum	\$300,000 \$200,000			
	Engineering Services - Cas				Lump Sum	\$50,000			
	Engineering Services - Wel	Ilbore Stability			Lump Sum	\$100,000			
	Engineering Services - Ope				Lump Sum	\$200,000			
	Engineering Services - Ris Engineering Services - Oth				Lump Sum Lump Sum	\$200,000 \$50,000			
	Engineering bervices - Our				Lump Oum	400,000			
Other Services / Costs							\$2,496,000	\$0	\$2,4
	Misc Contract Labor		41 Days	\$1,500 /day		\$511,500 \$700,000			
	Casing Running Well Insurance		70 Days	\$10,000 /day	Lump Sum	\$500,000			
	Overhead	34	41 Days	\$1,100 /day		\$375,100			
	Catering	34	41 Days	\$1,200 /day		\$409,200			
Intangible Contingency			15% /	Amount	ST Drlg =	\$237,003,000	\$35,551,000	\$0	\$35,5
									+/-
					ST Comp =	\$0			
						\$0 NTANGIBLE	\$272,554,000	\$0	
						গ্র <mark>NTANGIBLE</mark>	\$272,554,000	\$0 \$0	
TANGIBLE				Lon-th			\$272,554,000	\$0	
	OD	7 =#S	Strings	Length		\$/ft			\$272, t
Drive Pipe	OD 36"	7 =#S	itrings	200		\$/ft 650.0	\$130,000	\$0	\$272,5 \$1
	OD		Strings			\$/ft	\$130,000 \$119,000	\$0 \$0	\$272,5
Drive Pipe Conductor	OD 36" 22"	Г	Strings	200 656		\$/ft 650.0 180.0	\$130,000	\$0	\$272, t
Drive Pipe Conductor Surface	OD 36" 22" 16.5" SE	Г	Strings	200 656 5,058		\$/ft 650.0 180.0 300.0	\$130,000 \$119,000 \$1,518,000	\$0 \$0 \$0 \$0 \$0	\$272, \$ \$ \$ \$1, \$ \$1, \$
Drive Pipe Conductor Surface Intermediate	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	Г	Strings	200 656 5,058 4,049 12,507 16,563		\$/ft 650.0 180.0 300.0 300.0 155.0 140.0	\$130,000 \$119,000 \$1,518,000 \$1,215,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$272,5 \$ \$ \$1,5 \$1,5 \$1,5 \$1,5
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate	OD 36" 22" 16.5" SE 16.5" SE 16.5" SE	Г	Strings	200 656 5,058 4,049 12,507		\$/ft 650.0 180.0 300.0 300.0 155.0	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,939,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$272,5 \$1 \$1 \$1,5
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	Г	Strings	200 656 5,058 4,049 12,507 16,563		\$/ft 650.0 180.0 300.0 300.0 155.0 140.0	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$272,5 \$1 \$1 \$1,5 \$1,5 \$1,5 \$1,5 \$2,5
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	Г	Strings	200 656 5,058 4,049 12,507 16,563		\$/ft 650.0 180.0 300.0 300.0 155.0 140.0	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$272,5 \$1 \$1 \$1,5 \$1,5 \$1,5 \$1,5 \$2,5
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	Г	Strings	200 656 5,058 4,049 12,507 16,563		\$/ft 650.0 180.0 300.0 300.0 155.0 140.0	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$2,319,000 \$2,319,000 \$327,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$272,5 \$ \$1,5 \$1,5 \$1,6 \$2,5 \$ \$
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	Г	Strings	200 656 5,058 4,049 12,507 16,563		\$/ft 650.0 180.0 300.0 300.0 155.0 140.0	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$272,5 \$ \$ \$1,5 \$1,5 \$1,5 \$1,5 \$2,5
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	Г	Strings	200 656 5,058 4,049 12,507 16,563		\$/ft 650.0 180.0 300.0 300.0 155.0 140.0	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$2,319,000 \$2,319,000 \$327,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$272,5 \$ \$1,5 \$1,5 \$1,6 \$2,5 \$ \$
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Liner Liner Equipment Whipstock Equipment & BR Subsurface Completion	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	Г	Strings	200 656 5,058 4,049 12,507 16,563		\$/ft 650.0 180.0 300.0 300.0 155.0 140.0	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$2,319,000 \$2,319,000 \$327,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$272,5 \$ \$1,5 \$1,5 \$2,5 \$ \$ \$
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	Г	Strings	200 656 5,058 4,049 12,507 16,563		\$/ft 650.0 180.0 300.0 300.0 155.0 140.0	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,215,000 \$2,319,000 \$327,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$272,5 \$272,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Wiscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	Г		200 656 5,058 4,049 12,507 16,563 4,078		\$/ft 650.0 180.0 300.0 300.0 155.0 140.0 80.0	\$130,000 \$1,518,000 \$1,518,000 \$1,215,000 \$2,319,000 \$327,000 \$150,000 \$150,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$272,5 \$272,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Wiscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	Г		200 656 5,058 4,049 12,507 16,563	ST Drig =	\$/ft 650.0 180.0 300.0 165.0 140.0 80.0 \$8.317,000	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$327,000 \$150,000 \$5500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$272,5 \$272,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Wiscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	Г		200 656 5,058 4,049 12,507 16,563 4,078	ST Drig = ST Comp =	\$/ft 650.0 180.0 300.0 155.0 140.0 80.0 \$8.317,000 \$0	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$327,000 \$150,000 \$150,000 \$100,000 \$832,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$272, \$272, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	Г		200 656 5,058 4,049 12,507 16,563 4,078	ST Drig = ST Comp =	\$/ft 650.0 180.0 300.0 165.0 140.0 80.0 \$8.317,000	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$2,319,000 \$327,000 \$150,000 \$100,000 \$832,000 \$832,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$272,5 \$272,5 \$1,5 \$1,5 \$1,5 \$2,5 \$3 \$3 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	Г		200 656 5,058 4,049 12,507 16,563 4,078	ST Drig = ST Comp = TOTAL	\$/ft 650.0 180.0 300.0 155.0 140.0 80.0 \$8.317,000 \$0	\$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$327,000 \$150,000 \$150,000 \$100,000 \$832,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$272,5 \$ \$1,5 \$1,5 \$1,6 \$2,5 \$ \$



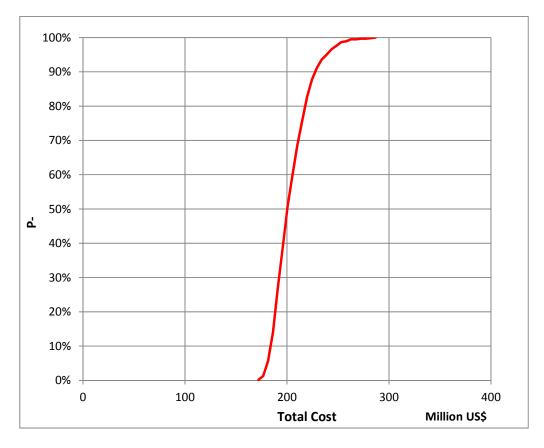
6.3.4 Case 4a Cost Estimate:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Tan	Total	P10	P50	P90	
248	\$209,320	\$2,650	\$211,970	\$183,967	\$200,309	\$227,601	

Figure 172. Hawaii Location: Case 4a – Cost Estimate

The following chart shows the cumulative probability of cost.





			<u>SCOPING C</u>	OST ESTIMATI	<u>E SUMMARY</u>			Re
			BEAM	- Hawaii, C	ase 4a		** DRAFT	**
		Bron		IODP / JAI				
SLAD	EBS	Fieh	aleu Foi.					Exploratory _X Development
FE# XXX		CDEX / JAM	STEC		Revision No.	1	Date:	30-Jun-13
ospect or Field	Lease Name		0120	Case No.	Water Depth	Proposed TD	Formation	
antle Hole	N/A	-		#4a	4050m	10,750m	Moho / Mantle	
					13,287 ft	35,269 ft		
ocation	Surface Loc			N / Long: 154.5 -				
awaii	Btm. Hole L	Location: La	at: 22.9 - 23.9	°N / Long: 154.5 -	155.8°W			
urpose of Expend		sume drilling	to the Moho th	en coring 500m of	the Mantle			
ase 4a: Orig Base		,	j to allo mono, a					
rilling Rig :	Chikyu		C	Directional Plan: V	ertical Hole			
	INTANGIBL	E ITEMS				Dry Hole Drig	Complete	TOTAL
						221 Days		221 Days
	egulatory Cost					\$3,020,000		\$3,020,0
	ation, Demobili - Day Work at		Jav			\$10,800,000 \$127,300,000		\$10,800,0 \$127,300,0
	ollars & Stabili		Juy			\$3,227,000		\$127,300,0
	& Downhole S					\$3,675,000	\$0	\$3,675,0
Fuel, Water	& Lube					\$12,929,000	\$0	\$12,929,0
Drilling Fluid						\$2,730,000		\$2,730,
	ging & Cased	Hole Logs				\$4,763,000		\$4,763,
Cementing	g and Geologi	ion Contra				\$677,000 \$542,000		\$677, \$542,
Land Trans		cal Services				\$542,000 \$100,000	\$0 \$0	\$542, \$100,
Boat Transp					\$2,542,000	\$0 \$0	\$2,542,	
	ransportation				\$995,000		\$995,	
Tubular Ser	vices				\$100,000	\$0	\$100,	
	/ Dock Service	S				\$442,000		\$442,
Communica						\$221,000		\$221,
	ous Rental Equ ous Special Se	· · · · · · · · · · · · · · · · · · ·				\$5,080,000 \$1,134,000		\$5,080,0 \$1,134,0
Other Servic		TVICES				\$1,740,000	\$0 \$0	\$1,740,0
Intan Contin		15%				\$27,303,000	\$0	\$27,303,
	<u> </u>							
				TOTAL INT		\$209,320,221	\$0	\$209,320,2
	TANGIBLE	ITEMS						
			OD	Footage	\$/ft			
Drive Pipe			36"	200	\$500.00			\$100,
Conductor			20"	606	\$180.00	\$110,000	\$0	\$110,
Surface			13-3/8"	5,364	\$140.00	\$751,000	\$0	\$751,
Intermediate			11-3/4"	8,715	\$80.00	\$698,000	\$0	\$698,
Intermediate			0	0	\$0.00			
Intermediate			0	0	\$0.00			
1			0	0	\$0.00			
Intermediate			0	0	\$0.00			
Production I	Lie-back		0	0	\$0.00			
Production I Production			0	0	\$0.00			
Production I Production ⁻ Tubing						\$150,000		\$150
Production I Production ⁻ Tubing Liner Equip						\$0		
Production I Production ⁻ Tubing Liner Equip Whipstock E	Equipment					\$0		
Production I Production ⁻ Tubing Liner Equip Whips tock E Subsurface								A=
Production I Production ⁻ Tubing Liner Equip Whipstock E Subsurface Wellheads	Equipment Completion					\$500,000	\$0	
Production I Production Tubing Liner Equip Whipstock B Subsurface Wellheads Miscellaneo	Equipment Completion bus/Other					\$500,000 \$100,000	\$0 \$0	\$100
Production 1 Production 7 Tubing Liner Equip Whipstock E Subsurface Wellheads	Equipment Completion bus/Other	10%				\$500,000 \$100,000 \$241,000	\$0 \$0 \$0	\$100 \$241
Production I Production Tubing Liner Equip Whipstock E Subsurface Wellheads Miscellaneo	Equipment Completion bus/Other	10%		TOTAL TA	ANGIBLE	\$500,000 \$100,000 \$241,000 \$2,650,000	\$0 \$0 \$0 \$0	\$100 \$241 \$2,650 ,
Production I Production Tubing Liner Equip Whipstock B Subsurface Wellheads Miscellaneo	Equipment Completion bus/Other	10%			ANGIBLE I Dry Hole Cost	\$500,000 \$100,000 \$241,000 \$2,650,000	\$0 \$0 \$0 \$0	\$500, \$100, \$241, \$2,650, \$211,970 ,
Production I Production Tubing Liner Equip Whipstock B Subsurface Wellheads Miscellaneo	Equipment Completion bus/Other	10%		Tota		\$500,000 \$100,000 \$241,000 \$2,650,000 \$211,970,221	\$0 \$0 \$0 \$0 \$0	\$100 \$241 \$2,650 ,



		IG COST EST						F
	BEA	M - Hawai	ii, Case 4	а	*	** DRAFT	**	
	Prepared	For: IODP	/ JAMSTEC	/ CDEX				Exploratory _X_
RGY PARTNE	R S							Development
XXX	Operator: CDEX / JAMSTEC				Revision No.	1	Date:	30-Jun-13
ect or Field	Lease Name N/A		Case No. #4a		Water Depth 4050m	Proposed TD 10,750m	Objective Moho / Mantle	
le noie			# 4 a		13,287 ft	35,269 ft	wono / wante	
ion	Surface Location: Lat: 22.9 - 23.9°N / Long	: 154.5 - 155.8°V	N	1				
ii	Btm. Hole Location: Lat: 22.9 - 23.9°N / Long	: 154.5 - 155.8°V	N					
se of Expendi								
	to the Mantle. Assume drilling to the Moho, the se Case Well Configuration	en coring 500m	of the Mantle					Avg Intan \$/o
ча. Опу ва	e case wen configuration							\$947,149
Drilling Rig :	Chikyu	Dir	rectional Plan:	Vertical Hol	e			** ,
	INTANGIBLE ITEMS					Dry Hole Drlg	Complete	TOTAL
				Ope	erational Time =	221 Days		221 Days
Location/ Re	gulatory Costs					\$3,020,000	\$0	\$3,020
	Metocean Study (desktop study, data co		ng)	Lump Sum	\$1,000,000		ļ	
	Site Survey (desktop study, bathymetry)			Lump Sum	\$2,000,000		L	
	Regulatory			Lump Sum	\$20,000			
Rig Mohiliza	ion, Demobilization					\$10,800,000	. 	\$10,800
	Mobilization (from Japan)			Lump Sum	\$5,400,000	÷10,800,000	<u> </u>	÷10,000
	Demobilization (to Japan)			Lump Sum	\$5,400,000		1	
Drilling Rig -	Day Work					\$127,300,000	\$0	\$127,300
	Drilling Day Rate	221 Days	\$300,000 /day		\$66,300,000			
	Existing Riser System Modifications			Lump Sum				
	Additional Riser			Lump Sum	\$47,000,000		L	
Bits Drill Co	lars & Stabilizers					\$3,227,000	\$0	\$3.227
2113, 2111 00	Drill Bits	26 No.	\$70,000 /bit		\$1,820,000	\$3,221,000	\$0	ə3,221
	Drill String Rentals: DC's, Jars, Stab, H		\$4,000 /day		\$884,000			
	Core Bits	6 No.	\$60,000 /bit		\$360,000			
	Coring Services	65 Days	\$2,500 /day		\$162,500			
Directional 8	Downhole Services					\$3,675,000	\$0	\$3,675
	Surveys/Gyros/Single & Multi-Shots MWD / LWD Mob / De-mob			Lump Sum				
	Standard MWD Rental	111 Days	\$3,000 /day	Lump Sum	\$30,000 \$331,500			
	Standard LWD Rental	111 Days	\$7,000 /day		\$773,500			
	MWD / LWD Engineers (2)	221 Days	\$2,000 /day		\$442,000			
	Mud Motors & Associated Tools	177 Days	\$3,000 /day		\$530,400			
		111 Days	\$4,000 /day		\$442,000			
	High Temp MWD Rental							
	High Temp MWD Rental High temp LWD Rental	111 Days	\$10,000 /day		\$1,105,000			
Evol Weter	High temp LWD Rental	111 Days	\$10,000 /day			¢42.000.0		#10 0
Fuel, Water	High temp LWD Rental				\$1,105,000	\$12,929,000	\$0	\$12,929
Fuel, Water	High temp LWD Rental & Lube Rig Fuel	221 Days	\$53,000 /day		\$1,105,000	\$12,929,000	\$0	\$12,929
Fuel, Water	High temp LWD Rental & Lube Rig Fuel Boat Fuel Helicopter Fuel	221 Days 111 Days 111 Days	\$53,000 /day \$4,000 /day \$3,000 /day		\$1,105,000 \$11,713,000 \$442,000 \$331,500	\$12,929,000	\$0	\$12,929
Fuel, Water	High temp LWD Rental & Lube Rig Fuel Boat Fuel Helicopter Fuel Lubricants	221 Days 111 Days 111 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day		\$1,105,000 \$11,713,000 \$442,000 \$331,500 \$287,300	\$12,929,000	\$0	\$12,929
Fuel, Water	High temp LWD Rental & Lube Rig Fuel Boat Fuel Helicopter Fuel	221 Days 111 Days 111 Days	\$53,000 /day \$4,000 /day \$3,000 /day		\$1,105,000 \$11,713,000 \$442,000 \$331,500	\$12,929,000	\$0	\$12,929
	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water	221 Days 111 Days 111 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day		\$1,105,000 \$11,713,000 \$442,000 \$331,500 \$287,300			
Fuel, Water	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water	221 Days 111 Days 111 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day		\$1,105,000 \$11,713,000 \$442,000 \$331,500 \$287,300 \$154,700	\$12,929,000		\$12,929
	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water s Services Drilling Fluids - WBM Mud Engineer	221 Days 111 Days 111 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day	Lump Sum	\$1,105,000 \$11,713,000 \$442,000 \$331,500 \$287,300 \$154,700			
	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM	221 Days 111 Days 111 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day	Lump Sum	\$1,105,000 \$11,713,000 \$442,000 \$331,500 \$287,300 \$154,700 \$2,000,000			
Drilling Fluid	High temp LWD Rental A Lube Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day	Lump Sum	\$1,105,000 \$11,713,000 \$331,500 \$287,300 \$154,700 \$2,000,000 \$176,800	\$2,730,000	\$0	\$2,730
Drilling Fluid	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Wud Engineer Cuttings Disposal ging & Cased Hole Logs	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum	\$1,105,000 \$11,713,000 \$442,000 \$331,500 \$154,700 \$154,700 \$176,800 \$552,500		\$0	\$2,730
Drilling Fluid	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water s Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal ging & Cased Hole Logs Wireline Unit and Personnel	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day		\$1,105,000 \$11,713,000 \$331,500 \$287,300 \$154,700 \$2,000,000 \$176,800 \$552,500 \$663,000	\$2,730,000	\$0	
Drilling Fluid	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal ging & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum	\$1,105,000 \$11,713,000 \$442,000 \$331,500 \$287,300 \$154,700 \$2,000,000 \$176,800 \$552,500 \$663,000 \$1,500,000	\$2,730,000	\$0	\$2,730
Drilling Fluid	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal ging & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum	\$1,105,000 \$11,713,000 \$442,000 \$331,500 \$154,700 \$154,700 \$176,800 \$552,500 \$663,000 \$1,500,000 \$1,500,000	\$2,730,000	\$0	\$2,730
Drilling Fluid	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal ging & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum	\$1,105,000 \$1,105,000 \$442,000 \$331,500 \$154,700 \$154,700 \$176,800 \$552,500 \$663,000 \$1,500,000 \$2,500,000	\$2,730,000	\$0 	\$2,730
Drilling Fluid	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal ging & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum	\$1,105,000 \$1,105,000 \$442,000 \$331,500 \$154,700 \$176,800 \$552,500 \$663,000 \$1,500,000 \$1,500,000 \$1,000,000	\$2,730,000	\$0 	\$2,730
Drilling Fluid	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Wud Engineer Cuttings Disposal ging & Cased Hole Logg High Temp Open Hole Logging High Temp Open Hole Logging Cased Hole Logging Cased Hole Logging 20"	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$1,105,000 \$11,713,000 \$442,000 \$331,500 \$154,700 \$2,000,000 \$176,800 \$552,500 \$663,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,00,000	\$2,730,000	\$0 	\$2,730
Drilling Fluid	High temp LWD Rental A Lube Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal jing & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 20* 13-3/8*	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$1,105,000 \$442,000 \$331,500 \$287,300 \$154,700 \$2,000,000 \$176,800 \$552,500 \$663,000 \$1,500,000 \$100,000 \$100,000 \$150,000	\$2,730,000	\$0 	\$2,730
Drilling Fluid	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Wud Engineer Cuttings Disposal ging & Cased Hole Logg High Temp Open Hole Logging High Temp Open Hole Logging Cased Hole Logging Cased Hole Logging 20"	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$1,105,000 \$442,000 \$331,500 \$287,300 \$154,700 \$2,000,000 \$176,800 \$552,500 \$663,000 \$1,500,000 \$100,000 \$100,000 \$150,000	\$2,730,000	\$0 	\$2,730
Drilling Fluid	High temp LWD Rental A Lube Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal jing & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 20* 13-3/8*	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$1,105,000 \$442,000 \$331,500 \$287,300 \$154,700 \$2,000,000 \$176,800 \$552,500 \$663,000 \$1,500,000 \$100,000 \$100,000 \$150,000	\$2,730,000	\$0 	\$2,730
Drilling Fluid	High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal ging & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 20* 13-3/8* 11-3/4*	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$1,105,000 \$442,000 \$331,500 \$154,700 \$154,700 \$2,000,000 \$176,800 \$552,500 \$663,000 \$1,500,000 \$1,500,000 \$100,000 \$100,000	\$2,730,000	\$0 	\$2,730
Drilling Fluid	High temp LWD Rental A Lube Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal jing & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 20* 13-3/8*	221 Days 111 Days 111 Days 221 Days 221 Days 221 Days 221 Days	\$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$1,105,000 \$442,000 \$331,500 \$154,700 \$2,000,000 \$176,800 \$552,500 \$663,000 \$1,500,000 \$1,500,000 \$100,000 \$100,000	\$2,730,000	\$0 	\$2,730



Personne Land Transportation Trucking Boat Transportation Boat Transportation Work Boa Crew Boa Helicopter Transportation Helicopter Trubular Services QAQC Shorebase / Dock Services Shorebase / Dock Services Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing TC Casing R Other Rer Brighneeri Engineeri Engine	- Spot Hire - Dispatcher - Dispatch	221 Days 40 Days 221 Days 221 Days 221 Days	\$1,250 /day \$1,200 /day \$900 /day \$14,000 /day \$9,000 /day \$9,000 /day \$2,000 /day \$1,000 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,200 /day	Lump Sum	\$276,250 \$265,200 \$99,450 \$1,547,000 \$994,500 \$100,000 \$442,000 \$221,000 \$240,000 \$240,000 \$240,000 \$240,000 \$240,000 \$240,000 \$200,000 \$200,000 \$100,000 \$200,000 \$100,000 \$200,0000 \$200,0000 \$200,0000 \$200,000	\$542,000 \$100,000 \$2,542,000 \$995,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000 \$1,134,000 \$1,134,000 \$1,740,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$2,5 \$9 \$1 \$4 \$2 \$5,0 \$5,0 \$1,1
Land Transportation Trucking Boat Transportation Work Boa Crew Boa Helicopter Transportation Helicopter Transportation Shorebase / Dock Services Communications Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing To Casing Ri Other Rer Miscellaneous Special Services Weather F Engineeri Sturface InterMS	- Spot Hire - Dispatcher - Dispatch	111 Days 111 Days 111 Days 111 Days 111 Days 111 Days 221 Days 0 Days 221 Days 0 ort is 221 Days	\$900 /day \$14,000 /day \$9,000 /day \$9,000 /day \$2,000 /day \$1,000 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$99,450 \$1,547,000 \$994,500 \$994,500 \$100,000 \$100,000 \$442,000 \$221,000 \$221,000 \$221,000 \$221,000 \$331,500 \$331,500 \$300,000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,00000 \$200,0000	\$2,542,000 \$995,000 \$100,000 \$442,000 \$221,000 \$221,000 \$5,080,000 \$5,080,000 \$1,134,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1 \$4 \$2 \$5,0 \$1,1
Trucking Boat Transportation Work Boa Crew Boa Helicopter Transportation Helicopter Tubular Services QAQC Shorebase / Dock Services Shorebase / Dock Services Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing Tc Casing R; Other Services / Costs Misc Contingency Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Interm ediate	t - Spot Hire - spot hire - spot hire e /Dispatcher ntrol bols nning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Drill String Design ng Services - Drill String Design ng Services - Derational Stypo ng Services - Risk Assessments ng Services - Other ract Labor 	111 Days 111 Days 111 Days 111 Days 111 Days 221 Days 0 Days 221 Days 0 ort is 221 Days 40 Days 221 Days 221 Days 221 Days 221 Days	\$14,000 /day \$9,000 /day \$9,000 /day \$2,000 /day \$1,000 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$1,547,000 \$994,500 \$994,500 \$100,000 \$100,000 \$4442,000 \$221,000 \$221,000 \$240,000 \$442,000 \$442,000 \$331,500 \$331,500 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,00000 \$200,0000 \$200,0000 \$200,0000 \$2	\$2,542,000 \$995,000 \$100,000 \$442,000 \$221,000 \$221,000 \$5,080,000 \$5,080,000 \$1,134,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$2,5 \$9 \$1 \$4 \$2 \$5,0 \$5,0 \$1,1
Trucking Boat Transportation Work Boa Crew Boa Helicopter Transportation Helicopter Tubular Services QAQC Shorebase / Dock Services Shorebase / Dock Services Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing Tc Casing R; Other Services / Costs Misc Contingency Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Interm ediate	t - Spot Hire - spot hire - spot hire e /Dispatcher ntrol bols nning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Drill String Design ng Services - Drill String Design ng Services - Derational Stypo ng Services - Risk Assessments ng Services - Other ract Labor 	111 Days 111 Days 111 Days 111 Days 111 Days 221 Days 0 Days 221 Days 0 ort is 221 Days 40 Days 221 Days 221 Days 221 Days 221 Days	\$14,000 /day \$9,000 /day \$9,000 /day \$2,000 /day \$1,000 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$1,547,000 \$994,500 \$994,500 \$100,000 \$100,000 \$4442,000 \$221,000 \$221,000 \$240,000 \$442,000 \$442,000 \$331,500 \$331,500 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,00000 \$200,0000 \$200,0000 \$200,0000 \$2	\$2,542,000 \$995,000 \$100,000 \$442,000 \$221,000 \$221,000 \$5,080,000 \$5,080,000 \$1,134,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$2,5 \$9 \$1 \$1 \$2 \$5,0 \$5,0 \$1,1
Work Boa Crew Boa Helicopter Transportation Helicopter Transportation Helicopter Transportation Helicopter Transportation Usar Shorebase / Dock Services Shorebase / Dock Services Shorebase / Dock Services Shorebase / Dock Services VSAT Miscellaneous Rental Equipment Solids Co Fishing Tc Casing R: Weather F Engineeri Engineer	t - Spot Hire - spot hire - spot hire e /Dispatcher ntrol bols nning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Drill String Design ng Services - Drill String Design ng Services - Derational Stypo ng Services - Risk Assessments ng Services - Other ract Labor 	111 Days 111 Days 111 Days 221 Days 0 Days 221 Days 0 cars 0 cars 0 cars 0 cars 0 cars 221 Days 40 Days 221 Days 221 Days 221 Days	\$9,000 /day \$9,000 /day \$2,000 /day \$2,000 /day \$1,000 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$994,500 \$994,500 \$100,000 \$100,000 \$442,000 \$221,000 \$221,000 \$233,1500 \$331,500 \$333,150 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$331,500 \$331,500 \$442,000 \$243,100	\$995,000 \$100,000 \$442,000 \$221,000 \$5,080,000 \$1,134,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$9 \$1 \$4 \$2 \$5,0 \$1,1 \$1,1
Work Boa Crew Boa Helicopter Transportation Helicopter Transportation Helicopter Transportation Helicopter Transportation Usar Shorebase / Dock Services Shorebase / Dock Services Shorebase / Dock Services Shorebase / Dock Services VSAT Miscellaneous Rental Equipment Solids Co Fishing Tc Casing R: Weather F Engineeri Engineer	t - Spot Hire - spot hire - spot hire e /Dispatcher ntrol bols nning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Drill String Design ng Services - Drill String Design ng Services - Derational Stypo ng Services - Risk Assessments ng Services - Other ract Labor 	111 Days 111 Days 111 Days 221 Days 0 Days 221 Days 0 cars 0 cars 0 cars 0 cars 0 cars 221 Days 40 Days 221 Days 221 Days 221 Days	\$9,000 /day \$9,000 /day \$2,000 /day \$2,000 /day \$1,000 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$994,500 \$994,500 \$100,000 \$100,000 \$442,000 \$221,000 \$221,000 \$233,1500 \$331,500 \$333,150 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$331,500 \$331,500 \$442,000 \$243,100	\$995,000 \$100,000 \$442,000 \$221,000 \$5,080,000 \$1,134,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$9 \$1 \$4 \$2 \$5,0 \$1,1 \$1,1
Crew Boa Helicopter Transportation Helicopter Transportation Helicopter Tubular Services QAQC Shorebase / Dock Services Shorebase / Dock Services Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing T Casing R Other Rer Miscellaneous Special Services Weather F Engineeri	t - Spot Hire - spot hire - spot hire e /Dispatcher ntrol bols nning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Drill String Design ng Services - Drill String Design ng Services - Derational Stypo ng Services - Risk Assessments ng Services - Other ract Labor 	111 Days 111 Days 111 Days 221 Days 0 Days 221 Days 0 cars 0 cars 0 cars 0 cars 0 cars 221 Days 40 Days 221 Days 221 Days 221 Days	\$9,000 /day \$9,000 /day \$2,000 /day \$2,000 /day \$1,000 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day \$1,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$994,500 \$994,500 \$100,000 \$100,000 \$442,000 \$221,000 \$221,000 \$233,1500 \$331,500 \$333,150 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$331,500 \$331,500 \$442,000 \$243,100	\$100,000 \$442,000 \$221,000 \$5,080,000 \$1,134,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$9 \$1 \$4 \$2 \$5,0 \$1,1 \$1,1 \$1,7
Helicopter Transportation Helicopter Transportation Helicopter Tubular Services OAQC Shorebase / Dock Services Shorebase Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing TC Casing R Other Ren Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Cother Services / Costs Misc Cont Casing R Well Insu Overhead Catering Intangible Contingency TANGIBLE ITEMS	- spothire - spothire e /Dispatcher ntrol olois unning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Drill String Design ng Services - Orerational Suppo ng Services - Operational Suppo ng Services - Other ract Labor unning	111 Days 221 Days 221 Days 221 Days 221 Days 221 Days 221 Days Days Days 221 Days 0 221 Days 221 Days	\$9,000 /day \$2,000 /day \$1,000 /day \$1,000 /day \$1,500 /day \$20,000 Day \$150 /day \$150 /day \$150 /day \$150 /day \$1,500 /day \$1,100 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$994,500 \$100,000 \$442,000 \$221,000 \$221,000 \$240,000 \$331,500 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$331,500 \$331,500 \$400,000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,00000 \$200,00000 \$200,00000 \$200,00000 \$200,00000000000 \$200,0000000000000000000000000000000000	\$100,000 \$442,000 \$221,000 \$5,080,000 \$1,134,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1 \$4 \$2 \$5,0 \$1,1
Helicoptei Tubular Services QAQC Shorebase / Dock Services Shorebase / Dock Services Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing To Casing R Other Rer Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Cother Services / Costs Misc Cont Casing R Weil Insu Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	e /Dispatcher ntrol ols unning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Drill String Design ng Services - Drill String Design ng Services - Operational Suppo ng Services - Operational Suppo ng Services - Other ract Labor unning	221 Days 221 Days 40 Days 221 Days	\$2,000 /day \$1,000 /day \$400 /day \$1,500 /day \$20,000 Day \$150 /day \$150 /day \$150 /day \$1,500 /day \$1,000 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$100,000 \$442,000 \$221,000 \$331,500 \$240,000 \$4,420,000 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$331,500 \$400,000 \$400,000 \$200,0000 \$200,000 \$200,000	\$100,000 \$442,000 \$221,000 \$5,080,000 \$1,134,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1 \$4 \$2 \$5,0 \$1,1
Tubular Services OAQC Shorebase / Dock Services Shorebase / Dock Services Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing TC Casing R Other Rer Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Cother Services / Costs Mis Cont Casing R Well Insu Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	e /Dispatcher ntrol ols unning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Drill String Design ng Services - Drill String Design ng Services - Operational Suppo ng Services - Operational Suppo ng Services - Other ract Labor unning	221 Days 221 Days 40 Days 221 Days 221 Days 221 Days 221 Days	\$2,000 /day \$1,000 /day \$400 /day \$1,500 /day \$20,000 Day \$150 /day \$150 /day \$150 /day \$1,500 /day \$1,000 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$100,000 \$442,000 \$221,000 \$331,500 \$240,000 \$4,420,000 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$331,500 \$400,000 \$400,000 \$200,0000 \$200,000 \$200,000	\$442,000 \$221,000 \$5,080,000 \$1,134,000 \$1,134,000	\$0 \$0 \$0 \$0 \$0 \$0	\$4 \$2 \$5,0 \$1,1
OAAC Shorebase / Dock Services Shorebase / Dock Services Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing TC Casing R Other Rer Miscellaneous Special Services Meather F Engineeri Engineeri Engineeri Engineeri Engineeri Coher Services / Costs Misc Cont Casing R Weil Insur Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ntrol ols unning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Casing Design ng Services - Operational Suppo ng Services - Operational Suppo ng Services - Other ract Labor unning	221 Days 221 Days 40 Days 221 Days Days Days 221 Days 221 Days 0 0 0 1 221 Days 221 Days	\$1,000 /day \$400 /day \$1,500 /day \$20,000 Day \$20,000 Day \$150 /day \$150 /day \$1,500 /day \$1,000 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$442,000 \$221,000 \$331,500 \$240,000 \$4,420,000 \$331,500 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$331,500 \$400,000 \$400,000 \$200,0000 \$200,000 \$200,0000 \$200,000	\$442,000 \$221,000 \$5,080,000 \$1,134,000 \$1,134,000	\$0 \$0 \$0 \$0 \$0 \$0	\$4 \$2 \$5,0 \$1,1
Shorebase / Dock Services Shorebase Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing To Casing R Other Ren Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing R Well Insu Overhead Catering Intangible Contingency Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ntrol ols unning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Casing Design ng Services - Operational Suppo ng Services - Operational Suppo ng Services - Other ract Labor unning	221 Days 221 Days 40 Days 221 Days Days Days 221 Days 221 Days 0 0 0 1 221 Days 221 Days	\$1,000 /day \$400 /day \$1,500 /day \$20,000 Day \$20,000 Day \$150 /day \$150 /day \$1,500 /day \$1,000 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$442,000 \$221,000 \$331,500 \$240,000 \$4,420,000 \$331,500 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$331,500 \$400,000 \$400,000 \$200,0000 \$200,000 \$200,0000 \$200,000	\$442,000 \$221,000 \$5,080,000 \$1,134,000 \$1,134,000	\$0 \$0 \$0 \$0 \$0 \$0	\$4 \$2 \$5,0 \$1,1
Shorebas Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing Tc Casing Ri Other Rer Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ntrol ols unning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Casing Design ng Services - Operational Suppo ng Services - Operational Suppo ng Services - Other ract Labor unning	221 Days 221 Days 40 Days 221 Days Days Days 221 Days 221 Days 0 0 0 1 221 Days 221 Days	\$1,000 /day \$400 /day \$1,500 /day \$20,000 Day \$20,000 Day \$150 /day \$150 /day \$1,500 /day \$1,000 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$221,000 \$331,500 \$240,000 \$4,420,000 \$4,420,000 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$3331,500 \$400,000 \$500,000 \$500,000	\$221,000	\$0 \$0 \$0 \$0	\$2 \$5,0 \$1,1
Shorebas Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing Tc Casing Ri Other Rer Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ntrol ols unning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Casing Design ng Services - Operational Suppo ng Services - Operational Suppo ng Services - Other ract Labor unning	221 Days 221 Days 40 Days 221 Days Days Days 221 Days 221 Days 0 0 0 1 221 Days 221 Days	\$1,000 /day \$400 /day \$1,500 /day \$20,000 Day \$20,000 Day \$150 /day \$150 /day \$1,500 /day \$1,000 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$221,000 \$331,500 \$240,000 \$4,420,000 \$4,420,000 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$3331,500 \$400,000 \$500,000 \$500,000	\$221,000	\$0 \$0 \$0 \$0	\$5,0
Shorebas Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing Tc Casing Ri Other Rer Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ntrol ols unning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Casing Design ng Services - Operational Suppo ng Services - Operational Suppo ng Services - Other ract Labor unning	221 Days 221 Days 40 Days 221 Days Days Days 221 Days 221 Days 0 0 0 1 221 Days 221 Days	\$1,000 /day \$400 /day \$1,500 /day \$20,000 Day \$20,000 Day \$150 /day \$150 /day \$1,500 /day \$1,000 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$221,000 \$331,500 \$240,000 \$4,420,000 \$4,420,000 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$3331,500 \$400,000 \$500,000 \$500,000	\$221,000	\$0 \$0 \$0 \$0	\$5,0
Communications VSAT Miscellaneous Rental Equipment Solids Co Fishing T Casing Ri Other Rer Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insu Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ntrol ols unning Equipment tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Casing Design ng Services - Operational Suppo ng Services - Operational Suppo ng Services - Other ract Labor unning	221 Days 221 Days 40 Days 221 Days Days Days 221 Days 221 Days 0 0 0 1 221 Days 221 Days	\$1,000 /day \$400 /day \$1,500 /day \$20,000 Day \$20,000 Day \$150 /day \$150 /day \$1,500 /day \$1,000 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$221,000 \$331,500 \$240,000 \$4,420,000 \$4,420,000 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$3331,500 \$400,000 \$500,000 \$500,000	\$5,080,000	\$0	\$5,0
VSAT Miscellaneous Rental Equipment Solids Co Fishing Tr Casing Ri Other Ren Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overfhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ols Inning Equipment tals orecasting 19 Services - Riser Analysis 19 Services - Drill String Design 19 Services - Casing Design 19 Services - Casing Design 19 Services - Operational Suppo 19 Services - Operational Suppo 19 Services - Other 19 Services - Other 10 Services - Other 10 Services - Design 10 Services - Other 10 Servic	221 Days 221 Days 40 Days 221 Days Days 221 Days 221 Days 0 0 0 1 221 Days 221 Days	\$400 /day \$1,500 /day \$20,000 Day \$1,500 /day \$1,500 /day \$1,500 /day \$1,000 /day \$1,100 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$88,400 \$331,500 \$240,000 \$4,420,000 \$4,420,000 \$33,150 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$331,500 \$400,000 \$500,000 \$500,000	\$5,080,000	\$0	\$5,0
Miscellaneous Rental Equipment Solids Co Fishing T Casing Ri Other Rer Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ols Inning Equipment tals orecasting 19 Services - Riser Analysis 19 Services - Drill String Design 19 Services - Casing Design 19 Services - Casing Design 19 Services - Operational Suppo 19 Services - Operational Suppo 19 Services - Other 19 Services - Other 10 Services - Other 10 Services - Design 10 Services - Other 10 Servic	221 Days 221 Days 40 Days 221 Days Days 221 Days 221 Days 0 0 0 1 221 Days 221 Days	\$400 /day \$1,500 /day \$20,000 Day \$1,500 /day \$1,500 /day \$1,500 /day \$1,000 /day \$1,100 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$88,400 \$331,500 \$240,000 \$4,420,000 \$4,420,000 \$33,150 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$331,500 \$400,000 \$500,000 \$500,000	\$1,134,000	\$0	\$1,1
Solids Co Fishing To Casing Ri Other Rer Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overhead Catering Intangible Contingency Intangible Contingency	ols Inning Equipment tals orecasting 19 Services - Riser Analysis 19 Services - Drill String Design 19 Services - Casing Design 19 Services - Casing Design 19 Services - Operational Suppo 19 Services - Operational Suppo 19 Services - Other 19 Services - Other 10 Services - Other 10 Services - Design 10 Services - Other 10 Servic	221 Days 40 Days 221 Days Days 221 Days 221 Days 0 0 0 0 0 1 221 Days 221 Days	\$1,500 /day \$6,000 Day \$20,000 Day \$150 /day \$1,500 /day \$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$331,500 \$240,000 \$4,420,000 \$330,100 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$50,000 \$331,500 \$400,000 \$500,000 \$243,100	\$1,134,000	\$0	\$1,1
Solids Co Fishing To Casing Ri Other Rer Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overhead Catering Intangible Contingency Intangible Contingency	ols Inning Equipment tals orecasting 19 Services - Riser Analysis 19 Services - Drill String Design 19 Services - Casing Design 19 Services - Casing Design 19 Services - Operational Suppo 19 Services - Operational Suppo 19 Services - Other 19 Services - Other 10 Services - Other 10 Services - Design 10 Services - Other 10 Servic	221 Days 40 Days 221 Days Days 221 Days 221 Days 0 0 0 0 0 1 221 Days 221 Days	\$1,500 /day \$6,000 Day \$20,000 Day \$150 /day \$1,500 /day \$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$331,500 \$240,000 \$4,420,000 \$330,100 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$50,000 \$331,500 \$400,000 \$500,000 \$243,100	\$1,134,000	\$0	\$1,1
Fishing T Casing R Other Rer Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing R Well Insur Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ols Inning Equipment tals orecasting 19 Services - Riser Analysis 19 Services - Drill String Design 19 Services - Casing Design 19 Services - Casing Design 19 Services - Operational Suppo 19 Services - Operational Suppo 19 Services - Other 19 Services - Other 10 Services - Other 10 Services - Design 10 Services - Other 10 Servic	221 Days 40 Days 221 Days Days 221 Days 221 Days 0 0 0 0 0 1 221 Days 221 Days	\$1,500 /day \$6,000 Day \$20,000 Day \$150 /day \$1,500 /day \$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$331,500 \$240,000 \$4,420,000 \$330,100 \$300,000 \$200,000 \$200,000 \$200,000 \$200,000 \$200,000 \$50,000 \$331,500 \$400,000 \$500,000 \$243,100			
Other Rer Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	tals orecasting ng Services - Riser Analysis ng Services - Drill String Design ng Services - Casing Design ng Services - Casing Design ng Services - Wellbore Stability ng Services - Operational Suppo ng Services - Other ract Labor unning	40 Days 221 Days Days 221 Days 221 Days 0 0 0 0 0 1 5 221 Days 40 Days 221 Days 221 Days 221 Days	\$6,000 Day \$20,000 Day \$150 /day \$150 /day \$1,500 /day \$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$240,000 \$4,420,000 \$333,150 \$300,000 \$200,0000 \$200,000 \$200,0000 \$200,0000 \$200,0000 \$200,0000 \$200,			
Miscellaneous Special Services Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	orecasting g Services - Riser Analysis g Services - Drill String Design g Services - Casing Design g Services - Wellbore Stability g Services - Operational Suppo ng Services - Risk Assessments ng Services - Other ract Labor unning	Days Days 221 Days ort is 221 Days 40 Days 221 Days 221 Days 221 Days	\$150 /day \$1,500 /day \$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$33,150 \$300,000 \$200,000 \$50,000 \$200,000 \$200,000 \$50,000 \$400,000 \$500,000 \$243,100			
Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Msc Cont Casing R Weil Insur Overhead Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ng Services - Riser Analysis ng Services - Drill String Design ng Services - Casing Design ng Services - Weilbore Stability ng Services - Operational Suppo ng Services - Operational Suppo ng Services - Other ract Labor 	Days 221 Days ort is 221 Days 40 Days 221 Days 221 Days 221 Days	\$1,500 /day \$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$300,000 \$200,000 \$50,000 \$100,000 \$200,000 \$50,000 \$3331,500 \$400,000 \$500,000 \$500,000			
Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Msc Cont Casing R Weil Insur Overhead Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ng Services - Riser Analysis ng Services - Drill String Design ng Services - Casing Design ng Services - Weilbore Stability ng Services - Operational Suppo ng Services - Operational Suppo ng Services - Other ract Labor 	221 Days ort is 221 Days 40 Days 221 Days 221 Days 221 Days	\$1,500 /day \$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$300,000 \$200,000 \$50,000 \$100,000 \$200,000 \$50,000 \$3331,500 \$400,000 \$500,000 \$500,000			
Weather F Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Msc Cont Casing R Weil Insur Overhead Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ng Services - Riser Analysis ng Services - Drill String Design ng Services - Casing Design ng Services - Weilbore Stability ng Services - Operational Suppo ng Services - Operational Suppo ng Services - Other ract Labor 	221 Days 40 Days 221 Days 221 Days 221 Days	\$1,500 /day \$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$300,000 \$200,000 \$50,000 \$100,000 \$200,000 \$50,000 \$3331,500 \$400,000 \$500,000 \$500,000			
Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Interm ediate	ng Services - Drill String Design ng Services - Casing Design ng Services - Wellbore Stability ng Services - Operational Suppo ng Services - Risk Assessments ng Services - Other ract Labor unning	221 Days 40 Days 221 Days 221 Days 221 Days	\$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$200,000 \$50,000 \$100,000 \$200,000 \$50,000 \$331,500 \$400,000 \$5500,000 \$243,100	\$1,740,000	\$0	\$1,7
Engineeri Engineeri Engineeri Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overhead Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ng Services - Casing Design ng Services - Wellbore Stability ng Services - Operational Suppo ng Services - Risk Assessments ng Services - Other ract Labor unning	221 Days 40 Days 221 Days 221 Days 221 Days	\$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$50,000 \$100,000 \$200,000 \$50,000 \$50,000 \$331,500 \$400,000 \$500,000 \$243,100	\$1,740,000	\$0	\$1,7
Engineeri Engineeri Engineeri Other Services / Costs Misc Cont Casing R Well Insu Overhead Catering Intangible Contingency Intangible Contingency Drive Pipe Conductor Surface Intermediate	ng Services - Wellbore Stability ng Services - Operational Suppo ng Services - Risk Assessments ng Services - Other ract Labor unning	221 Days 40 Days 221 Days 221 Days	\$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$100,000 \$200,000 \$50,000 \$331,500 \$400,000 \$500,000 \$243,100	\$1,740,000	\$0	\$1,7
Engineeri Engineeri Other Services / Costs Misc Cont Casing Ri Well Insur Overhead Catering Intangible Contingency Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ng Services - Operational Suppo ng Services - Risk Assessments ng Services - Other ract Labor unning	221 Days 40 Days 221 Days 221 Days	\$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum Lump Sum Lump Sum	\$200,000 \$200,000 \$50,000 \$331,500 \$400,000 \$500,000 \$243,100	\$1,740,000	\$0	\$1,7
Engineeri Other Services / Costs Misc Cont Casing R Weil Insu: Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	ng Services - Other ract Labor unning	221 Days 40 Days 221 Days 221 Days	\$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum	\$50,000 \$331,500 \$400,000 \$500,000 \$243,100	\$1,740,000	\$0	\$1,7
Other Services / Costs Misc Cont Casing R Well Insu Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	- ract Labor unning	40 Days 221 Days 221 Days	\$10,000 /day \$1,100 /day \$1,200 /day		\$331,500 \$400,000 \$500,000 \$243,100	\$1,740,000	\$0	\$1,7
Misc Cont Casing R Well Insu Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	unning	40 Days 221 Days 221 Days	\$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum	\$400,000 \$500,000 \$243,100	\$1,740,000	\$0	\$1,7
Misc Cont Casing R Well Insu Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate	unning	40 Days 221 Days 221 Days	\$10,000 /day \$1,100 /day \$1,200 /day	Lump Sum	\$400,000 \$500,000 \$243,100			
Well Insur Overhead Catering Intangible Contingency Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate		221 Days 221 Days	\$1,100 /day \$1,200 /day	Lump Sum	\$500,000 \$243,100			
Overhead Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate		221 Days	\$1,200 /day	Lump Sum	\$243,100			
Catering Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate		221 Days	\$1,200 /day					
Intangible Contingency TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate					\$200,200			
TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate		15%	Amount I					
TANGIBLE ITEMS Drive Pipe Conductor Surface Intermediate		15%		07.0./				+
Drive Pipe Conductor Surface Intermediate			/ thousand	ST Drlg = ST Comp =	\$182,017,000 \$0	\$27,303,000	\$0	\$27,3
Drive Pipe Conductor Surface Intermediate					7.5	¢000 000 000	¢0	¢000.0
Drive Pipe Conductor Surface Intermediate				TOTAL	NTANGIBLE	\$209,320,000	\$0	\$209,3
Drive Pipe Conductor Surface Intermediate								
Drive Pipe Conductor Surface Intermediate								
Conductor Surface Intermediate								
Conductor Surface Intermediate	OD 4	= # Strings	Length		\$/ft			
Surface Intermediate	36" 20"		200 606		\$500.00 \$180.00	\$100,000	\$0	\$1
Intermediate	13-3/8"		5,364		\$140.00	\$110,000 \$751,000	\$0 \$0	\$1
	11-3/4"		8,715		\$80.00	\$698,000	\$0 \$0	\$6
Intermediate			-,		÷::::00	\$0,000		ە 0
Intermediate								
Intermediate	1							
Production Liner								
Production Tie-back								
Tubing								
Liner Equipment						\$150,000	\$0	\$1
Whipstock Equipment & BP								
Subsurface Completion								
Wellheads						\$500,000	\$0	\$5
Miscellaneous / Other	+					\$100,000	\$0	\$1
Tangible Contingency	I	10%	Amount	ST Drlg =	\$2,409,000	\$241.000	¢0	\$2
.a.g.die Gontingenby		10%	,	ST Comp =	\$2,409,000	\$241,000	\$0	\$2
				-		\$2,650,000	\$0	\$2,6
				IUTAL	ANUDLE	\$2,030,000		
						A	\$0	
				Tota	al Dry Hole Cost Completion Cost	\$211,970,000 \$0	\$0 \$0	\$211,9



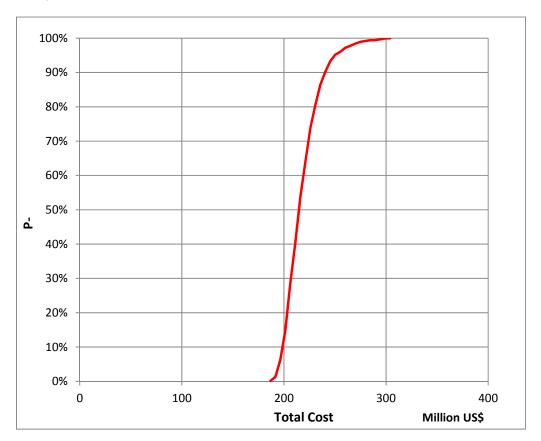
6.3.5 Case 4b Cost Estimate:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Tan	Total	P10	P50	P90	
239	\$220,814	\$6,253	\$227,067	\$198,614	\$214,640	\$240,231	

Figure 173. Hawaii Location: Case 4b – Cost Estimate

The following chart shows the cumulative probability of cost.





			<u>SCOPING</u>	COST ESTIMA	TE DETAIL			Re
			BFAM	- Hawaii, C	Case 4b		** DRAFT	**
	_	Due						
BLADE		Pre	pared For:	IODP / JA	MSTEC/C	DEX		Exploratory _X
NERGY PARTNEI		CDEX / JA	MOTEO		Davisian No.	4		Development
	_ease Nan		NISTEC	Case No.	Revision No. Water Depth	1 Proposed TD	Date: Formation	30-Jun-13
				#4b	4050m	10,750m	Moho / Mantle	
					13,287 ft	35,269 ft		
	Surface Lo			N / Long: 154.5 ·				
		Location:	Lat: 22.9 - 23.9°	N / Long: 154.5	- 155.8°W			
urpose of Expenditu								
cientific Drilling to the ase 4b: Conventiona				en coring 500m of	the Mantle			
ase 40. Conventiona	ii Deepwal		Configuration					
rilling Rig : (Chikyu		D	irectional Plan:	Vertical Hole			
	-	BLE ITEMS				Dry Hole Drig	Complete	TOTAL
						242 Days		242 Days
Location/ Reg	ulatory Cos	sts				\$3,020,000	\$0	\$3,020,0
Rig Mobilizatio	n, Demob	ilization				\$10,800,000	\$0	\$10,800,0
Drilling Rig - D			/Day			\$133,600,000	\$0	\$133,600,0
Bits, Drill Colla						\$3,311,000	\$0	\$3,311,
Directional & D Fuel, Water &		Services				\$4,019,000 \$14,157,000	\$0 \$0	\$4,019, \$14,157,
Drilling Fluids						\$14,157,000 \$2,799,000	\$0 \$0	\$14,157, \$2,799,
Electric Loggir		d Hole Logs				\$4,826,000	\$0	\$4,826
Cementing		- 30				\$1,053,000	\$0	\$1,053
Mud Logging a	and Geolog	gical Services	6			\$593,000	\$0	\$593
Land Transpo						\$109,000	\$0	\$109
Boat Transpor						\$2,783,000	\$0	\$2,783
Helicopter Tra Tubular Servic		n				\$1,089,000 \$150,000	\$0 \$0	\$1,089 \$150
Shorebase / D		-AC				\$130,000	\$0	\$130
Communicatio		00				\$242,000	\$0	\$242
Miscellaneous	Rental Ec	quipment				\$5,720,000	\$0	\$5,720
Miscellaneous	Special S	ervices				\$1,137,000	\$0	\$1,137
Other Services						\$2,120,000	\$0	\$2,120
Intan Continge	ency at	15%				\$28,802,000	\$0	\$28,802
				TOTAL IN	TANGIBLE	\$220,814,242	\$0	\$220,814 ,2
-	TANGIBLI	E ITEMS						
			OD	Footage	\$/ft			-
Drive Pipe			36"	200	\$650.00	\$130,000	\$0	\$130
Conductor			22"	656	\$180.00	\$119,000	\$0	\$119
Surface			18"	4,858	\$160.00	\$778,000	\$0	\$778
Intermediate			16"	8,707	\$155.00		\$0	\$1,350
Intermediate			13-3/8"	12,863	\$140.00		\$0	\$1,801
Intermediate				4,000	\$80.00	\$320,000	\$0	\$320
Intermediate	~~		9-5/8"	4,078	\$70.00	\$286,000	\$0 \$0	\$286
Production Lin			0	0	0.00	\$0	\$0 \$0	
Production Tie	-раск			0	\$0.00	\$0	\$0 \$0	
Tubing			0	0	\$0.00	\$0	\$0	# 000
Liner Equipmt Whipstock Equ						\$300,000 \$0	\$0 \$0	\$300
Subsurface Co	Sinpletion					\$0	\$0	#F^^
10/-11	Other					\$500,000	\$0 \$0	\$500
Wellheads		10%				\$100,000 \$569,000	\$0 \$0	\$100 \$569
Miscellaneous		1070						
	icyat				ANCIDIE	\$6,253,000	\$0	\$6,253,
Miscellaneous	icyat			TOTAL T	ANGIDLE			
Miscellaneous				Tota	al Dry Hole Cost	\$227,067,242	\$0	\$227,067,
Miscellaneous				Tota		\$227,067,242	\$0	



		SCOPING CO	<u>OST ESTIN</u>	ATE SUMM	<u>ARY</u>				F
		BEAM	Hawai	i, Case 4	b	*	** DRAFT	**	
	-	Prepared For		1					Exploratory _X_
RGY PARTNI	ERS	. Toparou i o	. 1001 /	UANOTEO	, ODLA				Development
XXX	Operator:	CDEX / JAMSTEC				Revision No.	1	Date:	30-Jun-13
ect or Field	Lease Name			Case No.		Water Depth	Proposed TD	Objective	
e Hole	N/A			#4b		4050m 13,287 ft	10,750m 35,269 ft	Moho / Mantle	
ion	Surface Loca	ation: Lat: 22.9 - 23.9°N / Long: 154	.5 - 155.8°V	v			00,200 11		
uii	Btm. Hole Lo								
se of Expend									
		e. Assume drilling to the Moho, then co	ring 500m	of the Mantle				· · · · · · · · ·	Ave Inten C/
4b: Convent	tional Deepw	ater Case Well Configuration							Avg Intan \$/ \$912,455
Drilling Rig	: Chikvu		Dir	ectional Plan:	Vertical Hol	e			4012 ,400
	INTANGIBLI	EITEMS				-	Dry Hole Drig	Complete	TOTAL
					Оре	erational Time =	242 Days		242 Days
Location/ R	egulatory Cost						\$3,020,000	\$0	\$3,020
		Metocean Study (desktop study, data collecti	on/processir	ng)	Lump Sum	\$1,000,000			
		Site Survey (desktop study, bathymetry)			Lump Sum	\$2,000,000			
		Regulatory			Lump Sum	\$20,000			
Rig Mobiliza	ation, Demobiliz	zation					\$10,800,000	 	\$10,800
		Mobilization (from Japan)			Lump Sum	\$5,400,000	φ10,300,000		÷10,000
		Demobilization (to Japan)			Lump Sum	\$5,400,000			
Drilling Rig	- Day Work						\$133,600,000	\$0	\$133,600
		Drilling Day Rate	242 Days	\$300,000 /day		\$72,600,000			
		Existing Riser System Modifications			Lump Sum				
		Additional Riser			Lump Sum	\$47,000,000			
Bits, Drill Co	ollars & Stabiliz	zers					\$3,311,000	\$0	\$3,311
		Drill Bits	26 No.	\$70,000 /bit		\$1,820,000	\$2,311,000		\$0,011
		Drill String Rentals: DC's, Jars, Stab, HWT	242 Days	\$4,000 /day		\$968,000			
		Core Bits	6 No.	\$60,000 /bit		\$360,000			
		Coring Services	65 Days	\$2,500 /day		\$162,500			
Directions	P Downhala O								
Directional	& Downhole Se	Surveys/Gyros/Single & Multi-Shots			Lump Sum	\$20,000	\$4,019,000	\$0	\$4,019
		MWD / LWD Mob / De-mob							
					Lump Sum	\$30.000			
		Standard MWD Rental	121 Days	\$3,000 /day	Lump Sum	\$30,000 \$363,000			
		Standard MWD Rental Standard LWD Rental	121 Days	\$7,000 /day	Lump Sum	\$363,000 \$847,000			
		Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2)	121 Days 242 Days	\$7,000 /day \$2,000 /day	Lump Sum	\$363,000 \$847,000 \$484,000			
		Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools	121 Days 242 Days 194 Days	\$7,000 /day \$2,000 /day \$3,000 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800			
		Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental	121 Days 242 Days 194 Days 121 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$484,000			
		Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools	121 Days 242 Days 194 Days	\$7,000 /day \$2,000 /day \$3,000 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800			
Fuel, Water	· & Lube	Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental	121 Days 242 Days 194 Days 121 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$484,000	\$14,157,000	\$0	\$14,157
Fuel, Water	& Lube	Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel	121 Days 242 Days 194 Days 121 Days 121 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$53,000 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$484,000 \$1,210,000 \$1,210,000 \$12,826,000	\$14,157,000	\$0	\$14,157
Fuel, Water	* & Lube	Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel	121 Days 242 Days 194 Days 121 Days 121 Days 242 Days 121 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$53,000 /day \$4,000 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$1,210,000 \$1,210,000 \$12,826,000 \$484,000	\$14,157,000	\$0	\$14,157
Fuel, Water	& Lube	Standard MWD Rental Standard LWD Rental MWD /LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel	121 Days 242 Days 194 Days 121 Days 121 Days 242 Days 121 Days 121 Days 121 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$53,000 /day \$4,000 /day \$3,000 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$1,210,000 \$12,826,000 \$484,000 \$484,000 \$363,000	\$14,157,000	\$0	\$14,157
Fuel, Water	& Lube	Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel	121 Days 242 Days 194 Days 121 Days 121 Days 242 Days 121 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$53,000 /day \$4,000 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$1,210,000 \$1,210,000 \$12,826,000 \$484,000	\$14,157,000	\$0	\$14,157
		Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 121 Days 121 Days 122 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$53,000 /day \$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$1,210,000 \$1,210,000 \$12,826,000 \$484,000 \$363,000 \$363,000	\$14,157,000	\$0	\$14,157
Fuel, Water		Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 121 Days 121 Days 122 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$53,000 /day \$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day		\$363,000 \$847,000 \$484,000 \$580,800 \$1,210,000 \$1,210,000 \$12,826,000 \$484,000 \$363,000 \$314,600 \$169,400	\$14,157,000		
		Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$4,000 /day \$1,300 /day \$1,300 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$1,210,000 \$1,210,000 \$12,826,000 \$484,000 \$363,000 \$314,600 \$169,400 \$2,000,000			
		Standard MWD Rental Standard LWD Rental MWD /LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer	121 Days 242 Days 194 Days 121 Days 121 Days 242 Days 121 Days 242 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$53,000 /day \$53,000 /day \$3,000 /day \$700 /day \$700 /day \$8800 /day		\$363,000 \$847,000 \$484,000 \$484,000 \$1,210,000 \$1,210,000 \$1,210,000 \$484,000 \$363,000 \$314,600 \$169,400 \$169,400 \$169,400 \$169,400 \$169,400 \$169,400			
		Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$4,000 /day \$1,300 /day \$1,300 /day		\$363,000 \$847,000 \$484,000 \$580,800 \$1,210,000 \$1,210,000 \$12,826,000 \$484,000 \$363,000 \$314,600 \$169,400 \$2,000,000			
Drilling Fluid		Standard MWD Rental Standard LWD Rental MWD /LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs	121 Days 242 Days 194 Days 121 Days 121 Days 242 Days 121 Days 242 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$53,000 /day \$53,000 /day \$3,000 /day \$700 /day \$700 /day \$8800 /day		\$363,000 \$847,000 \$484,000 \$580,800 \$484,000 \$1,210,000 \$1,210,000 \$484,000 \$314,600 \$169,400 \$169,400 \$169,400 \$193,600 \$605,000		\$0	\$2,799
Drilling Fluid	ds Services	Standard MWD Rental Standard LWD Rental MWD /LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel	121 Days 242 Days 194 Days 121 Days 121 Days 242 Days 121 Days 242 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$53,000 /day \$53,000 /day \$3,000 /day \$700 /day \$700 /day \$8800 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$484,000 \$1,210,000 \$1,210,000 \$12,826,000 \$363,000 \$363,000 \$314,600 \$169,400 \$169,400 \$193,600 \$605,000 \$726,000	\$2,799,000	\$0	\$14,157 \$2,799 \$4,826
Drilling Fluid	ds Services	Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$2,500 /day	Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$1,210,000 \$1,210,000 \$12,826,000 \$314,600 \$363,000 \$169,400 \$169,400 \$169,400 \$193,600 \$193,600 \$193,600 \$1726,000 \$1,500,000	\$2,799,000	\$0	\$2,799
Drilling Fluid	ds Services	Standard MWD Rental Standard LWD Rental MWD /LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$2,500 /day	Lump Sum Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$1,210,000 \$1,210,000 \$12,826,000 \$314,000 \$363,000 \$314,600 \$169,400 \$169,400 \$193,600 \$193,600 \$726,000 \$1,500,000 \$1,500,000	\$2,799,000	\$0	\$2,799
Drilling Fluid	ds Services	Standard MWD Rental Standard LWD Rental MWD / LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$2,500 /day	Lump Sum	\$363,000 \$447,000 \$484,000 \$580,800 \$1,210,000 \$1,210,000 \$12,826,000 \$314,000 \$363,000 \$314,600 \$314,600 \$169,400 \$169,400 \$193,600 \$193,600 \$1,500,000 \$1,500,000	\$2,799,000	\$0	\$2,799
Drilling Fluid	ds Services gging & Cased I	Standard MWD Rental Standard LWD Rental MWD /LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$2,500 /day	Lump Sum Lump Sum	\$363,000 \$847,000 \$484,000 \$580,800 \$1,210,000 \$1,210,000 \$12,826,000 \$314,000 \$363,000 \$314,600 \$169,400 \$169,400 \$193,600 \$193,600 \$726,000 \$1,500,000 \$1,500,000	\$2,799,000	\$0	\$2,799 \$4,826
Drilling Fluic	ds Services gging & Cased I	Standard MWD Rental Standard LWD Rental MWD /LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging Cased Hole Logging Cased Hole Logging	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$363,000 \$847,000 \$484,000 \$484,000 \$1,210,000 \$1,210,000 \$1,210,000 \$363,000 \$314,600 \$169,400 \$169,400 \$169,400 \$169,400 \$1,500,000 \$1,500,000 \$1,500,000 \$100,000	\$2,799,000 \$4,826,000	\$0	\$2,799 \$4,826
Drilling Fluic	ds Services gging & Cased I	Standard MWD Rental Standard LWD Rental MWD /LWD Engineers (2) Mud Motors & Associated Tools High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logg Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 18"	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$363,000 \$847,000 \$484,000 \$484,000 \$1,210,000 \$1,210,000 \$1,210,000 \$1484,000 \$314,600 \$314,600 \$169,400 \$169,400 \$193,600 \$193,600 \$193,600 \$100,000 \$11,500,000 \$100,000 \$100,000 100,000	\$2,799,000 \$4,826,000	\$0	\$2,799 \$4,826
Drilling Fluic	ds Services gging & Cased I	Standard MVD Rental Standard LVD Rental MVD / LVD Engineers (2) Mud Motors & Associated Tools High Temp MVD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging Cased Hole Logging 22"	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$363,000 \$847,000 \$484,000 \$484,000 \$1,210,000 \$1,210,000 \$12,826,000 \$314,000 \$363,000 \$314,600 \$169,400 \$169,400 \$169,400 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,000,000 \$1,000,000 100,000 150,000	\$2,799,000 \$4,826,000	\$0	\$2,799 \$4,826
Drilling Fluic	ds Services gging & Cased I	Standard MVD Rental Standard LVD Rental Standard LVD Rental MVD / LVD Engineers (2) Mud Motors & Associated Tools High Temp MVD Rental High Temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging Cased Hole Logging Cased Hole Logging 22" 18" 16"	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$363,000 \$847,000 \$484,000 \$484,000 \$1,210,000 \$1,210,000 \$1,210,000 \$1484,000 \$363,000 \$1484,000 \$149,400 \$149,400 \$193,600 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,000,000 100,000 150,000	\$2,799,000 \$4,826,000	\$0	\$2,799 \$4,826
Drilling Fluic	ds Services gging & Cased I	Standard MVD Rental Standard LVD Rental MVD / LVD Engineers (2) Mud Motors & Associated Tools High Temp MVD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging Cased Hole Logging 22"	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$363,000 \$847,000 \$484,000 \$484,000 \$1,210,000 \$1,210,000 \$1,210,000 \$314,600 \$363,000 \$149,400 \$169,400 \$169,400 \$150,000 \$11,500,000 \$11,500,000 \$100,000 \$100,000 100,000 150,000	\$2,799,000 \$4,826,000	\$0	\$2,799
Drilling Fluic	ds Services gging & Cased I	Standard MVD Rental Standard LVD Rental MVD /LWD Engineers (2) MUd Motors & Associated Tools High Temp MVD Rental High temp LWD Rental Rig Fuel Boat Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging Cased Hole Logging 22" 18" 16" 11.75"	121 Days 242 Days 194 Days 121 Days 121 Days 121 Days 121 Days 121 Days 242 Days 242 Days 242 Days 242 Days	\$7,000 /day \$2,000 /day \$3,000 /day \$4,000 /day \$10,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$363,000 \$847,000 \$484,000 \$484,000 \$1,210,000 \$1,210,000 \$12,826,000 \$314,600 \$363,000 \$149,400 \$169,400 \$169,400 \$169,400 \$169,400 \$1,500,000 \$1,500,000 \$1,500,000 \$100,000 100,000 100,000 100,000 100,000	\$2,799,000 \$4,826,000	\$0	\$2,799 \$4,826



	cal Services					\$593,000	\$0	\$5
	Logging Unit Operating rate	242 Days	\$1,250 /day		\$302,500			
	Personnel Charges	242 Days	\$1,200 /day		\$290,400			
Land Transportation						\$109,000	\$0	\$1
	Trucking	121 Days	\$900 /day		\$108,900			
Boat Transportation						\$2,783,000	\$0	\$2,7
bout manopolitation	Work Boat - Spot Hire	121 Days	\$14,000 /day		\$1,694,000	\$2,703,000	\$ 0	Ψ 2 ,1
	Crew Boat - Spot Hire	121 Days	\$9,000 /day		\$1,089,000			
Helicopter Transportation						\$1,089,000	\$0	\$1,0
	Helicopter - spot hire	121 Days	\$9,000 /day		\$1,089,000	\$1,089,000	\$0	\$1,0
		121 54,5	\$0,0007ddy		\$1,000,000			
Tubular Services						\$150,000	\$0	\$1
	QAQC			Lump Sum	\$150,000			
Shorebase / Dock Service:	S					\$484,000	\$0	\$4
	Shorebase /Dispatcher	242 Days	\$2,000 /day		\$484,000			
Communications						\$242,000	\$0	\$2
	VSAT	242 Days	\$1,000 /day		\$242,000	\$242,000	+0	
		······						
Miscellaneous Rental Equi		040 0	¢400 /4/		<u> </u>	\$5,720,000	\$0	\$5,7
	Solids Control Fishing Tools	242 Days 242 Days	\$400 /day \$1,500 /day		\$96,800 \$363,000			
	Casing Running Equipment	70 Days	\$6,000 Day		\$420,000			
	Other Rentals	242 Days	\$20,000 Day		\$4,840,000			
		Days Days						
Miscellaneous Special Ser	rvices	⊔ays				\$1,137,000	\$0	\$1.7
	Weather Forecasting	242 Days	\$150 /day		\$36,300	+ 1, 101,000	÷0	÷.,
	Engineering Services - Riser			Lump Sum	\$300,000			
	Engineering Services - Drill S Engineering Services - Casin			Lump Sum Lump Sum	\$200,000 \$50,000			
	Engineering Services - Wellbo			Lump Sum	\$100,000			
	Engineering Services - Opera			Lump Sum	\$200,000			
	Engineering Services - Risk A	Assessments		Lump Sum	\$200,000			
	Engineering Services - Other			Lump Sum	\$50,000			
Other Services / Costs						\$2,120,000	\$0	\$2,7
	Misc Contract Labor	242 Days	\$1,500 /day		\$363,000			
	Casing Running	70 Days	\$10,000 /day		\$700,000			
	Well Insurance Overhead	242 Days	\$1,100 /day	Lump Sum	\$500,000 \$266,200			
	Catering	242 Days	\$1,200 /day		\$290,400			
		······						
ntangible Contingency		15%	Amount	ST Drla –	\$102.012.000	\$28 802 000	¢0	\$20 (
Intangible Contingency		15%	Amount	ST Drlg = ST Comp =	\$192,012,000 \$0	\$28,802,000	\$0	\$28,8
Intangible Contingency		15%	Amount	ST Comp =	\$192,012,000 \$0 NTANGIBLE			
Intangible Contingency		15%	Amount	ST Comp =	\$0	\$28,802,000 \$220,814,000	\$0 \$0	
ntangible Contingency		15%	Amount	ST Comp =	\$0			
Intangible Contingency		15%	Amount	ST Comp =	so NTANGIBLE			
TANGIBLE I	OD	15% 7 =#Strings	Length	ST Comp =	\$0 NTANGIBLE \$/ft	\$220,814,000	\$0 	\$220,ŧ
TANGIBLE I Drive Pipe	OD 36"		Length 200	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00	\$220,814,000 \$130,000	\$0 \$0 \$0	\$220,8
TANGIBLE I Drive Pipe Conductor	OD 36" 22"		Length 200 656	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00	\$220,814,000 \$130,000 \$119,000	\$0 \$0 \$0 \$0	\$220,8
TANGIBLE I Drive Pipe Conductor Surface	OD 36" 22" 18"		Length 200 656 4,858	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00	\$220,814,000 \$130,000 \$119,000 \$778,000	\$0 \$0 \$0 \$0 \$0 \$0	\$220,8
TANGIBLE I Drive Pipe Conductor Surface Intermediate	OD 36" 22"		Length 200 656 4,858 8,707	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$155.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$220,8 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate	OD 36" 22" 18" 16"		Length 200 656 4,858	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000 \$1,801,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$220,8 \$ \$ \$ \$1,3 \$1,4
TANGIBLE I Drive Pipe Conductor Surface Intermediate	0D 36" 22" 18" 16" 13-3/8"		Length 200 656 4,858 8,707 12,863	ST Comp =	\$0 NTANGIBLE \$650.00 \$160.00 \$160.00 \$155.00 \$140.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$220,ŧ
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner	OD 36" 22" 18" 16" 13-378" 11-3/4"		Length 200 656 4,858 8,707 12,863 4,000	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000 \$1,801,000 \$320,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,8 \$ \$ \$ \$1,1 \$1,1 \$ \$1,1 \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate intermediate Production Liner Production Tie-back	OD 36" 22" 18" 16" 13-378" 11-3/4"		Length 200 656 4,858 8,707 12,863 4,000	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000 \$1,801,000 \$320,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,8 \$ \$ \$ \$1,1 \$1,1 \$ \$1,1 \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing	OD 36" 22" 18" 16" 13-378" 11-3/4"		Length 200 656 4,858 8,707 12,863 4,000	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000 \$1,801,000 \$320,000 \$286,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$220,8 \$ \$ \$1,1 \$1,1 \$ \$ \$ 2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment	OD 36" 22" 18" 16" 13-378" 11-3/4" 9-5/8"		Length 200 656 4,858 8,707 12,863 4,000	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000 \$1,801,000 \$320,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,8 \$ \$ \$ \$1,1 \$1,1 \$ \$1,1 \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP	OD 36" 22" 18" 16" 13-378" 11-3/4" 9-5/8"		Length 200 656 4,858 8,707 12,863 4,000	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000 \$1,801,000 \$320,000 \$286,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$220,8 \$ \$ \$1,1 \$1,1 \$ \$ \$ 2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion	OD 36" 22" 18" 16" 13-378" 11-3/4" 9-5/8"		Length 200 656 4,858 8,707 12,863 4,000	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,801,000 \$320,000 \$3286,000 \$3300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,8 \$ \$ \$ \$ \$ \$ 1,4 \$ 1,4 \$ \$ 2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tie-back Tubing Liner Equipment Ahipstock Equipment & BP Subsurface Completion Weilheads	OD 36" 22" 18" 16" 13-378" 11-3/4" 9-5/8"		Length 200 656 4,858 8,707 12,863 4,000	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000 \$1,350,000 \$286,000 \$3300,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,8 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tie-back Tubing Liner Equipment Ahipstock Equipment & BP Subsurface Completion Weilheads	OD 36" 22" 18" 16" 13-378" 11-3/4" 9-5/8"		Length 200 656 4,858 8,707 12,863 4,000	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,801,000 \$320,000 \$3286,000 \$3300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,i \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-378" 11-3/4" 9-5/8"	7 =#Strings	Length 200 656 4,858 8,707 12,863 4,000	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000 \$1,350,000 \$286,000 \$3300,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,4 \$220,4 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-378" 11-3/4" 9-5/8"	7 =#Strings	Length 200 656 4,858 8,707 12,863 4,000 4,078	ST Comp = TOTAL II	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00 \$70.00	\$220,814,000 \$130,000 \$119,000 \$1,350,000 \$1,801,000 \$320,000 \$286,000 \$300,000 \$300,000 \$500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,4 \$220,4 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-378" 11-3/4" 9-5/8"	7 =#Strings	Length 200 656 4,858 8,707 12,863 4,000 4,078	ST Comp = TOTAL II ST Drig = ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$20.00 \$140.00 \$20.00 \$140.00 \$20.00	\$220,814,000 \$130,000 \$119,000 \$1,350,000 \$1,801,000 \$320,000 \$286,000 \$300,000 \$300,000 \$500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,8 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP	OD 36" 22" 18" 16" 13-378" 11-3/4" 9-5/8"	7 =#Strings	Length 200 656 4,858 8,707 12,863 4,000 4,078	ST Comp = TOTAL II TOTAL II ST Drig = ST Comp = TOTAL	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$140.00 \$30.00 \$70.00 \$	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000 \$1,350,000 \$286,000 \$300,000 \$300,000 \$5509,000 \$569,000 \$6,253,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,8 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-378" 11-3/4" 9-5/8"	7 =#Strings	Length 200 656 4,858 8,707 12,863 4,000 4,078	ST Comp = TOTAL II ST Drlg = ST Drlg = ST Comp = TOTAL Tota	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00 \$70.00	\$220,814,000 \$130,000 \$119,000 \$778,000 \$1,350,000 \$1,350,000 \$286,000 \$300,000 \$300,000 \$5500,000 \$569,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$220,8 \$ \$ \$1,1 \$1,1 \$ \$ \$ 2



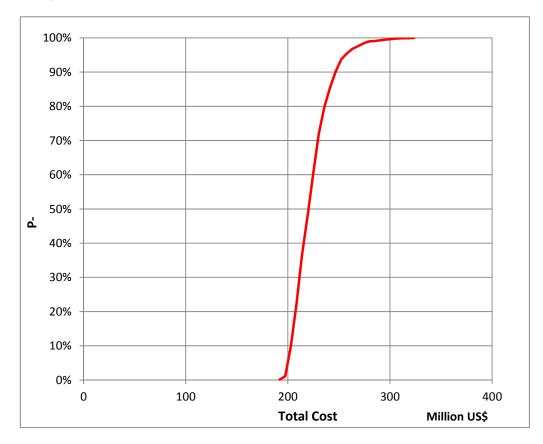
6.3.6 Case 4c Cost Estimate:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Sto	chastic Co	sts
Days	Intan	Tan	Total	P10	P50	P90
271	\$221,814	\$9,149	\$230,963	\$202,990	\$220,246	\$246,661

Figure 174. Hawaii Location: Case 4c – Cost Estimate

The following chart shows the cumulative probability of cost.





	l C	<u>SCOPING</u>	COST ESTIMAT	<u>E SUMMARY</u>			Re
	*	BEAN	/I - Hawaii, C	ase 4c		** DRAFT	**
	P		r: IODP/JA				
SLAD Nergy Partn		repared FO					Exploratory _X Development
FE# XXX	Operator: CDEX /	JAMSTEC		Revision No.	1	Date:	30-Jun-13
ospect or Field	Lease Name	0/4110120	Case No.	Water Depth	Proposed TD	Formation	
antle Hole	N/A		#4b	4050m	10,750m	Moho / Mantle	
				13,287 ft	35,269 ft		
ocation	Surface Location:		.9°N / Long: 154.5 -				
awaii	Btm. Hole Location	n: Lat: 22.9 - 23.	.9°N / Long: 154.5 -	155.8°W			
Irpose of Expend				1 M			
	the Mantle. Assume de Case Well Configur	-	then coring 500m of	the Mantie			
ise 40. Expandabl	e case well conligu	auon					
illing Rig :	Chikyu		Directional Plan:	/ertical Hole			
0 0	INTANGIBLE ITEN	//S			Dry Hole Drig	Complete	TOTAL
					244 Days		244 Days
Location/ Re	egulatory Costs				\$3,020,000	\$0	\$3,020
Rig Mobiliza	tion, Demobilization				\$10,800,000	\$0	\$10,800
	Day Work at \$300,00	00 / Day			\$134,200,000	\$0	\$134,200
	llars & Stabilizers				\$3,319,000	\$0	\$3,319
Fuel, Water	& Downhole Services				\$4,052,000 \$14,274,000	\$0 \$0	\$4,052 \$14,274
Drilling Fluid					\$14,274,000	\$0	\$14,274
	ging & Cased Hole Lo	ogs			\$4,832,000	\$0 \$0	\$4,832
Cementing					\$1,055,000	\$0	\$1,055
	g and Geological Serv	ices			\$598,000	\$0	\$598
Land Transp					\$110,000	\$0	\$110
Boat Transp	ransportation				\$2,806,000	\$0	\$2,806
Tubular Ser					\$1,098,000 \$150,000	\$0 \$0	\$1,098 \$150
	Dock Services				\$488,000	\$0	\$488
Communica					\$244,000	\$0	\$244
Miscellaneo	us Rental Equipment				\$5,764,000	\$0	\$5,764
	us Special Services				\$1,137,000	\$0	\$1,137
Other Servic					\$2,128,000	\$0	\$2,128
Intan Contin	gencyat 15%				\$28,933,000	\$0	\$28,933
	• · · · · · · · · · · · · · · · · · · ·						
			TOTAL IN		\$221,814,244	\$0	\$221,814,
	TANGIBLE ITEMS						
		OD	Footage	\$/ft			
Drive Pipe		36"	200	\$650.00	\$130,000	\$0	\$130
Conductor		22"	656	\$180.00	\$119,000	\$0	\$119
Surface		16.5" SE		\$300.00	\$1,518,000	\$0	\$1,518
Intermediate	,	16.5" SE		\$300.00	\$1,215,000	\$0	\$1,215
Intermediate		16"	12,507	\$155.00	\$1,939,000	\$0	\$1,939
Intermediate		13.375"	16,563	\$140.00	\$2,319,000	\$0	\$2,319
Intermediate		11.75"	4,078	\$80.00	\$327,000	\$0	\$327
Production L		0	0	\$0.00	\$0	\$0	
Production 1	ie-back	0	0	\$0.00	\$0	\$0	
Tubing		0	0	\$0.00	\$0	\$0	-
Liner Equip					\$150,000	\$0	\$150
Whipstock E					\$0	\$0	
Subsurface	Completion				\$0	\$0	A E • • •
Wellheads					\$500,000	\$0	\$500
Miscellaneo					\$100,000 \$832,000	\$0 \$0	\$100 \$832
Tan Conting							
Tan Conting			TOTAL T	ANGIBLE	\$9,149,000	\$0	\$9,149,
Tan Conting							
Tan Conting				I Dry Hole Cost	\$230,963,244	\$0	\$230,963,
Tan Conting			Tota	I Dry Hole Cost	\$230,963,244 \$0		\$230,963,



		SCOPING (<u>COST EST</u>	IMATE DETA	A/L				F
		BEAM	- Hawai	i, Case 4	с	*	** DRAFT	**	
		Prepared For	r: IODP/	JAMSTEC	/ CDEX				Exploratory _X_
RGY PARTNI	E R S								Development
# XXX	Operator:	CDEX / JAMSTEC			i i	Revision No.	1	Date:	30-Jun-13
pect or Field	Lease Name		-	Case No. #4b		Water Depth 4050m	Proposed TD 10,750m	Objective Moho / Mantle	
	N/A			#40		13,287 ft	35,269 ft	wono / wante	
tion	Surface Loca								
aii	Btm. Hole Lo	cation: Lat: 22.9 - 23.9°N / Long: 154	i.5 - 155.8℃	V					
ose of Expend		e. Assume drilling to the Moho, then co	ring 500m	of the Mantie					
		Il Configuration	ining South	or the Manue					Avg Intan \$/
									\$909,074
Drilling Rig			Dir	ectional Plan:	Vertical Hol	e			
	INTANGIBLE	ITEMS					Dry Hole Drig	Complete	TOTAL
Location/ P	egulatory Costs				Оре	erational Time =	244 Days	¢0	244 Days
Location/ R	egulatory Costs	Metocean Study (desktop study, data collecti	ion/processir	od)	Lump Sum	\$1,000,000	\$3,020,000	\$0	\$3,020
		Site Survey (desktop study, data conecti	on/processii	19)	Lump Sum	\$2,000,000			
·····		Regulatory			Lump Sum	\$20,000			
Rig Mobiliza	ation, Demobiliz						\$10,800,000		\$10,800
		Mobilization (from Japan)			Lump Sum	\$5,400,000			
	D	Demobilization (to Japan)			Lump Sum	\$5,400,000			
Drilling Rig	- Day Work	Drilling Day Rate	244 Dove	\$300,000 /day		¢72 000 000	\$134,200,000	\$0	\$134,200
		Existing Riser System Modifications	Z44 Days	φουυ,υυυ /uay	Lump Sum	\$73,200,000 \$14,000,000		<u> </u>	
		Additional Riser			Lump Sum	\$47,000,000			
		· · · · · · · · · · · · · · · · · · ·	<u> </u>		<u> </u>				
Bits, Drill Co	ollars & Stabiliz						\$3,319,000	\$0	\$3,319
		Drill Bits	26 No.	\$70,000 /bit		\$1,820,000			
		Drill String Rentals: DC's, Jars, Stab, HWT Core Bits	244 Days 6 No.	\$4,000 /day \$60,000 /bit		\$976,000 \$360,000			
		Coring Services	65 Days	\$00,000 /bit \$2,500 /day		\$162,500			
Directional	& Downhole Se	rvices					\$4,052,000	\$0	\$4,052
		Surveys/Gyros/Single & Multi-Shots			Lump Sum				
		MWD / LWD Mob / De-mob	400 D	\$2.000 (I)	Lump Sum	\$30,000			
		Standard MWD Rental Standard LWD Rental	122 Days 122 Days	\$3,000 /day \$7,000 /day		\$366,000 \$854,000			
		MWD / LWD Engineers (2)	244 Days	\$2,000 /day		\$488,000			
		Mud Motors & Associated Tools	195 Days	\$3,000 /day		\$585,600	·····		
		High Temp MWD Rental	122 Days	\$4,000 /day		\$488,000			
		High temp LWD Rental	122 Days	\$10,000 /day		\$1,220,000			
									
Dual West							A 4 6		
Fuel, Water	& Lube	Rig Fuel	244 Dave	\$53,000 /day		\$12 932 000	\$14,274,000	\$0	\$14,274
Fuel, Water	r & Lube	Rig Fuel Boat Fuel	244 Days 122 Days	\$53,000 /day \$4,000 /day		\$12,932,000 \$488,000	\$14,274,000	\$0	\$14,274
Fuel, Water	r & Lube	Boat Fuel Helicopter Fuel	122 Days 122 Days	\$4,000 /day \$3,000 /day		\$488,000 \$366,000	\$14,274,000	\$0	\$14,274
Fuel, Water	r & Lube	Boat Fuel Helicopter Fuel Lubricants	122 Days 122 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day		\$488,000 \$366,000 \$317,200	\$14,274,000	\$0	\$14,274
Fuel, Water	r & Lube	Boat Fuel Helicopter Fuel	122 Days 122 Days	\$4,000 /day \$3,000 /day		\$488,000 \$366,000	\$14,274,000	\$0	\$14,274
	ds Services	Boat Fuel Helicopter Fuel Lubricants	122 Days 122 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day		\$488,000 \$366,000 \$317,200			\$14,274
		Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM	122 Days 122 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day	Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$2,000,000	\$14,274,000 		\$14,274
		Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer	122 Days 122 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day	Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$2,000,000 \$195,200			
		Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM	122 Days 122 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day	Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$2,000,000			
Drilling Fluid	ds Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cutings Disposal	122 Days 122 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day	Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$2,000,000 \$195,200	\$2,806,000		\$2,806
Drilling Fluid		Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs	122 Days 122 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$12,000,000 \$195,200 \$610,000			\$2,806
Drilling Fluid	ds Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal fole Logs Wireline Unit and Personnel Standard Open Hole Logging	122 Days 122 Days 244 Days 244 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day	Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$170,800 \$195,200 \$610,000 \$732,000	\$2,806,000		
Drilling Fluid	ds Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	122 Days 122 Days 244 Days 244 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$170,800 \$195,200 \$610,000 \$1,500,000 \$1,500,000 \$2,500,000	\$2,806,000		\$2,806
Drilling Fluid	ds Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal fole Logs Wireline Unit and Personnel Standard Open Hole Logging	122 Days 122 Days 244 Days 244 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$2,000,000 \$195,200 \$610,000 \$732,000 \$1,500,000	\$2,806,000		\$2,806
Drilling Fluid	ds Services gging & Cased H	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	122 Days 122 Days 244 Days 244 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$170,800 \$195,200 \$610,000 \$1,500,000 \$1,500,000 \$2,500,000	\$2,806,000	\$0	\$2,806 \$4,832
Drilling Fluid	ds Services gging & Cased H	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	122 Days 122 Days 244 Days 244 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$170,800 \$195,200 \$610,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,000,000	\$2,806,000	\$0	\$2,806
Drilling Fluid	ds Services gging & Cased H	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Cuttings Disposal Hole Logg Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 16.5" SET	122 Days 122 Days 244 Days 244 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$2,000,000 \$195,200 \$610,000 \$732,000 \$1,500,000 \$1,500,000 \$100,000 100,000 100,000	\$2,806,000	\$0	\$2,806 \$4,832
Drilling Fluid	ds Services gging & Cased H	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal tole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging Cased Hole Logging 22" 16.5" SET	122 Days 122 Days 244 Days 244 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$170,800 \$195,200 \$610,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$100,000 100,000 100,000	\$2,806,000	\$0	\$2,806 \$4,832
Drilling Fluid	ds Services gging & Cased H	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal tole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 16.5" SET 16.5" SET 16"	122 Days 122 Days 244 Days 244 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$170,800 \$195,200 \$610,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,000,000 \$100,000 100,000 100,000 150,000	\$2,806,000	\$0	\$2,806 \$4,832
Drilling Fluid	ds Services gging & Cased H	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Cuttings Disposal Gue Logg Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 16.5" SET 16.5" SET 16" 13.375"	122 Days 122 Days 244 Days 244 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$2,000,000 \$195,200 \$810,000 \$1,500,000 \$1,500,000 \$100,000 100,000 100,000 150,000	\$2,806,000	\$0	\$2,806 \$4,832
Drilling Fluid	ds Services gging & Cased H	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging Cased Hole Logging 22" 16.5" SET 16.5" SET 16"	122 Days 122 Days 244 Days 244 Days 244 Days 244 Days 244 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$488,000 \$366,000 \$317,200 \$170,800 \$170,800 \$195,200 \$610,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,000,000 \$100,000 100,000 100,000 150,000	\$2,806,000	\$0	\$2,806 \$4,832



	cal Services						\$598,000	\$0	\$5
	Logging Unit Operati	ing rate	244 Days	\$1,250 /day		\$305,000			
	Personnel Charges		244 Days	\$1,200 /day		\$292,800			
Land Transportation							\$110,000	\$0	\$1
	Trucking		122 Days	\$900 /day		\$109,800			
Boat Transportation							\$2,806,000	\$0	\$2,8
Jour manoportation	Work Boat - Spot Hire	e	122 Days	\$14,000 /day		\$1,708,000	\$2,000,000	\$0	φ <u>2</u> ,0
A 111 11 11 11 111 11 111 11	Crew Boat - Spot Hire	e	122 Days	\$9,000 /day		\$1,098,000			
Helicopter Transportation							\$1,098,000	\$0	\$1,0
	Helicopter - spot hire		122 Days	\$9,000 /day		\$1.098.000	\$1,098,000	\$0	\$1,0
			ill bajo	\$0,000 /ddy		\$1,000,000			
Tubular Services							\$150,000	\$0	\$1
	QAQC				Lump Sum	\$150,000			
Shorebase / Dock Service	S						\$488,000	\$0	\$4
	Shorebase /Dispatch	ner	244 Days	\$2,000 /day		\$488,000			
Communications							\$244,000	\$0	\$2
Johnnahoulono	VSAT		244 Days	\$1,000 /day		\$244,000	\$244,000	\$0	
			· · · · · · · · · · · · · · · · · · ·						
Miscellaneous Rental Equi			244 Dec :	¢400 /		PO7 600	\$5,764,000	\$0	\$5,7
	Solids Control Fishing Tools		244 Days 244 Days	\$400 /day \$1,500 /day		\$97,600 \$366,000			
	Casing Running Equ	upment	70 Days	\$6,000 Day		\$420,000			
	Other Rentals		244 Days	\$20,000 Day		\$4,880,000			
			Days Days					_	
Miscellaneous Special Se	rvices		Days				\$1,137,000	\$0	\$1,
	Weather Forecasting	J	244 Days	\$150 /day		\$36,600			
	Engineering Services				Lump Sum	\$300,000			
	Engineering Services		<u>ו</u>		Lump Sum Lump Sum	\$200,000 \$50,000			
	Engineering Services Engineering Services				Lump Sum	\$100,000			
	Engineering Services		ort		Lump Sum	\$200,000			
	Engineering Services		ts		Lump Sum	\$200,000			
	Engineering Services	s - Other			Lump Sum	\$50,000			
Other Services / Costs							\$2,128,000	\$0	\$2,7
	Misc Contract Labor		244 Days	\$1,500 /day		\$366,000			
	Casing Running		70 Days	\$10,000 /day		\$700,000			
	Well Insurance Overhead		244 Days	\$1,100 /day	Lump Sum	\$500,000 \$268,400			
	Catering		244 Days	\$1,200 /day		\$292,800			
ntangible Contingency			15%	Amount	ST Drla –	\$102.881.000	\$28 923 000	0\$	\$20.0
Intangible Contingency			15%	Amount	ST Drlg = ST Comp =	\$192,881,000 \$0	\$28,933,000	\$0	\$28,9
Intangible Contingency			15%	Amount	ST Comp =	\$192,881,000 \$0 NTANGIBLE	\$28,933,000 \$221,814,000	\$0 \$0	
Intangible Contingency			15%	Amount	ST Comp =	\$0			
Intangible Contingency TANGIBLE I			15%		ST Comp =	so NTANGIBLE			
TANGIBLE I		OD 7	15% =#Strings	Length	ST Comp =	\$0 NTANGIBLE \$/ft	\$221,814,000	\$0	\$28,5 \$221, {
TANGIBLE I Drive Pipe		36"		Length 200	ST Comp =	50 NTANGIBLE \$/ft \$650.00	\$221,814,000 \$130,000	\$0 \$0 \$0	\$221,8 \$1
TANGIBLE I Drive Pipe Conductor		36" 22"		Length 200 656	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00	\$221,814,000 \$130,000 \$119,000	\$0 \$0 \$0 \$0	\$221,8 \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface	16.5	36" 22" 5" SET		Length 200 656 5,058	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$300.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000	\$0 \$0 \$0 \$0 \$0	\$221,8 \$ \$ \$ \$1,8
TANGIBLE I Drive Pipe Conductor Surface Intermediate	16.5 16.5	36" 22" 5" SET 5" SET		Length 200 656 5,058 4,049	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$300.00 \$300.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221,8 \$ \$ \$ \$1,8 \$1,1 \$1,2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate	16.5 16.5	36" 22" 5" SET 5" SET 16"		Length 200 656 5,058	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$300.00 \$155.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,939,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221,8 \$ \$ \$1,5 \$1,5 \$1,5 \$1,5 \$1,5
TANGIBLE I Drive Pipe Conductor Surface Intermediate	16.5 16.5 13	36" 22" 5" SET 5" SET		Length 200 656 5,058 4,049 12,507	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$300.00 \$300.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221,8
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"		Length 200 656 5,058 4,049 12,507 16,563	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,5 \$ \$ \$1,5 \$1,5 \$1,5 \$1,5 \$2,5
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"		Length 200 656 5,058 4,049 12,507 16,563	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,5 \$1 \$1 \$1,5 \$1,5 \$1,5 \$1,5 \$2,5
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"		Length 200 656 5,058 4,049 12,507 16,563	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221,8 \$1,5 \$1,5 \$1,5 \$1,7 \$2,3 \$2,3 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"		Length 200 656 5,058 4,049 12,507 16,563	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,939,000 \$2,319,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,5 \$ \$ \$1,5 \$1,5 \$1,5 \$1,5 \$2,5
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"		Length 200 656 5,058 4,049 12,507 16,563	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,215,000 \$1,939,000 \$2,319,000 \$327,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221,8 \$ \$1,1 \$1,2 \$1,2 \$1,2 \$2,5 \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"		Length 200 656 5,058 4,049 12,507 16,563	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,939,000 \$2,319,000 \$327,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,8 \$ \$ \$1,1 \$1,2 \$2,3 \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"		Length 200 656 5,058 4,049 12,507 16,563	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,215,000 \$2,319,000 \$327,000 \$327,000 \$327,000 \$327,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,8 \$ \$ \$1,1 \$1,2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"		Length 200 656 5,058 4,049 12,507 16,563	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,939,000 \$2,319,000 \$327,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,i \$221,i \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"	= # Strings	Length 200 656 5,058 4,049 12,507 16,563	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,215,000 \$1,215,000 \$1,215,000 \$1,215,000 \$1,215,000 \$150,000 \$150,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,i \$221,i \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"	= # Strings	Length 200 656 5,058 4,049 12,507 16,563 4,078	ST Comp = TOTAL II	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$880.00	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,215,000 \$2,319,000 \$327,000 \$327,000 \$327,000 \$327,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,i \$221,i \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"	= # Strings	Length 200 656 5,058 4,049 12,507 16,563 4,078	ST Comp = TOTAL II ST Drlg = ST Drlg = ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$140.00 \$80.00 \$10.00 \$0 \$0.00 \$0 \$0.00 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,215,000 \$1,215,000 \$1,215,000 \$1,215,000 \$1,215,000 \$327,0000\$300 \$327,00	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,8 \$ \$ \$1,1 \$1,2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"	= # Strings	Length 200 656 5,058 4,049 12,507 16,563 4,078	ST Comp = TOTAL II TOTAL II ST Drlg = ST Comp = TOTAL	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$150.00 \$	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,215,000 \$1,215,000 \$1,215,000 \$1,215,000 \$327,0000 \$327,0000 \$327,0000 \$327,0000 \$327,0000 \$327,0000 \$327,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,8 \$221,8 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Weilheads Miscellaneous / Other	16.5 16.5 13	36" 22" 5" SET 5" SET 16" 3.375"	= # Strings	Length 200 656 5,058 4,049 12,507 16,563 4,078	ST Comp = TOTAL II ST Drig = ST Drig = ST Comp = TOTAL Tota	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$140.00 \$80.00 \$10.00 \$0 \$0.00 \$0 \$0.00 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,814,000 \$130,000 \$119,000 \$1,518,000 \$1,215,000 \$1,215,000 \$1,215,000 \$1,215,000 \$1,215,000 \$1,215,000 \$327,0000\$300 \$327,00	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221,8 \$ \$ \$1,1 \$1,2 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$

6.4 Baja Location Cost Estimates

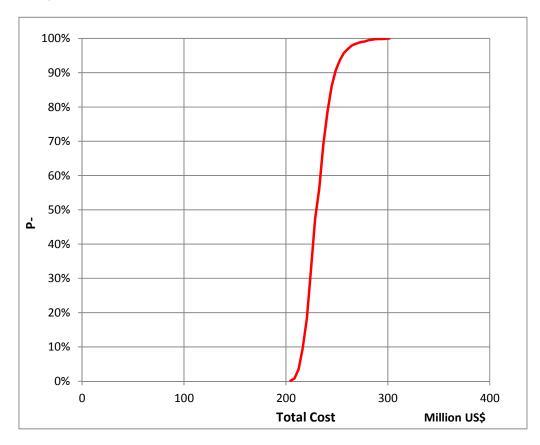
6.4.1 Case 2a Cost Estimate:

This case assumes the original Base Case wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Tan	Total	P10	P50	P90	
287	\$229,515	\$2,392	\$231,907	\$216,678	\$229,814	\$248,251	

Figure 175. Baja Location: Case 2a – Cost Estimate

The following chart shows the cumulative probability of cost.





			<u>SCOP</u>	ING COST EST	<u>IMATE</u>			Rev
			BEAN	/I - Baja Ca	se 2a		** DRAFT	**
ы Лг		Pro		IODP / JAN				Exploratory _X
ENERGY PART	NERS	110	Jarea I or.					Development
AFE# XXX	Operator:	CDEX / JAI	MSTEC		Revision No.	1	Date:	30-Jun-13
Prospect or Field	Lease Nam			Case No.	Water Depth	Proposed TD	Formation	
Mantle Hole	N/A	-		#4a	4300m	10,400m	Moho / Mantle	
					14,107 ft	34,120 ft		
ocation	Surface Loc			N / Long: 120.0 -				
Baja	Btm. Hole L	_ocation:	Lat: 25.0 - 33.0°	N / Long: 120.0 -	127.0°W			
Purpose of Exper								
Cientific Drilling t				en coring 500m of t	ne Mantie			
ase 4a. Ong ba	se case well c	onliguration						
Drilling Rig :	Chikyu			irectional Plan: V	ertical Hole			
ining rug .	INTANGIBI	E ITEMS				Dry Hole Drig	Complete	TOTAL
						251 Days	Complete	251 Days
Location/	Regulatory Cost	ts				\$3,020,000	\$0	\$3,020,0
	zation, Demobil					\$14,600,000	\$0	\$14,600,0
	g - Day Work at		Day			\$136,300,000	\$0	\$136,300,0
,	Collars & Stabili					\$4,284,000	\$0	\$4,284,0
	al & Downhole S	ervices				\$4,167,000	\$0	\$4,167,0
Fuel, Wate	er & Lube uids Services					\$14,684,000 \$2,629,000	\$0 \$0	\$14,684,0 \$2,629,0
	ogging & Cased	Hole Loas				\$2,829,000	\$0 \$0	\$4,853,0
Cementin		Tible Logo				\$714,000	\$0	\$714.0
	ing and Geologi	ical Services	5			\$615,000	\$0	\$615,0
	sportation					\$113,000	\$0	\$113,0
Boat Tran	· · · · · · · · · · · · · · · · · · ·					\$2,887,000	\$0	\$2,887,0
	r Transportation					\$1,130,000	\$0	\$1,130,0
Tubular S	erиces e / Dock Service					\$100,000 \$502,000	\$0 \$0	\$100,0 \$502,0
Communi						\$302,000	\$0	\$302,0
	eous Rental Equ	uipment				\$5,737,000	\$0	\$5,737,0
	eous Special Se					\$1,138,000	\$0	\$1,138,0
	vices / Costs					\$1,854,000	\$0	\$1,854,0
Intan Con	tingency at	15%				\$29,937,000	\$0	\$29,937,0
				TOTAL INT		\$229,515,251	\$0	\$229,515,2
						<i>ΨLLJ,JIJ,LJI</i>	Ψυ	ΨΖΖΟ,ΟΙΟ,Ζ
	TANGIBLE	ITEMS		Factors	¢ /64			
			OD 30"	Footage	\$/ft \$500.00	\$100.000	0.9	\$100.0
Drive Pipe)		30"	200	\$500.00	\$100,000	\$0	
Conducto)		30" 20"	200 279	\$500.00 \$180.00	\$51,000	\$0	\$51,0
Conducto Surface	3 r		30" 20" 13-3/8"	200 279 5,036	\$500.00 \$180.00 \$140.00	\$51,000 \$706,000	\$0 \$0	\$51,0 \$706,0
Conducto Surface Intermedia	e r ate		30" 20" 13-3/8" 11-3/4"	200 279 5,036 7,076	\$500.00 \$180.00 \$140.00 \$80.00	\$51,000 \$706,000 \$567,000	\$0 \$0 \$0	\$51,0 \$706,0 \$567,0
Conducto Surface Intermedia	e ate ate		30" 20" 13-3/8" 11-3/4" 0	200 279 5,036 7,076 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0	\$0 \$0 \$0 \$0	\$51,0 \$706,0 \$567,0
Conducto Surface Intermedia Intermedia	e constante cons		30" 20" 13-3/8" 11-3/4" 0 0	200 279 5,036 7,076 0 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0	\$51,0 \$706,0 \$567,0
Conducto Surface Intermedia	e r ate ate ate ate		30" 20" 13-3/8" 11-3/4" 0 0 0	200 279 5,036 7,076 0 0 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$51,c \$706,c \$567,c
Conducto Surface Intermedia Intermedia Intermedia Intermedia Production	e r ate ate ate ate		30" 20" 13-3/8" 11-3/4" 0 0	200 279 5,036 7,076 0 0 0 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$51,0 \$706,0 \$567,0
Conducto Surface Intermedia Intermedia Intermedia Production Production	e r ate ate ate ate n Liner		30" 20" 13-3/8" 11-3/4" 0 0 0 0	200 279 5,036 7,076 0 0 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$51,C \$706,C \$567,C
Conducto Surface Intermedia Intermedia Intermedia Production Production Tubing	e r ate ate ate n Liner n Tie-back		30" 20" 13-3/8" 11-3/4" 0 0 0 0 0 0	200 279 5,036 7,076 0 0 0 0 0 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$51,C \$706,C \$567,C
Conducto Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equ	e r ate ate ate n Liner n Tie-back		30" 20" 13-3/8" 11-3/4" 0 0 0 0 0 0	200 279 5,036 7,076 0 0 0 0 0 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$51,C \$706,C \$567,C
Conducto Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equ Whipstock	e r ate ate ate n Liner n Tie-back		30" 20" 13-3/8" 11-3/4" 0 0 0 0 0 0	200 279 5,036 7,076 0 0 0 0 0 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$51,C \$706,C \$567,C
Conducto Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equ Whipstock	e r ate ate ate n Liner n Tie-back ipmt k Equipment xe Completion		30" 20" 13-3/8" 11-3/4" 0 0 0 0 0 0	200 279 5,036 7,076 0 0 0 0 0 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$51,0 \$706,0 \$567,0 \$567,0 \$150,0
Conducto Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equ Whipstock Subsurfac Wellhead	e r ate ate ate n Liner n Tie-back ipmt k Equipment xe Completion		30" 20" 13-3/8" 11-3/4" 0 0 0 0 0 0	200 279 5,036 7,076 0 0 0 0 0 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$150,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$51,(\$706,(\$567,(\$567,(\$150,(\$500,(
Conducto Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equ Whipstock Subsurfac Wellhead	e r ate ate ate ate ate in Liner n Tie-back ipmt < Equipment se Completion s eous/Other	E ITEMS	30" 20" 13-3/8" 11-3/4" 0 0 0 0 0 0	200 279 5,036 7,076 0 0 0 0 0 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0 \$0 \$0 \$150,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$51, \$706, \$567, \$567, \$150, \$150, \$500, \$100,
Conducto Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equ Whipstock Subsurfac Wellhead Miscelland	e r ate ate ate ate ate in Liner n Tie-back ipmt < Equipment se Completion s eous/Other		30" 20" 13-3/8" 11-3/4" 0 0 0 0 0 0	200 279 5,036 7,076 0 0 0 0 0 0 0	\$500.00 \$180.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0 \$0 \$150,000 \$150,000 \$100,000 \$218,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$51,C \$706,C \$567,C \$567,C \$150,C \$150,C \$100,C \$218,C
Conducto Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equ Whipstock Subsurfac Wellhead Miscelland	e r ate ate ate ate ate in Liner n Tie-back ipmt < Equipment se Completion s eous/Other		30" 20" 13-3/8" 11-3/4" 0 0 0 0 0 0	200 279 5,036 7,076 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$500.00 \$180.00 \$140.00 \$80.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0 \$0 \$150,000 \$150,000 \$100,000 \$218,000 \$2,392,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$51,0 \$706,0 \$567,0 \$150,0 \$100,0 \$100,0 \$218,0 \$2,392,0
Conducto Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equ Whipstock Subsurfac Wellhead Miscelland	e r ate ate ate ate ate in Liner n Tie-back ipmt < Equipment se Completion s eous/Other		30" 20" 13-3/8" 11-3/4" 0 0 0 0 0 0	200 279 5,036 7,076 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$500.00 \$180.00 \$80.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$51,000 \$706,000 \$567,000 \$0 \$0 \$0 \$0 \$0 \$150,000 \$150,000 \$100,000 \$218,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$100,0 \$51,0 \$706,0 \$567,0 \$567,0 \$150,0 \$100,0 \$100,0 \$218,0 \$2,392,0 \$2,392,0 \$231,907,2



		SCOPING (COST EST	MATE DETA	<u>ML</u>				F
		BEAN	I - Baja	Case 2a		*	** DRAFT	**	
	E	Prepared For	: IODP	JAMSTEC	/ CDEX				Exploratory _X_
GY PARTNE	ERS						-		Development
xxx ect or Field	Operator: Lease Name	CDEX / JAMSTEC		Case No.	-	Revision No. Water Depth	1 Proposed TD	Date: Objective	30-Jun-13
e Hole	N/A		·	#4a		4300m	10,400m	Moho / Mantle	
						14,107 ft	34,120 ft		
on	Surface Location Btm. Hole Location								
e of Expendi		ation: Lat: 25.0 - 33.0°N / Long: 120	.u - 127.0°V	V					
		Assume drilling to the Moho, then co	ring 500m	of the Mantle					
a: Orig Ba	ise Case Well C	Configuration							Avg Intan \$/
villing Dig .	Chilan		Dir	actional Dian	Vertical Hel		r		\$914,402
Drilling Rig :	INTANGIBLE	ITEMS	DII	ectional Plan:	vertical hol	e	Dry Hole Drig	Complete	TOTAL
					Оре	erational Time =	251 Days	Complete	251 Days
Location/ Re	egulatory Costs						\$3,020,000	\$0	\$3,020
		Metocean Study (desktop study, data collecti	on/processir	ng)	Lump Sum	\$1,000,000]	
		Site Survey (desktop study, bathymetry)			Lump Sum	\$2,000,000 \$20,000			
		Regulatory			Lump Sum	φ20,000			
Rig Mobilizat	tion, Demobilizat	tion					\$14,600,000		\$14,600
		Mobilization (from Japan)			Lump Sum	\$7,300,000			
		Demobilization (to Japan)			Lump Sum	\$7,300,000			
Drilling Rig -			054 8	6000 000 (I)		675 000 655	\$136,300,000	\$0	\$136,300
		Drilling Day Rate Existing Riser System Modifications	251 Days	\$300,000 /day	Lump Sum	\$75,300,000 \$14,000,000			
		Additional Riser			Lump Sum	\$47,000,000			
			<u> </u>						
Bits, Drill Co	ollars & Stabilizer						\$4,284,000	\$0	\$4,284
		Drill Bits Drill String Rentals: DC's, Jars, Stab, HWT	17 No. 251 Days	\$70,000 /bit \$4,000 /day		\$1,190,000 \$1,004,000			
		Core Bits	251 Days 28 No.	\$4,000 /day \$60,000 /bit		\$1,680,000			
		Coring Services	164 Days	\$2,500 /day		\$410,000			
Directional 8	& Downhole Serv						\$4,167,000	\$0	\$4,167
		Surveys/Gyros/Single & Multi-Shots MWD / LWD Mob / De-mob			Lump Sum Lump Sum	\$20,000 \$30,000			
		Standard MWD Rental	126 Days	\$3,000 /day	Lump Sum	\$376,500			
		Standard LWD Rental	126 Days	\$7,000 /day		\$878,500			
		MWD / LWD Engineers (2)	251 Days	\$2,000 /day		\$502,000			
		MALINATION O ASSAULTS INT	201 Days	\$3,000 /day					
·· ··· ·· ··		Mud Motors & Associated Tools		\$4,000 /dov		\$602,400			
	1	High Temp MWD Rental	126 Days	\$4,000 /day \$10,000 /day		\$502,000			
				\$4,000 /day \$10,000 /day					
Fuel, Water	k Lube	High Temp MWD Rental High temp LWD Rental	126 Days 126 Days	\$10,000 /day		\$502,000 \$1,255,000	\$14,684,000	\$0	\$14,684
Fuel, Water	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel	126 Days 126 Days 251 Days	\$10,000 /day \$53,000 /day		\$502,000 \$1,255,000 \$13,303,000	\$14,684,000	\$0	\$14,684
Fuel, Water	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel	126 Days 126 Days 251 Days 126 Days	\$10,000 /day \$53,000 /day \$4,000 /day		\$502,000 \$1,255,000 \$13,303,000 \$502,000	\$14,684,000	\$0	\$14,684
Fuel, Water	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day		\$502,000 \$1,255,000 \$13,303,000 \$502,000 \$376,500 \$326,300	\$14,684,000	\$0	\$14,684
Fuel, Water	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel	126 Days 126 Days 251 Days 126 Days 126 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$3,000 /day		\$502,000 \$1,255,000 \$13,303,000 \$502,000 \$376,500	\$14,684,000	\$0	\$14,684
	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day		\$502,000 \$1,255,000 \$13,303,000 \$502,000 \$376,500 \$326,300			
Fuel, Water	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day	Lump Sum	\$502,000 \$1,255,000 \$13,303,000 \$502,000 \$376,500 \$326,300 \$175,700	\$14,684,000 \$2,629,000	\$0	
	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day	Lump Sum	\$502,000 \$1,255,000 \$13,303,000 \$502,000 \$376,500 \$326,300 \$175,700 \$1,800,000 \$200,800			
	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day	Lump Sum	\$502,000 \$1,255,000 \$13,303,000 \$502,000 \$376,500 \$326,300 \$175,700 \$1,800,000			
Drilling Fluid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day	Lump Sum	\$502,000 \$1,255,000 \$13,303,000 \$502,000 \$376,500 \$326,300 \$175,700 \$1,800,000 \$200,800	\$2,629,000		\$2,629
Drilling Fluid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Del Logs	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum	\$502,000 \$1,255,000 \$13,303,000 \$502,000 \$376,500 \$326,300 \$175,700 \$1,800,000 \$200,800 \$627,500			\$2,629
Drilling Fluid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day	Lump Sum	\$502,000 \$1,255,000 \$13,303,000 \$502,000 \$376,500 \$326,300 \$175,700 \$1,800,000 \$200,800 \$627,500 \$753,000	\$2,629,000		\$2,629
Drilling Fluid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal De Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum	\$502,000 \$1,255,000 \$12,555,000 \$12,552,000 \$376,500 \$376,500 \$376,500 \$376,500 \$376,500 \$175,700 \$1,800,000 \$627,500 \$1,500,000 \$1,500,000	\$2,629,000		\$2,629
Drilling Fluid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Die Logs Wireline Unit and Personnel Standard Open Hole Logging	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum	\$502,000 \$1,255,000 \$12,552,000 \$502,000 \$376,500 \$326,300 \$175,700 \$1,800,000 \$200,800 \$627,500 \$753,000 \$1,500,000	\$2,629,000		\$2,629
Drilling Ruid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal De Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum	\$502,000 \$1,255,000 \$12,555,000 \$12,552,000 \$376,500 \$376,500 \$376,500 \$376,500 \$376,500 \$175,700 \$1,800,000 \$627,500 \$1,500,000 \$1,500,000	\$2,629,000 \$4,853,000	\$0	\$2,629 \$4,853
Drilling Fluid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal De Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$502,000 \$1,255,000 \$11,255,000 \$12,5502,000 \$376,500 \$376,500 \$175,700 \$1,800,000 \$200,800 \$627,500 \$1,500,000 \$1,500,000 \$100,000 \$100,000	\$2,629,000	\$0	\$2,629 \$4,853
Drilling Fluid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Del Logs Wireline Unit and Personnel Standard Open Hole Logging Cased Hole Logging Cased Hole Logging 20° 13-3/8°	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$502,000 \$1,255,000 \$12,550,000 \$376,500 \$376,500 \$376,500 \$376,500 \$376,500 \$376,500 \$1,800,000 \$200,800 \$627,500 \$753,000 \$1,500,000 \$100,000 \$100,000 \$150,000	\$2,629,000 \$4,853,000	\$0	\$2,624 \$4,853
Drilling Fluid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal De Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging Cased Hole Logging 20°	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$502,000 \$1,255,000 \$12,550,000 \$376,500 \$376,500 \$376,500 \$376,500 \$376,500 \$376,500 \$1,800,000 \$200,800 \$627,500 \$753,000 \$1,500,000 \$100,000 \$100,000 \$150,000	\$2,629,000 \$4,853,000	\$0	\$2,629 \$4,853
Drilling Fluid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Del Logs Wireline Unit and Personnel Standard Open Hole Logging Cased Hole Logging Cased Hole Logging 20° 13-3/8°	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$502,000 \$1,255,000 \$12,550,000 \$376,500 \$376,500 \$376,500 \$376,500 \$376,500 \$376,500 \$1,800,000 \$200,800 \$627,500 \$753,000 \$1,500,000 \$100,000 \$100,000 \$150,000	\$2,629,000 \$4,853,000	\$0	\$2,629 \$4,853
Drilling Fluid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Del Logs Wireline Unit and Personnel Standard Open Hole Logging Cased Hole Logging Cased Hole Logging 20° 13-3/8°	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$502,000 \$1,255,000 \$12,550,000 \$376,500 \$376,500 \$376,500 \$376,500 \$376,500 \$376,500 \$1,800,000 \$200,800 \$627,500 \$753,000 \$1,500,000 \$100,000 \$100,000 \$150,000	\$2,629,000 \$4,853,000	\$0	\$2,629 \$4,853
Drilling Fluid	& Lube	High Temp MWD Rental High temp LWD Rental Rig Fuel Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Del Logs Wireline Unit and Personnel Standard Open Hole Logging Cased Hole Logging Cased Hole Logging 20° 13-3/8°	126 Days 126 Days 251 Days 126 Days 126 Days 251 Days 251 Days 251 Days 251 Days 251 Days	\$10,000 /day \$53,000 /day \$4,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$502,000 \$1,255,000 \$31,255,000 \$326,300 \$376,500 \$376,500 \$376,500 \$326,300 \$1,57,700 \$1,800,000 \$2,500,800 \$1,500,000 \$1,500,000 \$100,000 \$100,000	\$2,629,000 \$4,853,000	\$0	\$14,684 \$2,629 \$4,853 \$714



	al Services					\$615,000	\$0	\$6
	Logging Unit Operating rate	251 Days	\$1,250 /day		\$313,750			
	Personnel Charges	251 Days	\$1,200 /day		\$301,200			
Land Transportation						\$113,000	\$0	\$1
	Trucking	126 Days	\$900 /day		\$112,950			
Boat Transportation						\$2,887,000	\$0	¢0.0
	Work Boat - Spot Hire	126 Days	\$14,000 /day		\$1,757,000	\$2,887,000	\$U	\$2,8
	Crew Boat - Spot Hire	126 Days	\$9,000 /day		\$1,129,500			
Helicopter Transportation		100 0	A O 000 (1)		C1 400 500	\$1,130,000	\$0	\$1,1
	Helicopter - spot hire	126 Days	\$9,000 /day		\$1,129,500			
Tubular Services						\$100,000	\$0	\$1
	QAQC			Lump Sum	\$100,000			
Shorebase / Dock Service	\$					\$502,000	\$0	\$5
Shorebase / Doek der viel	Shorebase /Dispatcher	251 Days	\$2,000 /day		\$502,000	\$302,000	\$ 0	φ.
Communications						\$251,000	\$0	\$2
	VSAT	251 Days	\$1,000 /day		\$251,000			
Miscellaneous Rental Equi	ipment					\$5,737,000	\$0	\$5,7
	Solids Control	251 Days	\$400 /day		\$100,400	+=,: 07,000	÷0	÷0,1
	Fishing Tools	251 Days	\$1,500 /day		\$376,500			
	Casing Running Equipment	40 Days	\$6,000 Day		\$240,000			
	Other Rentals	251 Days	\$20,000 Day		\$5,020,000			
		Days Days						
Miscellaneous Special Ser	rvices					\$1,138,000	\$0	\$1,1
	Weather Forecasting	251 Days	\$150 /day		\$37,650			
	Engineering Services - Riser Analysis			Lump Sum	\$300,000			
	Engineering Services - Drill String Desig Engineering Services - Casing Design	gn		Lump Sum Lump Sum	\$200,000 \$50,000			
	Engineering Services - Wellbore Stabilit	y		Lump Sum	\$100,000			
	Engineering Services - Operational Sup			Lump Sum	\$200,000			
	Engineering Services - Risk Assessme	nts		Lump Sum	\$200,000			
	Engineering Services - Other			Lump Sum	\$50,000			
Other Services / Costs						\$1,854,000	\$0	\$1,8
	Misc Contract Labor	251 Days	\$1,500 /day		\$376,500	+ 1/ 1/		+ - / -
	Casing Running	40 Days	\$10,000 /day		\$400,000			
	Well Insurance	054 0	64 400 (1)	Lump Sum	\$500,000 \$276,100			
	Overhead Catering	251 Days 251 Days	\$1,100 /day \$1,200 /day		\$301,200			
			+.,,		400.,200			
		450/	A	07.0./	A 100 570 000			
Intangible Contingency		15%	Amount	ST Drlg = ST Comp =	\$199,578,000 \$0	\$29,937,000	\$0	\$29,9
Intangible Contingency		15%	Amount	ST Comp =	\$0			
Intangible Contingency		15%	Amount	ST Comp =		\$29,937,000 \$229,515,000	\$0 \$0	
Intangible Contingency		15%	Amount	ST Comp =	\$0			
Intangible Contingency		15%	Amount	ST Comp =	\$0			\$29,5 \$229, 5
Intangible Contingency	ITEMS	15%	Amount	ST Comp =	\$0			
			Amount Length	ST Comp =	\$0			
		15% 4 =#Strings		ST Comp =	SO NTANGIBLE			
TANGIBLE I	OD 20"		Length	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00	\$229,515,000	\$0 	\$229, t
TANGIBLE I Drive Pipe	OD 4 30" 20" 13-3/8"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000	\$0 \$0 \$0	\$229,5 \$1
TANGIBLE I Drive Pipe Conductor Surface Intermediate	OD 20"		Length 200 279	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00	\$229,515,000 \$100,000 \$51,000	\$0 \$0 \$0 \$0	\$229,5 \$1 \$1
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate	OD 4 30" 20" 13-3/8"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$229,5 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate	OD 4 30" 20" 13-3/8"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$229,5 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate	OD 4 30" 20" 13-3/8"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$229,5 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner	OD 4 30" 20" 13-3/8"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$229,5 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back	OD 4 30" 20" 13-3/8"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$229,5 \$1 \$1 \$7
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing	OD 4 30" 20" 13-3/8"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000 \$567,000	\$0 \$0 \$0 \$0 \$0 \$0	\$229,5 \$1 \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment	OD 4 30" 20" 13-3/8" 11-3/4"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$229,5 \$1 \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF	OD 4 30" 20" 13-3/8" 11-3/4"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000 \$567,000	\$0 \$0 \$0 \$0 \$0 \$0	\$229,5 \$1 \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion	OD 4 30" 20" 13-3/8" 11-3/4"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000 \$567,000 \$567,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$229,5 \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tine- Production Tine- Production Tine- Production Tine- Production Tine- Production Tine- Subsurface Completion Wellheads	OD 4 30" 20" 13-3/8" 11-3/4"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000 \$567,000	\$0 \$0 \$0 \$0 \$0 \$0	\$229,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tine- Production Tine- Production Tine- Production Tine- Production Tine- Production Tine- Subsurface Completion Wellheads	OD 4 30" 20" 13-3/8" 11-3/4"		Length 200 279 5,036	ST Comp =	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000 \$567,000 \$567,000 \$150,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$229,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 4 30" 20" 13-3/8" 11-3/4"	4 =#Strings	Length 200 279 5,036	ST Comp = TOTAL IN	\$0 VTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$229,515,000 \$100,000 \$51,000 \$706,000 \$567,000 \$567,000 \$150,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$229,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 4 30" 20" 13-3/8" 11-3/4"	4 =#Strings	Length 200 279 5,036 7,076	ST Comp = TOTAL IN	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00	\$229,515,000 \$100,000 \$51,000 \$706,000 \$567,000 \$150,000 \$150,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$229,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 4 30" 20" 13-3/8" 11-3/4"	4 =#Strings	Length 200 279 5,036 7,076	ST Comp = TOTAL IN ST Drig = ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,174,000	\$229,515,000 \$100,000 \$51,000 \$706,000 \$567,000 \$150,000 \$150,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$229,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment	OD 4 30" 20" 13-3/8" 11-3/4"	4 =#Strings	Length 200 279 5,036 7,076	ST Comp = TOTAL IN TOTAL IN ST Drig = ST Comp = TOTAL	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$180.00 \$140.00 \$80.00 \$2,174,000 \$0 TANGIBLE	\$229,515,000 \$100,000 \$51,000 \$706,000 \$567,000 \$567,000 \$150,000 \$150,000 \$100,000 \$218,000 \$218,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$229,5 \$229,5 \$1 \$1 \$1 \$2 \$2,32 \$2,32 \$2,32 \$2,32 \$2,32 \$2,32 \$2,32 \$2,32 \$2,52
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	OD 4 30" 20" 13-3/8" 11-3/4"	4 =#Strings	Length 200 279 5,036 7,076	ST Comp = TOTAL IN ST Drig = ST Drig = ST Comp = TOTAL Tota	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,174,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$229,515,000 \$100,000 \$51,000 \$706,000 \$567,000 \$567,000 \$150,000 \$150,000 \$100,000 \$218,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$229,5 \$1 \$1 \$7



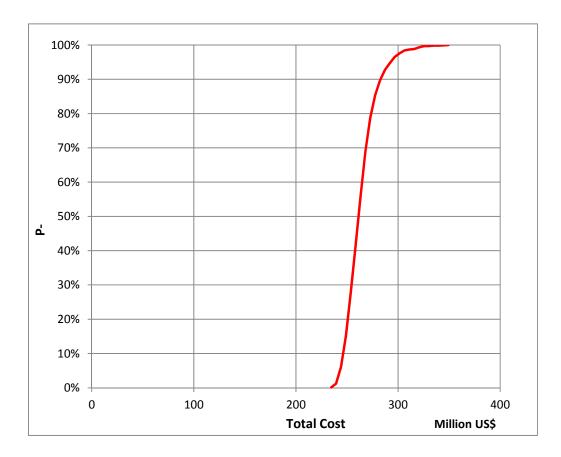
6.4.2 Case 2b Cost Estimate:

This case assumes the Deepwater wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Tan	Total	P10	P50	P90	
345	\$259,910	\$5,889	\$265,799	\$246,177	\$261,328	\$282,808	

Figure 176. Baja Location: Case 2c - Cost Estimate

The following chart shows the cumulative probability of cost.





			<u>SCOPING C</u>	OST ESTIMAT	<u>E SUMMARY</u>			Rev
			BEAN	/I - Baja Ca	se 2b		** DRAFT	**
		Pre		IODP / JAI		DFX		Exploratory _X
NERGY PARTN	I E R S	110				DEX		Development
FE# XXX	Operator:	CDEX / JA	MSTEC		Revision No.	1	Date:	30-Jun-13
rospect or Field	Lease Nan	ne		Case No.	Water Depth	Proposed TD	Formation	
lantle Hole	N/A			#4b	4300m 14,107 ft	10,400m 34,120 ft	Moho / Mantle	
ocation	Surface Lo	ocation:	Lat: 25.0 - 33.0°	N / Long: 120.0 -	,	34,120 10		
aja	Btm. Hole			N / Long: 120.0 -				
urpose of Expend	liture:							
				en coring 500m of	the Mantle			
ase 4b: Conventio	nal Deepwat	ter Case Wel	I Configuration					
rilling Rig :	Chikyu			irectional Plan:	/ertical Hole			
		BLE ITEMS				Dry Hole Drig	Complete	TOTAL
						308 Days	-	308 Days
	egulatory Cos					\$3,020,000	\$0	\$3,020,0
	ation, Demob		10			\$14,600,000	\$0	\$14,600,0
	- Day Work a ollars & Stabi		/ Day			\$153,400,000 \$5,312,000	\$0 \$0	\$153,400,0 \$5,312,0
	& Downhole					\$5,102,000	\$0	\$5,312,0
Fuel, Water		000				\$18,018,000	\$0	\$18,018,0
Drilling Fluid	ds Services					\$2,817,000	\$0	\$2,817,0
	ging & Case	d Hole Logs				\$5,024,000	\$0	\$5,024,0
Cementing	10.1					\$1,135,000	\$0	\$1,135,0
Land Trans	ig and Geolog	gical Service	S			\$755,000 \$139,000	\$0 \$0	\$755, \$139,
Boat Transp						\$3,542,000	\$0	\$3,542,
	Fransportatio	n				\$1,386,000	\$0 \$0	\$1,386,
Tubular Ser	vices					\$150,000	\$0	\$150,
	/ Dock Servic	es				\$616,000	\$0	\$616,
Communica						\$308,000	\$0	\$308,
	ous Rental Ecous Special S	· · ·				\$7,166,000 \$1,147,000	\$0 \$0	\$7,166,0 \$1,147,0
Other Servic	··· ··· ··	Jervices				\$2,371,000	\$0	\$2,371,0
Intan Contin		15%				\$33,902,000	\$0	\$33,902,0
				TOTAL INT		\$259,910,308	\$0	\$259,910,3
	TANGIBLI	E ITEMS						
			OD	Footage	\$/ft			
			36"	200	\$650.00	\$130,000	\$0	\$130,
Drive Pipe								\$51,
Conductor			22"	279	\$180.00	\$51,000	\$0	
Conductor Surface			18"	4,907	\$160.00	\$786,000	\$0	\$786,
Conductor Surface Intermediate			18" 16"	4,907 8,314	\$160.00 \$155.00	\$786,000 \$1,289,000	\$0 \$0	\$786, \$1,289,
Conductor Surface Intermediate	e		18" 16" 13-3/8"	4,907 8,314 11,693	\$160.00 \$155.00 \$140.00	\$786,000 \$1,289,000 \$1,638,000	\$0 \$0 \$0	\$786, \$1,289, \$1,638,
Conductor Surface Intermediate Intermediate	e		18" 16" 13-3/8" 11-3/4"	4,907 8,314 11,693 3,500	\$160.00 \$155.00 \$140.00 \$80.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000	\$0 \$0 \$0 \$0	\$786, \$1,289, \$1,638, \$280,
Conductor Surface Intermediate Intermediate Intermediate	e e e		18" 16" 13-3/8" 11-3/4" 9-5/8"	4,907 8,314 11,693 3,500 3,980	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000	\$0 \$0 \$0 \$0 \$0 \$0	\$786, \$1,289, \$1,638, \$280,
Conductor Surface Intermediate Intermediate Intermediate Intermediate Production I	e e e Liner		18" 16" 13-3/8" 11-3/4" 9-5/8" 0	4,907 8,314 11,693 3,500 3,980 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$786, \$1,289, \$1,638, \$280,
Conductor Surface Intermediate Intermediate Intermediate Production I Production	e e e Liner		18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$786, \$786, \$1,289, \$1,638, \$280, \$279,
Conductor Surface Intermediate Intermediate Intermediate Production I Production Tubing	e e Liner Tie-back		18" 16" 13-3/8" 11-3/4" 9-5/8" 0	4,907 8,314 11,693 3,500 3,980 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$786, \$1,289, \$1,638, \$280, \$279,
Conductor Surface Intermediate Intermediate Intermediate Production I Production Tubing Liner Equip	e e Liner Tie-back mt		18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$786, \$1,289, \$1,638, \$280, \$279,
Conductor Surface Intermediate Intermediate Intermediate Production I Production Tubing Liner Equip Whipstock B	e e Liner Tie-back mt Equipment		18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$300,000 \$0 \$300,000 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$786, \$1,289, \$1,638, \$280,
Conductor Surface Intermediate Intermediate Intermediate Production I Production Tubing Liner Equip Whipstock B	e e Liner Tie-back mt		18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$300,000 \$0 \$300,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$786, \$1,289, \$1,638, \$280, \$279, \$279, \$300,
Conductor Surface Intermediate Intermediate Intermediate Intermediate Production I Production Tubing Liner Equip Whipstock E Subsurface	e e Liner Tie-back mt Equipment Completion		18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$300,000 \$0 \$300,000 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$786, \$1,289, \$1,638, \$280, \$279, \$300, \$300, \$500,
Conductor Surface Intermediate Intermediate Intermediate Intermediate Production I Production Tubing Liner Equip Whipstock E Subsurface Wellheads	e e Liner Tie-back mt Equipment Completion bus/Other	10%	18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$300,000 \$0 \$300,000 \$0 \$500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$786, \$1,289, \$1,638, \$280, \$279, \$300, \$300, \$500, \$100,
Conductor Surface Intermediate Intermediate Intermediate Production I Production Tubing Liner Equip Whipstock E Subsurface Wellheads Miscellaneo	e e Liner Tie-back mt Equipment Completion bus/Other	10%	18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$300,000 \$300,000 \$100,000 \$536,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$786, \$1,289, \$1,638, \$280, \$279, \$300, \$300, \$500, \$100, \$536,
Conductor Surface Intermediate Intermediate Intermediate Production I Production Tubing Liner Equip Whipstock E Subsurface Wellheads Miscellaneo	e e Liner Tie-back mt Equipment Completion bus/Other	10%	18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$280,000 \$279,000 \$0 \$0 \$300,000 \$300,000 \$100,000 \$536,000 \$5,889,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$786, \$1,289, \$1,638, \$280, \$279, \$300, \$300, \$300, \$500, \$100, \$536, \$5,889,
Conductor Surface Intermediate Intermediate Intermediate Intermediate Production I Production Tubing Liner Equip Whipstock E Subsurface Wellheads Miscellaneo	e e Liner Tie-back mt Equipment Completion bus/Other	10%	18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$280,000 \$279,000 \$0 \$0 \$300,000 \$300,000 \$100,000 \$536,000 \$536,000 \$25,889,000 \$265,799,308	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$786, \$1,289, \$1,638, \$280, \$279,



		<u>SCOPING</u>	COST EST	IMATE DET	4 <u>/</u>				Rev4
		BEAN	I - Baja	Case 2b		*	** DRAFT	**	
BLAD	Σ	Prepared For	-		/ CDEX				Exploratory _X
ENERGY PARTNE	ERS								Development
AFE# XXX Prospect or Field	Operator: Lease Name	CDEX / JAMSTEC		Case No.		Revision No. Water Depth	1 Proposed TD	Date: Objective	30-Jun-13
Mantle Hole	N/A		-	#4b		4300m	10,400m	Moho / Mantle	
						14,107 ft	34,120 ft		
Location	Surface Loca							-	
Baja	Btm. Hole Lo	cation: Lat: 25.0 - 33.0°N / Long: 120).0 - 127.0°V	V					
Purpose of Expend									
		e. Assume drilling to the Moho, then co	ring 500m	of the Mantle					Ave laten f /day
Case 4b: Convent	tional Deepw	ater Case Well Configuration							Avg Intan \$/day \$843,864
Drilling Rig	: Chikvu		Dir	ectional Plan:	Vertical Hol	e		I	4040,004
<u></u>	INTANGIBLE	TTEMS					Dry Hole Drig	Complete	TOTAL
					Ор	erational Time =	308 Days		308 Days
Location/ Re	egulatory Costs	3					\$3,020,000	\$0	\$3,020,000
		Metocean Study (desktop study, data collecti	on/processir	ng)	Lump Sum	\$1,000,000			
		Site Survey (desktop study, bathymetry)			Lump Sum	\$2,000,000			
		Regulatory			Lump Sum	\$20,000			
Rig Mobiliza	ation, Demobiliz				1	AT 000 000	\$14,600,000		\$14,600,000
		Mobilization (from Japan) Demobilization (to Japan)			Lump Sum Lump Sum			<u> </u>	
Drilling Die	DayWork				Lump Sum	\$7,300,000	¢152 400 000		¢1E2 400 000
Drilling Rig	- Day WOrk	Drilling Day Rate	308 Dave	\$300,000 /day		\$92,400,000	\$153,400,000	\$0	\$153,400,000
· · · · · · · · · · · · · · · · · · ·		Existing Riser System Modifications	Joo Days	4000,000 /udy	Lump Sum			I	
		Additional Riser			Lump Sum				
Bits, Drill Co	ollars & Stabiliz	ers					\$5,312,000	\$0	\$5,312,000
		Drill Bits	27 No.	\$70,000 /bit		\$1,890,000			
		Drill String Rentals: DC's, Jars, Stab, HWT	308 Days	\$4,000 /day		\$1,232,000			
		Core Bits	28 No. 204 Days	\$60,000 /bit		\$1,680,000			
		Coring Services	204 Days	\$2,500 /day		\$510,000			
Directional	& Downhole Se	rvices					\$5,102,000	\$0	\$5,102,000
		Surveys/Gyros/Single & Multi-Shots			Lump Sum	\$20,000	\$3,102,000	\$ 0	\$3,102,000
		MWD / LWD Mob / De-mob			Lump Sum				
		Standard MWD Rental	154 Days	\$3,000 /day		\$462,000			
		Standard LWD Rental	154 Days	\$7,000 /day		\$1,078,000			
		MWD / LWD Engineers (2)	308 Days	\$2,000 /day		\$616,000			
		Mud Motors & Associated Tools High Temp MWD Rental	246 Days 154 Days	\$3,000 /day \$4,000 /day		\$739,200			
		High temp LWD Rental	154 Days	\$4,000 /day		\$616,000 \$1,540,000			
			TO4 Days	\$10,000 /day		\$1,540,000			
Fuel, Water	& Lube						\$18,018,000	\$0	\$18,018,000
		Rig Fuel	308 Days	\$53,000 /day		\$16,324,000		*	
		Boat Fuel	154 Days	\$4,000 /day		\$616,000			
		Helicopter Fuel	154 Days	\$3,000 /day		\$462,000			
		Lubricants Fresh Water	308 Days 308 Days	\$1,300 /day \$700 /day		\$400,400 \$215,600			
			JUO Days	φr σσ /udy		ψ2 10,000			
Drilling Fluid	ds Services						\$2,817,000	\$0	\$2,817,000
		Drilling Fluids - WBM			Lump Sum				
		Mud Engineer	308 Days	\$800 /day		\$246,400			
		Cuttings Disposal	308 Days	\$2,500 /day		\$770,000			
Electric I	ging & Cased I	tolo Logs					\$5,024,000	 	\$5,024,000
	ging a cased i	Wireline Unit and Personnel	308 Days	\$3,000 /day		\$924,000		1	⊅ 5,0∠4,000
		Standard Open Hole Logging		\$0,000 /duy	Lump Sum			<u>∤ · · · · · · · </u> ∤	
		High Temp Open Hole Logging			Lump Sum			1	
		Cased Hole Logging			Lump Sum				
Coment							¢4 405 055		<u> </u>
Cementing		22*			Lump Sum	\$100,000	\$1,135,000	\$0	\$1,135,000
		18"			Lump Sum			∤	
		16"			Lump Sum			1	
		13.375"			Lump Sum	\$150,000		t †	
		11.75"			Lump Sum			î	
		9.625"			Lump Sum			L	
		Retainers, Service Man, Manifold, Etc.	200 Dava	\$1.050 /Hr	Lump Sum	\$50,000 \$385,000			
		Unit Charge	308 Days	\$1,250 /day		გაი ნ,000		I	
								1	



	cal Services					\$755,000	\$0	\$7
	Logging Unit Operating rate	308 Days	\$1,250 /day		\$385,000			
	Personnel Charges	308 Days	\$1,200 /day		\$369,600			
Land Transportation						\$139,000	\$0	\$1
· · · · · · · · · · · · · · · · · · ·	Trucking	154 Days	\$900 /day		\$138,600			
Boat Transportation	Work Boat - Spot Hiro	154 Days	\$14,000 /day		\$2,156,000	\$3,542,000	\$0	\$3,5
	Work Boat - Spot Hire Crew Boat - Spot Hire	154 Days 154 Days	\$9,000 /day		\$1,386,000			
			,,		• .,,			
Helicopter Transportation						\$1,386,000	\$0	\$1,3
	Helicopter - spot hire	154 Days	\$9,000 /day		\$1,386,000			
Tubular Services						\$150,000	\$0	\$1
	QAQC			Lump Sum	\$150,000			
Shorebase / Dock Service	6					\$414.000	\$0	\$6
Shorebase / Dock Service	Shorebase /Dispatcher	308 Days	\$2,000 /day		\$616,000	\$616,000	\$0	\$0
	Chiclobace / Diopatchicl	000 24,0	\$2,000 /ddy		\$0.10,000			
Communications						\$308,000	\$0	\$3
	VSAT	308 Days	\$1,000 /day		\$308,000			
Miscellaneous Rental Equi	inment					\$7,166,000	\$0	\$7,1
	Solids Control	308 Days	\$400 /day		\$123,200	<i></i>	φŪ	φ1,
	Fishing Tools	308 Days	\$1,500 /day		\$462,000			
	Casing Running Equipment	70 Days	\$6,000 Day		\$420,000			
	Other Rentals	308 Days	\$20,000 Day		\$6,160,000			
		Days Days						
Miscellaneous Special Se	rvices	2 4 / 5				\$1,147,000	\$0	\$1,
	Weather Forecasting	308 Days	\$150 /day		\$46,200			
	Engineering Services - Riser A			Lump Sum	\$300,000			
	Engineering Services - Drill Str Engineering Services - Casing			Lump Sum Lump Sum	\$200,000 \$50,000			
	Engineering Services - Wellbo			Lump Sum	\$100,000			
	Engineering Services - Operati			Lump Sum	\$200,000			
	Engineering Services - Risk As	ssessments		Lump Sum	\$200,000			
	Engineering Services - Other			Lump Sum	\$50,000			
Other Services / Costs						\$2,371,000	\$0	\$2,3
	Misc Contract Labor	308 Days	\$1,500 /day		\$462,000			+=/-
	Casing Running	70 Days	\$10,000 /day		\$700,000			
	Well Insurance	000 D	64 400 (1)	Lump Sum	\$500,000 \$338,800			
	Overhead Catering	308 Days 308 Days	\$1,100 /day \$1,200 /day		\$369,600			
			,,					
Intangible Contingency		15%	Amount	ST Drlg = ST Comp =	\$226,008,000 \$0	\$33,902,000	\$0	\$33,9
Intangible Contingency		15%	Amount	ST Comp =	\$0			
Intangible Contingency		15%	Amount	ST Comp =		\$33,902,000 \$259,910,000	\$0 \$0	
Intangible Contingency		15%	Amount	ST Comp =	\$0			
ntangible Contingency		15%	Amount	ST Comp =	\$0			
Intangible Contingency	TEMS	15%	Amount	ST Comp =	\$0			
	ITEMS OD	15% 7 =#Strings	Amount Length	ST Comp =	\$0			\$33,5 \$259,5
	OD 36"			ST Comp =	so NTANGIBLE			
TANGIBLE I Drive Pipe Conductor	OD 36" 22"		Length 200 279	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00	\$259,910,000	\$0	\$259,s
TANGIBLE I Drive Pipe Conductor Surface	OD 36" 22" 18"		Length 200 279 4,907	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00	\$259,910,000 \$130,000 \$51,000 \$786,000	\$0 \$0 \$0 \$0 \$0	\$259,s
TANGIBLE I Drive Pipe Conductor Surface Intermediate	OD 36" 22" 18" 16"		Length 200 279 4,907 8,314	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$155.00	\$259,910,000 \$130,000 \$51,000 \$786,000 \$1,289,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,s
TANGIBLE I Drive Pipe Conductor Surface Intermediate intermediate	OD 36" 22" 18" 16" 13-3/8"		Length 200 279 4,907 8,314 11,693	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$160.00 \$155.00 \$140.00	\$259,910,000 \$130,000 \$51,000 \$786,000 \$786,000 \$1,289,000 \$1,638,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,s \$259,s \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate	OD 36" 22" 18" 16" 13-3/8" 11-3/4"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$80.00	\$259,910,000 \$130,000 \$51,000 \$786,000 \$1,638,000 \$1,638,000 \$280,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,5 \$259,5 \$1,2 \$1,2 \$1,4 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate	OD 36" 22" 18" 16" 13-3/8"		Length 200 279 4,907 8,314 11,693	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$160.00 \$155.00 \$140.00	\$259,910,000 \$130,000 \$51,000 \$786,000 \$786,000 \$1,289,000 \$1,638,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,\$ ***
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner	OD 36" 22" 18" 16" 13-3/8" 11-3/4"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$80.00	\$259,910,000 \$130,000 \$51,000 \$786,000 \$1,638,000 \$1,638,000 \$280,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,5 \$259,5 \$1,2 \$1,2 \$1,4 \$2
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Tie-back	OD 36" 22" 18" 16" 13-3/8" 11-3/4"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$80.00	\$259,910,000 \$130,000 \$51,000 \$786,000 \$1,638,000 \$1,638,000 \$280,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,5 \$259,5 \$1,2 \$1,2 \$1,4 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tine-back Tubing	OD 36" 22" 18" 16" 13-3/8" 11-3/4"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$80.00	\$259,910,000 \$130,000 \$51,000 \$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,9 \$ \$ \$ \$1,: \$1,: \$ \$; \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Tie-back	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$80.00	\$259,910,000 \$130,000 \$51,000 \$786,000 \$1,638,000 \$1,638,000 \$280,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,5 \$259,5 \$1,2 \$1,2 \$1,4 \$2
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$80.00	\$259,910,000 \$130,000 \$51,000 \$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,9 \$ \$ \$1,2 \$1,2 \$1,2 \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$80.00	\$259,910,000 \$130,000 \$51,000 \$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,\$ \$ \$ \$ \$ \$ \$ 1, \$ 1, \$ \$; \$; \$; \$; \$; \$; \$; \$; \$;
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$80.00	\$259,910,000 \$130,000 \$51,000 \$786,000 \$1,638,000 \$1,638,000 \$280,000 \$279,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$259,9 \$ \$ \$1,2 \$1,2 \$1,2 \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Whipstock Equipment & BF Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Length 200 279 4,907 8,314 11,693 3,500 3,980	ST Comp = TOTAL II	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$155.00 \$140.00 \$80.00 \$70.00	\$259,910,000 \$130,000 \$51,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$300,000 \$300,000 \$500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$259,5 \$259,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Mhipstock Equipment & BF Subsurface Completion Weilheads	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Length 200 279 4,907 8,314 11,693 3,500	ST Comp = TOTAL II 	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$140.00 \$20.00 \$70.00 \$70.00 \$70.00 \$70.00 \$70.00	\$259,910,000 \$130,000 \$51,000 \$1,289,000 \$1,289,000 \$1,289,000 \$2279,000 \$300,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$259,5 \$259,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Whipstock Equipment & BF Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Length 200 279 4,907 8,314 11,693 3,500 3,980	ST Comp = TOTAL II ST Drig = ST Drig = ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00 \$30.00 \$140.00 \$40.00 \$40.00 \$5,353,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,910,000 \$130,000 \$51,000 \$1,289,000 \$1,638,000 \$2279,000 \$300,000 \$300,000 \$5500,000 \$5500,000 \$536,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$259, \$259, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Whipstock Equipment & BF Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Length 200 279 4,907 8,314 11,693 3,500 3,980	ST Comp = TOTAL II ST Drig = ST Drig = ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$140.00 \$20.00 \$70.00 \$70.00 \$70.00 \$70.00 \$70.00	\$259,910,000 \$130,000 \$51,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$300,000 \$300,000 \$500,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$259, \$259, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Whipstock Equipment & BF Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Length 200 279 4,907 8,314 11,693 3,500 3,980	ST Comp = TOTAL II ST Drig = ST Comp = TOTAL	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$140.00 \$30.00 \$140.00 \$40.00 \$40.00 \$5,353,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$259,910,000 \$130,000 \$51,000 \$1,289,000 \$1,638,000 \$2279,000 \$300,000 \$300,000 \$500,000 \$5500,000 \$536,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$259,5 \$259,5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Whipstock Equipment & BF Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Length 200 279 4,907 8,314 11,693 3,500 3,980	ST Comp = TOTAL II ST Drlg = ST Drlg = ST Comp = TOTAL Tota	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$140.00 \$70.00 \$	\$259,910,000 \$130,000 \$130,000 \$1,289,000 \$1,638,000 \$1,638,000 \$279,000 \$279,000 \$300,000 \$300,000 \$5500,000 \$5536,000 \$536,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$259, \$259, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$



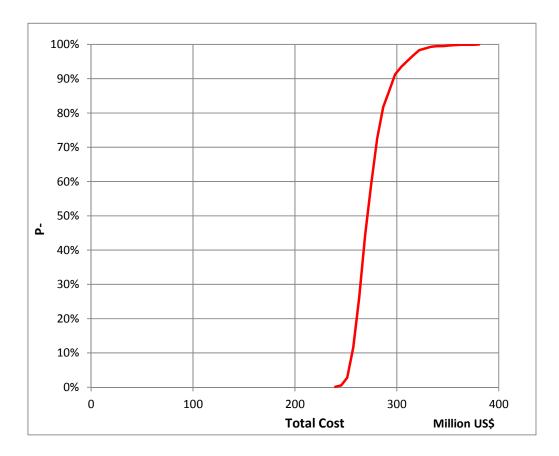
6.4.3 Case 2c Cost Estimate:

This case assumes the Deepwater wellbore configuration, coring the upper third of each stratigraphic section, drilling the middle third, and then coring the bottom third. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	itan Tan Total		P10	P50	P90	
363	\$269,685	\$8,528	\$278,213	\$246,177	\$261,328	\$282,808	

Figure 177. Baja Location: Case 2c – Cost Estimate
--

The following chart shows the cumulative probability of cost.





		SCOPING (COST ESTIMAT	<u>E SUMMARY</u>			Rev
		BEA	M - Baja Ca	se 2c		** DRAFT	**
	F	Prepared For	-				Exploratory _X
ENERGY PARTN		repared i or	. 1001 / 341				Development
AFE# XXX	Operator: CDEX	/ JAMSTEC		Revision No.	1	Date:	30-Jun-13
Prospect or Field	Lease Name		Case No.	Water Depth	Proposed TD	Formation	
Mantle Hole	N/A		#4b	4300m	10,400m 34,120 ft	Moho / Mantle	
Location	Surface Location:	l at: 25.0 - 33.0		14,107 ft	34,120 11	<u> </u>	
Baja		on: Lat: 25.0 - 33.0					
Purpose of Expend	iture:		-				
		drilling to the Moho,	then coring 500m of	the Mantle			
Case 4b: Conventio	nal Deepwater Case	e Well Configuration					
Drilling Rig :	Chikyu		Directional Plan: V	ertical Hole			
2	INTANGIBLE ITE				Dry Hole Drig	Complete	TOTAL
	-	-			327 Days		327 Days
	egulatory Costs				\$3,020,000		\$3,020,00
	tion, Demobilization				\$14,600,000		\$14,600,00
	- Day Work at \$300,0 ollars & Stabilizers	JUU / Day			\$159,100,000 \$5,636,000		\$159,100,00 \$5,636,00
	& Downhole Services				\$5,636,000		\$5,636,00
Fuel, Water					\$19,130,000		\$19,130,00
Drilling Flui					\$2,880,000		\$2,880,00
	ging & Cased Hole L	logs			\$5,081,000		\$5,081,00
Cementing Mud Loggin	g and Geological Se	nicos			\$1,159,000 \$802,000		\$1,159,00 \$802,00
Land Trans		TVICES			\$148,000		\$148,00
Boat Trans	ortation				\$3,761,000		\$3,761,00
	ransportation				\$1,472,000		\$1,472,00
Tubular Ser					\$150,000		\$150,00
Communic	/ Dock Services				\$654,000 \$327,000		\$654,00 \$327,00
	ous Rental Equipmer	nt			\$7,582,000		\$7,582,00
	ous Special Services				\$1,150,000		\$1,150,00
Other Service					\$2,443,000		\$2,443,00
Intan Contir	igencyat 15%				\$35,177,000	\$0	\$35,177,00
			TOTAL INT		\$269,685,327	\$0	\$269,685,32
	TANGIBLE ITEM	s					
		OD	Footage	\$/ft		<u> </u>	
Drive Pipe		36"	200	\$650.00	\$130,000	\$0	\$130,00
Conductor		22"	279	\$180.00	\$51,000		\$51,00
Surface		16.5" SET		\$300.00	\$1,533,000		\$1,533,00
Intermediat		16.5" SET		\$300.00	\$1,083,000		\$1,083,00
Intermediat		16"	11,714	\$155.00	\$1,816,000		\$1,816,00
Intermediat		13-3/8"	14,893	\$140.00	\$2,086,000		\$2,086,0
Intermediat Production		0	3,780	\$80.00 \$0.00	\$303,000 \$0		\$303,00
Production		0	0	\$0.00	\$0		
Tubing		0	0	\$0.00	\$0		
Liner Equip	mt				\$150,000		\$150,0
Whipstock I					\$0		
	Completion				\$0		
Wellheads					\$500,000	\$0	\$500,0
Miscellaneo					\$100,000		\$100,0
	gencyat 10%				\$776,000	\$0	\$776,0
Tan Conting			TOTAL T		\$8,528,000	\$0	\$8,528,0
Tan Conting							
Tan Conting			Tota	I Dry Hole Cost	\$278,213,327	\$0	\$278,213.3
Tan Conting				I Dry Hole Cost ompletion Cost			\$278,213,32



	<u>.sco</u>	PING COSTEST	MATE DETA	\/L				R
	В	EAM - Baja	Case 2c		*	** DRAFT	**	
		d For: IODP						Exploratory _X_
RGY PARTNE				, ODLX				Development
XXX	Operator: CDEX / JAMSTEC				Revision No.	1	Date:	30-Jun-13
bect or Field	Lease Name N/A	-	Case No. #4b		Water Depth 4300m	Proposed TD 10,400m	Objective Moho / Mantle	
le noie	N/A		#4D		4300m 14,107 ft	34,120 ft	wono / wantie	
tion	Surface Location: Lat: 25.0 - 33.0°N / Lo	ng: 120.0 - 127.0°V	v					
	Btm. Hole Location: Lat: 25.0 - 33.0°N / Lo	ng: 120.0 - 127.0°V	V					
ose of Expendi		hon coring 500m	of the Mantie					
	to the Mantle. Assume drilling to the Moho, t onal Deepwater Case Well Configuration	nen coring soom	or the Manue					Avg Intan \$/
								\$824,725
Drilling Rig		Dir	ectional Plan:	Vertical Hol	e			
	INTANGIBLE ITEMS			0		Dry Hole Drig	Complete	TOTAL
Location/R	gulatory Costs			Оре	erational Time =	327 Days \$3,020,000	\$0	327 Days \$3,020
Location	Metocean Study (desktop study, data	collection/processir		Lump Sum	\$1,000,000	\$3,020,000	\$U	\$3,020
	Site Survey (desktop study, bathymet		-9/	Lump Sum	\$2,000,000			
	Regulatory			Lump Sum	\$20,000			
Rig Mobiliza	ion, Demobilization					\$14,600,000		\$14,600
	Mobilization (from Japan) Demobilization (to Japan)			Lump Sum Lump Sum	\$7,300,000			
Drilling Rig -				Lump Sum	\$7,300,000	\$150 100 000	\$0	\$1E0 100
Diming Rig -	Drilling Day Rate	327 Davs	\$300,000 /day		\$98,100,000	\$159,100,000	\$0	\$159,100
	Existing Riser System Modifications			Lump Sum	\$14,000,000			
	Additional Riser			Lump Sum	\$47,000,000			
Bits, Drill Co	lars & Stabilizers Drill Bits	30 No.	\$70,000 /bit		\$2,100,000	\$5,636,000	\$0	\$5,636
	Drill Bits Drill String Rentals: DC's, Jars, Stab		\$70,000 /bit \$4,000 /day		\$2,100,000			
	Core Bits	28 No.	\$60,000 /bit		\$1,680,000			
	Coring Services	219 Days	\$2,500 /day		\$547,500			
Directional	Downhole Services					\$5,413,000	\$0	\$5,413
	Surveys/Gyros/Single & Multi-Shots MWD / LWD Mob / De-mob			Lump Sum Lump Sum	\$20,000 \$30,000			
	Standard MWD Rental	164 Days	\$3,000 /day	Lump Oum	\$490,500			
	Standard LWD Rental	164 Days	\$7,000 /day		\$1,144,500			
	MWD / LWD Engineers (2)	327 Days	\$2,000 /day		\$654,000			
	Mud Motors & Associated Tools	262 Days	\$3,000 /day		\$784,800			
	High Temp MWD Rental High temp LWD Rental	164 Days 164 Days	\$4,000 /day \$10,000 /day		\$654,000 \$1,635,000			
		104 Days	\$10,000 /ddy		\$1,000,000			
Fuel, Water	k Lube					\$19,130,000	\$0	\$19,130
	Rig Fuel	327 Days	\$53,000 /day		\$17,331,000			
	Boat Fuel	164 Days	\$4,000 /day		\$654,000 \$490,500			
	Helicopter Fuel Lubricants	164 Days 327 Days	\$3,000 /day \$1,300 /day		\$490,500			
	Fresh Water	327 Days	\$700 /day		\$228,900			
Drilling Fluid				1	64 000 655	\$2,880,000	\$0	\$2,880
	Drilling Fluids - WBM Mud Engineer	327 Days	\$800 /day	Lump Sum	\$1,800,000 \$261,600			
	Cuttings Disposal	327 Days	\$2,500 /day		\$817,500			
	jing & Cased Hole Logs					\$5,081,000		\$5,081
Electric Log	Wireline Unit and Personnel	327 Days	\$3,000 /day	Lump Curr	\$981,000			
Electric Log	Standard Open Hele Loggin -			Lump Sum Lump Sum	\$1,500,000 \$2,500,000			
Electric Log	Standard Open Hole Logging High Temp Open Hole Logging			Lump Sum	\$100,000			
Electric Log	Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging							
	High Temp Open Hole Logging						\$0	\$1,159
Electric Log	High Temp Open Hole Logging Cased Hole Logging			Lume Ou	MARK 650	\$1,159,000	<u>۵</u> ۵	4.1.4.
	High Temp Open Hole Logging Cased Hole Logging 22*			Lump Sum	\$100,000	\$1,159,000	\$U	
	High Temp Open Hole Logging Cased Hole Logging 22* 16.5 SET*			Lump Sum Lump Sum Lump Sum	\$100,000	\$1,159,000	\$0 	
	High Temp Open Hole Logging Cased Hole Logging 22*			Lump Sum		\$1,159,000	\$U	
	High Temp Open Hole Logging Cased Hole Logging 22* 16.5 SET* 16.5 SET* 16.5 SET* 16* 13.375*			Lump Sum Lump Sum Lump Sum Lump Sum	\$100,000 \$100,000 \$150,000 \$150,000	\$1,159,000		
	High Temp Open Hole Logging Cased Hole Logging 22* 16.5 SET* 16.5 SET* 16" 13.375" 11.750"			Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$100,000 \$100,000 \$150,000 \$150,000 \$100,000	\$1,159,000		
	High Temp Open Hole Logging Cased Hole Logging 22* 16.5 SET* 16.5 SET* 16* 13.375*	c. 327 Days	\$1,250 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$100,000 \$100,000 \$150,000 \$150,000	\$1,159,000		



	al Services					\$802,000	\$0	\$1
	Logging Unit Operating rate	327 Days	\$1,250 /day		\$408,750			
	Personnel Charges	327 Days	\$1,200 /day		\$392,400			
Land Transportation						\$148,000	\$0	\$
	Trucking	164 Days	\$900 /day		\$147,150	\$1.0,000		
Boat Transportation	Work Poot Spot Hiro	164 Dovo	\$14.000 /day		\$2,289,000	\$3,761,000	\$0	\$3,
	Work Boat - Spot Hire Crew Boat - Spot Hire	164 Days 164 Days	\$14,000 /day \$9,000 /day		\$2,289,000			
		101 54,0	\$0,000 /ddy		¢1, 11 1,000			
Helicopter Transportation						\$1,472,000	\$0	\$1,4
	Helicopter - spot hire	164 Days	\$9,000 /day		\$1,471,500			
Tubular Services						\$150,000	\$0	\$
	QAQC			Lump Sum	\$150,000			· · · · ·
Shorebase / Dock Service	e					\$654,000	\$0	\$
JIOICDUSC / DOCK OCI NOC	Shorebase /Dispatcher	327 Days	\$2,000 /day		\$654,000	\$034,000	\$0	÷.
					,,			
Communications						\$327,000	\$0	\$
	VSAT	327 Days	\$1,000 /day		\$327,000			
Miscellaneous Rental Equi	ipment					\$7,582,000	\$0	\$7,
	Solids Control	327 Days	\$400 /day		\$130,800			
	Fishing Tools	327 Days	\$1,500 /day		\$490,500			
	Casing Running Equipment	70 Days	\$6,000 Day		\$420,000 \$6,540,000			
	Other Rentals	327 Days Days	\$20,000 Day		φ0,540,000			
		Days						
Miscellaneous Special Se						\$1,150,000	\$0	\$1,
	Weather Forecasting Engineering Services - Riser Ana	327 Days	\$150 /day	Lump Sum	\$49,050 \$300,000			
	Engineering Services - Drill String			Lump Sum Lump Sum	\$200,000			
	Engineering Services - Casing De			Lump Sum	\$50,000			
	Engineering Services - Wellbore			Lump Sum	\$100,000			
	Engineering Services - Operation			Lump Sum	\$200,000			
	Engineering Services - Risk Asse Engineering Services - Other	ssments		Lump Sum Lump Sum	\$200,000 \$50,000			
	Linginooning controco - outor			Lump Cum	\$00,000			
Other Services / Costs						\$2,443,000	\$0	\$2,-
	Misc Contract Labor	327 Days	\$1,500 /day		\$490,500 \$700,000			
	Casing Running Well Insurance	70 Days	\$10,000 /day	Lump Sum	\$500,000			
	Overhead	327 Days	\$1,100 /day		\$359,700			
	Catering	327 Days	\$1,200 /day		\$392,400			
ntangible Contingency		15%	Amount	ST Drlg =	\$234,508,000	\$35,177,000	\$0	\$35,
				ST Comp =	\$0			
				TOTAL II	NTANGIBLE	\$269,685,000	\$0	<mark>\$269,</mark>
TANGIBLE I			Langth	TOTAL II		\$269,685,000	\$0	\$269,6
	OD	7 =#Strings	Length	TOTAL II	\$/ft			
TANGIBLE I Drive Pipe Conductor		7 =#Strings	Length 200 279		\$/ft \$650.00	\$130,000	\$0	\$
Drive Pipe	OD 36"	7 = #Strings	200		\$/ft			
Drive Pipe Conductor	OD 36" 22" 16.5" SET 16.5" SET	7 =#Strings	200 279		\$/ft \$650.00 \$180.00	\$130,000 \$51,000	\$0 \$0	\$
Drive Pipe Conductor Surface	OD 36" 22" 16.5" SET	7 =#Strings	200 279 5,107		\$/ft \$650.00 \$180.00 \$300.00	\$130,000 \$51,000 \$1,533,000 \$1,083,000 \$1,816,000	\$0 \$0 \$0	\$ \$1, \$1,
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 =#Strings	200 279 5,107 3,607 11,714 14,893		\$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$ \$1, \$1, \$1, \$2,
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate ntermediate	OD 36* 22* 16.5* SET 16.5* SET 16.* SET 16*	7 =#Strings	200 279 5,107 3,607 11,714		\$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00	\$130,000 \$51,000 \$1,533,000 \$1,083,000 \$1,816,000	\$0 \$0 \$0 \$0 \$0 \$0	\$
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 = # Strings	200 279 5,107 3,607 11,714 14,893		\$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$ \$1, \$1, \$1, \$2,
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 =#Strings	200 279 5,107 3,607 11,714 14,893		\$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$ \$1, \$1, \$1, \$2,
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Tie-back Tubing	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"	7 =#Strings	200 279 5,107 3,607 11,714 14,893		\$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000 \$303,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$ \$1, \$1, \$1, \$2, \$
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Tie-back Tubing Liner Equipment	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 =#Strings	200 279 5,107 3,607 11,714 14,893		\$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$ \$1, \$1, \$1, \$2,
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Tie-back Tubing	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 =#Strings	200 279 5,107 3,607 11,714 14,893		\$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000 \$303,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$ \$1, \$1, \$1, \$2, \$
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Tie-back Fubing Liner Equipment Whipstock Equipment & BF	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 =# Strings	200 279 5,107 3,607 11,714 14,893		\$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000 \$303,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$ \$1, \$1, \$1, \$2, \$
Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Minipstock Equipment & BF Subsurface Completion	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 = # Strings	200 279 5,107 3,607 11,714 14,893		\$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$130,000 \$51,000 \$1,533,000 \$1,083,000 \$1,816,000 \$2,086,000 \$303,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$ \$1, \$1, \$2, \$ \$ \$ \$ \$
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Tie-back Fubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads Wiscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		200 279 5,107 3,607 11,714 14,893 3,780		\$/ft \$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00	\$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000 \$303,000 \$15,150,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$ \$1, \$1, \$2, \$ \$ \$ \$ \$
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Tie-back Tubing Liner Equipment Mhipstock Equipment & BF Subsurface Completion Wellheads	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		200 279 5,107 3,607 11,714 14,893	ST Drig =	\$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$140.00 \$80.00 \$80.00 \$80.00 \$7,752,000	\$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000 \$303,000 \$15,150,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$ \$1, \$1, \$1, \$2, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Tie-back Fubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads Wiscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		200 279 5,107 3,607 11,714 14,893 3,780	ST Drlg = ST Comp =	\$/ft \$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$80.00 \$7,752,000 \$0	\$130,000 \$51,000 \$1,533,000 \$1,83,000 \$2,086,000 \$303,000 \$1550,000 \$150,000 \$100,000 \$776,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$ \$1, \$1, \$2, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Tie-back Fubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads Wiscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		200 279 5,107 3,607 11,714 14,893 3,780	ST Drlg = ST Comp =	\$/ft \$650.00 \$180.00 \$300.00 \$300.00 \$140.00 \$80.00 \$80.00 \$80.00 \$7,752,000	\$130,000 \$51,000 \$1,533,000 \$1,083,000 \$2,086,000 \$303,000 \$150,000 \$5500,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$ \$1, \$1, \$1, \$2, \$ \$ \$
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Tie-back Fubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads Wiscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		200 279 5,107 3,607 11,714 14,893 3,780	ST Drlg = ST Comp = TOTAL	\$/ft \$650.00 \$180.00 \$300.00 \$155.00 \$140.00 \$80.00 \$80.00 \$7,752,000 \$0	\$130,000 \$51,000 \$1,533,000 \$1,83,000 \$2,086,000 \$303,000 \$1550,000 \$150,000 \$100,000 \$776,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$ \$1, \$1, \$2, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Tie-back Fubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads Wiscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		200 279 5,107 3,607 11,714 14,893 3,780	ST Drig = ST Comp = TOTAL Tota	\$/ft \$650.00 \$180.00 \$300.00 \$135.00 \$140.00 \$80.00 \$80.00 \$87.752,000 \$0 TANGIBLE	\$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000 \$303,000 \$150,000 \$150,000 \$100,000 \$776,000 \$8,528,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$ \$1, \$1, \$2, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$



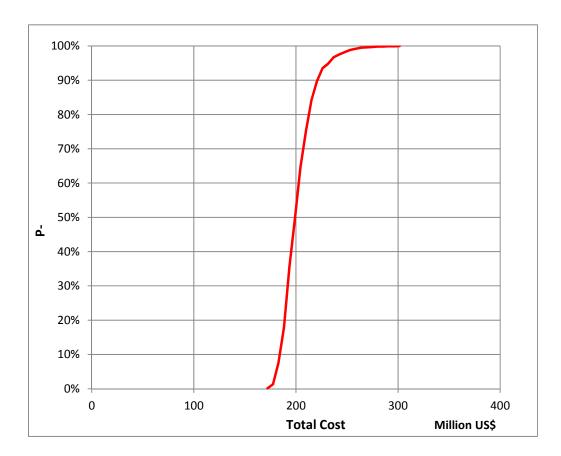
6.4.4 Case 4a Cost Estimate:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs			
Days	Intan	Tan	Total	P10 P50 P5			
244	\$206,803	\$2,392	\$209,195	\$184,132	\$199,057	\$221,027	

Figure 178. Baja Location: Case 4a – Cost Estimate

The following chart shows the cumulative probability of cost.





			<u>SCOPING C</u>	<u>OST ESTIMAT</u>	<u>E SUMMARY</u>			Rev	
	BEAM - Baja Case 4a						** DRAFT **		
	DE	Pre		IODP / JA		DEX		Exploratory _X	
FE# XXX		CDEX / JA	MSTEC		Revision No.	1	Date:	Development 30-Jun-13	
Prospect or Field	Lease Name			Case No.	Water Depth	Proposed TD	Formation		
Mantle Hole	N/A			#4a	4300m	10,400m	Moho / Mantle		
_ocation	Surface Loc	ation.	lat: 25.0 - 33.0°	N / Long: 120.0	14,107 ft - 127 0°W	34,120 ft	<u> </u>		
Baja	Btm. Hole L			N / Long: 120.0					
Purpose of Expen									
Scientific Drilling to Case 4a: Orig Bas				en coring 500m of	the Mantle				
Case 4a. Ong Das		omgulator							
Drilling Rig :	ling Rig : Chikyu Directional Plan: Vertical Hol								
	INTANGIBL	E ITEMS				Dry Hole Drig	Complete	TOTAL	
						208 Days \$3,020,000		208 Days	
	Location/ Regulatory Costs Rig Mobilization, Demobilization							\$3,020,00	
	g - Day Work at		/Day			\$14,600,000 \$123,400,000		\$123,400,00	
Bits, Drill Collars & Stabilizers						\$3,032,000	\$0	\$3,032,00	
Directional & Downhole Services						\$3,462,000		\$3,462,00	
Fuel, Water & Lube Drilling Fluids Services						\$12,168,000 \$2,487,000		\$12,168,00	
Electric Logging & Cased Hole Logs						\$4,724,000		\$4,724,00	
Cementing						\$660,000	\$0	\$660,00	
	Mud Logging and Geological Services						\$0	\$510,00	
	Land Transportation Boat Transportation						\$0 \$0	\$94,0 \$2,392,0	
Helicopter Transportation						\$2,392,000 \$936,000		\$936,0	
Tubular Services						\$100,000		\$100,0	
Shorebase / Dock Services						\$416,000 \$208,000		\$416,0	
	Communications Miscellaneous Rental Equipment							\$208,00 \$4,796,00	
Miscellaneous Special Services						\$4,796,000 \$1,132,000		\$1,132,00	
	Other Services / Costs						\$0	\$1,691,00	
Intan Conti	Intan Contingency at 15%						\$0	\$26,975,00	
									
				TOTAL IN	TANGIBLE	\$206,803,208	\$0	\$206,803,20	
	TANGIBLE	ITEMS			A 16.				
Drive Dine			OD 30"	Footage	\$/ft	£100.000	0.3	£100.00	
Drive Pipe Conductor			20"	200 279	\$500.00 \$180.00			\$100,00 \$51,00	
Surface			13-3/8"	5,036	\$140.00			\$706,0	
Intermedia	ate		11-3/4"	7,076	\$80.00			\$567,0	
Intermedia			0	0	\$0.00				
Intermedia	ate		0	0	\$0.00	\$0	\$0		
Intermedia	ate		0	0	\$0.00				
Production			0	0	\$0.00				
Production	n Tie-back		0	0	\$0.00				
Tubing			0	0	\$0.00			<u>.</u>	
Liner Equi	Equipment					\$150,000 \$0		\$150,0	
						\$0			
				-		\$500,000		\$500,0	
Subsurfac						\$100,000		\$100,0	
	eous/Other					\$218,000		\$218,0	
Subsurfac Wellheads		10%							
Subsurfac Wellheads Miscellane		10%		TOTALT		\$2,392.000	\$0	\$2.392.0	
Subsurfac Wellheads Miscellane		10%				\$2,392,000 \$209.195.208			
Subsurfac Wellheads Miscellane		10%		Tota	ANGIBLE al Dry Hole Cost Completion Cost	\$209,195,208	\$0	<mark>\$2,392,0</mark> \$209,195,20	



	SCOPING	COST EST	IMATE DETA	<u>ML</u>				F
	BEA	M - Baja	Case 4a		*	** DRAFT	**	
	Prepared F	or: IODP/	JAMSTEC	/ CDEX				Exploratory _X_
GY PARTNE	s -							Development
XXX	Operator: CDEX / JAMSTEC		0 N		Revision No.	1 Description	Date:	30-Jun-13
ect or Field Hole	ease Name I/A	-	Case No. #4a		Water Depth 4300m	Proposed TD 10.400m	Objective Moho / Mantle	
			<i>"</i>		14,107 ft	34,120 ft		
on	Surface Location: Lat: 25.0 - 33.0°N / Long: 1							
	Btm. Hole Location: Lat: 25.0 - 33.0°N / Long: 1	20.0 - 127.0°W	1					
se of Expendit	the Mantle. Assume drilling to the Moho, then	coring 500m	of the Mantle					
	Case Well Configuration	coming coomin						Avg Intan \$/
								\$994,245
Drilling Rig :		Dire	ectional Plan:	Vertical Hole	e			TOTAL
	NTANGIBLE ITEMS			One	erational Time =	Dry Hole Drlg 208 Days	Complete	TOTAL 208 Days
Location/ Re	ulatory Costs			Ope		\$3,020,000	\$0	\$3,020
	Metocean Study (desktop study, data colle	ction/processir	ig)	Lump Sum	\$1,000,000			
	Site Survey (desktop study, bathymetry)			Lump Sum	\$2,000,000		l i	
	Regulatory			Lump Sum	\$20,000			
Rig Mobilizat	n, Demobilization			Lume Ore	67 000 000	\$14,600,000		\$14,600
·	Mobilization (from Japan) Demobilization (to Japan)			Lump Sum Lump Sum	\$7,300,000 \$7,300,000			
Drilling Rig -				Lump Sum	φι,300,000	\$123,400,000	\$0	\$123,400
	Drilling Day Rate	208 Days	\$300,000 /day		\$62,400,000	\$120,400,000		ψ123,400
	Existing Riser System Modifications		·····	Lump Sum	\$14,000,000			
	Additional Riser			Lump Sum	\$47,000,000			
Bito Deill Col	ro 8 Stabilizara					#2 COO 077		<u> </u>
DITS, Drill Col	Irs & Stabilizers	24 No.	\$70,000 /bit		\$1,680,000	\$3,032,000	\$0	\$3,032
	Drill String Rentals: DC's, Jars, Stab, HW		\$4,000 /bit		\$1,680,000			
	Core Bits	6 No.	\$60,000 /bit		\$360,000			
	Coring Services	64 Days	\$2,500 /day		\$160,000			
Directional 8	Downhole Services				*	\$3,462,000	\$0	\$3,462
	Surveys/Gyros/Single & Multi-Shots MWD / LWD Mob / De-mob			Lump Sum Lump Sum	\$20,000 \$30,000			
	Standard MWD Rental	104 Days	\$3,000 /day	Lump Out	\$312,000			
	Standard LWD Rental	104 Days	\$7,000 /day		\$728,000			
	MWD / LWD Engineers (2)	208 Days	\$2,000 /day		\$416,000			
	Mud Motors & Associated Tools High Temp MWD Rental	166 Days 104 Days	\$3,000 /day \$4,000 /day		\$499,200			
	High temp LWD Rental	104 Days 104 Days	\$4,000 /day \$10,000 /day		\$416,000 \$1,040,000			
			\$10,000 /udy		ψ1,0 4 0,000			
Fuel, Water &	Lube					\$12,168,000	\$0	\$12,168
	Rig Fuel	208 Days	\$53,000 /day		\$11,024,000			
	Boat Fuel	104 Days	\$4,000 /day		\$416,000			
	Helicopter Fuel Lubricants	104 Days 208 Days	\$3,000 /day \$1,300 /day		\$312,000 \$270,400			
		208 Days	\$700 /day		\$145,600			
	Fresh Water						1	
							\$0	\$2,487
Drilling Fluids	Services					\$2,487,000	**	
Drilling Fluids	Services Drilling Fluids - WBM	208 Dave	\$800 /day	Lump Sum	\$1,800,000 \$166 400	\$2,487,000	* *	
Drilling Fluids	Services	208 Days 208 Days	\$800 /day \$2,500 /day	Lump Sum	\$1,800,000 \$166,400 \$520,000	\$2,487,000		
Drilling Fluids	Services Drilling Fluids - WBM Mud Engineer			Lump Sum	\$166,400	\$2,487,000		
	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal ng & Cased Hole Logs	208 Days	\$2,500 /day	Lump Sum	\$166,400 \$520,000	\$2,487,000 \$4,724,000		\$4,724
	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal ng & Cased Hole Logs Wireline Unit and Personnel				\$166,400 \$520,000 \$624,000			\$4,724
	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal org & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging	208 Days	\$2,500 /day	Lump Sum	\$166,400 \$520,000 \$624,000 \$1,500,000			\$4,724
	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal ng & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	208 Days	\$2,500 /day	Lump Sum Lump Sum	\$166,400 \$520,000 \$624,000 \$1,500,000 \$2,500,000			\$4,724
Electric Logg	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal org & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging	208 Days	\$2,500 /day	Lump Sum	\$166,400 \$520,000 \$624,000 \$1,500,000	\$4,724,000		\$4,724
	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal or a cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging	208 Days	\$2,500 /day	Lump Sum Lump Sum Lump Sum	\$166,400 \$520,000 \$624,000 \$1,500,000 \$2,500,000 \$100,000			
Electric Logg	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal ng & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 20*	208 Days	\$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$166,400 \$520,000 \$624,000 \$1,500,000 \$2,500,000 \$100,000 \$100,000	\$4,724,000		
Electric Logg	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal mg & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 20* 13-3/8*	208 Days	\$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$166,400 \$520,000 \$1,500,000 \$2,500,000 \$100,000 \$100,000 \$100,000	\$4,724,000		
Electric Logg	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal ng & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 20*	208 Days	\$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$166,400 \$520,000 \$624,000 \$1,500,000 \$2,500,000 \$100,000 \$100,000	\$4,724,000		
Electric Logg	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal mg & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 20* 13-3/8*	208 Days	\$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$166,400 \$520,000 \$1,500,000 \$2,500,000 \$100,000 \$100,000 \$100,000	\$4,724,000		
Electric Logg	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal mg & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 20° 13-3/8° 11-3/4°	208 Days	\$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$166,400 \$520,000 \$6,24,000 \$1,500,000 \$1,500,000 \$100,000 \$100,000 \$150,000 \$150,000	\$4,724,000		
Electric Logg	Services Drilling Fluids - WBM Mud Engineer Cuttings Disposal mg & Cased Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 20* 13-3/8*	208 Days	\$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$166,400 \$520,000 \$1,500,000 \$2,500,000 \$100,000 \$100,000 \$100,000	\$4,724,000		\$4,724 \$660



	al Services						\$510,000	\$0	\$!
	Logging Un	it Operating rate	208 Days	\$1,250 /day		\$260,000			
	Personnel (Charges	208 Days	\$1,200 /day		\$249,600			
Land Transportation							\$94,000	\$0	5
	Trucking		104 Days	\$900 /day		\$93,600	\$71,000		
Boat Transportation	Work Poot	Spot Hiro	104 Days	\$14.000 /day		\$1,456,000	\$2,392,000	\$0	\$2,3
a	Work Boat - Crew Boat -		104 Days	\$14,000 /day \$9,000 /day		\$936,000			
				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		+,			
Helicopter Transportation							\$936,000	\$0	\$
	Helicopter -	- spot hire	104 Days	\$9,000 /day		\$936,000			
Tubular Services							\$100,000	\$0	\$
	QAQC				Lump Sum	\$100,000			
Shorebase / Dock Services	s						\$416,000	\$0	\$4
Shorebase / Dock Oct Net.		/Dispatcher	208 Days	\$2,000 /day		\$416,000	\$410,000	\$0	φ.
		· · · ·				,			
Communications							\$208,000	\$0	\$2
	VSAT		208 Days	\$1,000 /day		\$208,000			
Miscellaneous Rental Equi	ipment						\$4,796,000	\$0	\$4,
	Solids Cont		208 Days	\$400 /day		\$83,200			
	Fishing Too		208 Days	\$1,500 /day		\$312,000			
	Casing Rur Other Renta	nning Equipment	40 Days	\$6,000 Day \$20,000 Day		\$240,000 \$4,160,000			
	Outer Refit	210	208 Days Days	φ20,000 Day		φ4,100,000			
			Days						
Miscellaneous Special Ser							\$1,132,000	\$0	\$1,
	Weather Fo		208 Days	\$150 /day	Lump Sum	\$31,200 \$300,000			
		g Services - Riser Analysis g Services - Drill String Design			Lump Sum Lump Sum	\$200,000			
	Engineering	g Services - Casing Design			Lump Sum	\$50,000			
		g Services - Wellbore Stability			Lump Sum	\$100,000			
		g Services - Operational Suppor			Lump Sum	\$200,000			
		g Services - Risk Assessments g Services - Other			Lump Sum Lump Sum	\$200,000 \$50,000			
	Linginooning	g oornood outor			Lump Oum	\$00,000			
Other Services / Costs							\$1,691,000	\$0	\$1,0
	Misc Contra		208 Days 40 Days	\$1,500 /day \$10,000 /day		\$312,000 \$400,000			
	Casing Rur Well Insura		40 Days	\$10,000/day	Lump Sum	\$500,000			
	Overhead		208 Days	\$1,100 /day		\$228,800			
	Catering		208 Days	\$1,200 /day		\$249,600			
Intangible Contingency				Amount	ST Drlg =	\$179,828,000	\$26,975,000	\$0	\$26,
ntangible Contingency				Amount	ST Drlg = ST Comp =	\$179,828,000 \$0	\$26,975,000	\$0	\$26,9
ntangible Contingency				Amount	ST Comp =		\$26,975,000 \$206,803,000	\$0 \$0	
ntangible Contingency				Amount	ST Comp =	\$0			
				Amount	ST Comp =	\$0			\$26, [,] \$206,
intangible Contingency TANGIBLE I			15%		ST Comp =	so NTANGIBLE			
TANGIBLE I		OD 4 30°		Length	ST Comp =	SO NTANGIBLE \$/ft	\$206,803,000	\$0 	\$206,t
TANGIBLE I' Drive Pipe		30"	15%	Length 200	ST Comp =	50 NTANGIBLE \$/ft \$500.00	\$206,803,000 \$206,803,000 \$100,000	\$0 \$0 \$0	\$206,t
TANGIBLE I			15%	Length	ST Comp =	SO NTANGIBLE \$/ft	\$206,803,000 \$100,000 \$51,000	\$0 \$0 \$0 \$0	\$206,t
TANGIBLE I Drive Pipe Conductor		30" 20"	15%	Length 200 279	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00	\$206,803,000 \$206,803,000 \$100,000	\$0 \$0 \$0	\$206,t
TANGIBLE I' Drive Pipe Conductor Surface		30" 20" 13-3/8"	15%	Length 200 279 5,036	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$206,803,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$206,4
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate		30" 20" 13-3/8"	15%	Length 200 279 5,036	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$206,803,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$206,4
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Intermediate		30" 20" 13-3/8"	15%	Length 200 279 5,036	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$206,803,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$206,4
TANGIBLE I' Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner		30" 20" 13-3/8"	15%	Length 200 279 5,036	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$206,803,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$206,i
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Tie-back		30" 20" 13-3/8"	15%	Length 200 279 5,036	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$206,803,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$206,i
TANGIBLE I' Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing		30" 20" 13-3/8"	15%	Length 200 279 5,036	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$206,803,000 \$100,000 \$51,000 \$706,000 \$567,000	\$0 \$0 \$0 \$0 \$0 \$0	\$206, \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment	TEMS	30" 20" 13-3/8"	15%	Length 200 279 5,036	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$206,803,000 \$100,000 \$51,000 \$706,000	\$0 \$0 \$0 \$0 \$0 \$0	\$206,i
TANGIBLE I' Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP	TEMS	30" 20" 13-3/8"	15%	Length 200 279 5,036	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$206,803,000 \$100,000 \$51,000 \$706,000 \$567,000	\$0 \$0 \$0 \$0 \$0 \$0	\$206, \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment	TEMS	30" 20" 13-3/8"	15%	Length 200 279 5,036	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$206,803,000 \$100,000 \$51,000 \$706,000 \$567,000 \$567,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$206, \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion	TEMS	30" 20" 13-3/8"	15%	Length 200 279 5,036	ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00	\$206,803,000 \$100,000 \$51,000 \$706,000 \$567,000	\$0 \$0 \$0 \$0 \$0 \$0	\$206, \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Mipistock Equipment & BP Subsurface Completion Weilheads Wiscellaneous / Other	TEMS	30" 20" 13-3/8"	15%	Length 200 279 5,036	ST Comp =	\$0 NTANGIBLE \$500.00 \$180.00 \$140.00 \$80.00	\$206,803,000 \$100,000 \$51,000 \$706,000 \$567,000 \$150,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$206, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Mipistock Equipment & BP Subsurface Completion Weilheads Wiscellaneous / Other	TEMS	30" 20" 13-3/8"	=#Strings	Length 200 279 5,036	ST Comp = TOTAL II 	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,174,000	\$206,803,000 \$100,000 \$51,000 \$706,000 \$567,000 \$150,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$206, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Mipistock Equipment & BP Subsurface Completion Weilheads Wiscellaneous / Other	TEMS	30" 20" 13-3/8"	=#Strings	Length 200 279 5,036 7,076	ST Comp = TOTAL II ST Drig = ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,174,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$206,803,000 \$100,000 \$51,000 \$706,000 \$567,000 \$567,000 \$150,000 \$150,000 \$100,000 \$218,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$206, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Mipistock Equipment & BP Subsurface Completion Weilheads Wiscellaneous / Other	TEMS	30" 20" 13-3/8"	=#Strings	Length 200 279 5,036 7,076	ST Comp = TOTAL II ST Drig = ST Comp =	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,174,000	\$206,803,000 \$100,000 \$51,000 \$706,000 \$567,000 \$150,000 \$150,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$206, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I' Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Weilheads	TEMS	30" 20" 13-3/8"	=#Strings	Length 200 279 5,036 7,076	ST Comp = TOTAL II ST Drig = ST Comp = TOTAL	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,174,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$206,803,000 \$100,000 \$51,000 \$706,000 \$567,000 \$567,000 \$150,000 \$150,000 \$100,000 \$218,000 \$218,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$206, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Wellheads Miscellaneous / Other	TEMS	30" 20" 13-3/8"	=#Strings	Length 200 279 5,036 7,076	ST Comp = TOTAL II ST Drlg = ST Drlg = ST Comp = TOTAL Tota	\$0 NTANGIBLE \$/ft \$500.00 \$180.00 \$140.00 \$80.00 \$80.00 \$2,174,000 \$0 TANGIBLE	\$206,803,000 \$100,000 \$51,000 \$706,000 \$567,000 \$567,000 \$150,000 \$150,000 \$100,000 \$218,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$206, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$



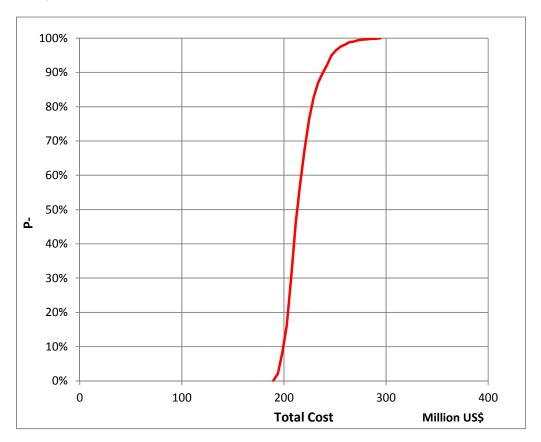
6.4.5 Case 4b Cost Estimate:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs				
Days	Intan Tan		Total	P10	P50	P90		
265	\$218,304	\$5,889	\$224,193	\$199,389	\$212,987	\$238,289		

Figure 179. Baja Location: Case 4b – Cost Estimate

The following chart shows the cumulative probability of cost.





			<u>SCOPING C</u>	OST ESTIMATE	<u>E SUMMARY</u>			Rev
			BEAN	1 - Baja Ca	se 4b		** DRAFT	**
	-	Bro		IODP / JAN				
ENERGY PART		FIE	pareu For.	IODF / JAI				Exploratory _X Development
FE# XXX		CDEX / JA	MSTEC		Revision No.	1	Date:	30-Jun-13
Prospect or Field	Lease Nam			Case No.	Water Depth	Proposed TD	Formation	
Iantle Hole	N/A	_		#4b	4300m	10,400m	Moho / Mantle	
aaatian	Curfooolo	action	1 - 4: 05 0 . 00 00	N / L	14,107 ft	34,120 ft		
ocation Baja	Surface Lo Btm. Hole			N / Long: 120.0 - N / Long: 120.0 -				
urpose of Expen		Location.	Lat. 25.0 - 55.0	N7 Long. 120.0 -	121.0 W			
		ssume drilli	ng to the Moho, th	en coring 500m of	the Mantle			
ase 4b: Conventi	ional Deepwat	er Case Wel	I Configuration	-				
						-		
rilling Rig :	Chikyu		D	irectional Plan: V	ertical Hole			
	INTANGIB	LEITEMS				Dry Hole Drlg	Complete	TOTAL 220 Davia
Location/	Regulatory Cos	te				229 Days \$3,020,000	\$0	229 Days \$3,020,0
	zation, Demobi					\$14,600,000	\$0	\$14,600,0
Drilling Rig	g - Day Work at	t \$300,000	/Day			\$129,700,000	\$0	\$129,700,0
	Collars & Stabi					\$3,116,000	\$0	\$3,116,0
	I & Downhole S	Services				\$3,806,000	\$0	\$3,806,0
Fuel, Wate	ids Services					\$13,397,000 \$2,556,000	\$0 \$0	\$13,397,0 \$2,556,0
	gging & Cased	d Hole Logs				\$4,787,000	\$0	\$4,787,0
Cementing	g					\$1,037,000	\$0	\$1,037,0
	ing and Geolog	gical Service	S			\$562,000	\$0	\$562,0
Land Tran						\$104,000	\$0	\$104,0
Boat Trans	sportation Transportatior					\$2,634,000 \$1,031,000	\$0 \$0	\$2,634,0 \$1,031,0
Tubular Se	· · · · · · · · · · · · · · · · · · ·	<u> </u>				\$1,031,000	\$0 \$0	\$1,031,0
	e / Dock Servic	es				\$458,000	\$0	\$458,0
Communi						\$229,000	\$0	\$229,0
	eous Rental Eq					\$5,436,000	\$0	\$5,436,0
	eous Special S	ervices				\$1,135,000	\$0	\$1,135,0
Other Serv Intan Cont	vices / Costs	15%				\$2,071,000 \$28,475,000	\$0 \$0	\$2,071,0 \$28,475,0
intan cont	ingencyat	1376				\$20,475,000	φU	\$20,475,0
				TOTAL INT		\$218,304,229	\$0	\$218,304,2
	TANGIBLE	EITEMS						
		_	OD	Footage	\$/ft			
			36"	200	\$650.00	\$130,000	\$0	\$130,0
Drive Pipe			22"	279	¢100.00	\$51,000	\$0	\$51,0
Drive Pipe Conductor	·				\$180.00			
			18"	4,907	\$180.00	\$786,000	\$0	\$786,0
Conductor Surface Intermedia	ate		18" 16"	4,907 8,314	\$160.00 \$155.00	\$786,000 \$1,289,000	\$0	\$1,289,0
Conductor Surface Intermedia	ate		18" 16" 13-3/8"	4,907 8,314 11,693	\$160.00 \$155.00 \$140.00	\$786,000 \$1,289,000 \$1,638,000	\$0 \$0	\$1,289,(\$1,638,(
Conductor Surface Intermedia Intermedia	ate ate		18" 16" 13-3/8" 11-3/4"	4,907 8,314 11,693 3,500	\$160.00 \$155.00 \$140.00 \$80.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000	\$0 \$0 \$0	\$1,289,(\$1,638,(\$280,(
Conductor Surface Intermedia Intermedia Intermedia	ate ate ate ate		18" 16" 13-3/8" 11-3/4" 9-5/8"	4,907 8,314 11,693 3,500 3,980	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000	\$0 \$0 \$0 \$0	\$1,289,(\$1,638,(\$280,(
Conductor Surface Intermedia Intermedia Intermedia Intermedia Production	ate ate ate ate n Liner		18" 16" 13-3/8" 11-3/4" 9-5/8" 0	4,907 8,314 11,693 3,500 3,980 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0	\$0 \$0 \$0 \$0 \$0 \$0	\$1,289,(\$1,638,(\$280,(
Conductor Surface Intermedia Intermedia Intermedia Intermedia Production Production	ate ate ate ate n Liner		18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1,289,(\$1,638,(\$280,(
Conductor Surface Intermedia Intermedia Intermedia Intermedia Production Production Tubing	ate ate ate h Liner h Tie-back		18" 16" 13-3/8" 11-3/4" 9-5/8" 0	4,907 8,314 11,693 3,500 3,980 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1,289,(\$1,638,(\$280,(\$279,(
Conductor Surface Intermedia Intermedia Intermedia Intermedia Production Production Tubing Liner Equi	ate ate ate ate n Liner n Tie-back		18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1,289,(\$1,638,(\$280,(\$279,(
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock	ate ate ate n Liner n Tie-back pmt k Equipment		18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$300,000 \$0 \$0 \$0 \$0 \$300,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1,289,(\$1,638,(\$280,(\$279,(
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock	ate ate ate n Liner n Tie-back pmt c Equipment ce Completion		18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$300,000 \$0 \$300,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1,289,0 \$1,638,0 \$280,0 \$279,0 \$279,0 \$300,0
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock Subsurfac Wellheads	ate ate ate n Liner n Tie-back pmt c Equipment ce Completion		18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$300,000 \$0 \$0 \$0 \$0 \$300,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1,289,0 \$1,638,0 \$280,0 \$279,0 \$300,0 \$300,0 \$500,0
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock Subsurfac Wellheads	ate ate ate h Liner h Tie-back pmt k Equipment te Completion seous/Other	10%	18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$0 \$300,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$1,289,0 \$1,638,0 \$280,0 \$279,0 \$300,0 \$300,0 \$500,0 \$100,0
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock Subsurfac Wellheads Miscellane	ate ate ate h Liner h Tie-back pmt k Equipment te Completion seous/Other	10%	18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 3,980 0 0 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$300,000 \$0 \$500,000 \$100,000 \$536,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$1,289,0 \$1,638,0 \$280,0 \$279,0 \$300,0 \$300,0 \$500,0 \$100,0 \$536,0
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock Subsurfac Wellheads Miscellane	ate ate ate h Liner h Tie-back pmt k Equipment te Completion seous/Other	10%	18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4.907 8.314 11,693 3,500 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$300,000 \$300,000 \$500,000 \$100,000 \$536,000 \$536,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$786, \$1,289, \$1,289, \$280, \$2280, \$279, \$279, \$300, \$300, \$300, \$500, \$500, \$536, \$5,889,0 \$224,193,2
Conductor Surface Intermedia Intermedia Intermedia Production Production Tubing Liner Equi Whipstock Subsurfac Wellheads Miscellane	ate ate ate h Liner h Tie-back pmt k Equipment te Completion seous/Other	10%	18" 16" 13-3/8" 11-3/4" 9-5/8" 0 0	4,907 8,314 11,693 3,500 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$160.00 \$155.00 \$140.00 \$80.00 \$70.00 \$0.00 \$0.00 \$0.00	\$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$0 \$0 \$0 \$300,000 \$0 \$500,000 \$100,000 \$536,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1,289,0 \$1,638,0 \$280,0 \$279,0 \$300,0 \$300,0 \$500,0 \$100,0 \$536,0



		SCOPING	COST EST	MATE DETA	A/L				Rev4
		BEAN	I - Baja	Case 4b		*	** DRAFT	**	
BLAD	ΣΞ.	Prepared Fo			/ CDEX				Exploratory _X
ENERGY PARTNE	ERS	•							Development
AFE# XXX	Operator:	CDEX / JAMSTEC		One a Nia		Revision No.	1	Date:	30-Jun-13
Prospect or Field Mantle Hole	Lease Name		-	Case No. #4b		Water Depth 4300m	Proposed TD 10,400m	Objective Moho / Mantle	
						14,107 ft	34,120 ft	mono / manac	
Location	Surface Loca						-		
Baja	Btm. Hole Lo	cation: Lat: 25.0 - 33.0°N / Long: 120).0 - 127.0°V	/					
Purpose of Expendi		e. Assume drilling to the Moho, then co	ring 500m	of the Mantie					
		ater Case Well Configuration	ing soon i	or the Manue					Avg Intan \$/day
									\$953,293
Drilling Rig			Dir	ectional Plan:	Vertical Hole	e			
	INTANGIBLE	TEMS			000	rational Time -	Dry Hole Drig	Complete	TOTAL 229 Days
Location/ Re	egulatory Costs				Ope	erational Time =	229 Days \$3,020,000	\$0	\$3,020,000
Loounon	ogulatory coole	Metocean Study (desktop study, data collect	ion/processir		Lump Sum	\$1,000,000	\$3,020,000	**	\$3,020,000
		Site Survey (desktop study, bathymetry)		57	Lump Sum	\$2,000,000			
		Regulatory			Lump Sum	\$20,000			
Rig Mobiliza	ation, Demobiliz						\$14,600,000		\$14,600,000
		Mobilization (from Japan)			Lump Sum	\$7,300,000		┠	
Deilline D'	Day Warts	Demobilization (to Japan)			Lump Sum	\$7,300,000	¢100 700 000		¢100 700 0
Drilling Rig -	- Day WORK	Drilling Day Rate	229 Days	\$300,000 /day		\$68,700,000	\$129,700,000	\$0	\$129,700,000
		Existing Riser System Modifications	Duy3	2000,000 /udy	Lump Sum	\$14,000,000			
		Additional Riser			Lump Sum	\$47,000,000			
Bits, Drill Co	ollars & Stabiliz					A4 000 000	\$3,116,000	\$0	\$3,116,000
		Drill Bits Drill String Rentals: DC's, Jars, Stab, HWT	24 No. 229 Days	\$70,000 /bit \$4,000 /day		\$1,680,000 \$916,000			
		Core Bits	6 No.	\$60,000 /bit		\$360,000			
		Coring Services	64 Days	\$2,500 /day		\$160,000			
Directional	& Downhole Se						\$3,806,000	\$0	\$3,806,000
		Surveys/Gyros/Single & Multi-Shots			Lump Sum	\$20,000			
		MWD / LWD Mob / De-mob Standard MWD Rental	115 Days	\$3,000 /day	Lump Sum	\$30,000			
		Standard LWD Rental	115 Days	\$3,000 /day		\$343,500 \$801,500			
		MWD/LWD Engineers (2)	229 Days	\$2,000 /day		\$458,000			
		Mud Motors & Associated Tools	183 Days	\$3,000 /day		\$549,600			
		High Temp MWD Rental	115 Days	\$4,000 /day		\$458,000			
		High temp LWD Rental	115 Days	\$10,000 /day		\$1,145,000			
Fuel, Water	& Luba						\$13,397,000	\$0	\$13,397,000
i dei, water	a Lube	Rig Fuel	229 Days	\$53,000 /day		\$12,137,000	\$13,397,000	\$ 0	\$13,397,000
		Boat Fuel	115 Days	\$4,000 /day		\$458,000			
		Helicopter Fuel	115 Days	\$3,000 /day		\$343,500			
		Lubricants Fresh Water	229 Days 229 Days	\$1,300 /day \$700 /day		\$297,700 \$160,300		∤	
			Duys	4.007ddy		\$100,000			
Drilling Fluid	ds Services						\$2,556,000	\$0	\$2,556,000
		Drilling Fluids - WBM			Lump Sum	\$1,800,000			
		Mud Engineer Cuttings Disposal	229 Days	\$800 /day		\$183,200 \$572,500			
		Cullings Disposal	229 Days	\$2,500 /day		\$572,500			
Electric Log	gging & Cased H	lole Logs					\$4,787,000	1	\$4,787,000
		Wireline Unit and Personnel	229 Days	\$3,000 /day		\$687,000		1	
		Standard Open Hole Logging			Lump Sum	\$1,500,000			
		High Temp Open Hole Logging			Lump Sum	\$2,500,000		łł	
		Cased Hole Logging			Lump Sum	\$100,000		┨	
Cementing							\$1,037,000	\$0	\$1,037,000
		22"			Lump Sum	\$100,000			
		18"			Lump Sum	\$100,000			
		16" 13.375"			Lump Sum Lump Sum	\$150,000 \$150,000		Į	
		13.375"			Lump Sum	\$150,000		╂╂	
		9.625"			Lump Sum	\$100,000			
		Retainers, Service Man, Manifold, Etc.			Lump Sum	\$50,000			
		Unit Charge	229 Days	\$1,250 /day		\$286,250			



	al Services					\$562,000	\$0	\$
	Logging Unit Operating rate Personnel Charges	229 Days 229 Days	\$1,250 /day \$1,200 /day		\$286,250 \$274,800			
	T claoniner onlarges	225 Duj3	\$1,2007day		φ 2 14,000			
Land Transportation	Trucking	115 Days	\$900 /day		\$103.050	\$104,000	\$0	\$
	indokang	110 54,0	\$000 /ddj					
Boat Transportation	Work Boat - Spot Hire	115 Days	\$14,000 /day		\$1,603,000	\$2,634,000	\$0	\$2,0
	Crew Boat - Spot Hire	115 Days	\$9,000 /day		\$1,030,500			
Helicopter Transportation						\$1,031,000	\$0	\$1,
	Helicopter - spot hire	115 Days	\$9,000 /day		\$1,030,500	+		
Tubular Services						\$150,000	\$0	\$
	QAQC			Lump Sum	\$150,000	\$100,000		
Shorebase / Dock Services						\$458,000	\$0	\$
	Shorebase /Dispatcher	229 Days	\$2,000 /day		\$458,000			
Communications						\$229,000	\$0	\$2
	VSAT	229 Days	\$1,000 /day		\$229,000			
Miscellaneous Rental Equi						\$5,436,000	\$0	\$5,·
	Solids Control Fishing Tools	229 Days 229 Days	\$400 /day \$1,500 /day		\$91,600 \$343,500			
	Casing Running Equipment	70 Days	\$6,000 Day		\$420,000			
	Other Rentals	229 Days	\$20,000 Day		\$4,580,000			
		Days Days						
Miscellaneous Special Ser		000 0	\$450 /J		004 050	\$1,135,000	\$0	\$1,
	Weather Forecasting Engineering Services - Riser	229 Days Analysis	\$150 /day	Lump Sum	\$34,350 \$300,000			
	Engineering Services - Drill S	tring Design		Lump Sum	\$200,000			
	Engineering Services - Casin Engineering Services - Wellbo			Lump Sum Lump Sum	\$50,000 \$100,000			
	Engineering Services - Opera			Lump Sum	\$200,000			
	Engineering Services - Risk A Engineering Services - Other	Assessments		Lump Sum Lump Sum	\$200,000 \$50,000			
	Engineening Services - Other			Lump Sum	\$30,000			
Other Services / Costs	Misc Contract Labor	229 Days	\$1,500 /day		\$343,500	\$2,071,000	\$0	\$2,
	Casing Running	70 Days	\$10,000 /day		\$700,000			
	Well Insurance			Lump Sum	\$500,000			
	Overhead Catering	229 Days 229 Days	\$1,100 /day \$1,200 /day		\$251,900 \$274,800			
ntangible Contingency		15%	Amount	ST Drlg =	\$189,829,000	\$28,475,000	\$0	\$28,
ntangible Contingency		15%	Amount	ST Comp =	\$0			
ntangible Contingency		15%	Amount	ST Comp =		\$28,475,000 \$218,304,000	\$0 \$0	
ntangible Contingency			Amount	ST Comp =	\$0			
ntangible Contingency	TEMS	15%	Amount	ST Comp =	\$0			\$28, [,] \$218,
TANGIBLE I	OD	15% 7 =#Strings	Amount Length	ST Comp =	\$0 NTANGIBLE \$/ft			
TANGIBLE I' Drive Pipe	OD 36"		Length 200	ST Comp =	50 NTANGIBLE \$/ft \$650.00	\$218,304,000 \$130,000	\$0	\$218,i
TANGIBLE I Drive Pipe Conductor	OD 36" 22"		Length 200 279	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00	\$218,304,000 \$130,000 \$51,000	\$0 \$0 \$0 \$0	\$218, \$
TANGIBLE I' Drive Pipe	OD 36"		Length 200	ST Comp =	50 NTANGIBLE \$/ft \$650.00	\$218,304,000 \$130,000 \$51,000 \$786,000	\$0 \$0 \$0 \$0 \$0 \$0	\$218, \$ \$
TANGIBLE I' Drive Pipe Conductor Surface	OD 36" 22" 18"		Length 200 279 4,907	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00	\$218,304,000 \$130,000 \$51,000	\$0 \$0 \$0 \$0	\$218, \$
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate	OD 36" 22" 18" 16" 13-3/8" 11-3/4"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$80.00	\$218,304,000 \$218,304,000 \$130,000 \$51,000 \$786,000 \$1,289,000 \$1,638,000 \$280,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$218, \$ \$ \$ \$1, \$1, \$1, \$
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate ntermediate	OD 36" 22" 18" 16" 13-3/8"		Length 200 279 4,907 8,314 11,693	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$160.00 \$155.00 \$140.00	\$218,304,000 \$130,000 \$51,000 \$786,000 \$1,289,000 \$1,638,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$218, \$ \$ \$ \$1, \$1,
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate	OD 36" 22" 18" 16" 13-3/8" 11-3/4"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$80.00	\$218,304,000 \$218,304,000 \$130,000 \$51,000 \$786,000 \$1,289,000 \$1,638,000 \$280,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$218, \$ \$ \$ \$1, \$1, \$1, \$
TANGIBLE I' Drive Pipe Conductor Surface ntermediate ntermediate ntermediate ntermediate roduction Liner Production Tie-back Tubing	OD 36" 22" 18" 16" 13-3/8" 11-3/4"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$80.00	\$218,304,000 \$218,304,000 \$130,000 \$51,000 \$786,000 \$1,289,000 \$1,638,000 \$280,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$218, \$ \$ \$ \$1, \$1, \$ \$
TANGIBLE I' Drive Pipe Conductor Surface ntermediate ntermediate ntermediate roduction Liner Production Liner Production Tie-back Tubing Liner Equipment	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$80.00	\$218,304,000 \$218,304,000 \$130,000 \$51,000 \$786,000 \$1,289,000 \$1,638,000 \$280,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$218, \$ \$ \$ \$1, \$1, \$1, \$
TANGIBLE I' Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Tie-back Fubing Liner Equipment Whipstock Equipment & BP	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$80.00	\$218,304,000 \$218,304,000 \$130,000 \$551,000 \$786,000 \$1,289,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$218, \$ \$ \$1, \$1, \$ \$
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Tic-back Tubing Liner Equipment Mhipstock Equipment & BP Subsurface Completion	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$80.00	\$218,304,000 \$218,304,000 \$130,000 \$551,000 \$786,000 \$1,289,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$218, \$ \$ \$1, \$1, \$ \$
TANGIBLE I' Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Tie-back Tubing Liner Equipment Whipstock Equipment & BP Subsurface Completion Vellheads	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"		Length 200 279 4,907 8,314 11,693 3,500	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$160.00 \$140.00 \$140.00 \$80.00	\$218,304,000 \$218,304,000 \$130,000 \$1,000 \$1,638,000 \$1,638,000 \$280,000 \$279,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$218, \$ \$ \$ \$ \$ 1, \$ 1, \$ 1, \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Veilheads Wiscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Length 200 279 4,907 8,314 11,693 3,500 3,980	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$155.00 \$140.00 \$80.00 \$770.00	\$218,304,000 \$130,000 \$51,000 \$786,000 \$1,289,000 \$1,638,000 \$280,000 \$279,000 \$300,000 \$500,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$218, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Veilheads Wiscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Length 200 279 4,907 8,314 11,693 3,500	ST Drlg =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$140.00 \$70.00 \$70.00 \$70.00	\$218,304,000 \$218,304,000 \$130,000 \$551,000 \$786,000 \$1,289,000 \$1,289,000 \$280,000 \$2299,000 \$279,000 \$300,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$218, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Veilheads Wiscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Length 200 279 4,907 8,314 11,693 3,500 3,980	ST Comp = TOTAL II ST Drlg = ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$140.00 \$70.	\$218,304,000 \$218,304,000 \$130,000 \$786,000 \$1,289,000 \$1,289,000 \$1,289,000 \$280,000 \$280,000 \$279,000 \$279,000 \$300,000 \$300,000 \$300,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$218, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface ntermediate ntermediate ntermediate Production Liner Production Liner Production Liner Production Liner Production Liner Subsurface Completion Weilbeads Wiscellaneous / Other	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Length 200 279 4,907 8,314 11,693 3,500 3,980	ST Comp = TOTAL II ST Drlg = ST Comp = TOTAL	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$155.00 \$140.00 \$155.00 \$140.00 \$155.00 \$140.00 \$155.00 \$140.00 \$155.00 \$140.00 \$155.00 \$140.00 \$155.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$100.0	\$218,304,000 \$218,304,000 \$130,000 \$551,000 \$786,000 \$1,289,000 \$1,289,000 \$280,000 \$2279,000 \$2279,000 \$2300,000 \$5300,000 \$536,000 \$536,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$218, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I' Drive Pipe Conductor Surface ntermediate ntermediate ntermediate roduction Liner Production Liner Production Tie-back Tubing Liner Equipment	OD 36" 22" 18" 16" 13-3/8" 11-3/4" 9-5/8"	7 =#Strings	Length 200 279 4,907 8,314 11,693 3,500 3,980	ST Comp = TOTAL II ST Drig = ST Comp = TOTAL Tot	\$0 NTANGIBLE \$650.00 \$180.00 \$160.00 \$140.00 \$140.00 \$140.00 \$70.	\$218,304,000 \$218,304,000 \$130,000 \$786,000 \$1,289,000 \$1,289,000 \$1,289,000 \$280,000 \$280,000 \$279,000 \$279,000 \$300,000 \$300,000 \$300,000 \$300,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$218, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$



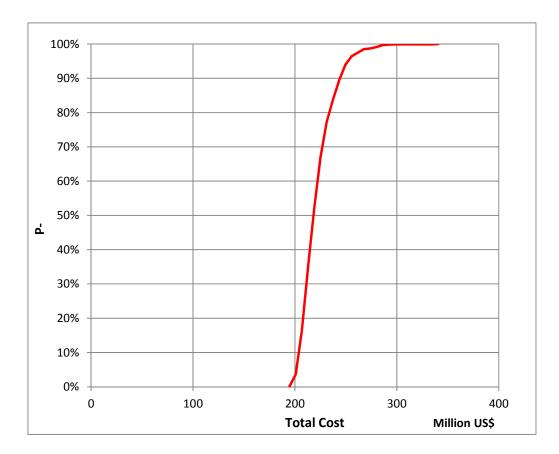
6.4.6 Case 4c Cost Estimate:

This case assumes the original Base Case wellbore configuration, and drilling to the Moho and then coring just the mantle. A summary of the cost estimate for this case is shown below.

Project	Nom	inal Costs	(M\$)	Stochastic Costs					
Days	Intan	Tan	Total	P10	P50	P90			
267	\$221,746	\$8,528	\$230,274	\$203,813	\$218,213	\$244,136			

Figure 180.	Baia Location	: Case 4c –	Cost Estimate
1 19410 1001	Buju Eooution	. 0400 10	

The following chart shows the cumulative probability of cost.





			<u>SCOPING CO</u>	DST ESTIMATE	<u>SUMMARY</u>			Rev
	r		BEAN	l - Baja Ca	se 4c		** DRAFT	**
		Pro	pared For:	-				Exploratory _X
ENERGY PARTN	ERS	110	pared ror.					Development
AFE# XXX	Operator:	CDEX / JA	MSTEC		Revision No.	1	Date:	30-Jun-13
Prospect or Field	Lease Nam			Case No.	Water Depth	Proposed TD	Formation	
Mantle Hole	N/A	_		#4c	4300m	10,400m	Moho / Mantle	
4'	Ourfaire La	4'				34,120 ft		
<u>₋ocation</u> Baja	Surface Loo Btm. Hole L		Lat: 25.0 - 33.0°N Lat: 25.0 - 33.0°N					
Purpose of Expendit		Location.	Lat. 23.0 - 33.0 F	17 Long. 120.0 -	127.0 W			
Scientific Drilling to the		ssume drilli	ng to the Moho, the	n coring 500m of	he Mantle			
Case 4c: Expandable				, , , , , , , , , , , , , , , , , , ,				
Drilling Rig :	Chikyu		Di	rectional Plan: V	ertical Hole			
	INTANGIBI	LE ITEMS				Dry Hole Drig	Complete	TOTAL
						231 Days		231 Days
	gulatory Cost					\$3,020,000 \$14,600,000		\$3,020,00
	tion, Demobil Day Work at		/Day			\$14,600,000		\$130,300,00
	llars & Stabili		, Cay			\$5,252,000		\$5,252,00
	Downhole S					\$3,839,000		\$3,839,00
Fuel, Water &	& Lube					\$13,514,000	\$0	\$13,514,00
Drilling Fluid						\$2,563,000		\$2,563,0
	ging & Cased	Hole Logs				\$4,793,000		\$4,793,0
Cementing		ingl Coming	-			\$1,039,000		\$1,039,0
Land Transp	g and Geologi	Ical Service	S			\$566,000 \$104,000		\$566,0 \$104,0
Boat Transp						\$2,657,000		\$2,657,0
	ransportation	 1				\$1,040,000		\$1,040,0
Tubular Serv	ices					\$150,000	\$0	\$150,0
	Dock Service	es				\$462,000		\$462,0
Communica						\$231,000		\$231,0
	us Rental Equ us Special Se					\$5,479,000 \$1,135,000		\$5,479,0 \$1,135,0
Other Service		ervices				\$2,078,000		\$2,078,0
Intan Conting		15%				\$28,924,000		\$28,924,0
	<u>.</u>							
				TOTAL INT	ANGIBLE	\$221,746,231	\$0	\$221,746,23
	TANGIBLE	ITEMS						
			OD	Footage	\$/ft			
Drive Pipe			36"	200	\$650.00	\$130,000	\$0	\$130,0
Conductor			22"	279	\$180.00	\$51,000	\$0	\$51,0
Surface			16.5" SET	5,107	\$300.00	\$1,533,000	\$0	\$1,533,0
Intermediate	•		16.5" SET	3,607	\$300.00	\$1,083,000	\$0	\$1,083,0
Intermediate	;		16"	11,714	\$155.00			\$1,816,0
Intermediate			13-3/8"	14,893	\$140.00			\$2,086,0
Intermediate			11-3/4"	3,780	\$80.00			\$303,0
Production L			0	0	\$0.00			
Production T	ie-back		0	0	\$0.00			
			0	0	\$0.00			
Tubing				ļļ.		\$150,000		\$150,0
Liner Equipn	quipment					\$0		
Liner Equipn Whipstock E				↓		\$0		
Liner Equipn Whipstock E Subsurface (Completion					\$500,000		\$500,0
Liner Equipn Whipstock E Subsurface (Wellheads					1	\$100,000	\$0	\$100,0
Liner Equipn Whipstock E Subsurface (Wellheads Miscellaneou	us/Other	10%				¢776.000	e	¢770.0
Liner Equipn Whipstock E Subsurface (Wellheads	us/Other	10%				\$776,000		
Liner Equipn Whipstock E Subsurface (Wellheads Miscellaneou	us/Other	10%		TOTAL T	NGIBLE	\$776,000 \$8,528,000		
Liner Equipn Whipstock E Subsurface (Wellheads Miscellaneou	us/Other	10%			NGIBLE I Dry Hole Cost	\$8,528,000	\$0	\$8,528,0
Liner Equipn Whipstock E Subsurface (Wellheads Miscellaneou	us/Other	10%		Tota		\$8,528,000 \$230,274,231	\$0 \$0	\$776,0 \$8,528,0 \$230,274,2



	(SCOPING (COST EST	MATE DETA	A/L				R
		BEAN	I - Baia	Case 4c		*	** DRAFT	**	
	_						DIVAL		
LAD RGY PARTNE	RS	Prepared For	iodp/	JAMSTEC	/ CDEX				Exploratory _X_
¥ xxx	Operator:	CDEX / JAMSTEC				Revision No.	1	Date:	Development _ 30-Jun-13
pect or Field	Lease Name		(Case No.		Water Depth	Proposed TD	Objective	30-5011-13
tle Hole	N/A		-	#4c		4300m	10,400m	Moho / Mantle	
						14,108	34,120 ft		
tion	Surface Loc	.							
	Btm. Hole L	ocation: Lat: 25.0 - 33.0°N / Long: 120	1.0 - 127.0°W						
ose of Expendi		e. Assume drilling to the Moho, then co		f the Mentle					
		ell Configuration	ning soom c	or the manue					Avg Intan \$/o
- to: Expande									\$959,939
Drilling Rig	: Chikyu		Dire	ectional Plan:	Vertical Hol	e		,	
00	INTANGIBL	EITEMS					Dry Hole Drig	Complete	TOTAL
					Оре	erational Time =	231 Days		231 Days
Location/ Re	egulatory Cost	s					\$3,020,000	\$0	\$3,020
		Metocean Study (desktop study, data collecti	on/processin	g)	Lump Sum	\$1,000,000			
		Site Survey (desktop study, bathymetry)			Lump Sum				
		Regulatory			Lump Sum	\$20,000			
								ļ'	<u> </u>
Rig Mobiliza	tion, Demobili				Luma Ou		\$14,600,000		\$14,600
·		Mobilization (from Japan)			Lump Sum				
Deilline Dir	Day Wards	Demobilization (to Japan)			Lump Sum	\$7,300,000			
Drilling Rig -	- Day work	Drilling Day Rate	231 Date	\$300,000 /day		\$60 200 000	\$130,300,000	\$0	\$130,300
		Existing Riser System Modifications	201 Days	4000,000 /udy	Lump Sum	\$69,300,000 \$14,000,000			
		Additional Riser			Lump Sum			t	
						,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		1	
Bits, Drill Co	ollars & Stabili	zers					\$5,252,000	\$0	\$5,252
		Drill Bits	30 No.	\$70,000 /bit		\$2,100,000			
		Drill String Rentals: DC's, Jars, Stab, HWT	231 Days	\$4,000 /day		\$924,000			
		Core Bits	28 No.	\$60,000 /bit		\$1,680,000			
		Coring Services	219 Days	\$2,500 /day		\$547,500			
Directional	& Downhole S						\$3,839,000	\$0	\$3,839
		Surveys/Gyros/Single & Multi-Shots MWD / LWD Mob / De-mob			Lump Sum				
		Standard MWD Rental	116 Days	\$3,000 /day	Lump Sum	\$30,000 \$346,500			
		Standard LWD Rental	116 Days	\$7,000 /day		\$808,500			
		MWD / LWD Engineers (2)	231 Days	\$2,000 /day		\$462,000			
		Mud Motors & Associated Tools	185 Days	\$3,000 /day		\$554,400			
		High Temp MWD Rental	116 Days	\$4,000 /day		\$462,000			
		High temp LWD Rental	116 Days	\$10,000 /day		\$1,155,000			
Fuel, Water	& Lube						\$13,514,000	\$0	\$13,514
Fuel, Water	& Lube	Rig Fuel	231 Days	\$53,000 /day		\$12,243,000	\$13,514,000	\$0	\$13,514
Fuel, Water	& Lube	Boat Fuel	116 Days	\$4,000 /day		\$12,243,000 \$462,000	\$13,514,000	\$0	\$13,514
Fuel, Water	& Lube		116 Days 116 Days			\$12,243,000	\$13,514,000	\$0	\$13,514
Fuel, Water	& Lube	Boat Fuel Helicopter Fuel	116 Days	\$4,000 /day \$3,000 /day		\$12,243,000 \$462,000 \$346,500	\$13,514,000	\$0	\$13,514
		Boat Fuel Helicopter Fuel Lubricants	116 Days 116 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day		\$12,243,000 \$462,000 \$346,500 \$300,300	\$13,514,000	\$0	\$13,514
Fuel, Water		Boat Fuel Helicopter Fuel Lubricants Fresh Water	116 Days 116 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day		\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700	\$13,514,000 \$2,563,000		
		Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM	116 Days 116 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day	Lump Sum	\$12,243,000 \$462,000 \$300,300 \$161,700 \$1,800,000			
		Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer	116 Days 116 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day	Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$1,800,000 \$184,800			
		Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM	116 Days 116 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day	Lump Sum	\$12,243,000 \$462,000 \$300,300 \$161,700 \$1,800,000			
Drilling Fluid	ls Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal	116 Days 116 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day	Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$1,800,000 \$184,800	\$2,563,000		\$2,563
Drilling Fluid		Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs	116 Days 116 Days 231 Days 231 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day	Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$1,800,000 \$184,800 \$577,500			\$2,563
Drilling Fluid	ls Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal	116 Days 116 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$1,800,000 \$184,800 \$577,500 \$693,000	\$2,563,000		\$2,563
Drilling Fluid	ls Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	116 Days 116 Days 231 Days 231 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$184,800 \$577,500 \$693,000 \$1,500,000 \$1,500,000	\$2,563,000		\$2,563
Drilling Fluid	ls Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging	116 Days 116 Days 231 Days 231 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$184,800 \$577,500 \$693,000 \$1,500,000 \$1,500,000	\$2,563,000		\$2,563
Drilling Fluid	ls Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging	116 Days 116 Days 231 Days 231 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$184,800 \$577,500 \$693,000 \$1,500,000 \$2,500,000	\$2,563,000 \$4,793,000	\$0	\$2,563
Drilling Fluid	ls Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging	116 Days 116 Days 231 Days 231 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$1,800,000 \$184,800 \$577,500 \$693,000 \$1,500,000 \$2,500,000 \$100,000	\$2,563,000	\$0	\$2,563
Drilling Fluid	Is Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22"	116 Days 116 Days 231 Days 231 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$184,800 \$577,500 \$693,000 \$1,500,000 \$2,500,000 \$100,000	\$2,563,000 \$4,793,000	\$0	\$2,563
Drilling Fluid	Is Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 16.5" SET	116 Days 116 Days 231 Days 231 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$1,800,000 \$184,800 \$577,500 \$693,000 \$1,500,000 \$100,000 \$100,000 \$100,000	\$2,563,000 \$4,793,000	\$0	\$2,563 \$4,793
Drilling Fluid	Is Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22 ⁿ 16.5" SET	116 Days 116 Days 231 Days 231 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$184,800 \$577,500 \$693,000 \$1,500,000 \$1,500,000 \$1100,000 \$100,000 \$100,000	\$2,563,000 \$4,793,000	\$0	\$2,563
Drilling Fluid	Is Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging Cased Hole Logging 22" 16.5" SET 16.5" SET	116 Days 116 Days 231 Days 231 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$184,800 \$1,500,000 \$1,500,000 \$1,500,000 \$1,000,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000 \$100,000	\$2,563,000 \$4,793,000	\$0	\$2,563
Drilling Fluid	Is Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22 ⁿ 16.5" SET	116 Days 116 Days 231 Days 231 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$1,800,000 \$1,800,000 \$1,500,000 \$1,500,000 \$100,000 \$100,000 \$100,000 \$100,000 \$150,000	\$2,563,000 \$4,793,000	\$0	\$2,563
Drilling Fluid	Is Services	Boat Fuel Helicopter Fuel Lubricants Fresh Water Drilling Fluids - WBM Mud Engineer Cuttings Disposal Hole Logs Wireline Unit and Personnel Standard Open Hole Logging High Temp Open Hole Logging Cased Hole Logging 22" 16.5" SET 16.5" SET 16.5" SET 16" 13.375"	116 Days 116 Days 231 Days 231 Days 231 Days 231 Days 231 Days	\$4,000 /day \$3,000 /day \$1,300 /day \$700 /day \$800 /day \$2,500 /day	Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum Lump Sum	\$12,243,000 \$462,000 \$346,500 \$300,300 \$161,700 \$184,800 \$17,800,000 \$184,800 \$577,500 \$693,000 \$150,000 \$100,000 \$100,000 \$100,000 \$150,000 \$150,000 \$150,000 \$150,000	\$2,563,000 \$4,793,000	\$0	\$13,514 \$2,563 \$4,793 \$1,039



	cal Services					\$566,000	\$0	\$!
	Logging Unit Operating rate Personnel Charges	231 Days 231 Days	\$1,250 /day \$1,200 /day		\$288,750 \$277,200			
	Feisonnei Ghaiges	231 Days	\$1,2007day		\$211,200			
Land Transportation					0 400.050	\$104,000	\$0	\$
	Trucking	116 Days	\$900 /day		\$103,950			
Boat Transportation						\$2,657,000	\$0	\$2,
	Work Boat - Spot Hire	116 Days	\$14,000 /day		\$1,617,000			
	Crew Boat - Spot Hire	116 Days	\$9,000 /day		\$1,039,500			
Helicopter Transportation	1					\$1,040,000	\$0	\$1,0
	Helicopter - spot hire	116 Days	\$9,000 /day		\$1,039,500			
Tubular Services						\$150,000	\$0	\$
	QAQC			Lump Sum	\$150,000	\$150,000		\$
Shorebase / Dock Service	A.C.					\$463,000	\$0	\$4
Shorebase / Dock Service	Shorebase /Dispatcher	231 Days	\$2,000 /day		\$462,000	\$462,000	\$U	\$
			,,		. ,			
Communications						\$231,000	\$0	\$2
	VSAT	231 Days	\$1,000 /day		\$231,000			
Miscellaneous Rental Equ	lipment					\$5,479,000	\$0	\$5,4
	Solids Control	231 Days	\$400 /day		\$92,400			
	Fishing Tools	231 Days	\$1,500 /day		\$346,500 \$420,000			
	Casing Running Equipment Other Rentals	70 Days 231 Days	\$6,000 Day \$20,000 Day		\$4,620,000			
		Days	+==,000 Ddy		÷ .,020,000			
Miccollonoous Sassis O	ri	Days				¢1 125 000		**
Miscellaneous Special Se	Weather Forecasting	231 Days	\$150 /day		\$34,650	\$1,135,000	\$0	\$1,
	Engineering Services - Riser		\$1507day	Lump Sum	\$300,000			
	Engineering Services - Drill S	String Design		Lump Sum	\$200,000			
	Engineering Services - Casir			Lump Sum	\$50,000			
	Engineering Services - Wellb Engineering Services - Opera			Lump Sum Lump Sum	\$100,000 \$200,000			
	Engineering Services - Risk			Lump Sum	\$200,000			
	Engineering Services - Other			Lump Sum	\$50,000			
Other Services / Costs						\$2,078,000	\$0	\$2,
	Misc Contract Labor	231 Days	\$1,500 /day		\$346,500			
	Casing Running	70 Days	\$10,000 /day		\$700,000			
	Well Insurance Overhead	231 Days	\$1,100 /day	Lump Sum	\$500,000 \$254,100			
	Catering	231 Days 231 Days	\$1,200 /day		\$277,200			
ntangible Contingency		15%	Amount	ST Drla =	\$192,822,000	\$28 924 000	\$0	\$28
Intangible Contingency		15%	Amount	ST Drlg = ST Comp =	\$192,822,000 \$0	\$28,924,000	\$0	\$28,9
Intangible Contingency		15%	Amount	ST Comp =		\$28,924,000 \$221,746,000	\$0 \$0	
Intangible Contingency TANGIBLE I				ST Comp =	so NTANGIBLE			\$28,9 \$221, 7
TANGIBLE	OD	15% 7 =#Strings	Length	ST Comp =	50 NTANGIBLE \$/ft	\$221,746,000	\$0 <mark></mark>	\$221,
				ST Comp =	so NTANGIBLE	\$221,746,000 \$130,000	\$0 \$0 \$0	\$221,; \$221,; \$
TANGIBLE Drive Pipe	OD 36" 22" 16.5" SET		Length 200	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00	\$221,746,000	\$0 <mark></mark>	\$221,
TANGIBLE I Drive Pipe Conductor Surface Intermediate	OD 36" 22" 16.5" SET 16.5" SET		Length 200 279 5,107 3,607	ST Comp =	\$0 NTANGIBLE \$/ft \$650.00 \$180.00 \$300.00 \$300.00	\$221,746,000 \$130,000 \$51,000 \$1,533,000 \$1,083,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221, \$ \$ \$ \$1,1 \$1,1
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate	OD 36" 22" 16.5" SET 16.5" SET 16"		Length 200 279 5,107 3,607 11,714	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00	\$221,746,000 \$130,000 \$1,533,000 \$1,533,000 \$1,083,000 \$1,816,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221, \$ \$ \$ \$ 1, \$ 1, \$ 1, \$ 1,
TANGIBLE Drive Pipe Conductor Surface Intermediate Intermediate Intermediate	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 279 5,107 3,607 11,714 14,893	ST Comp =	50 S/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,746,000 \$221,746,000 \$130,000 \$1,51,000 \$1,533,000 \$1,816,000 \$2,086,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221, \$ \$ \$1, \$1, \$1, \$1, \$2,
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Intermediate	OD 36" 22" 16.5" SET 16.5" SET 16"		Length 200 279 5,107 3,607 11,714	ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00	\$221,746,000 \$130,000 \$1,533,000 \$1,533,000 \$1,083,000 \$1,816,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221, \$ \$ \$1, \$1, \$1, \$1, \$2,
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 279 5,107 3,607 11,714 14,893	ST Comp =	50 S/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,746,000 \$221,746,000 \$130,000 \$1,51,000 \$1,533,000 \$1,816,000 \$2,086,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221, \$ \$ \$1, \$1, \$1, \$1, \$2,
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Intermediate	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 279 5,107 3,607 11,714 14,893	ST Comp =	50 S/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,746,000 \$221,746,000 \$130,000 \$1,51,000 \$1,533,000 \$1,816,000 \$2,086,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221, \$ \$ \$ \$ 1, \$ 1, \$ 1, \$ 1,
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Intermediate Production Liner Production Tie-back	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8"		Length 200 279 5,107 3,607 11,714 14,893	ST Comp =	50 S/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,746,000 \$221,746,000 \$130,000 \$1,533,000 \$1,083,000 \$1,083,000 \$1,083,000 \$2,086,000 \$20,86,000 \$303,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221, \$ \$ \$1, \$1, \$1, \$1, \$2,
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BR	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		Length 200 279 5,107 3,607 11,714 14,893	ST Comp =	50 S/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,746,000 \$221,746,000 \$130,000 \$1,51,000 \$1,533,000 \$1,816,000 \$2,086,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221, \$221, \$1, \$1, \$1, \$1, \$2, \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & Bf Subsurface Completion	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		Length 200 279 5,107 3,607 11,714 14,893	ST Comp =	50 S/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,746,000 \$221,746,000 \$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000 \$303,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221, \$ \$1, \$1, \$1, \$2, \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		Length 200 279 5,107 3,607 11,714 14,893	ST Comp =	50 S/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,746,000 \$221,746,000 \$1,000 \$1,533,000 \$1,080,000 \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$}	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221, \$ \$1, \$1, \$1, \$2, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface Intermediate Intermediate Intermediate Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"		Length 200 279 5,107 3,607 11,714 14,893	ST Comp =	50 S/ft \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00	\$221,746,000 \$221,746,000 \$130,000 \$51,000 \$1,533,000 \$1,816,000 \$2,086,000 \$303,000 \$150,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221, \$ \$1, \$1, \$1, \$2, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 =#Strings	Length 200 279 5,107 3,607 11,714 14,893 3,780	ST Comp = TOTAL II	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$300.00 \$155.00 \$140.00 \$80.00	\$221,746,000 \$130,000 \$51,000 \$1,533,000 \$1,533,000 \$1,816,000 \$2,086,000 \$303,000 \$150,000 \$150,000 \$100,000	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221, \$ \$1, \$1, \$1, \$2, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 =#Strings	Length 200 279 5,107 3,607 11,714 14,893	ST Comp = TOTAL II 	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$135.00 \$140.00 \$140.00 \$140.00 \$140.00 \$155.00 \$140.00 \$17,752,000	\$221,746,000 \$221,746,000 \$1,000 \$1,533,000 \$1,080,000 \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$ \$1,080,000\$}	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221, \$ \$1, \$1, \$1, \$2, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 =#Strings	Length 200 279 5,107 3,607 11,714 14,893 3,780	ST Comp = TOTAL II ST Drlg = ST Drlg = ST Comp =	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$1355.00 \$140.00 \$140.00 \$40.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$17,752,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$221,746,000 \$221,746,000 \$1,50,000 \$1,533,000 \$1,083,000 \$1,083,000 \$1,083,000 \$1,083,000 \$1,083,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500,000 \$1,500 \$1,0000\$1,000\$1,000\$1,000\$1,000\$1,000\$1,000\$1,0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221, \$ \$1, \$1, \$1, \$2, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
TANGIBLE I Drive Pipe Conductor Surface intermediate intermediate intermediate Production Liner Production Liner Production Liner Production Tie-back Tubing Liner Equipment Whipstock Equipment & BF Subsurface Completion Wellheads Miscellaneous / Other	OD 36" 22" 16.5" SET 16.5" SET 16" 13-3/8" 11-3/4"	7 =#Strings	Length 200 279 5,107 3,607 11,714 14,893 3,780	ST Comp = TOTAL II TOTAL II ST Drlg = ST Comp = TOTAL	\$0 NTANGIBLE \$650.00 \$180.00 \$300.00 \$185.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$140.00 \$155.00 \$140.00 \$155.00 \$140.00 \$17,752,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$10 \$1	\$221,746,000 \$221,746,000 \$1,51,000 \$1,533,000 \$1,083,000 \$1,0000\$1,000\$1,000\$1,000\$1,000\$1,000\$1,000\$1,	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$221, \$ \$1, \$1, \$2, \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
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7 Implementation Timeline

As described in this section, an integrated project timeline has been developed that describes what needs to be done to move this project from its current feasibility stage to an execution stage. It is an effort to provide a detailed roadmap that considers the key milestones, decision points, and the steps that need to be taken to provide the highest probability of success for the Mantle Drilling project. It has been assumed that the target date for the start of operations would be January 2018 as per the IODP project road map shown in Section 2.2.

The framework for developing the timeline is based on a well delivery process that is used in the oil and gas industry for this kind of complex deep water project. A generic description of the five phases of the well delivery process is provided below. Note that it typically takes 12-18 months to work through this process for deep water oil and gas projects. Detailed flowcharts for each of these phases and a typical deepwater project timeline are also provided for reference in Appendix 4.

Well Delivery Process Description

1. Front End Engineering – Well Objectives Definition

This process involves meeting with the project stakeholders (geoscience, management, engineering, etc.) in order to fully understand and then define the objectives of the well which are written into a Statement of Requirements (SOR) document. This is arguably the most important process since the lack of clear objectives defined early in the planning process can lead to needless confusion, duplication of effort and unnecessary costs. This process culminates with the preparation of a Basis of Design (BOD) document or Design Premise Document (DPD) which, once approved by management, serves as the guide for all subsequent planning and design work.

2. Front End Engineering – Initial Well Planning

This process involves the thorough review of the offset or analog well data in order to identify potential problem areas, and to understand what worked and what did not during the offset/analog well operations. These lessons learned are then accounted for during the well planning work. An initial well design is generated including a preliminary tubulars design, drilling fluids design, cement design, and so on. Ideally, this work should result in several well design options that satisfy the requirements of the well objectives. A scoping cost is then developed for each option as well as a comparison of the relative risks. These options are then presented to management and a decision is made on which option to move forward with.

3. Detailed Well Planning

Once the selected option has been decided on and approved, the detailed well planning and design work can begin. This includes getting outside input on the various technical issues and guidance in the form of a HAZID meeting and a peer review of the well plan. An important part of this process is the development of a tender strategy, the development of the work scope for the various services that will be required, and then the tendering of the services. This process should culminate with the preparation of a draft drilling program.

4. Detailed Well Planning – Finalize Well Plan

When the services contracts are awarded the well design can be finalized with input from the key service companies, and a final well cost estimate is prepared. A "drill well on paper" (DWOP) exercise is then held with the rig crew and service company representatives and then the final drilling program is prepared based on the feedback from the DWOP.

5. Operations Execution and Close Out

During the operations execution, the engineering and geoscience team provides technical support for the operation, monitors and tracks the operational progress against the plan, and prepares any program revisions that might be required due to changing or unexpected conditions. At the end of the work, a reconciliation between the estimated and actual well costs is prepared as well as an analysis of the operational performance metrics. This culminates with the preparation of a detailed end of well report.

7.1 High Level Timeline Overview

The following Figure shows a high level version of the implementation timeline. The timing is based around 3 key assumptions. The first is that the operations would begin in January 2018. The second has that dedicated work on the project cannot begin before March 2014 which is the start of JAMSTEC's fiscal year. The third, is that the additional marine riser that will be required will not need to be purchased unless the mantle project is approved.

The most notable feature in the timeline is part C - Long Lead Time Items. The 3 year lead time associated with purchasing the additional riser needed to drill at any of the three candidate locations has the most impact on the implementation timeline.

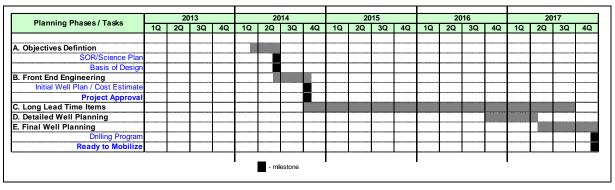


Figure 181. High-level Implementation Timeline

The riser will need to be delivered prior to the start of operations so that it can be integrated onto the Chikyu. If a September 2017 delivery is assumed, then a commitment to purchase the riser needs to be made in September 2014 because of the lead time. This means that the time available to do the upfront work needed to develop the science plan, do the initial well planning, and present the project for approval is the 8 months from March to September 2014. Because of this, there is also an unusually long gap between when this upfront work needs to be done and when the final planning work needs to done for a January 2018 project start.



7.2 Detailed Timeline Discussion

Below is a more detailed implementation timeline that lists the key tasks associated with each phase as well as the key milestones and decision points. A larger version of this timeline is provided in Appendix 3.

Diamatica Diamatica (Territor		20	13			20)14			20	15			20	016			20)17	
Planning Phases / Tasks	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Ohio stiwe a Definition																				
A. Objectives Definition								·												
1.) Select Mgmt/Steering Team																				
2.) Define Objectives																				
- Well Objectives Defined																				
- FE Objectives Defined																				
- Design Assumptions Defined																				
SOR/Science Plan																				
Basis of Design																				
3. Front End Engineering																				
- Data Review / Lessons Learned																				
- Major Risks Defined																				
 Prelim PP/ FG/ OBG/ Temp Analysis 				L		ļ									L			ļ		
- Develop Well Plan Options						L														
- Prelim Drill Str/ Bit / BHA Plan						L														
- Prelim Cement / Fluids Design																				
- Preliminary Well Design																				
- Ident Long Lead Items																				
- Ident Services Requirements																				
Initial Well Plan / Cost Estimate																				· · · · ·
Project Approval																				
C. Long Lead Time Items																				
- Additional Riser								•	– com	mit										
- Additional Buoyancy								•	- com	mit										
- Metocean Study									•	commi										
- Site Survey									•	commi	!									
- Tubulars																				
- Bit/Core System Testing									4						•					
D. Detailed Well Planning																				
- Detailed Well Design																				
- Risk Assessment																				
- Initiate Technical Studies																				
- Contingency Plan Development																*******				
- Devel Tender Strategy / Tender Services																				
- Logistics Plan				·····																
Draft Drilling Program						<u> </u>		·		<u> </u>				·	<u> </u>				·	
E. Final Well Planning								· · · · ·		<u> </u>				·						
- Services Integration										<u> </u>				·				h		
- Finalize Design Work								·												
- Final Cost Estimate																				
- Pre-Spud / DWOP Meetings																				
- Finalize Drilling Program																				
Drilling Program																				
Ready to Mobilize																				
Reauy to MODITIZE				I			estone								l					

Figure 182. Detailed Implementation Timeline

A. Objectives Definition

The objective of this phase is to formally define the objectives of the project. The milestones would be the preparation of the Statement of Requirements (SOR) or science plan, and Basis of Design (BOD) documents.

Logically, the first thing that would be needed is the creation of the management function to
oversee the project. This could be a classic management team with one individual having
overall responsibility and several direct reports, or it could be some sort of steering
committee. Regardless, a dedicated team will be needed to oversee the project to provide
direction, prioritization of efforts, arbitrate differences, and have final decision making



authority. Part of this process would also be to develop an project organizational chart, identify the functional requirements and define roles and responsibilities

- The next step would be to bring together the project stakeholders to define the objectives. The oilfield equivalent of stakeholders would include representatives of the management, geology, geophysics, reservoir, environmental, safety, drilling and completions engineering, and the operations functions. An important goal of this effort would be to define what the minimum requirements are, in terms of types of data that need to be obtained, and the amount of data that needs to be collected along with the associated evaluation program (coring, wireline logging, LWD, cuttings) required to gather the data. Additionally, a prioritized list of data that would be "nice to have" if circumstances allow should also be developed. Ideally, this effort would also include the selection of the candidate location to allow a more focused effort during the Front End Engineering phase, but this is probably not required at this stage. The results would then be documented in an SOR or science plan.
- Finally, the key information and initial assumptions that are to be used in the design of the well would be documented in the BOD. This would include geologic information (formation tops, thicknesses, seismic sections), identification of offset or analog hole data, geothermal temperature profile, subsurface formation pressure and strength profile, considerations to be used in the tubulars selection and design, riser design, cementing and drilling fluids systems design, and environmental, health, and safety considerations.

As discussed in section 3.2 a vital aspect of this effort will be to define and then mitigate the uncertainties around the down hole conditions in order to develop the appropriate well design. This will require a concerted joint effort between the science community, industry subject matter experts and the well design engineers to define the most likely down hole conditions that can be expected, and which aspects have the most uncertainty.

B. Front End Engineering

The objective of this phase would develop an initial well design (or designs) so that a more comprehensive cost estimate can be prepared which can then be presented to the management team in order to get a formal decision on whether or not to go ahead with the project before having to make any significant financial commitments. The milestones would be the development of the initial well design(s), cost estimate and project approval.

- With the project objectives and the design basis defined, the engineering team now has the information and tools needed to prepare an initial well design and develop an estimate of the project costs.
- The first step of this process typically involves a thorough review of the offset or analog hole data in order to identify the major issues and risks and to identify the previous "lessons learned" that should be incorporated into the well plan.
- There is seldom just one way to design a well so several different design options are typically developed along with initial designs for the tubulars, drill string, drilling fluids and cement systems, riser and so on. In addition, the key risks are identified as well as what additional information (i.e. additional technical studies) are needed to help mitigate the risks.



 Once the foundational design work has been done, cost estimate can be prepared for each design option. The options, cost estimates and an evaluation of the risks associated with each option would then be presented to management who now has the information needed to decide whether or not to move ahead with the project. Note that if a decision on the location was not been made during the objectives definition phase, then this work would need to be done for all three locations, and the final decision will need to made on where the hole will be drilled as part of the management review.

Given the assumptions around which this timeline is based, the time available for these two phases is the 8 months from March to September 2014. The time available was arbitrarily split between the two phases so four months are allocated to each. This is a rather tight time frame given the amount of work that needs to be done, particularly if the final location decision is not made early on in the process.

C. Long Lead Time Items

Long lead time items are equipment or services that need a longer than usual period of time to manufacture or source. As such, they typically require a financial commitment much earlier than what is needed (or desired) for the majority of the products or services that will be used during a project. In this case, the lead time associated with purchasing the additional riser and buoyancy needed to drill at any of the three candidate locations has the most impact on the implementation timeline

- The lead time for conventional steel riser is currently running at 3 years based on information and a quote provided by NOV. This is also consistent with information provided by the other riser manufactures. Obviously the lead time associated with aluminum, titanium, hybrid, or composite risers would be longer. As such, the commitment for purchasing the additional riser would need to be made in September 2014 in order to have it delivered in September 2017 so that there is time to incorporate it onto the Chikyu prior to the start of the project.
- Collecting the required metocean data takes about a year. Ideally the information should be available before the start of the detailed well planning phase, in which case the data collection efforts would need to begin around September 2015 and committed to in January 2015 because of the lead time required to organize the survey. The site survey does not take as much time to complete, but it is assumed that this would be done at the same time as the metocean survey to minimize mobilization costs. Recall from Section 5 that it has been assumed that this work would be done by a third party contractor.
- The typical lead time for purchasing tubulars is between 10 to 18 months and does not need to be delivered until just before the start of operations. Depending on the final wellbore configuration that is selected, the commitment for the tubulars would need to done somewhere between the 3rd quarter of 2016 and the 1st quarter of 2017.
- As was discussed in Section 2.2, conducting field tests of promising bit designs on other representative IODP projects in order to optimize the bit selection would be very beneficial considering that time has the largest influence on costs. Although this is not technically a long lead time item, it will require some time to organize and conduct the design iterations. There should be an ample amount of time available to conduct these field tests between the time the project would be approved and when the detailed design work needs to start.

• It is conceivable that high temperature down hole tools could become a long lead time if specific tools need to be developed specifically for this project because they are not yet available in the industry. This is not specifically listed in the timeline because it depends on the science plan, the location selected, and the state of industry technology 2-3 years from now.

Note that these long lead time requirements imply that a financial commitment of some \$64,000,000 has to be made around 3 years before the start of the project.

D. Detailed Well Planning

This phase normally begins right after the project is approved and involves conducting the required detailed design work that builds on the initial work done during the front end engineering phase. The milestone would be a draft drilling program. The key aspects of this phase include:

- Detailed designs for the tubulars, drill string, BHA's, drilling fluids and cement systems, riser and so on.
- Development of risk mitigation strategies and contingency plans.
- Development of a logistics and operations support plan
- Initiation of the technical studies needed to resolve particular technical issues. These may be done internally or may require outside expertise. These studies could include:
 - Riser analysis
 - Drill string design
 - Wellbore stability
 - Tubulars design
 - Risk assessment / HAZID / Peer Review support
 - Drill fluids design
 - Cementing system design
- Development of a tender strategy and the development of the work scope for the various services that will be required, followed by the tendering and selection of the services companies.

E. Final Well Planning

At this point the major service companies (drilling fluids, cementing, bits, MWD/LWD, etc) will have been selected, and the design work can be completed with their input based on the actual tools, equipment, expertise, and services that will be provided for the project. A DWOP exercise is typically held towards the end of this phase. This is held with the rig crews and service company representatives in order to walk through the well plan in detail to familiarize them with the plans and to get their suggestions and feedback. The milestone is a finalized drilling program and operations are ready to commence as soon as the Chikyu arrives on location. It has been assumed that the detailed and final well planning efforts will take around 15 months which is not uncommon for complex deepwater wells. As such, this work would need to begin in the 4th quarter of 2016.



Commentary

Clearly the main driver for timing for this implementation plan is the lead time required to for the additional riser, and the assumption that the mantle project must be approved before a commitment is made to purchase the riser. If these issues are de-linked so that the decision to purchase the riser is independent of whether the mantle project will go forward, then the riser will still need to be ordered in September 2014, but the work on the mantle project will not need to begin until around late 2015 or possibly early 2016.



8 Conclusions

The key conclusions and recommendations from this study are as follows.

- The Base Case wellbore configuration developed during the Feasibility Study may be overly
 optimistic in terms of the number of casing strings that may be needed to get to TD. The
 uncertainty with respect to the down hole conditions and the hole stability problem that
 occurred at the 1256D site suggests that the wellbore configuration needs to be able to
 accommodate additional contingency casing strings to allow for unexpected wellbore
 stability problems. The wellbore configurations provided represent the range of options. The
 Base Case represents the most simple configuration and arguably most risky in terms of
 being able to get to TD and accomplish the goals of the project. The Expandable Cases
 represents the most complex/expensive but least risky option in terms of being able to get to
 TD.
- The uncertainty over the down hole condition poses the biggest risk with respect to being able to actually get to the mantle. Mitigating these risks will require a concerted joint effort between the science community, industry subject matter experts, and the well design engineers to define the most likely down hole conditions that can be expected, and which aspects have the most uncertainty. The results of this effort can then serve as the basis for developing an appropriate wellbore configuration.
- The uncertainty over drilling and coring performance and the resulting impact on operational time cost poses the biggest risk associated with being able to complete this project within a reasonable amount of time at a reasonable cost. This uncertainty can be reduced by working a drilling tools service companies in order to take advantage of the full range of experience and services they can provide during both the planning and operational phases of the project in order to optimize the bit selection and drilling practices.
- The main driver of project cost is the number of days it will take to drill/core the hole which accounts for over 50% of the total cost. The effect of the other cost elements is almost irrelevant.
- The cost of coring large sections of the hole vs. drilling to the Moho and just coring the mantle adds between \$14 to \$51 million to the project cost depending on the location,
- The 3 year lead time associated with purchasing the additional riser needed to drill at any of the locations is the main timeline driver. The riser would need to be ordered around September 2014 to be ready in time for a January 2018 project start. Assuming that the project needs to be approved before the making the financial commitment for the riser, then upfront project work including the development of the science plan will need to start around March 2014. If these issues are de-linked so that the decision to purchase the riser is independent of whether the mantle project will go forward, then the riser will still need to be ordered in September 2014, but the work on the project will not need to begin until around late 2015 or possibly early 2016



Based on the results of the new set of drilling riser analyses and sensitivity studies, it appears that steel riser can be used without changing current industry practices to a maximum of 3657m (12,000 ft) water depth, and for certain drilling conditions (i.e. mud weight and metocean data). Beyond this water depth, some critical responses from the drilling riser (i.e. VME stress) and riser components (i.e. rotation of the upper and lower flex joints) violate the current API 16Q criteria if riser joints made of steel are used.

In order to push the envelope using steel material, the maximum allowable VME will have to be increased from 67% of minimum yield to a higher ratio. It is important to note that API 16Q currently does not address riser response criteria for ultra-deepwater wells with water depth greater than 3048m (10,000 ft) and also that the VME criteria is limited to 67% of minimum yield to avoid accounting for and tracking riser joint fatigue during the life of the riser. To push the envelope, and to be able to use steel riser for water depth greater than 3657m, a new set of riser response criteria will have to be developed and a design/operational risk assessment will also have to be conducted. Regarding the VME maximum limit, this could very well be increased from 67% to 80% or 90% but the fatigue damage of the riser joints will also have to be monitored during the entire life of the riser. This is feasible for drilling operations conducted with the Chikyu since it currently uses a riser monitoring system which is capable of tracking stress and fatigue in the riser. Also, tests to increase the mean allowable rotation angle at the two flex joints will have be performed.

Finally, the technical solution that would follow current API 16Q riser response criteria, and that will enable to drill in water depths up to 4267m (i.e. Hawaii and Baja) will be to use drilling hybrid riser joints or joints with advanced materials such as titanium or composite. The high minimum yield and strength to weight ratio of titanium and composite materials relative to steel would not require any adjustment to API 16Q recommended practices criteria, or a need for riser component limits, or even risk assessments. Nonetheless, the high cost associated with titanium and the lack of experience with composite materials for ultra-deepwater offshore applications can be seen as a different technical limitation for conduct drilling operations in water depths greater than 3657m. Composite materials seem very attractive, but these materials have not been tested or field deployed for deepwater drilling riser systems. Indeed, the ability to keep the same weight and strength for a given riser joint made of composite material, as well as maintaining the structural integrity of the drilling riser connectors, remain a great challenge yet to be resolved.



Appendix 1: Evolution of ROP Assumptions

The evolution of the rate ROP assumptions used in the time and cost estimates is illustrated below.

• 2011 Feasibility Study Assumptions

Stratigraphy	Coring	Drilling	
Sediments	3.0	15.2	m/hr
Lava	1.5	3.0	m/hr
Dikes	1.5	3.0	m/hr
Textured Gabbros	1.2	2.4	m/hr
Foliated Gabbros	1.2	2.4	m/hr
Layered Gabbros	0.9	1.5	m/hr
Mantle	0.9	0.0	m/hr

• Ideal Estimates per NOV – 2012

Hole Section	Rate of Per	te of Penetration (ft/hr)		Rate of Penetration (m/hr)		
Hole Section	Ideal Bit	Ideal Bit/Motor	Ideal Bit	Ideal Bit/Motor	(hours)	
Upper part of the hole :	70.0	100.0	21.3	30.5	110	
Lower part of the hole :	50.0	70.0	15.2	21.3	70	

• 2012 High Impact Study Assumptions

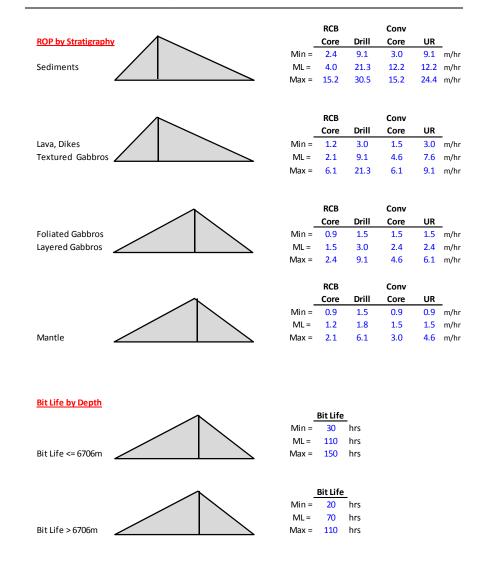
Stratigraphy	RCB Coring	Drilling		_
Sediments	4.0	21.3	m/hr	
Lava	2.1	9.1	m/hr	
Dikes	2.1	9.1	m/hr	Bit Life < 7010m = 110 hrs
Textured Gabbros	1.5	9.1	m/hr	Bit Life > 7010m = 70 hrs
Foliated Gabbros	1.5	3.0	m/hr	
Layered Gabbros	1.2	3.0	m/hr	
Mantle	1.2	1.8	m/hr	_



<u>2013 Implementation Plan Study Assumptions</u>

Stratigraphy	Coring	Drilling	Coring	UR	
Sediments	12.0	26.2	14.4	16.5	m/hr
Lava	1.7	21.1	4.3	7.6	m/hr
Dikes	4.9	10.4	3.2	8.1	m/hr
Textured Gabbros	2.8	10.2	2.6	3.6	m/hr
Foliated Gabbros	2.0	6.5	4.3	2.1	m/hr
Layered Gabbros	1.6	5.2	2.9	2.9	m/hr
Mantle	1.3	2.7	2.4	1.8	m/hr

• 2013 Implementation Plan Study Stochastic Assumptions





Appendix 2: Example Cost Estimate Element Assumptions

The following is an example of the cost estimate assumptions that were used for each cost element using the Cocos Case 4b as an example. The same basic assumptions were used for all of the cost estimates.

cation/ Regulatory Costs				
<u>Metocean Study</u> Obtain data regarding weather, wind, waves and cuu nalysis, stationing keeping / weather downtime prec Cost / work scope info per meetings with RPS and	diction. Data co	llection takes	s about a ye	ar
RPS 750,000 12 month water column study Fugro 1,000,000 12 month water column study		Assume:	1,000,000	1
<u>Site Survey</u> Obtain seafloor bathymetry data, slope stability, Al	JV hi-res data, s	soil strength a	assessment	:
Fugro Survey costs \$50-60,000 /day Ballpark cost \$2 million		Assume: Which is	<mark>2,000,000</mark> 33.3) days
Mobilization, Demobilization		Assume:	20,000	<u>•</u>
Nobilization From : Tokyo				
Distance : 6600 miles	Speed	Time (d)	Day rate	Rig Cost
Avg Speed : 10 kts	10	23.9	300,000	7,170,000
Time : 23.9 days	5	47.8	300,000	14,340,000
Fuel Costs per IODP kl/day gal/	d \$/gal	\$/day	Tot Days	Tot \$
Fuel - Transit (5 kt) kl/d 50 13,20	· •	52,836	47.8	2,525,561
Fuel - Transit (10 kt) kl/d 100 26,4	17 4.00	105,668	23.9	2,525,465
Lump Sum = 16,865	,561 at 5 knots ,465 at 10 knots	5		
Going fast is cheaper Assume: 9,700	<mark>,000</mark>			
	,000			

Day rate assumption - Start with the average oilfield drill ship day rate for 2012 per Ocean Industry

Magazine, then reduce the cost to account for the fact that this is a non-profit operation

Worldwide d	lay rates			Monthly Avgs
Year/Month	Minimum	Average	Maximum	432,407
				438,974
Drillship				438.541
2012 Jan	\$155,000	\$432,407	\$690,000	443.204
2012 Feb	\$155,000	\$438,974	\$672,000	439.230
2012 Mar	\$155,000	\$438,541	\$671,000	433,976
	*****		**=* ***	,



2012 Apr	\$157,000	\$443,204	\$671,000		100 071		
					438,074		
2012 May	\$157,000	\$439,230	\$671,000		442,213		
2012 June	\$50,000	\$433,976	\$671,000		429.391		
2012 July	\$50,000	\$438,074	\$671,000		427,920		
2012 Aug	\$50,000	\$442,213	\$671,000		443.074		
2012 Sept	\$50,000	\$429,391	\$671,000		450,437		
2012 Oct	\$50,000	\$427,920	\$672,000		,	= Average	
2012 Nov	\$50,000	\$443.074	\$672,000		400,120	, nonago	
2012 Dec	\$50,000	\$450,437	\$672,000			NP Adj*	Day Rate
2012 000	ψ00,000	ψ+00,407	W072,000	<u>.</u>			
				Assume:	438,000	138,000	300,000

*Non-Profit Adjustment: Adjustment from normal commercial pricing that considers market conditions, profit, depreciation and other cost components that do not apply in this case.

Assume: 47,000,000

Assume: 14,000,000

Additional Riser

- additional 5000 ft of riser required.

- cost per NOV quote, April 2013

Existing Riser System Modifications

- costs for new buoyancy modules and associated rig mods

- cost per NOV quote, April 2013

Bits, Drill Collars & Stabilizers

Bit Costs

- Determine number of drill/core bits needed from ops time estimate spreadsheet

- Avg bit cost per oilfield analog

Drill Bits	# Needed 24	\$/bit 70.000	Bit \$			
		-,				
Core Bits	# Needed 6	\$/bit 60,000	Bit \$ 360,000			
Core Servi			•	0.500 /day	•	22 Dave Mandad
- per oilfiel	d analog		Assume:	2,500 /day	Assume:	62 Days Needed
Drill String - per oilfiel	Rentals - Ge d analog	eneral	Assume:	4,000 /day	includes reamer	s, etc

Directional & Downhole Services

Costs per oilfield analogs

Surveys/Gyros/Single & Multi-Shots	Assume:	20,000	lump sum	
MWD/LWDMob/De-mob	Assume:	30,000	lump sum	
Standard MWD Rental	Assume:	3,000	/day	
Standard LWD Rental	Assume:	7,000	/day	
MWD/LWD Engineers (2)	Assume:	2,000	/day	battery disposal, 6-700/set
Mud Motors & Associated Tools	Assume:	3,000	/day	
High Temp MWD Rental	Assume:	4,000	/day	
High temp LWD Rental	Assume:	10,000	/day	



el, Water & Lube						
Rig Fuel						
- Usage per IODP is	40-60 kl/day	during DP o	perations			
	kl/day	gal/d	\$/gal	\$/day		
	50	13,209	4.00	52,836	Assume:	<mark>53,000</mark> /day
Costs per oilfield and						
Boat Fuel	Assume:	4,000	/dav			
Helicopter Fuel	Assume:	3,000				
Assume spot hire se	ervices, since	likely won't	need them	every day.		
Lubricants						
- Usage per IODP is	0.6 kl/day					
	2012 total		A (1			
	(yen)	(USD	\$/day 1232.88	-	A	1 200 /dov
	45,000,000	+30,000	1202.00		Assume:	<mark>1,300</mark> /day
Fresh Water						
- Usage per IODP						
	2012 total					
	(yen)	(USD	\$/day	-	•	700 / 1-1
	5,000,000	50,000	136.99		Assume:	700 /day per oilfield analog
						per onneid analog
WBM Cost - per Buck Dear		e riser volu	me is huge	assuming a	20" riser and	d there are
WBM Cost - per Buck Dear - "I would assume \$	2 million as th		-	-		
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals	2 million as th		-	oss control."	= 91.00 \$/ft Assume: Mud Cost =	1,900,000 WBM System 1,865,955
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer	2 million as th s for temperat	ure stability	and fluid lo	oss control."	= 91.00 \$/ft Assume: Mud Cost = e Footage =	1,900,000 WBM System 1,865,955 20,505
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer	2 million as th		and fluid lo	oss control."	= 91.00 \$/ft Assume: Mud Cost =	1,900,000 WBM System 1,865,955 20,505
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog	2 million as th s for temperat	ure stability	and fluid lo	oss control."	= 91.00 \$/ft Assume: Mud Cost = e Footage =	1,900,000 WBM System 1,865,955 20,505
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal	2 million as th s for temperat	ure stability	and fluid lo	bss control." Hol	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 WBM System 1,865,955 20,505
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog	2 million as th s for temperat Assume: Assume:	ure stability 800 2,500	and fluid lo	bss control." Hol	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog	2 million as th s for temperat Assume: Assume:	ure stability 800 2,500	and fluid lo	bss control." Hol	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
rilling Fluid Servi WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog Rectric Logging & Costs per oilfield analog	2 million as th s for temperat Assume: Assume:	ure stability 800 2,500	and fluid lo	bss control." Hol	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog Rectric Logging & Costs per oilfield analog	2 million as th s for temperat Assume: Assume: Cased Hole alogs	ure stability 800 2,500 e Logs	r and fluid lo /day /day	Hol	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog ectric Logging & Costs per oilfield ana Wireline Unit and Per	2 million as th s for temperat Assume: Assume: Cased Hole alogs rsonnel	ure stability 800 2,500	r and fluid lo /day /day 3,000	Hol	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog ectric Logging & Costs per oilfield ana Wireline Unit and Per Standard Open Hole	2 million as th s for temperat Assume: Assume: Cased Hole alogs rsonnel Logging	ure stability 800 2,500 e Logs Assume:	and fluid lo /day /day 1,500,000 2,500,000	/day lump sum lump sum	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog ectric Logging & Costs per oilfield ana Wireline Unit and Per Standard Open Hole High Temp Open Hole	2 million as th s for temperat Assume: Assume: Cased Hole alogs rsonnel Logging le Logging	are stability 800 2,500 e Logs Assume: Assume:	and fluid lo /day /day 1,500,000 2,500,000	/day lump sum	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog ectric Logging & Costs per oilfield ana Wireline Unit and Per Standard Open Hole High Temp Open Hol Cased Hole Logging	2 million as th s for temperat Assume: Assume: Cased Hole alogs rsonnel Logging le Logging	ave stability 800 2,500 e Logs Assume: Assume: Assume:	and fluid lo /day /day 1,500,000 2,500,000	/day lump sum lump sum	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog ectric Logging & Costs per oilfield ana Wireline Unit and Per Standard Open Hole High Temp Open Hole	2 million as th s for temperat Assume: Assume: Cased Hole alogs rsonnel Logging le Logging	ave stability 800 2,500 e Logs Assume: Assume: Assume:	and fluid lo /day /day 1,500,000 2,500,000	/day lump sum lump sum	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog ectric Logging & Costs per oilfield ana Wireline Unit and Per Standard Open Hole High Temp Open Hole High Temp Open Hole Standard Hole Logging Ementing	2 million as th s for temperat Assume: Assume: Cased Hole alogs rsonnel Logging le Logging	ave stability 800 2,500 e Logs Assume: Assume: Assume:	and fluid lo /day /day 1,500,000 2,500,000	/day lump sum lump sum	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog ectric Logging & Costs per oilfield ana Wireline Unit and Per Standard Open Hole High Temp Open Hole High Temp Open Hole Cased Hole Logging ementing Costs per oilfield ana	2 million as th s for temperat Assume: Assume: Cased Hole alogs rsonnel Logging le Logging	800 2,500 2,500 2 Logs Assume: Assume: Assume:	and fluid lo /day /day 1,500,000 2,500,000 100,000	/day lump sum lump sum	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog ectric Logging & Costs per oilfield ana Wireline Unit and Per Standard Open Hole High Temp Open Hole High Temp Open Hole Cased Hole Logging ementing Costs per oilfield ana 22"	2 million as th s for temperat Assume: Assume: Cased Hole alogs rsonnel Logging le Logging	Assume: Assume: Assume: Assume: Assume:	r and fluid lo /day /day 1,500,000 2,500,000 100,000	/day lump sum lump sum	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0
WBM Cost - per Buck Dear - "I would assume \$ expensive chemicals Mud Engineer - per oilfield analog Cuttings Disposal - per oilfield analog ectric Logging & Costs per oilfield ana Wireline Unit and Per Standard Open Hole High Temp Open Hole High Temp Open Hole Cased Hole Logging ementing Costs per oilfield ana	2 million as th s for temperat Assume: Assume: Cased Hole alogs rsonnel Logging le Logging	800 2,500 2,500 2 Logs Assume: Assume: Assume:	r and fluid lo /day /day 1,500,000 2,500,000 100,000 100,000	/day lump sum lump sum	= 91.00 \$/ft Assume: Mud Cost = e Footage = Cost/ft =	1,900,000 1,865,955 20,505 91.0



13.375"	Assume:	· · · · ·	lump sum
11.75"	Assume:		lump sum
9.625"	Assume:	· · · · ·	Iump sum
Unit Charge	Assume:	1,250	/day
Retainers, Misc Equip	Assume:	50,000	lump sum

Mud Logging and Geological Services

Costs per oilfield analogs

Logging Unit Operating rate	Assume:	1,250 /day
Personnel Charges	Assume:	1,200 /day

Transportation

Costs per oilfield analogs

- Presumably don't need these every day, but will be some costs due to project duration

Land	Assume:	900	/day
Work Boat	Assume:	14,000	/day
Crew Boat	Assume:	9,000	/day
Helicopter	Assume:	9,000	/day
Days Needed	Assume:	100	

Tubular Services

Costs per oilfield analo	<u>gs</u>					
QAQC	Assume:	150,000	ump sum			
Shorebase / Dock Se	rvices					
Costs per oilfield analo	gs					
Shorebase /Dispatcher		Assume:	2,000	/day		
Communications						
Costs per IODP						
	Yen/mon	\$/mon	\$/day			
Comms V-Sat	3,000,000	30,000	1000		Assume:	1,000 /day
Miscellaneous Renta	al Equipm	ent				
Casta non silfald anala						
Costs per oilfield analo	<u>gs</u>					
Solids Control		Assume:	400	/day		
Fishing Tools		Assume:	1,500	/day		
Casing Running Equipn	nent	Assume:	6,000	-	Assume:	70 Days Needed
Other Rentals		Assume:	20,000	/day		10d/String



Miscellaneous Special Services

Costs per oilfield analogs

Weather Forecasting Engineering Services - Riser Analysis Engineering Services - Drill String Design Engineering Services - Casing Design	Assume: Assume: Assume: Assume:	300,000 200,000	/day lump sum lump sum lump sum
· · · ·	Assume: Assume: Assume: Assume: Assume: Assume:	200,000 50,000 100,000 200,000 200,000	•

Other Services / Costs

Costs per oilfield analogs

Misc Contract Labor	Assume:	1,500	/day			
Casing Running	Assume:	10,000	/day	Assume:	70	Days Needed
Well Insurance	Assume:	500,000	lump sum			10d/String
Overhead	Assume:	1,100	/day			
Catering	Assume:	1,200	/day			

TANGIBLE ITEMS

Costs per oilfield analogs

	From	То	Length		
36"	11,975	12,175	200	Assume:	650
22"	11,975	12,745	770	Assume:	180
18"	12,645	17,552	4,907	Assume:	160
16"	12,545	20,850	8,305	Assume:	155
13-3/8"	11,975	24,200	12,225	Assume:	140
11-3/4"	23,900	27,500	3,600	Assume:	80
9-5/8"	27,200	30,840	3,640	Assume:	70

Liner Equipment	Assume:	300,000 lump sum (\$150,000 each)
Wellheads	Assume:	500,000 lump sum
Miscellaneous / Other	Assume:	100,000 lump sum



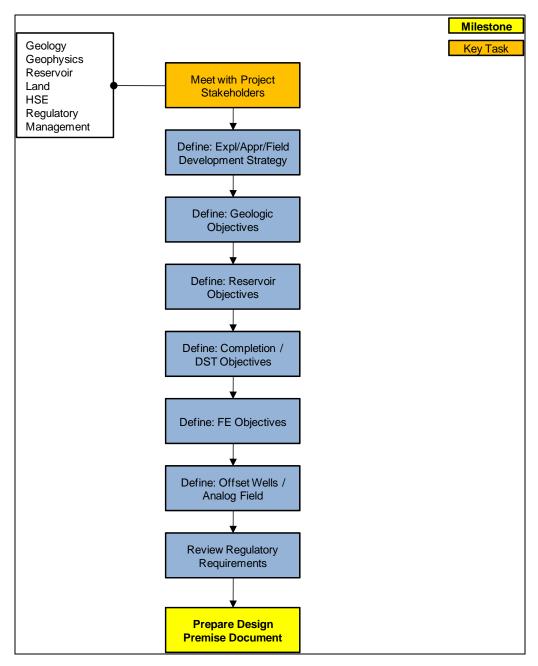
đ ğ 2017 2Q ğ 4Q 3Q 2016 2Q ð -----ð ----ğ 2015 ▲ commit ▲ commit 1111 2Q commit commit ۲ ð ++ đ - milestone ğ 2014 2Q ğ 4Q ğ 2013 ğ ğ **Ready to Mobilize** Project Approva Devel Tender Strategy / Tender Services Drilling Progran Pla Prelim PP/FG/OBG/Temp Analysis Initial Well Plan / Cost Estimat Basis of Desig ng Prog Objectives Definition 1.) Select Mgmt/Steering Team SOR/Science Planning Phases / Tasks - Data Review / Lessons Learned Prelim Drill Str/ Bit / BHA Plan Prelim Cement / Fluids Design - Design Assumptions Defined - Ident Services Requirements - Contingency Plan Development - Develop Well Plan Options - Bit/Core System Testing D. Detailed Well Planning C. Long Lead Time Items B. Front End Engineering Pre-Spud / DWOP Meetings - Well Objectives Defined - FE Objectives Defined - Preliminary Well Design Draft Drilli - Finalize Drilling Program - Initiate Technical Studies Ident Long Lead Items E. Final Well Planning - Major Risks Defined 2.) Define Objectives - Additional Buoyancy - Finalize Design Work - Detailed Well Design - Metocean Study - Site Survey - Services Integration - Final Cost Estimate Additional Riser - Risk Assessment - Logistics Plan - Tubulars à

Appendix 3: Implementation Timeline

Appendix 3: Example Well Delivery Process Flowcharts

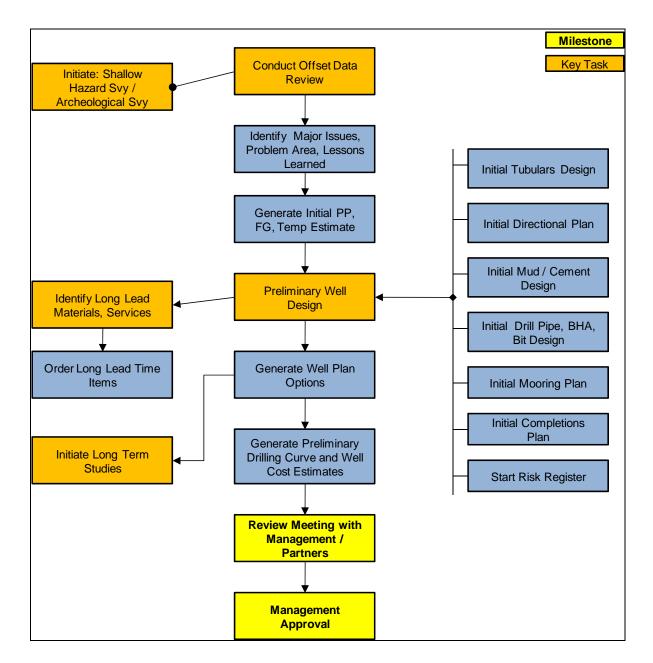
The following are generic flowcharts that describe the various phases of the well delivery process that is used for planning deepwater drilling projects in the oil and gas business. Obviously not everything will be directly applicable to the BEAM project, but they are provided for reference.

1. Front End Engineering – Well Objectives Definition



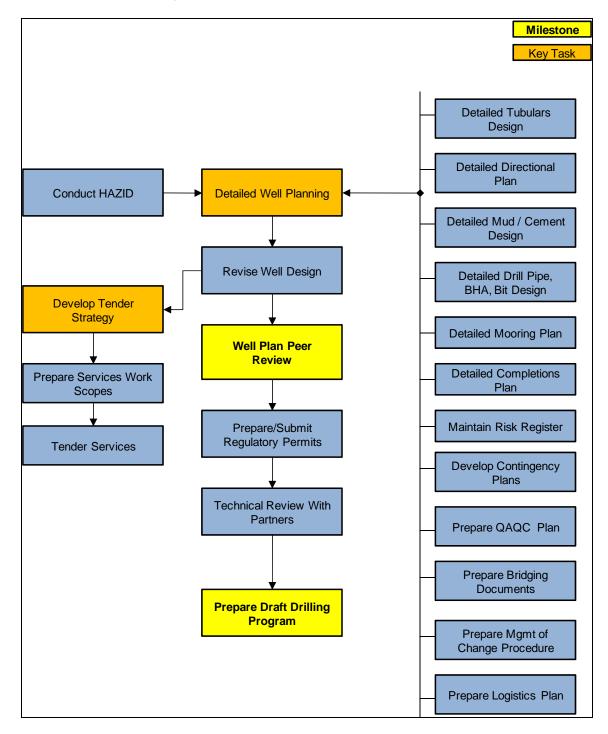


2. Front End Engineering – Initial Well Planning



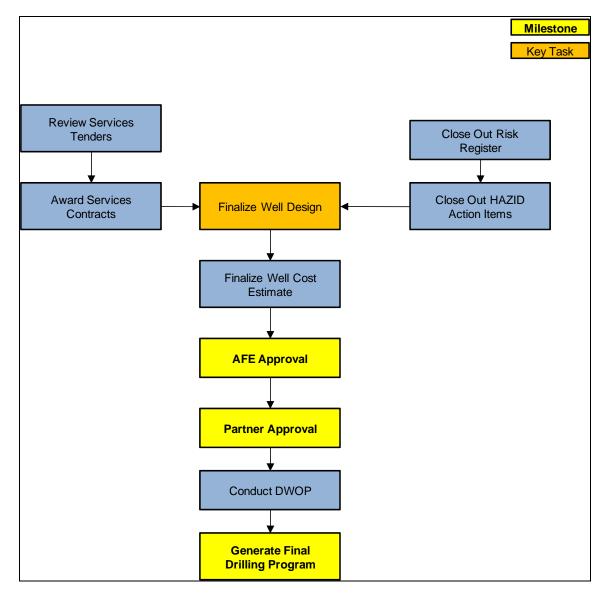


3. Detailed Well Planning



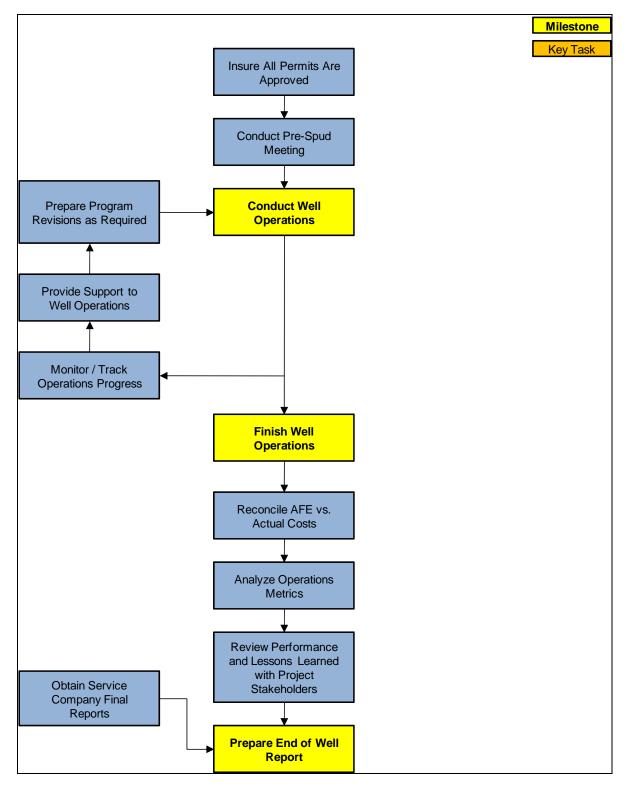


4. Detailed Well Planning – Finalize Well Plan





5. Operations Execution and Close Out





Generic Deepwater Well Planning Timeline Example

For reference, the following is a generic planning timeline for a deepwater well. The planning process typically takes 12-18 months depending on the complexity of the project and its location.

Generic Deepwater Well Planning Timeline

Well Planning Phases / Tasks	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13
A. Front End Engineering (FEED)													
1.) Well Objectives Definition													
- Well Objectives Defined													
- FE Objectives Defined													
- Offset Wells / Analog Field Defined													
- Completion/DST Objectives Defined													
Basis of Design													
2.) Initial Well Planning													
- Offset Data Review / Lessons Learned													
- Maior Risks Defined													
- Prelim PP / FG / Temp Analysis													
- Develop Well Plan Options / Scenarios													
- Preliminary Well Design / Schematic													
- Prepare Casing Design													
- Prelim Drill Str / Landing Str / BHA Plan								*** ** **					
- Prelim Cement / Fluids Design													
Initial Well Plan(s)													
Initial Cost Estimate(s)													
Management Approval													
B. Detailed Well Planning													
1.) Well Design													
- Detailed Well Design													
- Anchor Handling / Mooring Procedure													
- Order Long Lead Time Items													
- Rig Acceptance Strategy													
- Develop Tender Strategy / Tender Services	s												
- Logistics Plan													
- Contingency Plan Development													
- Permit to Drill													
2.) Services Tendering													
C. Final Well Planning													
1.) Finalize Well Design													
- Final Cost Estimate													
- Prepare Drilling Program													
- Pre-Spud / DWOP Meetings													
Drilling Program													
D. Spud													
·····													
<u> </u>													