



Þeistareykir – Well ÞG-12

Phases 0 and 1: Drilling for Surface Casing
down to 120 m and Anchor Casing down to 300 m Depth

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Title: Peistareykir – Well ÞG-12. Phases 0 and 1: Drilling for Surface Casing down to 120 m and Anchor Casing down to 300 m Depth.

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Co operators: _____

Abstract: Well ÞG-12 is a directionally drilled production well for the Peistareykir power plant. It is sited on the extended drill pad C, the same drill pad as wells ÞG-3, ÞG-6 and ÞG-7. The well is located approximately 600 m north of Mt. Bæjarfjall and west of Mt. Ketilfjall. The aim of the drilling was to penetrate a purported fracture systems north of, and under, Mt. Bæjarfjall. This report addresses the drilling history and data acquisition of the 0th and 1st phase. This includes subsurface mapping of the lithologies and alteration in the well based on drill-cuttings, estimating subsurface temperatures from key alteration minerals, and relating drill-data and geophysical logs to lithology to constrain formation boundaries and identify potential aquifers. ÞG-12 was pre-drilled with 21" drill bit for 18⁵/₈" surface casing to 120 m. Drilling continued with a 17¹/₂" drill bit for a 13⁵/₈" anchor casing, down to 300 m. The stratigraphy of phases 0 and 1 in well ÞG-12 is composed of basaltic lava flows and hyaloclastite formations, including basaltic breccias, tuffs and pillow basalts. Alteration is first noticed at 56 m where light colored clay, quartz and epidote color is noticed. Stilbite, scolecite and laumontite were the only zeolites analyzed from the drill cuttings. No zeolites are observed below 180 m

Key words:

Peistareykir, well ÞG-12, geothermal area, high temperature, wellbore, steam production, geological strata, feed zones, wireline logging, Iceland Drilling, Óðinn, Landsvirkjun, ÍSOR

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Ágrip

Hola ÞG-12 er stefnuboruð vinnsluhola fyrir raforkuverið á Þeistareykjum. Hún er staðsett á framlengdu borplani C, um það bil 600 metra norðan við Bæjarfjall, vestur af Ketilfjalli. Fyrir voru á plani C holur ÞG-3, ÞG-6 og ÞG-7. Lagt var upp með að skera þekkt sprungukerfi norðan við Bæjarfjall með það að markmiði að fá sem mestan hita og lekt í holuna eins og mögulegt væri. Þessi skýrsla fjallar um borsögu og gagnaöflun forborunar og 1. áfanga holunnar. Þar með er talin kortlagning jarðlagasúlunnar og ummyndunarsteinda niður holuna, sem greind var út frá borsvarfi sem kom upp með skolvökvanum. Einnig er hér átt við jarðeðlislegar mælingar sem gerðar voru á meðan borverkinu stóð. ÞG-12 var forboruð með 21" krónu fyrir 18⁵/₈" yfirborðsfóðringu niður á 120 m dýpi. Borun var haldið áfram með 17¹/₂" krónu niður á 300 m dýpi og 13⁵/₈" öryggisfóðring sett niður. Jarðlagasúlan einkennist af basískum hraunlögum og móbergsmýndunum, s.s. breksíu, túffi og bólstrabergi. Fyrst er vart við ummyndun á 56 m dýpi en þar sást fínjaðra leir, kvars og epidótlitur í svarfinu. Stílbít, skólesít og laumontít voru einu greinanlegu zeólítarnir og sáust þeir niður á 180 m dýpi.

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1 Introduction

Drilling of well ÞG-12 in the Þeistareykir geothermal field was conducted by Iceland Drilling (Jarðboranir) for Landsvirkjun. ÞG-12 is drilled from an extended drillpad C. The production wells ÞG-3 (2659 m deep), ÞG-6 (2799 m deep) and ÞG-7 (2509 m deep) are located on the same drillpad approximately 150 m ENE of well ÞG-12. Drillpad C is located under the slopes of Mt. Ketilfjall, by the road up to Bóndhólsskarð pass (Figures 1–3).

Exploration drilling for electrical power production in the Þeistareykir geothermal area was first carried out in 2002. The area is thought to be one of three largest geothermal areas in northeastern Iceland. The surface manifestations cover an area of 11 km² and TEM resistivity measurements in the bedrock, conducted in 2006, indicate the size 45 km² (Karlsdóttir et al., 2006).

The geothermal system is within an active central volcano. The fissure swarm (NNE-SSW) reaches from lake Mývatn in the south and north to the sea in Kelduhverfi. The fissure swarm is up to 5 km wide and 50–60 km long (Sæmundsson et al., 2012). The surface manifestations are mostly seen in three areas 1) by the southwestern slopes of Mt. Ketilfjall, 2) In the northern slopes of Mt. Bæjarfjall and 3) in southern Tjarnarás (see Figure 1).

The planned depth of well ÞG-12 is 2000–2500 m (MD). The well will be directionally drilled towards southwest, with the aim of intersecting the permeability and heat anomaly related to the fracture system north of, and under, Mt. Bæjarfjall (see Khodayar et al., 2016; Mortensen, 2012).

Table 1. Geographical position of well ÞG-12. Coordinates are in ISNET93.

Well name	Well ID	East (X) (m)	North (Y) (m)	Elevation (m a.s.l.)	Planned depth (m)
ÞG-12	60412	593923	599459	355	2500

The planned design of well ÞG-12 (Figure 4) is as follows:

- Phase 0: Pre-drilling for the surface casing with 21" drill bit to approximately 110 m depth. Cased with 18⁵/₈" pipes.
- Phase 1: Drilling for the anchor casing with 17¹/₂" drill bit down to ~ 300 m depth. Cased with 13⁵/₈".
- Phase 2: Drilling for the production casing with 12" drill bit down to ~ 800 m depth. Cased with 9⁵/₈".
- Phase 3: Drilling of the production part with 8¹/₂" drill bit to 2000–2500 m depth, cased with 7" perforated liner.

To reach the target zones the direction of the well was set at 235°±5° relative to true North, with an inclination 30°±3° from the vertical within the depth range 400 m to 1600 m (MD). Below 1600 m (MD) greater deviations in direction and inclination are tolerated i.e. ±15° for direction and ±12° for inclination (Figure 5). The kick-off was planned c. 20 m below the anchor casing, at 320 m depth. The angle build-up rate was planned to be 2.5°/30 m with the final inclination of 30° from the vertical, to be completed before 660 m (MD). Phases 0 and 1 were

drilled by the drill-rig Óðinn. Depths in this report refer to measured depth (MD) relative to Óðinn's rig floor (6.80 m above ground level, except if otherwise is stated).

The drilling contractor, Iceland Drilling (Jarðboranir), carried out the drilling operations with Landsvirkjun monitoring the work. Iceland GeoSurvey (ÍSOR) managed cutting inspection, geophysical logging, gyro surveying and geothermal consulting.

This report presents the geological part of the drilling of phases 0 and 1, including lithology, alteration and feed points, as well as the wireline logging of the well. The report is divided into four main chapters. The *first chapter* gives an introduction. The *second chapter* reports on the drilling operations during these phase. The *third chapter* describes the geological strata, geothermal alteration and loss zones/aquifers in the well. The *fourth chapter* describes the wireline loggings carried out by ÍSOR's logging engineers.

The aim of the report is to document the drilling progress and the geological- and geophysical studies carried out during the drilling of phases 0 and 1 in ÞG-12, and present all the data collected and provide data interpretations. Appendix B contains all daily reports written by the on-site geologist during drilling operations, presenting preliminary results.

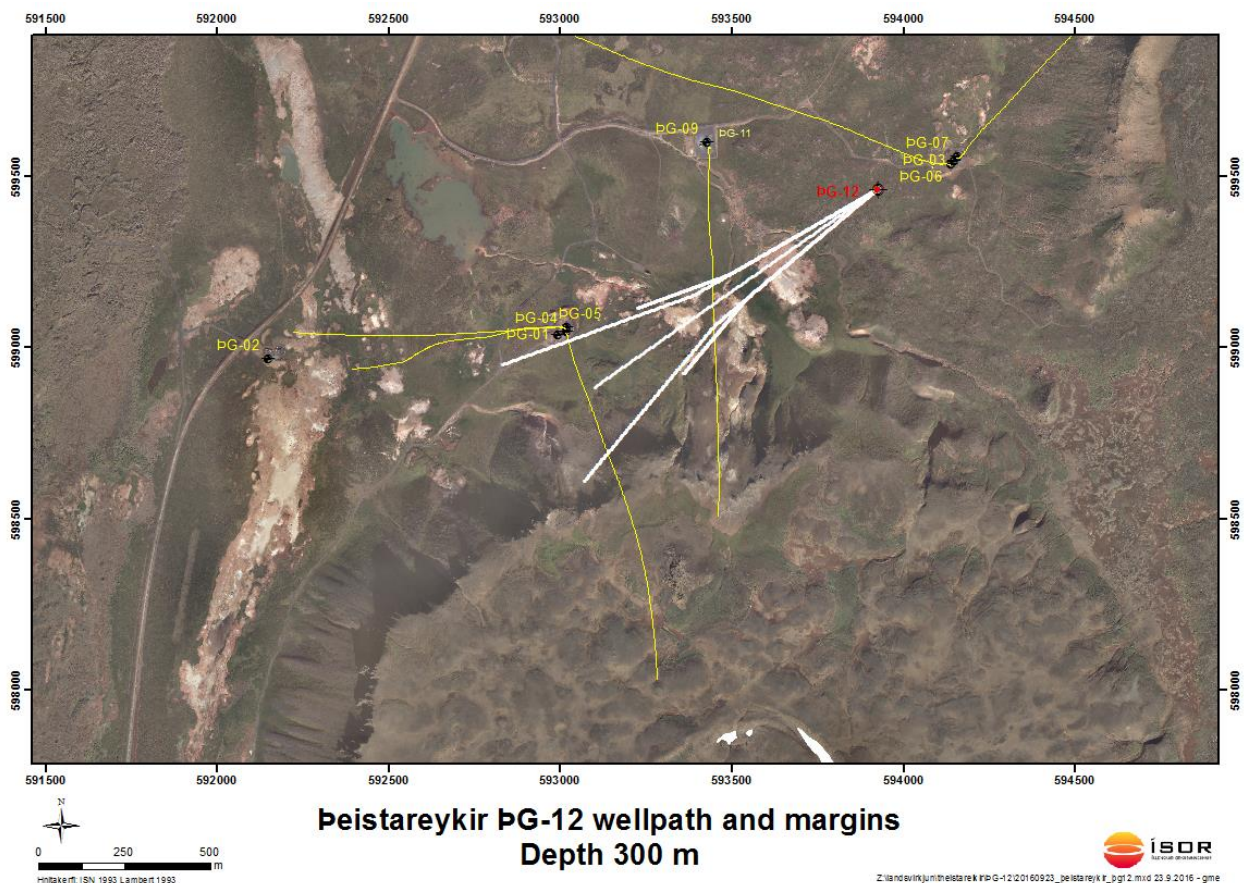


Figure 1. Aerial photograph of Peistareykir. Location of current drillpads and production wells in the Peistareykir geothermal field. Locations of wells ÞG-3, ÞG-6 and ÞG-7 on wellpad C are shown.

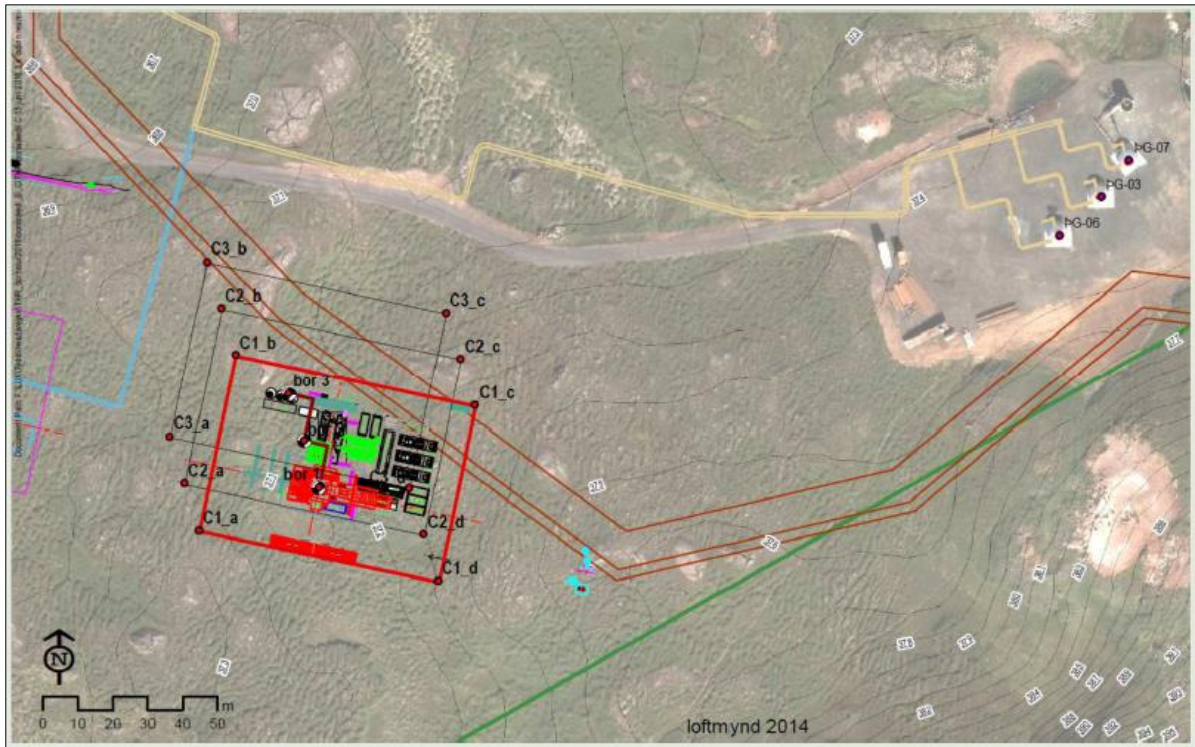


Figure 2. Location of wellpad C (upper right corner) and its extension towards WSW where well PG-12 is located.



Figure 3. An overview of the drill site, seen from top of Mt. Bæjarfjall.

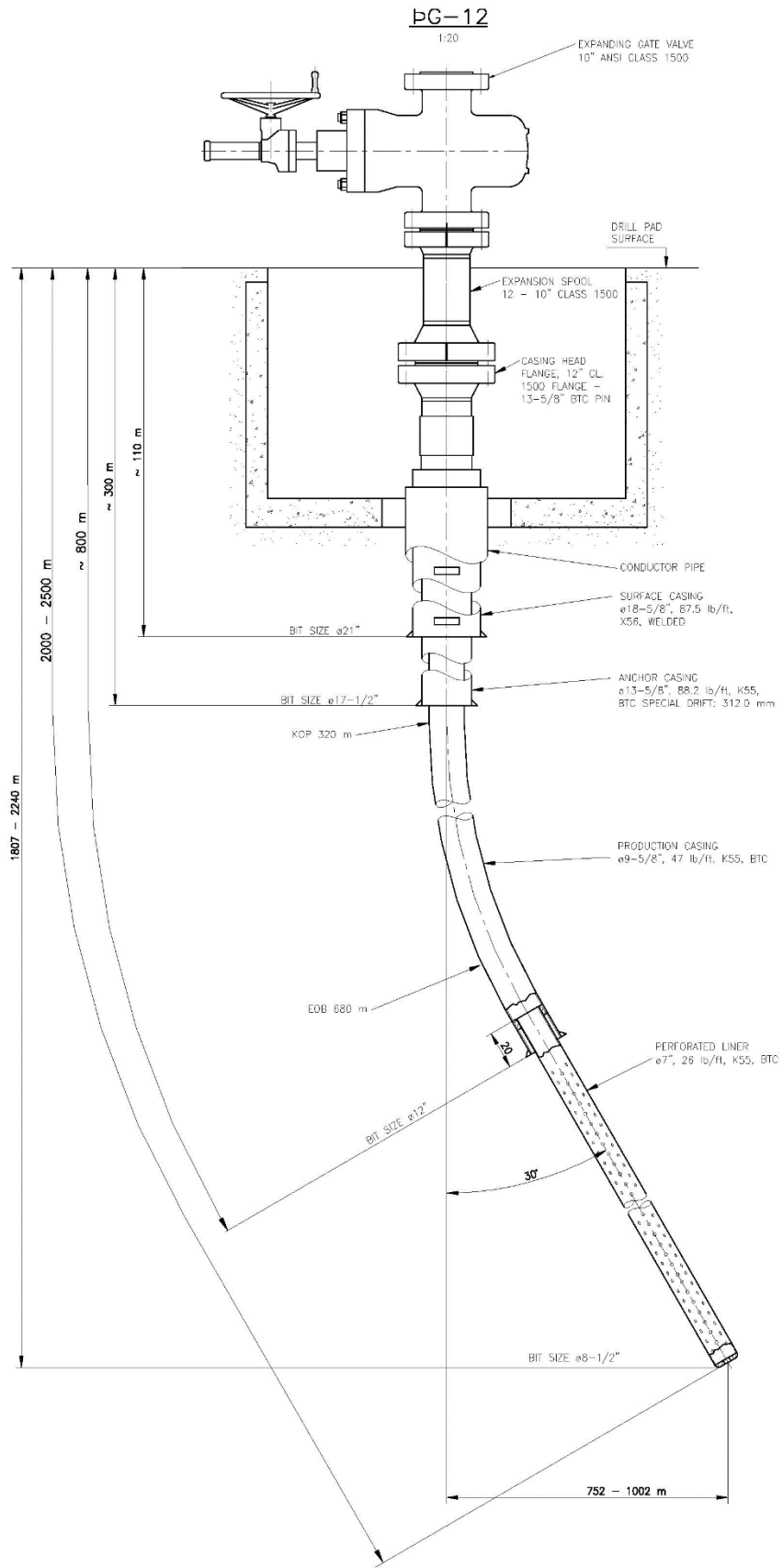


Figure 4. Well design of BG-12.

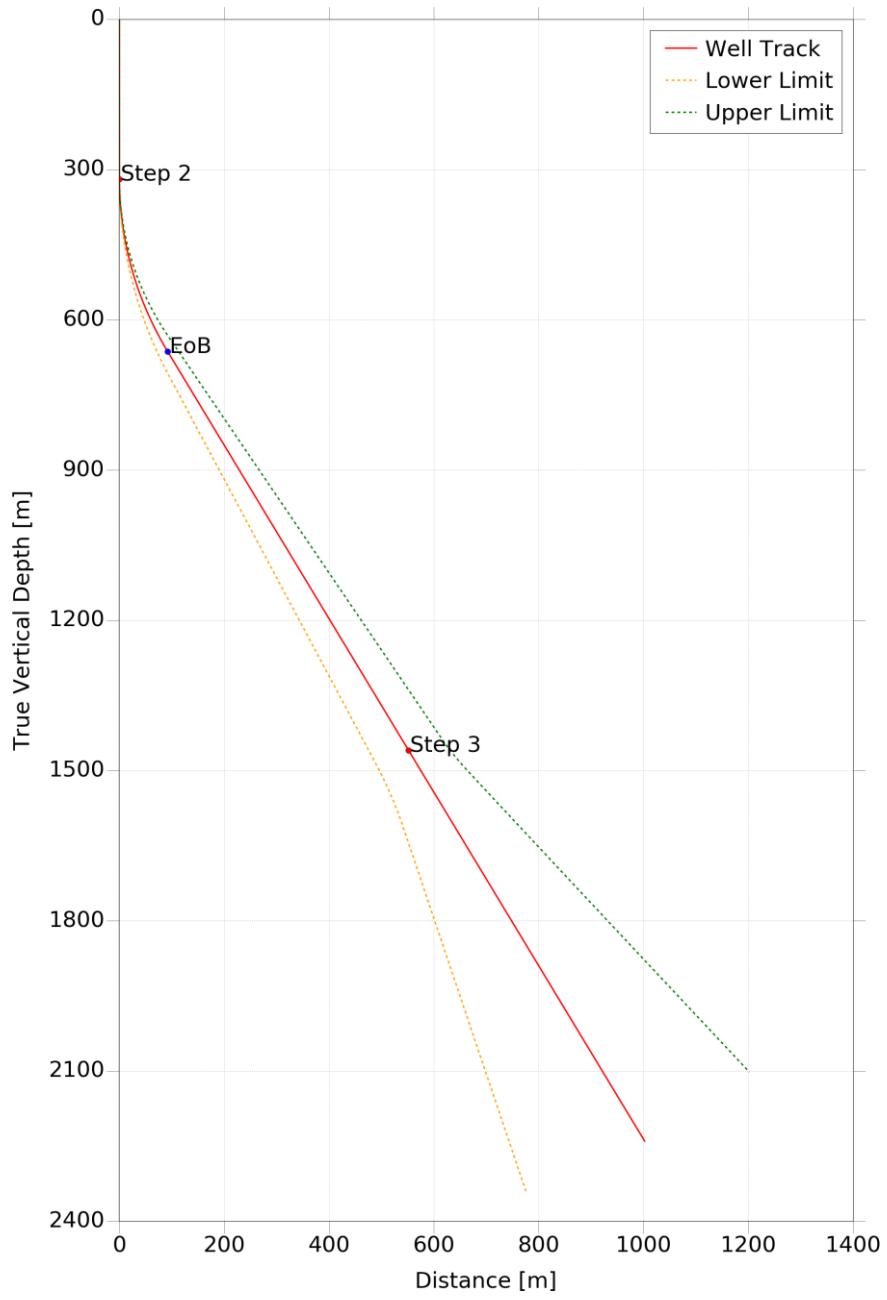


Figure 5. Cross section and birds-eye-view of the planned trajectory of well DG-12 with allowable deviation indicated.

2 Drilling operations

2.1 Overview

Drill rig Óðinn was ready for commencing drilling on the 6th of August 2016. Drilling with a 21" drill bit started the same day at 11.9 m. Total loss of circulation was encountered numerous times during drilling of phase 0, resulting in 6 cement jobs. Drilling, casing, cementing and logging of phase 0 was completed on the 18th of August 2016, workday 15. At this point the well was 120 m deep relative to the drilling platform of Óðinn (6.80 m above ground). The 18^{5/8}" surface casing was set at 116.6 m depth.

Preparations for the drilling of phase 1 started on the 18th of August 2016 with testing of the blow-out preventers (BOP). Problems with leakage of the BOP's caused slight delays of drilling operations. Drilling into formation with a 17½" drill bit started at noon the 20th of August, at 120 m. Phase 1 was complete 25th of August 2016 (workday 21). A 13^{5/8}" anchor casing was run to 292.2 m depth.

An overview of the drilling phases and details of the casing depths are shown in Table 2. Figure 6 shows the drilling progress of well ÞG-12 during drilling of phases 0 and 1.

Table 2. *Drilling and casing depths in well ÞG-12.*

Drill-Rig	Phase	Drill bit	Depth (m)	Depth Reference	Casing Type	Casing Depth (m)
Óðinn	0	21"	120	Óðinn RF*	18 ^{5/8} "	116.6
Óðinn	1	17½"	300	Óðinn RF*	13 ^{5/8} "	292.2

* RF = rig floor. Óðinn's rig floor is 6.80 m above ground level.

PG-12 - Drilling Progress

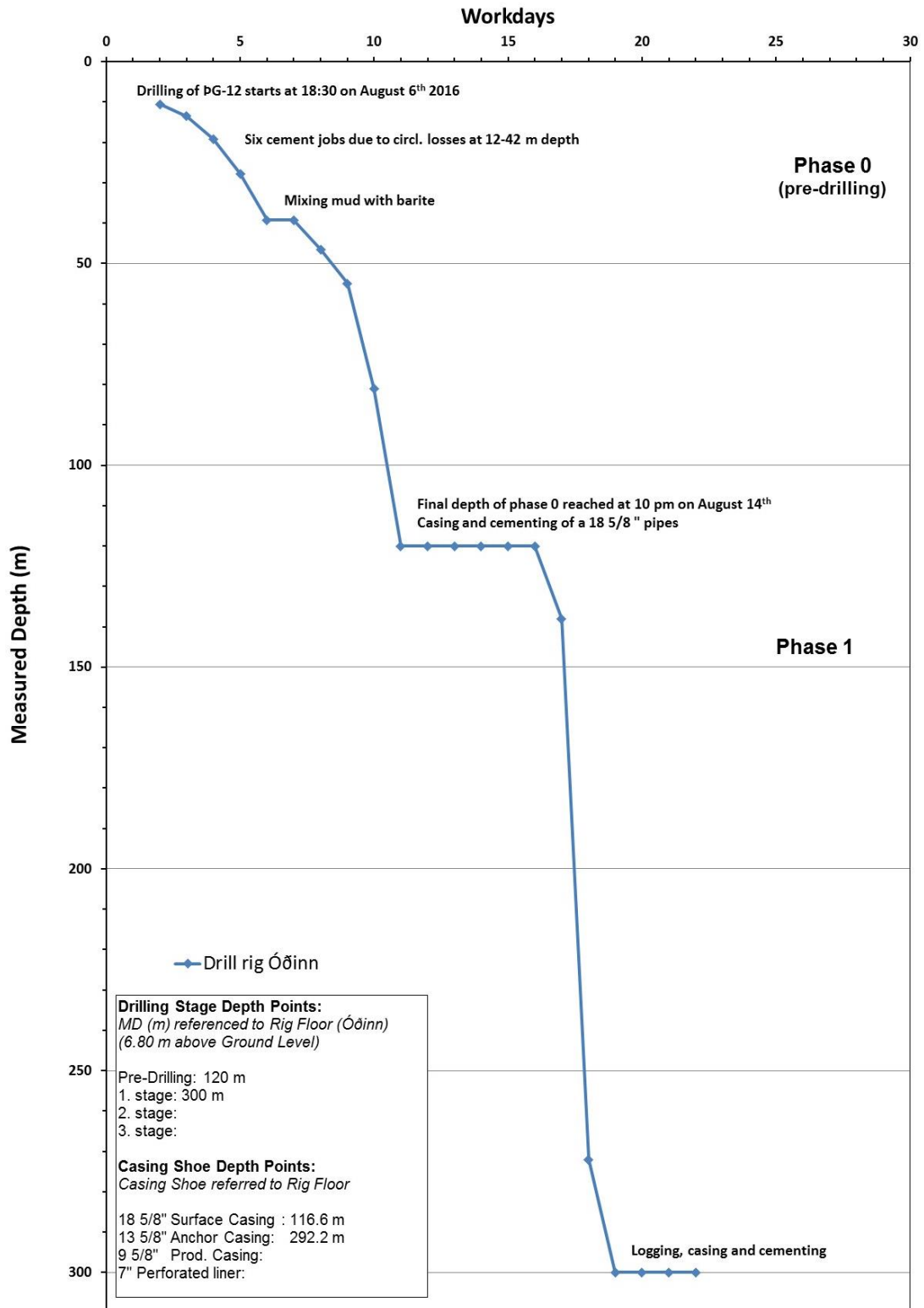


Figure 6. Drilling progress of well PG-12 during drilling of phases 0–1.

2.2 Pre-drilling for the surface casing (18⁵/₈") - Phase 0

In the beginning of August, the drill rig Óðinn was moved from drill pad B (well ÞG-11) to drill pad C. On the 6th of August it was ready for drilling. While drilling for on drill pad B for the surface casing in wells ÞG-3, ÞG-6 and ÞG-7, over-pressurized zones were intersected, followed by mud eruptions and temperature peaks in the circulation fluid. No circulation losses were however observed. Based on this experience, over-pressurized zones were expected to be intersected while drilling ÞG-12.

On the 5th of August, the drill crew set up the blow out preventers stack (BOP's) and connected the flow-line. The BOP's were then pressure tested and the annular preventer leaked while using 10 bar pressure. The pressure was lowered to 7 bars and the annular preventer passed. Pressure testing of the BOP was complete at 06:30 on the 6th of August. The bottom hole assembly (BHA) was composed of a 21" drill bit, stabilizer 27/8, damper, stabilizer 27/8, exover and 8" collars. During drilling of phase 0 the average rate of penetration was 1.8 m/hr. Total loss of circulation was encountered numerous times during drilling of phase 0, resulting in 6 cement jobs with total volume of cement slurry used, 41.5 m³. Table 3 gives information on the cement jobs performed during drilling of phase 0, and cementing reports for the cemented plugs are shown in Figures 7–12.

Table 3. Information on the six cement jobs performed due to circulation losses in well ÞG-12 during drilling of phase 0.

dd.mm.yyyy	Depth (m)	Circl. loss (l/s)	Vol. cement (m3)	Remarks
06.09.2016	11.9	35	3	Cement was drilled from 10.5-11.9 m, where a TLC occurred when drilling in formation started. Drilling continued down to 13.5 m.
07.09.2016	19.2	35	7	Well circulated for half an hour before the drill string was POOH. TOC at 10.7 m.
08.09.2016	26.8	35	7 and 12 L of plastifier	Drilling continued down to 27.8 m and the well circulated and the string POOH. TOC at 15.7 m.
09.09.2016	36	36	11.5	Drilling was carried on to 39.3 m. Well circulated and the string POOH. First, 7m ³ of cement slurry and 17 L of plastifier were pumped into the well. TOC at 36 m. An hour later 2m ³ of sandy cement was pumped down and TOC at 30 m. Few hours later the well was filled with water, 13 l/s losses were recorded. It was decided to do one more cement job with 2.5 m ³ . TOC at 22.6 m. WOC carried out and then the well was filled with water and no circulation losses measured.
11.09.2016	39.8	36	10	Drilling continued to 42 m. POOH. TOC at 36.6.
11.09.2016	42	38	3	Drilling into formation started at 42 m and a TLC was encountered. Drilling was carried on down to 46.5 m and the well circulated and the string POOH. TOC 37 m.

Drilling after the sixth cementing continued down to 55 m, where it was stopped at 14:00 on the 12th of August. In the afternoon a loss of about 1.5–2 L/s was estimated and a drilling mud, including barite was mixed. Barite (BaSO₄) is a high density mineral (about 4.5 g/cm³) commonly used for preparing a drilling mud of high density.

Mixing of the drilling mud was complete around noon on August 13th. The density of the drilling fluid was adjusted to 1.34 g/cm³. Then drilling started again at 55 m depth. No loss of circulation was noted. In the afternoon, with well depth of 70 m, drilling was stopped for conducting a fluid loss test. Pumping was cut off for a while. A minor amount of fluid was found to be effused from the well but hardly detectable. At this time density of the mud had decreased down to 1.31 g/cm³. At 17:30–19:00 the crew worked on mixing of the mud, adding more barite and then drilling continued.

At 10:00 on August 14th (workday 11) the final depth of phase 0 (pre-drilling) was reached at 120 m depth. During the night until 6:30 on August 15th the well was circulated and a wiper trip conducted. A pump rate of 38 L/s was applied. A minor increase in torque was noticed at 20–25 m but otherwise no obstacles were noted. After the wiper trip the well was circulated for three hours. At the same time the crew started to prepare for running the 18⁵/₈" casing in the well. At 07:00 the 15th of August, the float shoe/casing shoe was welded on the end of the casing and the drill string was then pulled out of the well. Some delays in the casing process were caused by a broken forklift which had a rollover on a road close by. A new one was moved to the site. At 09:00 on August 15th the casing of the well started.

At 13:45 on August 16th the casing of the well with 18⁵/₈" pipes finished (Figure 13). A pumping of 5–10 L/s was applied while lowering the pipes into the hole. The upper annular BOP was kept closed while welding the casing pipes together. The shoe of the casing sits at 116.6 m depth. In the afternoon a cementing-string was run in the hole. In the late evening the drillers started to clean mud from the annulus by using water and soda. Just after midnight, on the 17th of August the cementing operation started. The cement was retrieved at the surface. In total 11.6 m³ of cement slurry (G-mixture) with a density of 1.7 g/cm³ was used (Figure 14). In the end a displacement water of 1200 l was used. No top job was needed. The cementing string was then pulled out of the well. Waiting on cement lasted until 19:00 on August 17th when the top of the surface casing was cut to a desired height. Shortly after midnight on August 18th a new flange was welded on top of the casing and that marks the end of phase 0 (workday 15). Table 4 shows the drilling progress during drilling of phase 0.

Table 4. *Drilling progress of the pre-drilling phase carried out by Óðinn. Depths are relative to the rig-floor of Óðinn (6.80 m above the ground).*

Day	Workday	Drilled Section (m)	Drill Time (h)	ROP (m/h)	Total Depth at 24:00 (m)
6.08.2016	3	1.6	1.5	1.1	13.5
7.08.2016	4	5.7	5.75	1.0	19.2
8.08.2016	5	8.6	6.5	1.3	27.8
9.08.2016	6	11.5	7	1.6	39.3
11.08.2016	8	7.2	4.5	1.6	46.5
12.08.2016	9	8.5	3.5	2.4	55.0
13.08.2016	10	26	9.3	2.8	81.0
14.08.2016	11	39	18	2.2	120.0
Total		120	56	1.8	120.0

Iceland Drilling		Cementing Report		Iceland Drilling		
Rig: Óðinn		Rig No: 65000		Job Name: Þeistareykir DG-12		
Job No: 65138						
Cement Job Information						
Start Date/Time:	07-ágú.-16 00:25	Well Bore:	Original Well Bore			
Job Type:	PLUG	Cementing Engineer:				
Cementing Co:	JARDB					
Plug Job Detail						
Plug Type:	Lekasteypa					
Plug: Top (m):	8,6	Bottom (m):	13,5	Length (m):	4,9	
Calc. Displacement Vol (cu m):	Hole Size at Plug (cm):		53,34			
	Volume (cu m)	Pump Time	Rate (cu.m./min)	Volume (bar)		
	Conditioning Data:					
	Cement Data:					
	Displacement Data:					
Slurry Information						
Type	Density	Yield	Sacks	Volume	Rate	Additives
No Slurry Information Data						
Post Job Information						
Actual Top of Cmt (m):	8,6	Job Success?	Yes			
Misc. Comments:	Steypt úr þremur rúmmetrum af sandsleypu með steypubíll og steypudælubíll					

Figure 7. Cement report for the first cement plug during drilling of phase 0 in DG-12.

Iceland Drilling		Cementing Report		Iceland Drilling		
Rig: Óðinn		Rig No: 65000		Job Name: Þeistareykir DG-12		
Job No: 65138						
Cement Job Information						
Start Date/Time:	07-ágú.-16 21:15	Well Bore:	Original Well Bore			
Job Type:	PLUG	Cementing Engineer:				
Cementing Co:	JARDB					
Plug Job Detail						
Plug Type:	Lekasteypu					
Plug: Top (m):	11,0	Bottom (m):	19,2	Length (m):	8,2	
Calc. Displacement Vol (cu m):	Hole Size at Plug (cm):		53,34			
	Volume (cu m)	Pump Time	Rate (cu.m./min)	Volume (bar)		
	Conditioning Data:					
	Cement Data:					
	Displacement Data:					
Slurry Information						
Type	Density	Yield	Sacks	Volume	Rate	Additives
No Slurry Information Data						
Post Job Information						
Actual Top of Cmt (m):	11,0	Job Success?	Yes			
Misc. Comments:	Steypt úr 7 rúmmetrum af sandsleypu með steypubíll og steypudælubíll					

Figure 8. Cement report for the second cement plug during drilling of phase 0 in DG-12.

Iceland Drilling		Cementing Report		Iceland Drilling		
Rig: Óðinn		Rig No: 65138		Rig No: 65000		
Job No: 65138		Job Name: Deistareykir DG-12				
Cement Job Information						
Start Date/Time:	08-ágú.-16 21:45	Well Bore:	Original Well Bore			
Job Type:	PLUG	Cementing Engineer:				
Cementing Co:	JARDB					
Plug Job Detail						
Plug Type:	Lekasteyping					
Plug Top (m):	15,7	Bottom (m):	27,8	Length (m):	12,1	
Calc. Displacement Vol (cu m):	Hole Size at Plug (cm):		53,34			
	Volume (cu m)	Pump Time	Rate (cu.m./min)	Volume (bar)		
Conditioning Data:						
Cement Data:						
Displacement Data:						
Slurry Information						
Type	Density	Yield	Sacks	Volume	Rate	Additives
No Slurry information Data						
Post Job Information						
Actual Top of Cmt (m):	15,7	Job Success?	Yes			
Misc. Comments:	Steypt úr 7 rúmmetrum af sandsteypu+ 12 lítra af floti með steypubli og steypuáslubli					

Figure 9. Cement report for the third cement plug during drilling of phase 0 in PG-12.

Iceland Drilling		Cementing Report		Iceland Drilling		
Rig: Óðinn		Rig No: 65138		Rig No: 65000		
Job No: 65138		Job Name: Deistareykir DG-12				
Cement Job Information						
Start Date/Time:	09-ágú.-16 21:15	Well Bore:	Original Well Bore			
Job Type:	PLUG	Cementing Engineer:				
Cementing Co:	JARDB					
Plug Job Detail						
Plug Type:	Lekasteypa					
Plug Top (m):	22,6	Bottom (m):	39,3	Length (m):	16,7	
Calc. Displacement Vol (cu m):	11,50	Hole Size at Plug (cm):	53,34			
	Volume (cu m)	Pump Time	Rate (cu.m./min)	Volume (bar)		
Conditioning Data:						
Cement Data:						
Displacement Data:						
Slurry Information						
Type	Density	Yield	Sacks	Volume	Rate	Additives
No Slurry information Data						
Post Job Information						
Actual Top of Cmt (m):	22,6	Job Success?	No			
Misc. Comments:	Steypt úr 7m ³ af sandsteypu kl 22:15, steypuborð í 36m Steypt úr 2m ³ af sandsteypu kl 23:30, steypuborð í 30m Steypt úr 2,5m ³ af sandsteypu kl 08:30, steypuborð í 22,6m Alls var bætt 31 lítra af floti í þessar steypingar					

Figure 10. Cement report for the fourth cement plug during drilling of phase 0 in PG-12.

Iceland Drilling		Cementing Report		Iceland Drilling		
Rig: Óðinn		Rig No: 65138		Rig No: 65000		
Job No: 65138		Job Name: Deistareykir DG-12				
Cement Job Information						
Start Date/Time:	11-ágú.-16 07:12	Well Bore:	Original Well Bore			
Job Type:	PLUG	Cementing Engineer:				
Cementing Co:	JARDB					
Plug Job Detail						
Plug Type:	Lekasteypa					
Plug Top (m):	36,0	Bottom (m):	42,0	Length (m):	6,0	
Calc. Displacement Vol (cu m):	10,00	Hole Size at Plug (cm):	53,34			
	Volume (cu m)	Pump Time	Rate (cu.m./min)	Volume (bar)		
	Conditioning Data:					
	Cement Data:					
	Displacement Data:					
Slurry Information						
Type	Density	Yield	Sacks	Volume	Rate	Additives
No Slurry Information Data						
Post Job Information						
Actual Top of Cmt (m):	36,6	Job Success?	Yes			
Misc. Comments:	07:12 Steypt úr 7m3 sandsteypu frá 42m toppur á tappa í 40,3m 08:40 Steypt úr 2m3 sandsteypu frá 40,3m toppur á tappa í 37,8m 08:50 Steypt úr 1m3 sandsteypa frá 37,8m toppur á tappa í 36,6m notað 1 poki salt í steypunna Steypubíll og steypuðæla					

Figure 11. Cement report for the fifth cement plug during drilling of phase 0 in DG-12.

Iceland Drilling		Cementing Report		Iceland Drilling		
Rig: Óðinn		Rig No: 65138		Rig No: 65000		
Job No: 65138		Job Name: Deistareykir DG-12				
Cement Job Information						
Start Date/Time:	12-ágú.-16 01:58	Well Bore:	Original Well Bore			
Job Type:	PLUG	Cementing Engineer:				
Cementing Co:	JARDB					
Plug Job Detail						
Plug Type:	Lekasteypa					
Plug Top (m):	37,0	Bottom (m):	46,5	Length (m):	9,5	
Calc. Displacement Vol (cu m):			Hole Size at Plug (cm):	53,34		
	Volume (cu m)	Pump Time	Rate (cu.m./min)	Volume (bar)		
	Conditioning Data:					
	Cement Data:					
	Displacement Data:					
Slurry Information						
Type	Density	Yield	Sacks	Volume	Rate	Additives
No Slurry Information Data						
Post Job Information						
Actual Top of Cmt (m):	37,0	Job Success?	Yes			
Misc. Comments:	02:06 Steypt 2m3 af sandsteypu steypuborð í 41,6m 02:10 Steypt 1m3 af sandsteypu steypuborð í 37m Flot 10l Notað steypuðæla og steypubíll					

Figure 12. Cement report for the sixth cement plug during drilling of phase 0 in DG-12.

ICELAND DRILLING		Casing Information Report		Iceland Drilling				
		Rig: Óðinn		Rig No: 65000				
		Job No: 65138		Job Name: Þeistareykir ÞG-12				
Casing Information								
Run Date/Time:	16-ágú.-16 13:45		Leak Off Test (kg/cu m):					
Well Section:	SURF		String Type:	FULL				
String Top MD (m):	1,0		String Top TVD (m):					
Casing Shoe MD (m):	116,6		Casing Shoe TVD (m):	116,6				
String Nominal OD (cm):	47,30		String Nominal ID (cm):	45,11				
Bit Diameter (cm):	53,34		Avg. Open Hole Diam. (cm):	53,34				
Centralizers: No:	Manufacturer/Type:							
Depths:								
Hanger Type:			Manufacturer:					
Comments: Transferred from Casing Tally Detail on 17-ágú.-16 07:41								
String Component Details								
Joints	Item	Length (m)	OD(cm)	ID (cm)	Weight (kg)	Grade	Connection	Torque
1	SHOE	0,560	50,80			K-55	WELD	
1	JOINT	11,750	47,31	45,10	87,5	X-56	WELD	
1	FLOAT	0,650	50,80			K-55	WELD	
9	JOINT	104,680	47,31	45,10	87,5	X-56	WELD	
Totals:	12	117,640						

Figure 13. Casing report for the 18%” surface casing.

ICELAND DRILLING		Cementing Report		Iceland Drilling		
		Rig: Óðinn		Rig No: 65000		
		Job No: 65138		Job Name: Þeistareykir ÞG-12		
Cement Job Information						
Start Date/Time:	17-ágú.-16 01:15		Well Bore:	Original Well Bore		
Job Type:	PRIMARY		String OD (cm):	47,30		
Well Section:	INT1		String Type:	FULL		
Cementing Co:	JARDB		Cementing Engineer:	Andrés Konráðsson		
Primary Job Detail						
	Volume (cu m)	Pump Time	Rate (cu.m./min)	Pressure (bar)		
Conditioning Data:						
Cement Data:	11,6	20	0,6		3	
Displacement Data:	1,2	2	0,6		4	
Calc. Displacement Vol:						
<input type="checkbox"/> Batch Mix?		<input type="checkbox"/> Bump Plug?		Bump Pressure:		
Returns to Surface:	FULL	<input type="checkbox"/> Reciprocate Pipe?		<input checked="" type="checkbox"/> Cement at Surface?		
Calc Top of Cement (m):		Excess (%):	Avg. Hole Size (cm):		53,34	
Slurry Information						
Type	Density	Yield	Sacks	Volume	Rate	Additives
LEAD	1.700,00			11,6	0,6	
Post Job Information						
Liner Top Test (kg/cu m):				Job Success?	No	
Actual Top of Cmt (m):				CBL Bond Quality:		
Misc. Comments:	Steyptir 11,6 rúmmetrar af G-blöndu. Eðlisþyngd 1,7. Neðri belgloki lokaður og bakþrýstingi 2 bar haldið á fóðringu með choke loka. Steypa kom upp.					

Figure 14. Cementing report for cementing of the surface casing in ÞG-12.

2.3 Drilling for the anchor casing (13⁵/₈") - Phase 1

Drilling operations of phase 1 were conducted from August 18th (workday 15) to August 25th (workday 21). Drilling of phase 1 went well, with an average ROP of 4.1 m/h and only minor circulation losses were measured.

The BOP stack was pressure tested around noon the 18th of August. The pipe-ram and the blind-ram were tested by applying pressure of 20 bar for 8 minutes and also 15 bar for 15 minutes. Both of them passed the tests, no leakage was observed. The annular blowout preventers, upper and lower, did not pass the tests. The lower annular was tested by applying variable pressure for closing it, i.e. 900, 1200 and 1400 psi. When applying 1400 psi the annular remained shut and seemed to be working properly. The upper annular remained problematic. Despite various attempts and experiments it did not work. A new annular BOP was brought from Krafla (the rig Sleipnir) to Þeistareykir at 8:30 in the morning of August 19th. Between 11:30 and 12:00 it was tested and worked fine. Between 12:30 and 17:30 the drill crew was working on the BOP stack and connecting the flow-line. Pressure testing of the BOP's was in action in the evening, and they all passed. At 22:30 the bottom hole assembly was run in the hole with 17½" drill bit (Figure 15) and the top of float collar was found at 103.8 m.

Drilling into formation started at 120 m depth at 11:00 on the 20th of August. Drilling was continued down to 122 m when it was paused and as the Washington BOP valve was put in place. The top drive needed some maintenance for half an hour and then drilling was continued. At 14:00 the drill crew noticed a leak in the tanks and a 10" butterfly equalizer was replaced between tanks 4 and 5. When that had been repaired, the drilling fluid was changed from water to gel. Drilling went on slowly at the depth around 125.6 m, with rate of penetration around 0.5 m/h, which was caused by the stabilizer which was still inside the casing. At 22:30 the rate of penetration increased to 8–10 m/h and the RPM increased to 65. WOB was around 12–13 ton.

Drilling was continuous the whole day and night of 21st of August (workday 18). Drilling was continued from 185–272 m with no problems. A circulation loss of 5 l/s were measured at 191 m but no losses were measured at 192 m. The anchor casing depth was reached at 6:30 the 22nd of August, at 300 m. An overview of the drilling of phase 1 is shown in Table 5 and Figure 6.

Afterwards, the well was circulated for 1.5 hours. A wiper trip was performed and bottom hole deposit was 1 meter. ÍSOR's logging engineers carried out temperature and caliper logging in the well (see Figures 26 and 27 in Chapter 4)

The drill crew was running in the casing between 00:00 and 12:00 the 23rd of August. The final casing depth was 292.2 m and then the well was circulated for 2 hours. The cement string was run in hole in the afternoon and then the well was circulated with water for 2.5 hours. The pressure rose up in the beginning to 52 bar but decreased rapidly when the circulation was continued. Maximum temperature was recorded 66.3°C. The well was circulated for additional 1.5 hours' trough poorboy, with water and soda. Figure 16 shows the casing report for the 13⁵/₈" anchor casing.

Cementing of the anchor casing was carried out the 24th of August. In total, 21.5 m³ of cement slurry were used in the operation (Figure 17). Cement returns were noticed and the string was pulled out. Waiting on cement was carried out until 22:30 the 24th of August, when ÍSOR's logging engineers performed temperature and cement bond logging measurements (see Figures 26 and 28). The CBL log revealed good bonding above 130 m, but below the pipe

amplitude was greater, indicating less bonding. However, mud was noticed on the instruments and could have affected the measurement, by giving bad signal. Waiting on cement was continued until 04:00 the 25th of August. Then the flow-line was disconnected and the BOP stack taken down. The 13⁵/₈" anchor casing was cut and the 12x1500 psi flange was screwed to the casing, and that was complete at 18:00 and marks the end of phase 1 (workday 21).

Table 5. Drilling progress during drilling of phase 1 in DG-12.

Day	Workdays	Drilled Section (m)	Drill Time (h)	ROP (m/h)	Total Depth at 24:00 (m)
20.08.2016	17	18	7.75	2.3	138
21.08.2016	18	134	24	5.6	272
22.08.2016	19	28	6.5	4.3	300
Total		180	38.25	4.1 (average)	

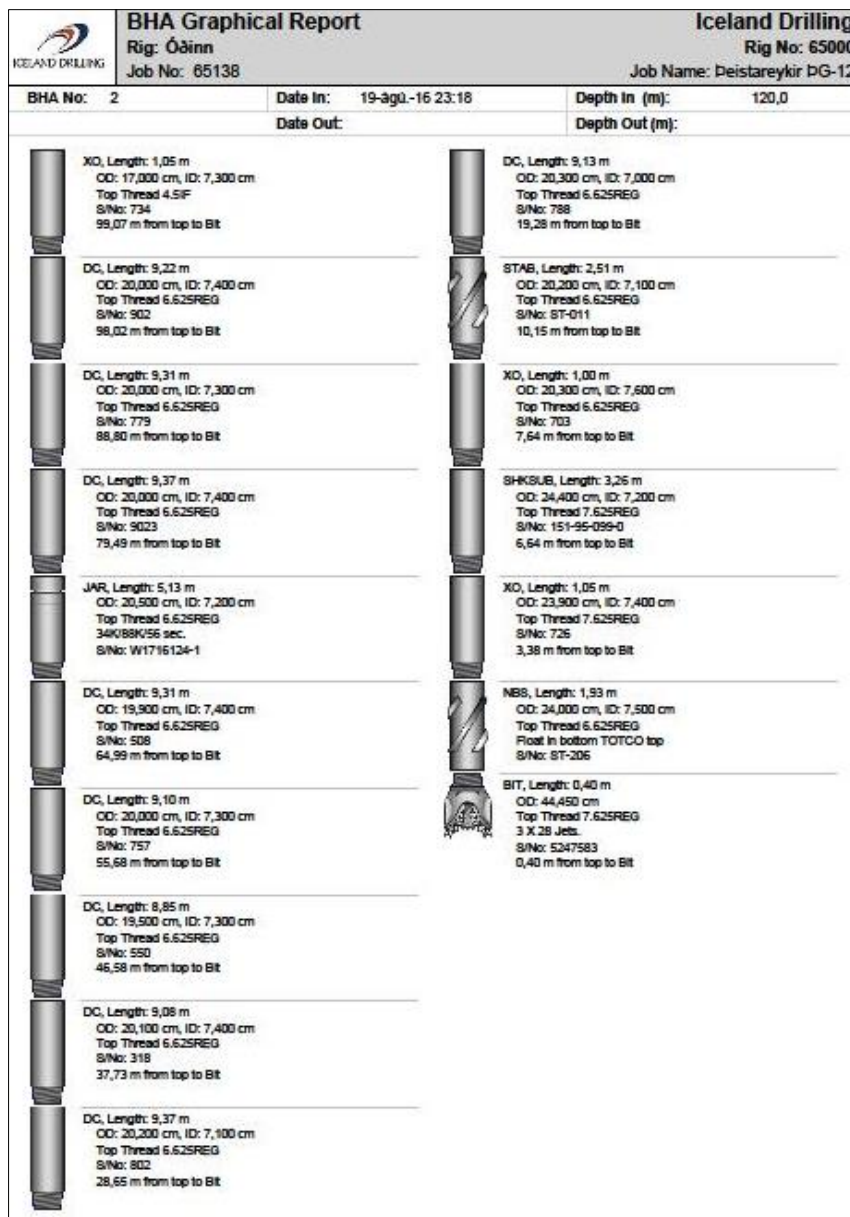


Figure 15. The set-up of the BHA used during drilling of phase 1 in DG-12.

Iceland Drilling		Casing Tally Run Report				Iceland Drilling			
Rig: Óðinn		Job No: 65138				Rig No: 65000			
Job Name: Deistareykir DG-12		String Nominal OD (cm): 34,61		String Type: FULL					
Items Run:	27	Length Run:	284,240	Top Depth:	7,920				
Items Excluded:	0	Length Excluded:	0,000	Bottom Depth:	292,160				
Items Talled:	27	Length All Items:	284,240	Cut Off Length:	0,000				
Run No.	Joint No	Item	Length	Top	Bottom	Description	Comments	Cnt	Sc
1		SHOE	0,840	291,320	292,160	0,00 x 0,00 BUTT			
2	25	JOINT	11,440	279,880	291,320	34,61 x 0,00 K-55 BUTT		2	
3	24	JOINT	11,420	268,460	279,880	34,61 x 0,00 K-55 BUTT			
4	23	JOINT	11,440	257,020	268,460	34,61 x 0,00 K-55 BUTT			
5		FLOAT	0,500	256,520	257,020	0,00 x 0,00 BUTT			
6	22	JOINT	11,430	245,090	256,520	34,61 x 0,00 K-55 BUTT		1	
7	21	JOINT	10,980	234,110	245,090	34,61 x 0,00 K-55 BUTT			
8	20	JOINT	11,440	222,670	234,110	34,61 x 0,00 K-55 BUTT			
9	19	JOINT	11,420	211,250	222,670	34,61 x 0,00 K-55 BUTT		1	
10	18	JOINT	10,840	200,410	211,250	34,61 x 0,00 K-55 BUTT			
11	17	JOINT	11,440	188,970	200,410	34,61 x 0,00 K-55 BUTT			
12	16	JOINT	11,280	177,690	188,970	34,61 x 0,00 K-55 BUTT		1	
13	15	JOINT	11,420	166,270	177,690	34,61 x 0,00 K-55 BUTT			
14	14	JOINT	11,200	155,070	166,270	34,61 x 0,00 K-55 BUTT			
15	13	JOINT	11,440	143,630	155,070	34,61 x 0,00 K-55 BUTT		1	
16	12	JOINT	11,410	132,220	143,630	34,61 x 0,00 K-55 BUTT			
17	11	JOINT	11,430	120,790	132,220	34,61 x 0,00 K-55 BUTT			
18	10	JOINT	11,400	109,390	120,790	34,61 x 0,00 K-55 BUTT		1	
19	9	JOINT	11,420	97,970	109,390	34,61 x 0,00 K-55 BUTT			
20	8	JOINT	11,400	86,570	97,970	34,61 x 0,00 K-55 BUTT			
21	7	JOINT	11,420	75,150	86,570	34,61 x 0,00 K-55 BUTT			
22	6	JOINT	11,000	64,150	75,150	34,61 x 0,00 K-55 BUTT		1	
23	5	JOINT	11,010	53,140	64,150	34,61 x 0,00 K-55 BUTT			
24	4	JOINT	11,230	41,910	53,140	34,61 x 0,00 K-55 BUTT			
25	3	JOINT	11,430	30,480	41,910	34,61 x 0,00 K-55 BUTT			
26	2	JOINT	11,160	19,320	30,480	34,61 x 0,00 K-55 BUTT			
27	1	JOINT	11,400	7,920	19,320	34,61 x 0,00 K-55 BUTT			

Figure 16. Casing report for the 13 5/8" anchor casing.

Iceland Drilling		Cementing Report				Iceland Drilling	
Rig: Óðinn		Job No: 65138				Rig No: 65000	
Job Name: Deistareykir DG-12							
Cement Job Information							
Start Date/Time:	24-águ.-16 02:38	Well Bore:	Original Well Bore				
Job Type:	PRIMARY	String OD (cm):	34,61				
Well Section:	INT1	String Type:	FULL				
Cementing Co:	JARDB	Cementing Engineer:	Sveinbjörn / Andrés				
Primary Job Detail							
	Volume (cu m)	Pump Time	Rate (cu.m./min)	Pressure (bar)			
Conditioning Data:							
Cement Data:	21,5	31	0,7				
Displacement Data:	3,5	6	0,6				
Calc. Displacement Vol:							
<input type="checkbox"/> Batch Mix?		<input type="checkbox"/> Bump Plug?		Bump Pressure:			
Returns to Surface:	FULL	<input type="checkbox"/> Reciprocate Pipe?		<input checked="" type="checkbox"/> Cement at Surface?			
Calc Top of Cement (m):	Excess (%):		Avg. Hole Size (cm):		44,45		
Slurry Information							
Type	Density	Yield	Sacks	Volume	Rate	Additives	
LEAD	1.730,00			21,5	0,7		
Post Job Information							
Liner Top Test (kg/cu m):				Job Success?	Yes		
Actual Top of Cmt (m):				CBL Bond Quality:			
Misc. Comments:	13 5/8" Footringar steyping						

Figure 17. Cement report for the anchor casing.

3 Lithology, alteration, intrusions and circulation losses

The crew of Óðinn collected cutting samples at two metres interval during the drilling of phases 0 and 1 in well ÞG-12. Depth values of the samples refer to the rig floor of Óðinn (6.80 m above ground level). The samples were collected in 150 ml plastic containers. During the drilling the ÍSOR's borehole geologist inspected the cutting samples and determined the lithology and the alteration mineral assemblage with the aid of a binocular microscope. Additionally, data from the drill-rig data acquisition system, including the main drilling parameters, were collected systematically and also information on losses of circulation. The description of the lithology is below and graphical presentation of the lithology and the alteration minerals is shown in Figures 19 to 24 with the legend for the graphs in Figure 18.

Phase 0 (11.9–120 m)

The uppermost 58 m are composed of different lava units with scoria boundaries. No alteration is observed at that depth interval, where the units are fresh and partly oxidized. From 58–120 m is a thick hyaloclastite unit, with different formations of basaltic breccia, pillow-basalt and basaltic tuff. Alteration becomes low or moderate.

11.9–14 m: FINE-MEDIUM GRAINED BASALT

Dark and fresh basalt. Plagioclase porphyritic. Slightly porous but with no fillings. Cement mixed. The groundmass becomes glassier and oxidized at the lowermost part. Unaltered black glass (tachylite) is noticed in the cuttings. Still mostly fine- to medium grained basalt.

14–15.2 m: SCORIA

Grains become more vesicular and scoria-like than above, with glassy groundmass and highly oxidized.

15.2–20 m: NO CUTTINGS

Total loss of circulation

20–22 m: MEDIUM-COARSE GRAINED BASALT

Light colored, dense, plagioclase and olivine rich basalt. Few grains with glassy groundmass.

22–24 m: SCORIA

Grains with glassy groundmass, porous and red oxidation. Half of the upper sample is still well crystallized, plagioclase rich basalt. At 24 m more oxidation is observed in a mixture of well crystallized basalt and scoria.

24–28 m: CEMENT

28–36 m: MEDIUM-COARSE GRAINED BASALT

Medium to coarse grained crystalline basalt, olivine porphyritic. Unaltered rock but moderately oxidized. A very pronounced oxidation is seen in the uppermost sample at 28–30 m. Most likely a lava from the postglacial Stórávíti lava shield.

36–46 m: NO CUTTINGS

Total loss of circulation at 36 m.

46–54 m: MEDIUM-COARSE GRAINED BASALT

Medium to coarse grained basalt, most probably a postglacial lava (from the Stórávíti lava shield). Fragments of feldspar and olivine are common in the cuttings. The grade of alteration is minor. The rock is moderately oxidized. Pores are not abundant (all empty). The rock is light grayish in color but admixed are some fragments of blackish fine grained crystalline basalt.

54–58 m: SCORIA/SEDIMENT

Highly oxidized fragments are abundant in the cuttings. Some pieces of vesicular tephra or pumice are seen. This sample marks the lower boundary of the lava unit described above. Most likely a thin sedimentary layer, possibly a soil. Increased ROP was noted at 54.2 m depth.

58–62 m: BASALTIC BRECCIA

Mixed cuttings, composed of fragments from various types of fine sedimentary tuff, green to brownish in color. Also there is a minor amount of altered crystalline basalt. The grade of alteration increased from above. Fine grained clay, quartz and traces of epidote are found.

62–70 m: NO CUTTINGS SAMPLED

70–76 m: REWORKED TUFF

Sedimentary tuff of several types, fine to coarse grained. The tuff is green to gray in color. A considerable alteration is noted. The tuff becomes more homogenous in the lower part of the unit. Quartz is found. Pyrite is common but calcite is scarce.

76–82 m: SANDSTONE

Fine grained sediment. Composed of glass, crystals and pieces of crystalline basalt. The sandstone becomes coarser in the lower part of the unit.

82–86 m: BASALTIC BRECCIA

Mixed cuttings, composed of reworked tuff, fine grayish sediment and crystalline basalt. Pyrite is abundant.

86–100 m: GLASSY BASALT

Rather homogenous formation, composed of fine brownish crystalline basalt and some minor amounts of brownish glass. The rock is non porphyritic. The rock is non-porous. Glassy rinds are seen on some of the fragments indicating that this unit most likely represent a pillow lava. Fractures filled with quartz and pyrite are found.

100–106 m: NO CUTTINGS SAMPLED

106–120 m: REWORKED TUFF

Fine grained tuff, mostly reworked tuff. Green to green-bluish in color. Seems to be somewhat fractured and brecciated at intervals. Moderately altered. Quartz and green fine grained clay are common. Also pyrite is common but calcite is still scarce.

Phase 1 (120–300 m)

Phase 1 is composed of different hyaloclastite units (breccia, tuff and pillow basalt), intersected by several thin basaltic lava units. Some of them are marked as possible intrusions, where the grains are moderately fresh, others are more altered and have greenish appearances.

120–122 m: CEMENT

Mostly cement fragments from the cementing of the surface casing.

122–126 m: NO CUTTINGS SAMPLED

126–128 m: CEMENT

128–158 m: BASALTIC TUFF

Dense and grayish tuff grains. Plagioclase seen in groundmass. Cement mixed in the uppermost part. Tuff grains become occasionally more porous and increase in pyrite is observed down the formation. Tuff gets more greenish and white at the bottom of the formation.

158–184 m: BASALTIC BRECCIA

Dark and fine grained basalt mixed with highly altered tuff grains. The basalt grains are less altered than the surrounding tuff grains. Becomes more tuff-rich down the formation.

184–188 m: BASALTIC TUFF

Fractured and pyrite rich white tuff grains, some very dense.

188–190 m: BASALTIC BRECCIA

190–194 m: BASALTIC TUFF

Similar to the tuff formation above. Loss of circulation measured 5 L/s at 191 m, but 0 L/s at 192 m.

194–200 m: FINE-MEDIUM GRAINED BASALT

Greenish and highly altered fine grained basalt. Coarse grained clay and quartz in pores. Tuff mixed in at the bottom.

200–212 m: GLASSY BASALT

Fine grained basalt and tuff grains in a mixture. Pyrite, clay and quartz seen in pores.

212–214 m: FINE-MEDIUM GRAINED BASALT

Slightly fractured, light colored, pyrite rich basalt.

214–216 m: BASALTIC BRECCIA

Dark and fresh intrusion like grains, mixed with plagioclase porphyritic grains and tuff grains.

216–224 m: GLASSY BASALT

Slightly fractured grains with white/clear fillings. Plagioclase porphyritic and light in color (green or grey). Porous with clay and quartz as pore fillings. Most likely pillow basalt, but could also be a lava formation.

224–228 m: BASALTIC BRECCIA

Tuff grains mixed with fine grained basalt, highly altered.

228–236 m: FINE-MEDIUM GRAINED BASALT

Fine grained light colored, dense and partly fresh basalt, could be an intrusion. Slight oxidation, and clay in pores. Becomes more altered down the formation.

236–240 m: *GLASSY BASALT*

Almost no fresh intrusion like grains. Mostly green grains, with glass in groundmass, porous and filled with clay. Tuff also seen.

240–250 m: *FINE-MEDIUM GRAINED BASALT*

Plagioclase in groundmass. Still some intrusion like grains mixed in. Slight oxidation and the grains are fine crystallized. Slightly porous with clay in pores. Becomes denser down the formation.

250–252 m: *BASALTIC BRECCIA*

Quartz in pores, grains mostly white but still mixed with dark and fresh basalt grains (dolerite).

252–254 m: *FINE-MEDIUM GRAINED BASALT*

Mostly fresh, intrusion like grains.

254–256 m *GLASSY BASALT*

White and porous (clay and quartz in pores), seem partly crystallized. Tuff grains also noticed.

256–274 m: *FINE-MEDIUM GRAINED BASALT*

Medium altered basalt grains, light gray in color. Pores filled with clay and quartz. Little amount of oxidation. Becomes intrusion like at 260–262 m, plagioclase porphyritic. Below the grains are various in color and slightly mixed with white tuff. The formation becomes more oxidized at 268 m and plagioclase needles are noticed in groundmass. could be a boundary between the lava formation and an intrusion below. At 272–274 m the grains become less altered and dense.

274–284 m: *BASALTIC TUFF*

Mostly tuff grains, likely reworked sedimentary tuff. Large pyrite crystals noticed. Few fine grained basalt grains mixed in.

284–288 m: *BASALTIC BRECCIA*

Reworked tuff and fine grained basalt in a mixture.

288–292 m: *GLASSY BASALT*

Green and light colored basalt with pores mixed with tuff grains.

292–294 m: *FINE-MEDIUM GRAINED BASALT*

Light colored and greenish fine grained basalt. Pores filled with clay. Slightly plagioclase porphyritic.






















294–296 m: *BASALTIC BRECCIA*

Tuff mixed with fresh and oxidized basalt grains.



296–300 m: *FINE-MEDIUM GRAINED BASALT*

Clay in pores. Fresh and fine grained basalt. Medium oxidation. Possibly intrusion. Becomes variously altered at 300 m, green, grey and dark grey.





Rock Types

	Scoria
	Basaltic Tuff
	Basaltic Breccia
	Glassy Basalt
	Fine-medium crystalline Basalt
	Medium-coarse crystalline Basalt
	Coarse crystalline Basalt
	Intermediate (andesitic) Tuff
	Intermediate (andesitic) Breccia
	Intermediate fine-medium crystalline Formation (e.g. Andesite)
	Intermediate coarse crystalline Formation (e.g. Diorite)
	Acidic Tuff
	Acidic Breccia
	Acidic fine-medium crystalline Formation (e.g. Rhyolite)
	Acidic coarse crystalline Formation (e.g. Granite)
	Sedimentary Tuff
	Glacial Deposits (Tillite)
	Clay- / Siltstone
	Sandstone
	Gravel Deposit
	No Cuttings




Intrusion

	Intrusion
	Possible Intrusion

Degree of Alteration

	Unaltered
	Low alteration
	Medium alteration
	High alteration

Feed Point

	Small Feed Point
	Medium Feed Point
	Large Feed Point

Alteration Minerals



	Positive Identification
	Uncertain Identification

Figure 18. Lithology legend for Figures 19–24.

Staður: Peistareykir
 Holunafn: ÞG-12

 Bor: Óðinn
 Dýptarbil: 11-100 m

 Skolvökvi: Mud
 Verkluti: Phase 0

 Staðarnúmer: 60412
 Starfsmenn: SRG/MÁS

 Dýpi (m)
 Raunadýpi (m)
 Röðingur
 Jæðfag

 Unnuyndun
 Innskot
 Þdur

Skýringar

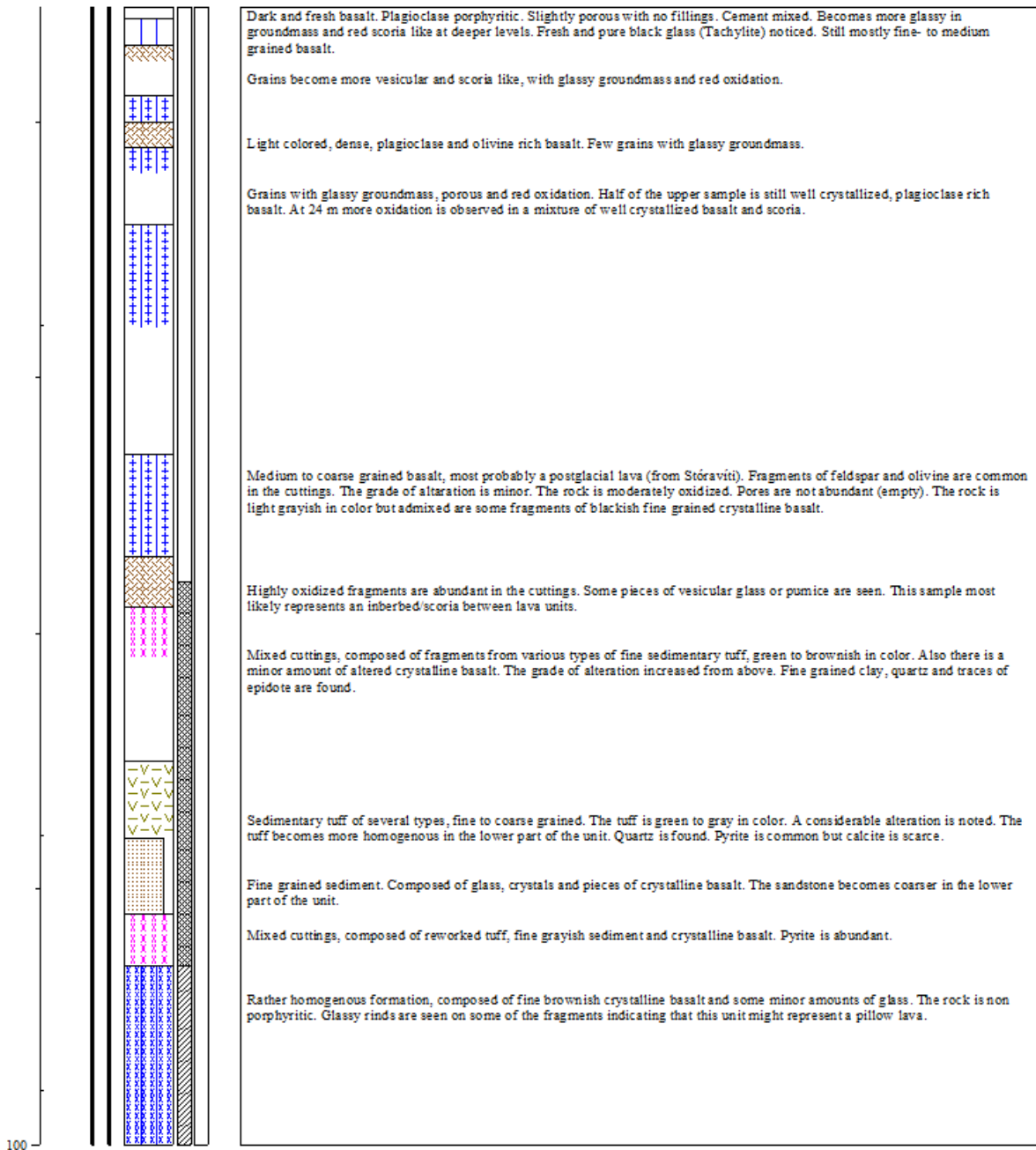


Figure 19. Lithology, alteration and description of lithology at 11–100 m in ÞG-12.

Location Peistareykir Drill rig Óðinn Circulation fluid Mud
 Well name ÞG-12 Depth interval 100-200 m Drill stage Phase 0-1

Well ID 60412
 Geologist SRG/MÁS

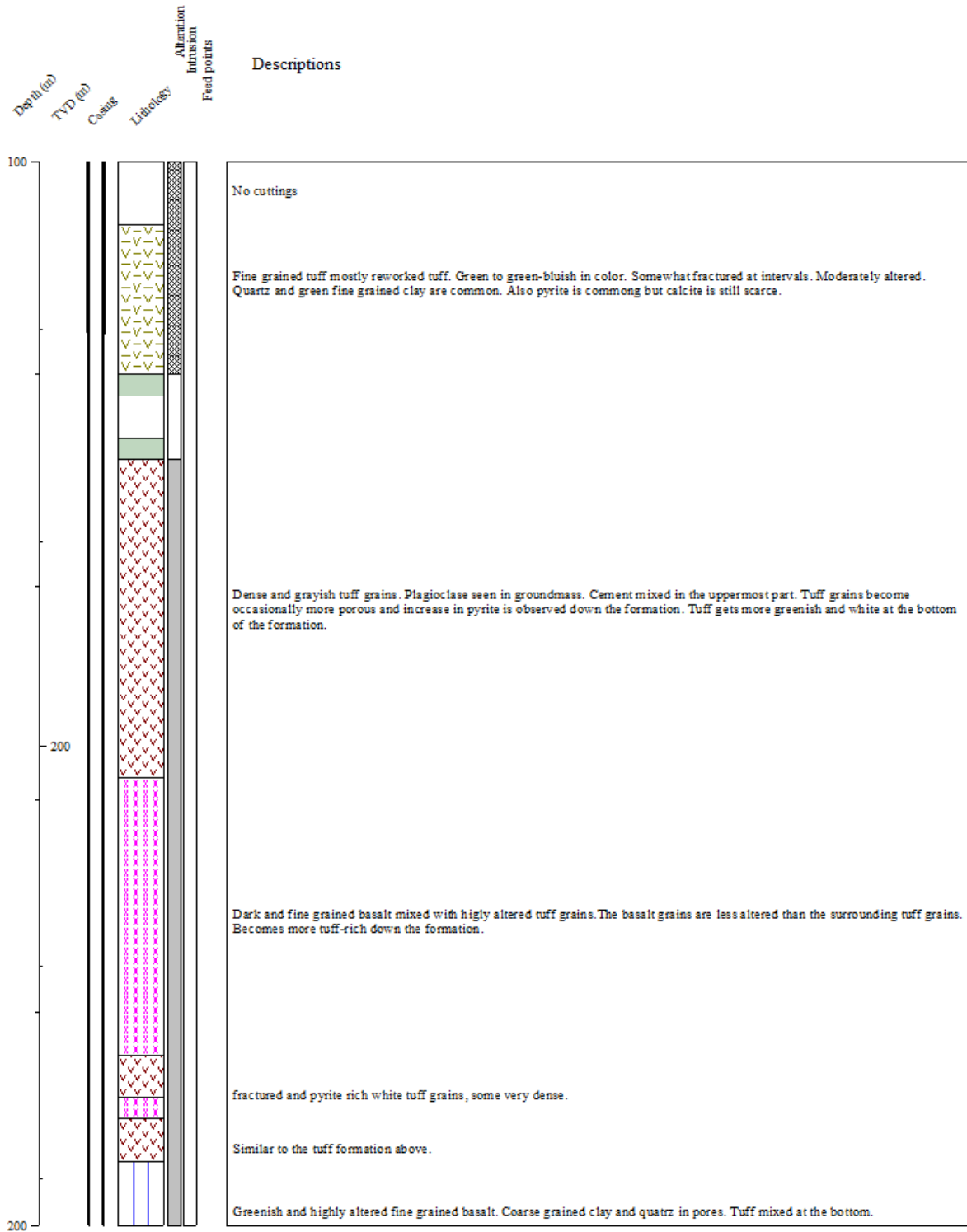


Figure 20. Lithology, alteration and description of lithology at 100–200 m in ÞG-12.

Location Peistareykir Drill rig Óðinn Circulation fluid Mud
 Well name ÞG-12 Depth interval 200-300 m Drill stage Phase 1

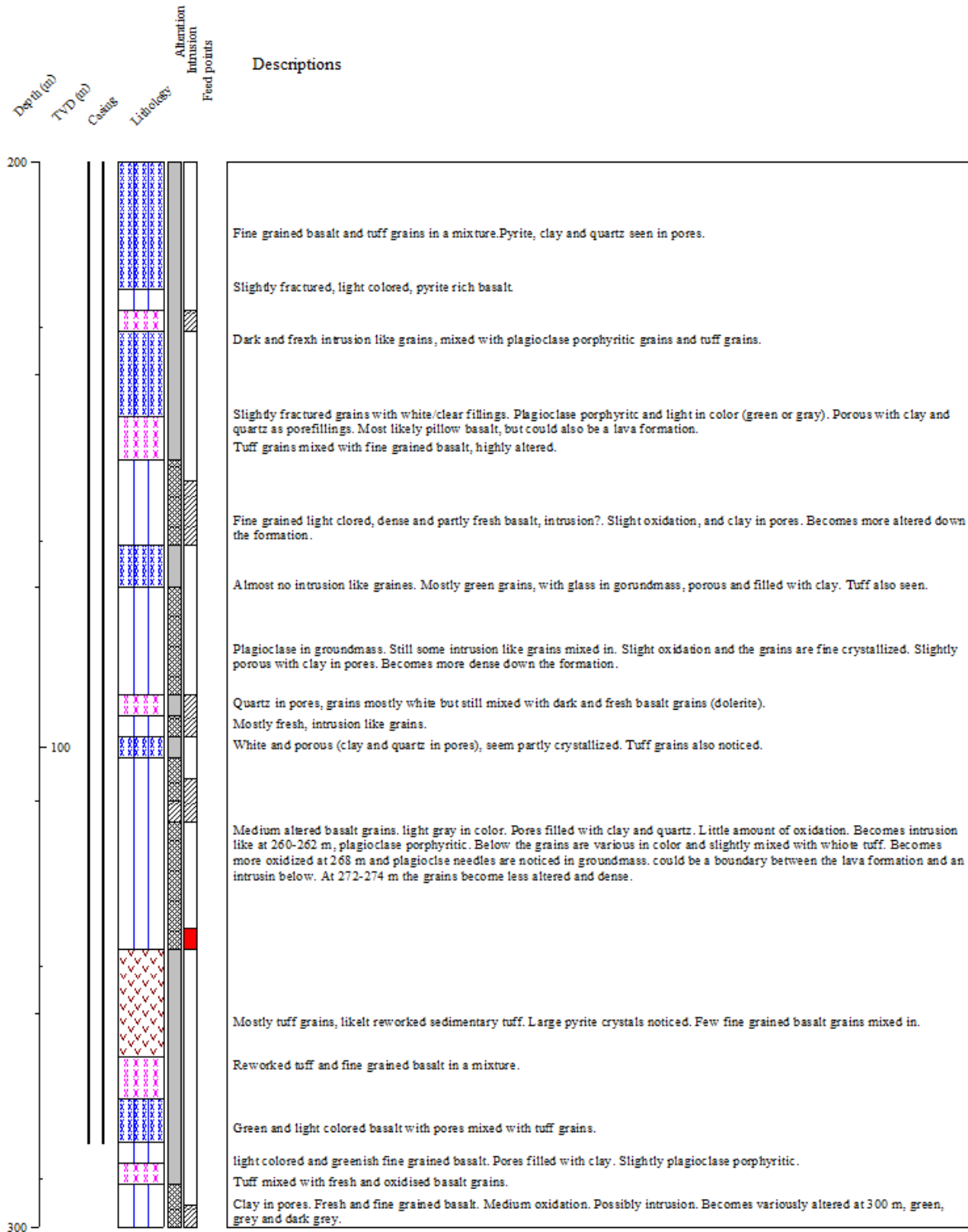
 Well ID 60412
 Geologist SRG/MÁS


Figure 21. Lithology, alteration and description of lithology at 200–300 m in well ÞG-12.

Location: Peistareykir
Well: ÞG-12

Drill rig: Óðinn
Depth interval: 11-300 m

Drilling fluid: Mud
Work phase: Phase 0-1

UWI: 60412
Geologists: SRG/MÁS

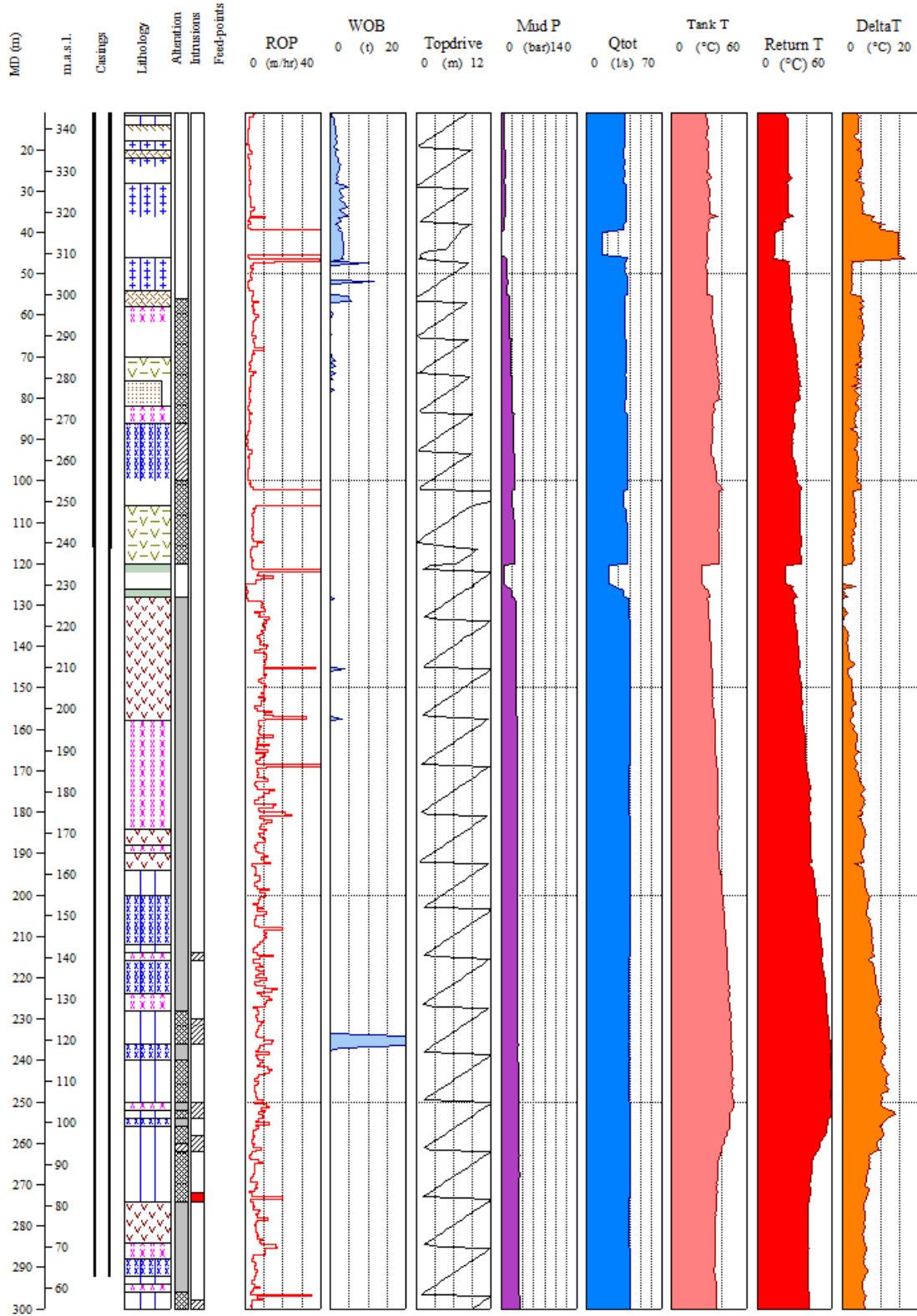


Figure 22. Comparison of lithology and selected drilling data from 11–300 m in ÞG-12.

Figure 23 shows a comparison of the lithology in wells ÞG-12 and ÞG-6. In both the wells medium grained basalt is dominant in the uppermost 40–50 meters, where a thick unit of hyaloclastite formations (e.g. tuff, breccia and pillow basalt) takes over below. The hyaloclastite unit seems to be thicker in ÞG-12, where it reaches down to approximately 190 m depth, but 130 m in ÞG-6. Below the hyaloclastite unit, in both the wells, a section of fine grained basalt (intrusions in some cases), intersected by variously thick pillow basalt formations is seen down to approximately 280 m. Below that, breccia and tuff formations seem to become more dominant.



24.08.2016

Location: Þeistareykir Drill Rig: Óðinn Circulation fluid: Mud Geologist: SRG/MÁS
 Well Name: ÞG-12 Depth Interval: 11-300 m Drill-stage: Phase 0-1

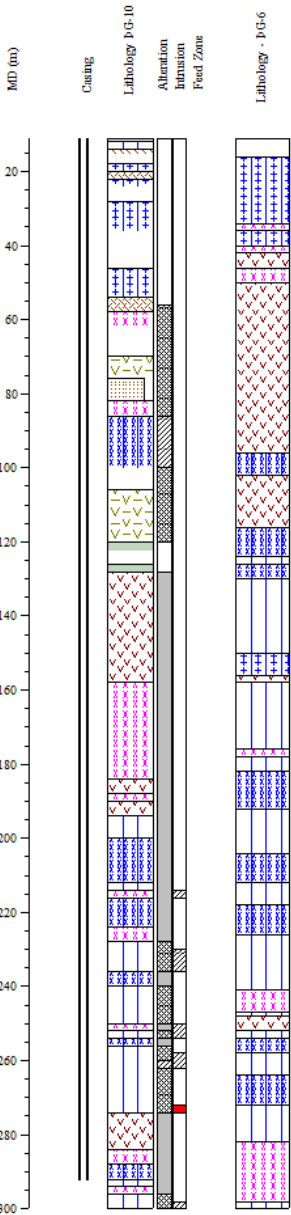


Figure 23. Comparison of the lithology in wells ÞG-12 (left column) and ÞG-6 (right column), from 11–300 m.

3.1 Intrusions

One intrusion and several possible intrusions were observed in the drill cuttings from 214–300 m in well PG-12. Table 6 gives an overview of the intrusions observed in well PG-12.

Table 6. *An overview of possible intrusions/intrusions in well PG-12.*

Depth interval (m)	Type	Remarks
214-216	Possible intrusion	Dark and fresh basalt grains mixed with basaltic breccia.
230-236	Possible intrusion	Fine grained lava unit. Grey in color and partly altered with coarse grained clay in pores. Slight oxidation noticed (1 on the scale from 1-3).
250-254	Possible intrusion	Dark and fresh (most likely dolerite) basalt grains mixed with highly altered basaltic breccia.
258-262	Possible intrusion	Fresh or partly altered basaltic lava formation. Fine grained. Oxidation 1, slightly plagioclase porphyritic. Could be a dolerite intrusion.
272-274	Intrusion	Fresh an oxidized (scale 2) intrusion. Rather dense, coarse grained clay found in pores. Becomes more mixed with glassy grains and tuff at 274 m.
298-300	Possible intr.	Partly altered fine grained basalt. Oxidation scale 2.

3.2 Alteration

Alteration is first noticed at 56 m depth where light colored clay, quartz (180°C) and epidote color is noticed (Figure 24). Stilbite, scolecite and laumontite were the only zeolites analyzed from the drill cuttings, and no zeolites are found below 180 m, indicating that the temperature has exceeded 180°C at that depth. Alteration is generally high below 128 m, with no signs of retrograde alteration. Quartz is seen quite continuously from 56 m down to the bottom at 300 m. Coarse grained clay replaces fine grain clay at 158 m and at that depth epidote is seen again. Abundant of coarse grained clay and quartz is seen in veins and pores in almost every sample below 190 m.

Calcite is first noticed at 72 m, and is found in various amount down to 294 m.

Pyrite is fist seen at 60 m, and is almost seen in every sample down to the anchor casing depth. Pyrite is seen in the greatest abundance (3 on the scale 1–3) in the fully altered hyolacastite formation from 185–222 m.

Staður: Beistareykir
 Holunafn: ÞG-12

 Bor: Óðinn
 Dýptarbil: 11-300 m

 Skolvökvi: Mud
 Verkhloti: Phase 0-1

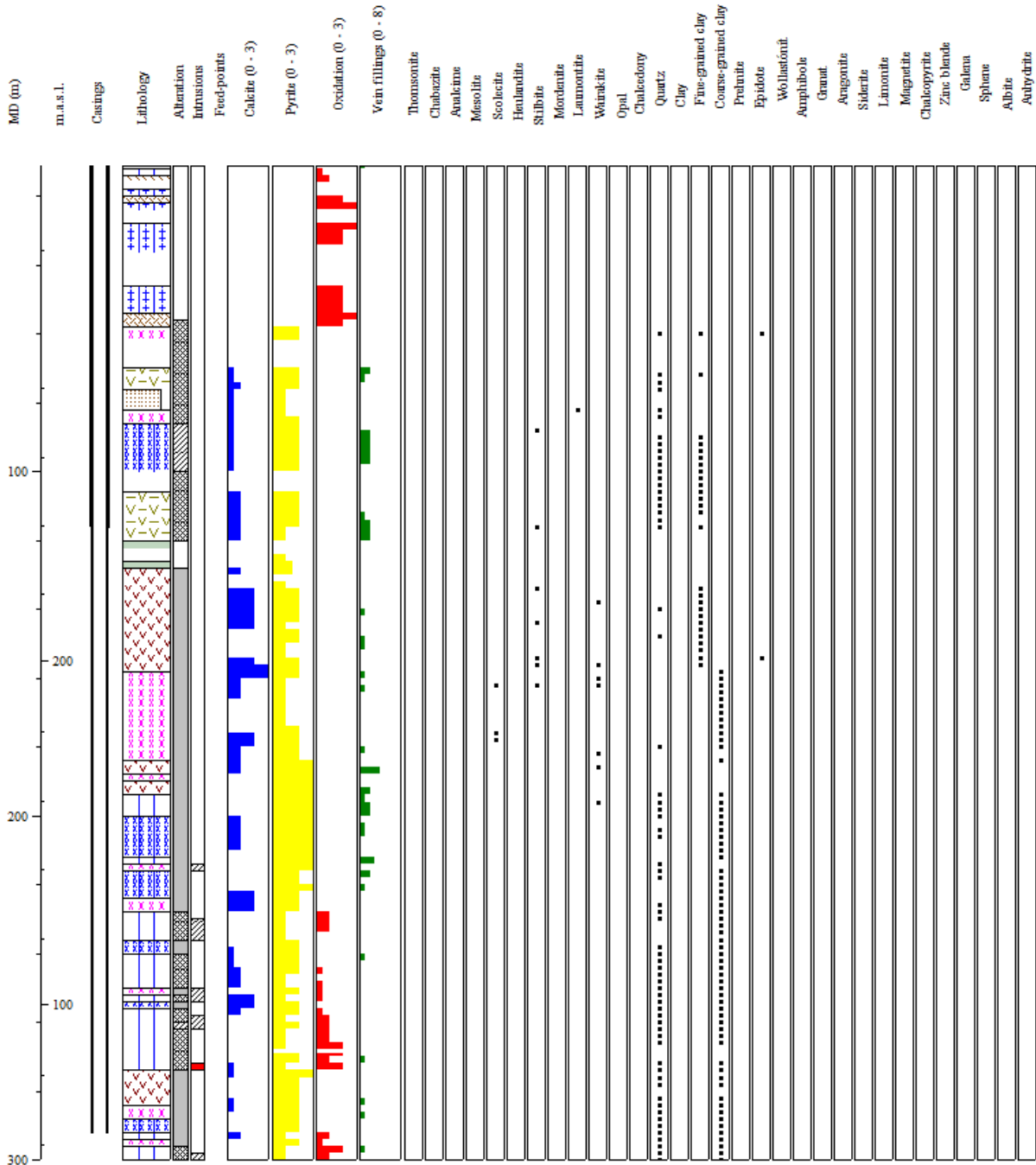
 Staðarnúmer: 60412
 Starfsmenn: SRG/MÁS


Figure 24. A summary of the alteration minerals found in ÞG-12 during drilling of phases 0 and 1.

3.3 Circulation losses during drilling of phases 0 and 1

Table 7 gives an overview of the measured circulation losses in PG-12 during drilling of phases 0 and 1. Several loss zones were cut in the uppermost 42 m, where total loss of circulation was encountered for seven times. Only one minor circulation loss was observed during drilling of phase 1.

Table 7. Measurements of circulation losses during drilling of phases 0 and 1 in PG-12.

Date	Time	Depth (m)	Circ. Losses (L/s)	Remarks
6.8.2016	20:30	11.9	>35	TLC. Drilled to 13.5 m for a cement plug
7.8.2016	15:30	15.2	>35	TLC for 5 min.
7.8.2016	18:45	17.7	13	
7.8.2016	19:15	19.2	>35	TLC. A cement plug placed in the well
8.8.2016	18:00	26.8	>35	TLC. Drilled to 27.8 m for a cement plug
9.8.2016	17:00	36 m	>35	TLC. Drilled to 39.3 m for a cement plug
11.8.2016	02:20	39.8	>36	TLC. Drilled to 42 m for a cement plug
11.8.2016	18:20	42	>38	TLC. Drilled to 46.5 m for a cement plug
21.8.2016	10:00	191	5	Well tightens up, no losses at 192 m

4 Wireline logging

Wireline logging in drilling phase 1 of well PG-12 may be categorized as follows:

- Temperature log to locate possible feed zones.
- Caliper log prior to cementing in order to map the well's diameter, i.e. cavities and possible obstacles inside the well that require further reaming. In addition, the caliper log gives the minimum volume behind the casing needed to be filled with cement.
- Temperature log and CBL-log after cementing in order to check the hardening- and the binding process of the cement that is exothermic and heats up the stagnant water inside the casing.

Table 8 shows an overview of all logs performed during phase 1 of well PG-12.

Table 8. Overview of wireline logging in drilling phase 1 for the anchor casing.

Date	Time	Log type	Depth (m)	Purpose	Q [l/s]	Remarks
22.8.2016	15:38-15:52	Temperature	10-299	Temperature, feed zones	0	Logged in open hole
22.8.2016	16:34-16:52	XY-Caliper	10-299	Well diameter, obstacles, washouts, Estimated cement volume	0	
24.8.2016	22:00-22:12	Temperature	10-256	Temperature	0	
25.8.2016	00:31-00:45	CBL	10-252	Cement Bond	0	About 21,5 hours after cementing

In this chapter the logging activity and the logging results in phase 1 in PG-12 are introduced and discussed. No logging was carried out while drilling phase 0. After drilling for the anchor casing (phase 1), temperature and caliper logs were carried out prior to running in hole and cementing of the 13⁵/₈" casing. Following the cementing of the anchor casing, temperature and cement bond logs (CBL) were carried out in order to map the actual bonding of the casing.

The anchor casing depth was reached at 6:30 the 22nd of August, at 300 m. The well was circulated with mud for 1.5 hours with no circulation losses. A wiper trip was performed and bottom hole deposit was 1 meter. The string was pulled out of the well at 15:00. ÍSOR's logging engineers carried out temperature and caliper logging in the well. The temperature profile is shown in Figure 25 (red curve). The bottom was tagged at 299 m depth and the highest temperature measured was 62°C at 230 m depth. Due to high amount of mud in the well, that compacted on the heat sensor on the instrument the sensor reacted slowly to heat changes, the temperature measurement does therefore not give accurate measurement the temperature condition in the well, but no indication of permeability is seen in the log.

The XY-caliper tool was next run in hole (Figure 26). The same can be said on the caliper measurement, where it seems that the mud had covered the walls in the well, making it look like there was no roughness or cavities in the well except just below the surface casing at 116 to about 120 m i.e. the bottom of the predrilled section, which is a well-known phenomenon, where drill bit size is changed from larger to smaller. Based on the caliper log, the cementing of the anchor casing required 20.6 m³ of cement slurry (Figure 26).

The cementing of the 13³/₈" anchor casing was finished on August 24th. In total, 21.5 m³ of cement slurry were used in the operation. About 19 hours after the completion of the cement job, ÍSOR's logging engineers arrived at the drill site for temperature and CBL logging. The temperature log was performed first and the results are shown in Figure 25 (blue curve). Highest temperature measured was 120°C at the bottom. The temperature rises smoothly with depth and there are no cooling zones or other indicator of a permeability in this depth interval.

Figure 27 shows the CBL-log measured inside the casing about 21.5 hours after the cement job finished. The CBL-log revealed that cement was behind the casing at all depths. The CBL log revealed good bonding between the surface casing and the anchor casing and down to 130 m. Below 130 m depth the pipe amplitude was larger, indicating less bonding. However, mud was noticed on the instruments and it is possible that mud on the outside of the casing could have affected the cement bond.

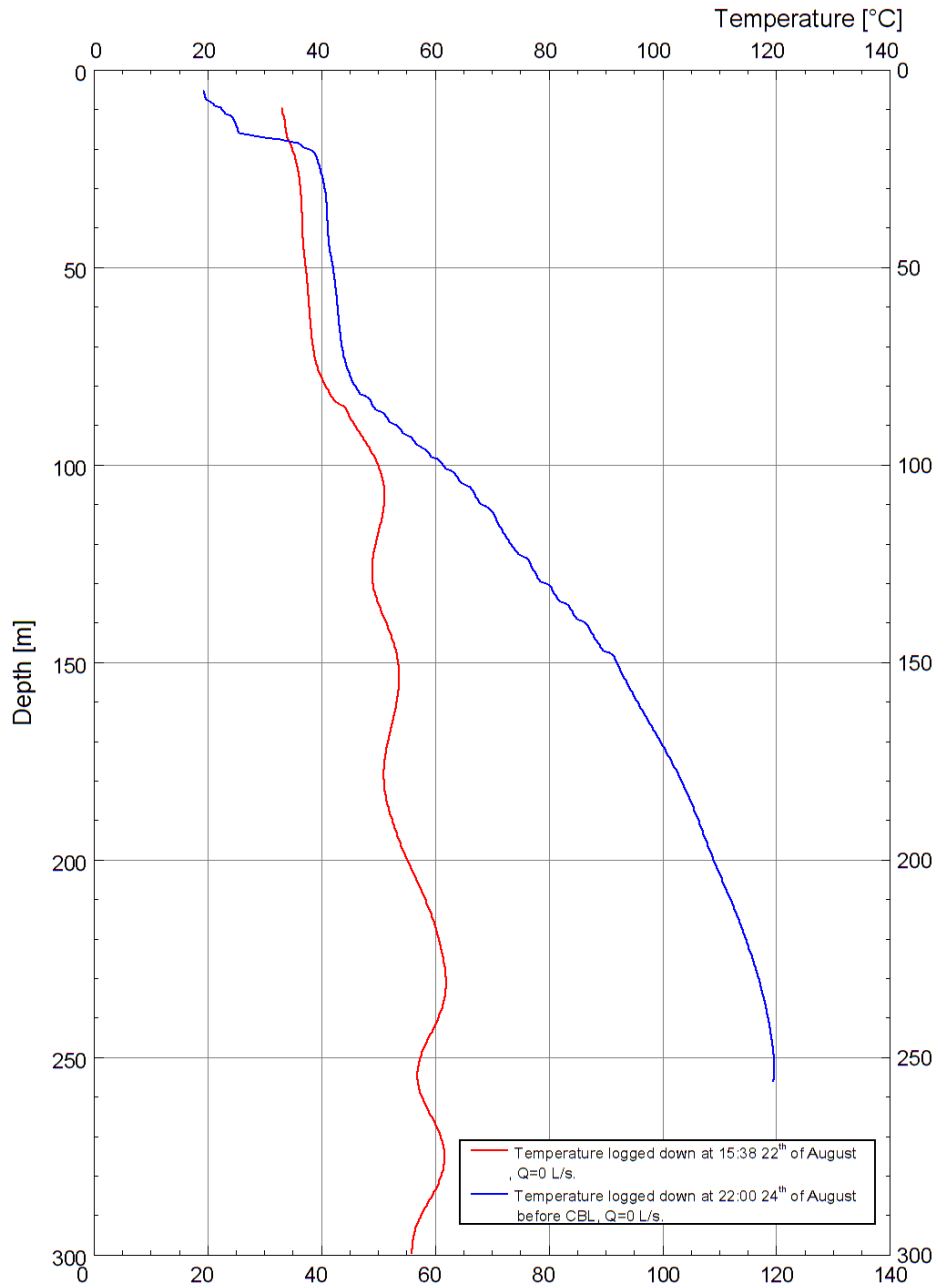


Figure 25. Temperature logs in ÞG-12 during phase 1.

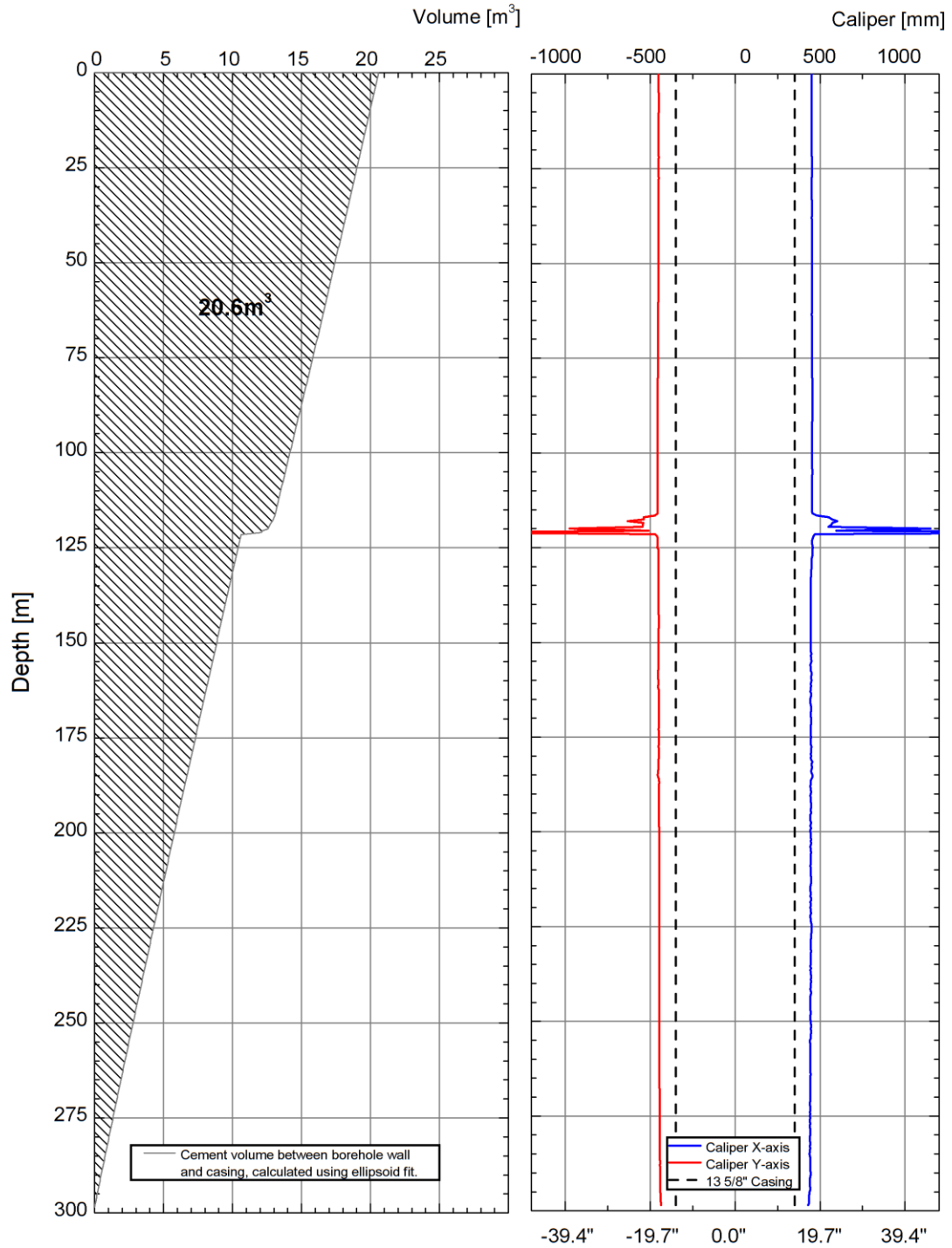


Figure 26. 2D caliper log and calculated volume of the annulus outside the anchor casing. This is the estimated amount of cement needed for cementing the casing.

Well PG-12

Database File: c:\bhm\theistareykir\thg12\1af\maelingar\thg12_1_nn-519.db
 Dataset Pathname: field\thei\thg12\S20160825\N0031CBL
 Presentation Format: isorcbl2
 Dataset Creation: Thu Aug 25 00:32:05 2016 by Log Open-Cased 090629
 Charted by: Depth in Meters scaled 1:1200

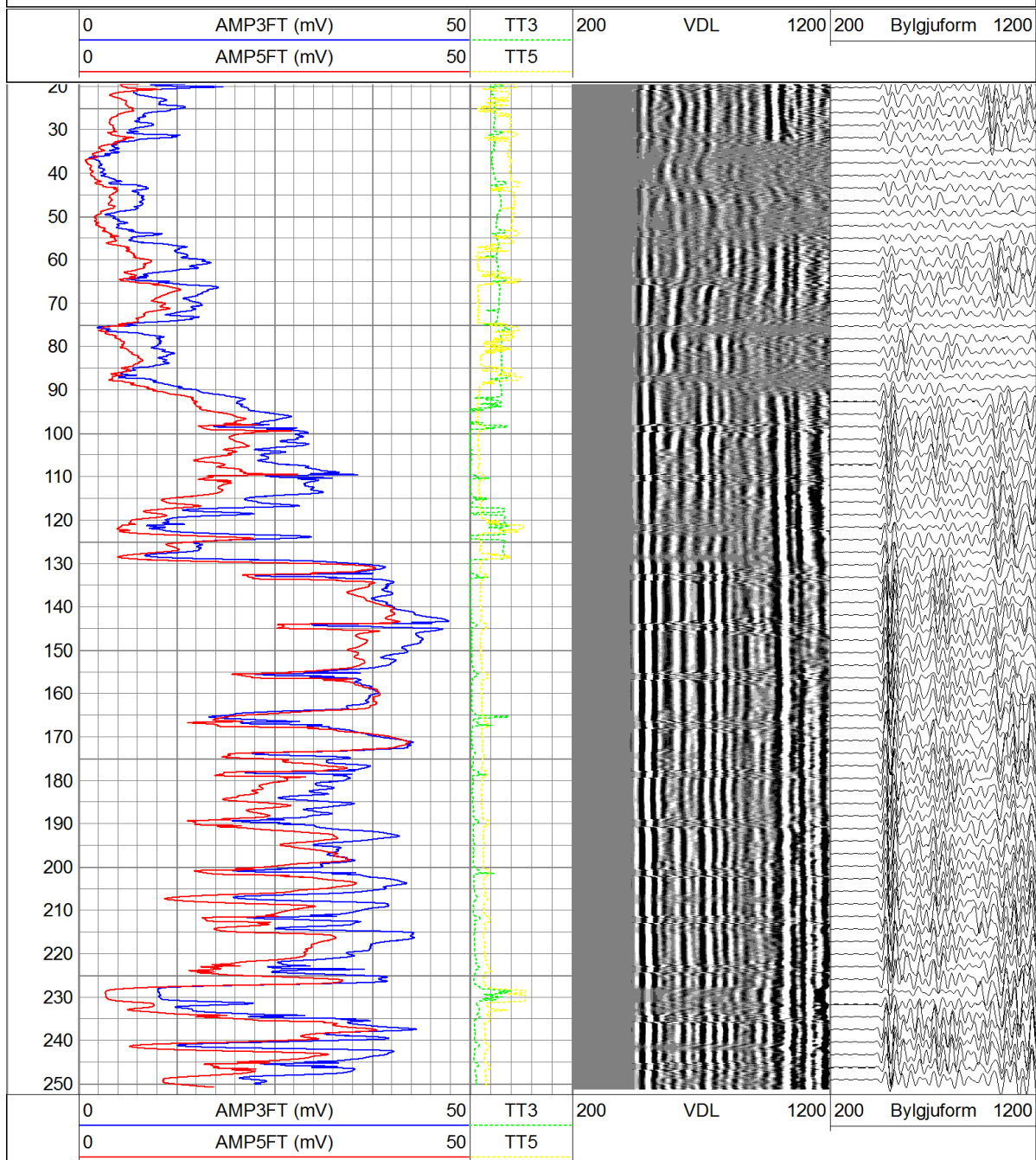


Figure 27. CBL log from August 25th in well PG-12.

5 Conclusions

- Drill rig Óðinn was ready for to start drilling well ÞG-12 on the 6th of August 2016.
- Total loss of circulation was encountered numerous times during drilling of phase 0, resulting in 6 cement jobs.
- Phase 0 was completed on August 18th (workday 15) at 120 m but the 18⁵/₈" surface was landed at 116.6 m.
- Phase 1 was complete 25th of August 2016 (workday 21) at 300 m depth, without any significant problems or circulation losses.
- After reaching the anchor casing depth (300 m), ÍSOR's loggings engineers carried out temperature and caliper logging. Caliper estimated the volume outside the 13⁵/₈" at 10.6 m³
- The cementing of the 13³/₈" anchor casing was finished on August 24th. In total, 21.5 m³ of cement slurry were used in the operation.
- CBL-log measured inside the casing about 21.5 hours after the cement job finished. The log revealed good bonding between the surface casing and the anchor casing and down to 130 m. Below 130 m depth the pipe amplitude signal indicates poorer cement bonding, possibly due to mud cake on the outer surface of the casing.
- The lithology in phase 0 is composed of lava units in the uppermost 58 m, but below a thick hyaloclastite unit is observed, trough phase 0 (120 m).
- The lithology in phase 1 is composed of different hyaloclastite units (breccia, tuff and pillow basalt), intersected by several thin basaltic lava units (some, possible intrusions).
- Alteration is first noticed at 56 m where light colored clay, quartz and epidote color is noticed.
- Alteration is generally high below 128 m, with no signs of retrograde alteration.
- Pyrite is fist seen at 60 m, and is almost seen in every sample down to the anchor casing dept.
- Calcite is first noticed at 72 m, and is found in various amount down to 294 m.

6 References

- Khodayar, M., Kristinsson, S.G., and Karlsdóttir, R. (2016). *Structural Drilling Targets from Platforms A, B, and F at Þeistareykir. Northern Zone and Tjörnes Fracture Zone*. Iceland GeoSurvey, report ÍSOR-2016/030. 24 pp.
- Mortensen, A. K. (2012). *Þeistareykir. Tillögur um staðsetningu borholna í jarðhitakerfinu á Þeistareykjum 2012*. Iceland GeoSurvey, report, ÍSOR-2012/043, 36 p.
- Sæmundsson, K., Sigurgeirsson, M.Á. and Grönvold, K. (2012). *Þeistareykir. Jarðfræðirannsóknir 2011*. Iceland GeoSurvey, report, ÍSOR-2012/024, 61 pp.

Appendix A: Casing report

Surface casing

ICELAND DRILLING		Casing Tally Run Report				Jarðboranir			
		Rig: Óðinn				Rig No: 65000			
		Job No: 65138				Job Name: Þeistareykir ÞG-12			
String Nominal OD (cm):		47,30		String Type: FULL					
Items Run:	12	Length Run:	117,640	Top Depth:	1,000				
Items Excluded:	0	Length Excluded:	0,000	Bottom Depth:	117,640				
Items Tallied:	12	Length All Items:	117,640	Cut Off Length:	1,000				
Run No.	Joint No	Item	Length	Top	Bottom	Description	Comments	Cnt	Scr
1		SHOE	0,560	117,080	117,640	50,80 x 0,00 K-55 WELD			
2	10	JOINT	11,750	105,330	117,080	47,31 x 45,10 X-56 WELD			
3		FLOAT	0,650	104,680	105,330	50,80 x 0,00 K-55 WELD			
4	9	JOINT	11,750	92,930	104,680	47,31 x 45,10 X-56 WELD			
5	8	JOINT	11,410	81,520	92,930	47,31 x 45,10 X-56 WELD			
6	7	JOINT	11,690	69,830	81,520	47,31 x 45,10 X-56 WELD			
7	6	JOINT	11,750	58,080	69,830	47,31 x 45,10 X-56 WELD			
8	5	JOINT	11,640	46,440	58,080	47,31 x 45,10 X-56 WELD			
9	4	JOINT	11,680	34,760	46,440	47,31 x 45,10 X-56 WELD			
10	3	JOINT	11,760	23,000	34,760	47,31 x 45,10 X-56 WELD			
11	2	JOINT	11,620	11,380	23,000	47,31 x 45,10 X-56 WELD			
12	1	JOINT	11,380	0,000	11,380	47,31 x 45,10 X-56 WELD			

Anchor casing

ICELAND DRILLING		Casing Tally Run Report				Jarðboranir			
		Rig: Óðinn				Rig No: 65000			
		Job No: 65138				Job Name: Þeistareykir PG-12			
String Nominal OD (cm): 34,61		String Type: FULL							
Items Run:	27	Length Run:	284,240	Top Depth:	7,920				
Items Excluded:	0	Length Excluded:	0,000	Bottom Depth:	292,160				
Items Talled:	27	Length All Items:	284,240	Cut Off Length:	0,000				
Run No.	Joint No	Item	Length	Top	Bottom	Description	Comments	Cnt	Scr
1		SHOE	0,840	291,320	292,160	0,00 x 0,00 BUTT			
2	25	JOINT	11,440	279,880	291,320	34,61 x 0,00 K-55 BUTT		2	
3	24	JOINT	11,420	268,460	279,880	34,61 x 0,00 K-55 BUTT			
4	23	JOINT	11,440	257,020	268,460	34,61 x 0,00 K-55 BUTT			
5		FLOAT	0,500	256,520	257,020	0,00 x 0,00 BUTT			
6	22	JOINT	11,430	245,090	256,520	34,61 x 0,00 K-55 BUTT		1	
7	21	JOINT	10,980	234,110	245,090	34,61 x 0,00 K-55 BUTT			
8	20	JOINT	11,440	222,670	234,110	34,61 x 0,00 K-55 BUTT			
9	19	JOINT	11,420	211,250	222,670	34,61 x 0,00 K-55 BUTT		1	
10	18	JOINT	10,840	200,410	211,250	34,61 x 0,00 K-55 BUTT			
11	17	JOINT	11,440	188,970	200,410	34,61 x 0,00 K-55 BUTT			
12	16	JOINT	11,280	177,690	188,970	34,61 x 0,00 K-55 BUTT		1	
13	15	JOINT	11,420	166,270	177,690	34,61 x 0,00 K-55 BUTT			
14	14	JOINT	11,200	155,070	166,270	34,61 x 0,00 K-55 BUTT			
15	13	JOINT	11,440	143,630	155,070	34,61 x 0,00 K-55 BUTT		1	
16	12	JOINT	11,410	132,220	143,630	34,61 x 0,00 K-55 BUTT			
17	11	JOINT	11,430	120,790	132,220	34,61 x 0,00 K-55 BUTT			
18	10	JOINT	11,400	109,390	120,790	34,61 x 0,00 K-55 BUTT		1	
19	9	JOINT	11,420	97,970	109,390	34,61 x 0,00 K-55 BUTT			
20	8	JOINT	11,400	86,570	97,970	34,61 x 0,00 K-55 BUTT			
21	7	JOINT	11,420	75,150	86,570	34,61 x 0,00 K-55 BUTT			
22	6	JOINT	11,000	64,150	75,150	34,61 x 0,00 K-55 BUTT		1	
23	5	JOINT	11,010	53,140	64,150	34,61 x 0,00 K-55 BUTT			
24	4	JOINT	11,230	41,910	53,140	34,61 x 0,00 K-55 BUTT	311425-111-0033-B6		
25	3	JOINT	11,430	30,480	41,910	34,61 x 0,00 K-55 BUTT			
26	2	JOINT	11,160	19,320	30,480	34,61 x 0,00 K-55 BUTT	311425-111-0032-B6		
27	1	JOINT	11,400	7,920	19,320	34,61 x 0,00 K-55 BUTT	311425-111-0034-B6		

Appendix B

Daily reports

Þeistareykir

Report for Workday #3 Preliminary results

Phase 0 (18 5/8" surface casing)

<i>Operator:</i> Landsvirkjun	<i>Drilling Company:</i> Iceland Drilling Company	
<i>Well Name:</i> ÞG-12	<i>Drill-Rig:</i> Óðinn	
<i>Well-Id:</i> 60412	<i>Geologist/Geophysicist:</i> SRG (E-mail: srg@isor.is)	
Last casing size: -	Depth at 24:00. m	Hole made last 24 hrs. : - m
Last casing depth: m	Depth at 8:00. m	Drilling time: - hrs.
Drilling fluid: Mud	Circulation losses at 8:00 - L/s	Average ROP: - m/hr

Drilling operation

This is the first report for drilling of well ÞG-12 in Þeistareykir, workday 3 of drill rig Óðinn. ÞG-12 is drilled from the same drillpad (C) as the vertical well ÞG-3 (2659 m deep), directionally drilled well ÞG-6 (2799 m deep) and ÞG-7, which is a 2509 m deep directionally drilled well towards northeast. Drill pad C is located under the slopes of Mt. Ketilfjall, by the road up to Bóndhólsskarð (Figure 1)

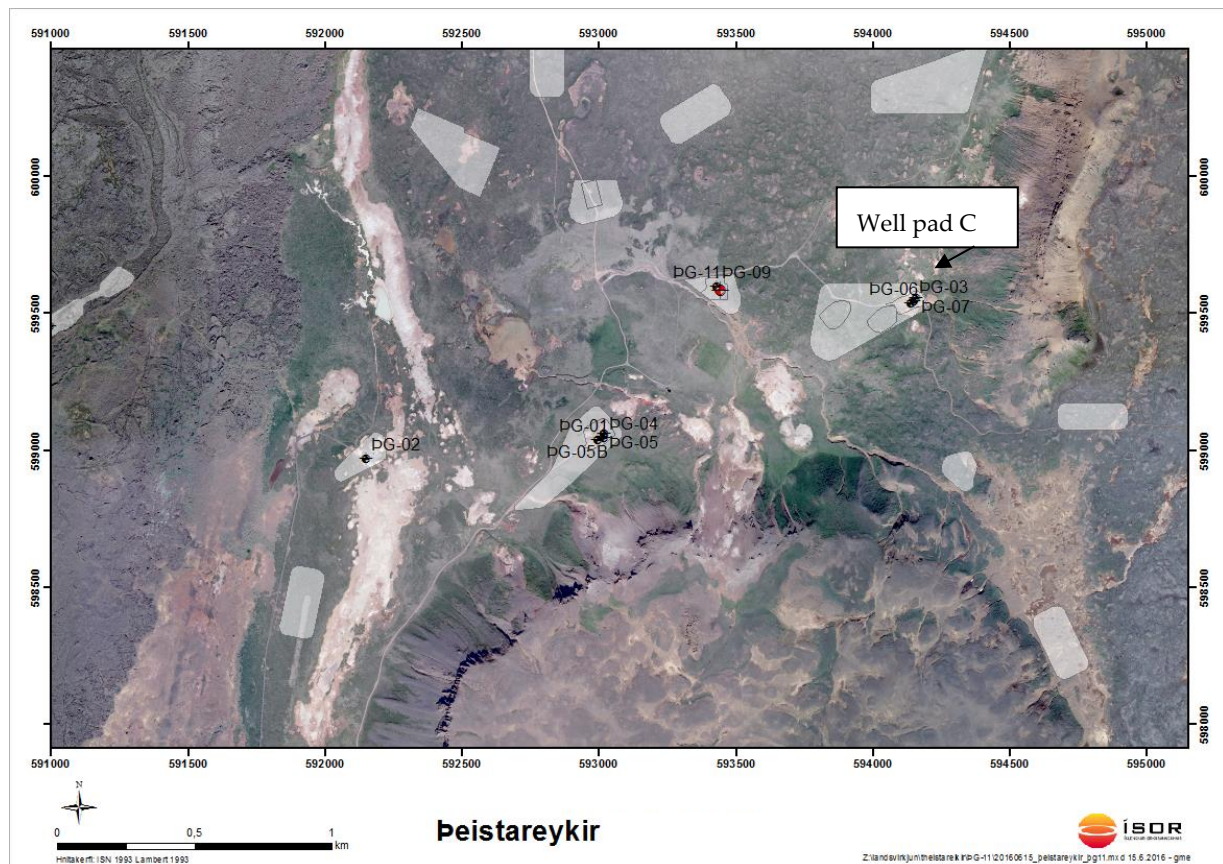


Figure 1. Location of wells in the Þeistareykir geothermal area.

Exploration drilling for electrical power production in the Peistareykir geothermal area were first carried out in 2002. The area is thought to be one of three largest geothermal areas in northeastern Iceland. The surface manifestations cover an area of 11 km² and TEM- resistance measurements in the bedrock, conducted in 2006, indicate the size of 45 km² (Karlisdóttir et al., 2006).

The geothermal system is the result of an active central volcano. The fissure swarm (NNA-SSV) reaches from lake Mývatn in the south and north to the sea in Kelduhverfi. The fissure swarm is up to 5 km wide and 50-60 km long. The surface manifestations are mostly seen in three areas 1) by the southwestern slopes of Mt. Ketilfjall, 2) In the northern slopes of Mt. Bæjarfjall and 3) in southern Tjarnarás.

Drill rig Óðinn was moved in the beginning of August from drill pad B (PG-11) and to drill pad C. The 6th of August the rig was set up and ready for drilling. While drilling for the surface casing in wells PG-3, 6 and 7 in drill pad C, over pressurized feeders were penetrated, followed by a mud eruption and temperature peaks in the circulation fluid. No recorded circulation losses were observed. Therefore, the evidence indicate that this will also be the case in PG-12, and preparations have been made and everyone at the drill site are informed.

The 5th of August, the drill crew set up the blow out preventers stack (BOP's) and connected the flow-line (Figure 2). The BOP's were then pressure tested and the annular preventer leaked while using 10 bar pressure. The pressure was lowered to 7 bars and the annular preventer passed. Currently at 10:00 the 6th of August, the drill crew is preparing for drilling. The bottom hole assembly (BHA) is made of 21" drill bit, steering 27/8, damper, steering 27/8, exover and 8" collars.

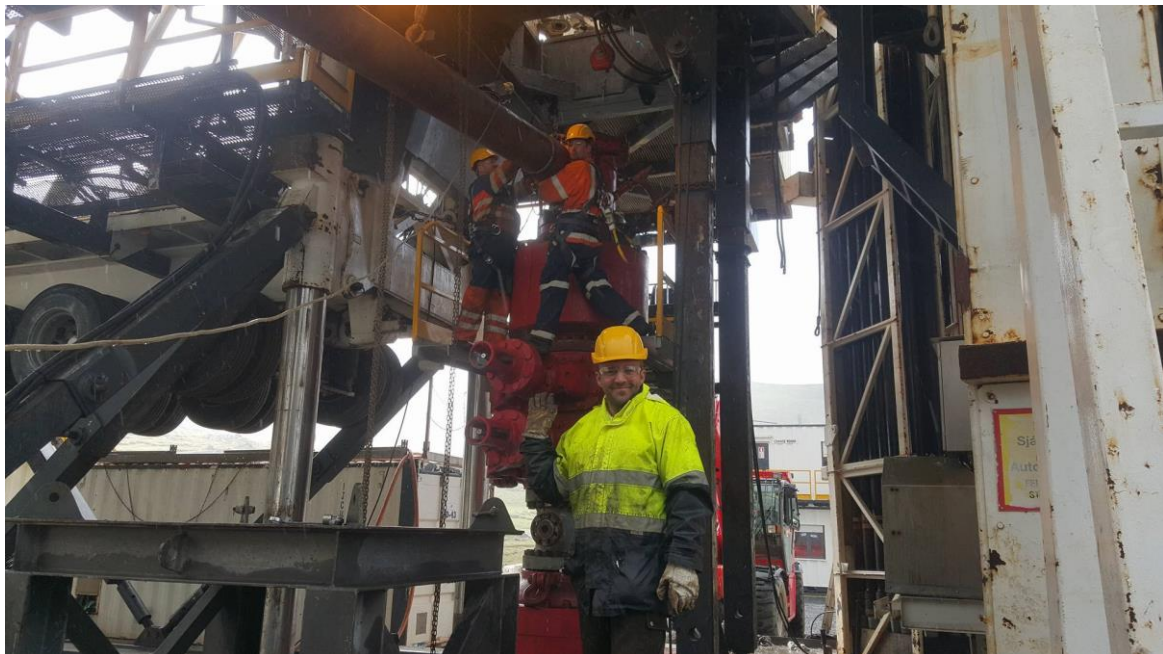


Figure 2. *The drill crew working on connecting the flow-line.*

Peistareykir	Report for Workday #4 Preliminary results	Phase 0 (18 5/8" surface casing)
<i>Operator:</i> Landsvirkjun		<i>Drilling Company:</i> Iceland Drilling Company
<i>Well Name:</i> ÞG-12		<i>Drill-Rig:</i> Óðinn
<i>Well-Id:</i> 60412		<i>Geologist/Geophysicist:</i> SRG (E-mail: srg@isor.is)
Last casing size: -	Depth at 24:00. 13.5 m	Hole made last 24 hrs. : 1.6 m
Last casing depth: m	Depth at 8:00. 13.5 m	Drilling time: 1.5 hrs.
Drilling fluid: Mud, water	Circulation losses at 8:00 35 L/s	Average ROP: 1.1 m/hr

Drilling operation

Pressure testing of the BOP was complete at 06:30 the 6th of August. The BHA was run into the well down to 10.5 m. Cement was drilled from 10.5-11.9, where a total loss of circulation occurred (35 l/s). Drilling with water was then conducted from 11.9-13.5. Then the well was circulated for 15 minutes and the drill string POOH. At 23:50 the cement truck was on the site and cementing of the loss zone began. Currently at 09:00 drilling into cement is being prepared with no changes on the BHA from yesterday.

Geology

Only one sample was achieved before the TLC. A dark and fresh fine-to medium grained basalt, with pores but no fillings. Slightly cement mixed.

Peistareykir	Report for Workday #5 Preliminary results	Phase 0 (18 5/8" surface casing)
Operator: Landsvirkjun	Drilling Company: Iceland Drilling Company	
Well Name: ÞG-12	Drill-Rig: Óðinn	
Well-Id: 60412	Geologist/Geophysicist: SRG (E-mail: srg@isor.is)	
Last casing size: -	Depth at 24:00: 13.5 m	Hole made last 24 hrs. : 5.7 m
Last casing depth: m	Depth at 8:00: 19.2 m	Drilling time: 5.75 hrs.
Drilling fluid: Mud, water	Circulation losses at 8:00: L/s	Average ROP: 1.0 m/hr

Drilling operation

3 m³ of cement slurry were used to cement the loss zone at 11.9 m. Cement was drilled from 13.1 m – 13.5 m. Drilling into formation was conducted from 13.5-14.5 m and then the well was circulated and drilling fluid changed to mud. At 15.2 m total circulation losses were observed for 5 minutes and then the well tightened up. Drilling fluid was changed to water. Drilling was continuous down to 19.2 m when total losses (35 l/s) were observed once again. The well was circulated for half an hour and then the drill string was pulled out. The second cement job started at 21:15, using 5m³ of sand slurry and then again at 22:40, 2m³ of cement slurry was pumped down, cement was found at 10.7 m. Figures 1 and 2 show the cement reports for the two cement jobs. Table 1 shows measured circulation losses in ÞG-12.

Cementing Report		Iceland Drilling	
Rig: Óðinn Job No: 85138		Rig No: 65000 Job Name: Peistareykir ÞG-12	
Cement Job Information			
Start Date/Time:	07-ágú.-16 00:25	Well Bore:	Original Well Bore
Job Type:	PLUG	Cementing Engineer:	
Cementing Co:	JARDB		
Plug Job Detail			
Plug Type:	Lekasteypa		
Plug Top (m):	8,6	Bottom (m):	13,5
		Length (m):	4,9
Calc. Displacement Vol (cu m):	Hole Size at Plug (cm):		53,34
	Volume (cu m)	Pump Time	Rate (cu.m./min)
Conditioning Data:			
Cement Data:			
Displacement Data:			
Slurry Information			
Type	Density	Yield	Sacks
			Volume
			Rate
			Additives
No Slurry Information Data			
Post Job Information			
Actual Top of Cmt (m):	8,6	Job Success?	Yes
Misc. Comments:	Sleyptr úr þremur rúmmetrum af sandsteypu með steypubúll og steypuðæluþill		

Figure 1. Cement report for the first cement job.

Iceland Drilling		Cementing Report		Iceland Drilling	
Rig: Óðinn		Job No: 85138		Rig No: 65000	
				Job Name: Deistareykir bG-12	
Cement Job Information					
Start Date/Time:		07-ágú.-16 21:15		Well Bore: Original Well Bore	
Job Type:		PLUG		Cementing Engineer:	
Cementing Co:		JARDB			
Plug Job Detail					
Plug Type:		Leikasteypu			
Plug: Top (m):		11,0		Bottom (m): 19,2 Length (m): 8,2	
Calc. Displacement Vol (cu m):				Hole Size at Plug (cm): 53,34	
		Volume (cu m)		Pump Time	
		Rate (cu.m./min)		Volume (bar)	
Conditioning Data:					
Cement Data:					
Displacement Data:					
Slurry Information					
Type		Density		Yield	
Sacks		Volume		Rate	
Additives					
No Slurry Information Data					
Post Job Information					
Actual Top of Cmt (m):		11,0		Job Success? Yes	
Misc. Comments:		Steypt úr 7 rúmmetrum af sandssteypu með steypubíll og steypudælubíll			

Figure 2. Cement report for the second cement job.

Table 1. Measured circulation losses in bG-12

Date	Time	Depth (m)	Circ.loss (l/s)	Remarks
6.8.2016	20:30	11.9	35	TLC
7.8.2016	15:30	15.2	35	TLC for 5 min.
7.8.2016	18:45	17.7	13	
7.8.2016	19:15	19.2	35	TLC

Geology

Samples down to 15.2 m have been analyzed and are described hereunder:

11.9-14 m FINE-MEDIUM GRAINED BASALT

Dark and fresh basalt. Plagioclase porphyritic. Slightly porous with no fillings. Cement mixed. Becomes glassier in groundmass and red scoria like at deeper levels. Fresh and pure black glass (Tachylite) noticed. Still mostly fine- to medium grained basalt.

14-15.2 m SCORIA

Grains become more vesicular and scoria like, with glassy groundmass and red oxidation.

Peistareykir		Report for Workday #6 Preliminary results		Phase 0 (18 5/8" surface casing)	
Operator:	Landsvirkjun	Drilling Company:	Iceland Drilling Company		
Well Name:	ÞG-12	Drill-Rig:	Óðinn		
Well-Id:	60412	Geologist/Geophysicist:	SRG (E-mail: srg@isor.is)		
Last casing size:	-	Depth at 24:00:	27.8 m	Hole made last 24 hrs. :	8.6 m
Last casing depth:	m	Depth at 8:00:	27.8 m	Drilling time:	6.5 hrs.
Drilling fluid:	Mud, water	Circulation losses at 8:00:	L/s	Average ROP:	1.3 m/hr

Drilling operation

Waiting on cement was carried out until 03:00 in the morning of 8th of August. Drilling started at 03:30 from 11 m, but was terminated at 12 m since the cement was not fully hardened. At 05:00 drilling from 12 m started. No circulation losses were recorded at 18.7 m. Drilling into formation was conducted from 19.2m-20 m and no circulation losses observed. When the well was 25 m deep the drilling fluid was changed from water to mud. At 26.8 m a total loss of circulation (35 l/s) happened and the drilling fluid was changed over to water, and drilling continued down to 27.8 m. Next, the well was circulated and the string pulled out. At 21:45 the third cement job was started, using 7m³ of cement slurry and 12 L of plastifier. The cement job was over at 22:20. Currently at 10:00 the 9th of August, drilling into cement is carried on. The cement report is shown in Figure 1.

ISOR ICELAND DRILLING		Cementing Report		Iceland Drilling		
Rig: Óðinn		Job No: 65138		Rig No: 65000		
				Job Name: Peistareykir ÞG-12		
Cement Job Information						
Start Date/Time:	08-ágú.-16 21:45		Well Bore:	Original Well Bore		
Job Type:	PLUG		Cementing Engineer:			
Cementing Co:	JARDB					
Plug Job Detail						
Plug Type:	Lekasteyping					
Plug: Top (m):	15,7	Bottom (m):	27,8	Length (m):	12,1	
Calc. Displacement Vol (cu m):			Hole Size at Plug (cm):	53,34		
	Volume (cu m)	Pump Time	Rate (cu.m./min)	Volume (bar)		
Conditioning Data:						
Cement Data:						
Displacement Data:						
Slurry Information						
Type	Density	Yield	Sacks	Volume	Rate	Additives
No Slurry Information Data						
Post Job Information						
Actual Top of Cmt (m):	15,7		Job Success?	Yes		
Misc. Comments:	Steypt úr 7 rúmmetrum af sandsteypu+ 12 lítra af flöti með steypubíl og steypudæslubíl					

Figure 1. Cement report for the third cement job carried out in ÞG-12.

Geology

Samples down to 26 m have been analyzed (Figure 2) and are described hereunder:

15.2-20 m NO CUTTINGS

Total loss of circulation

20-22 m MEDIUM-COARSE GRAINED BASALT

Light colored, dense, plagioclase and olivine rich basalt. Few grains with glassy groundmass.

22-24 m SCORIA

Grains with glassy groundmass, porous and red oxidation. Half of the upper sample is still well crystallized, plagioclase rich basalt. At 24 m more oxidation is observed in a mixture of well crystallized basalt and scoria.

24-26 m CEMENT

Staður: Peistareykir
 Holunafn: ÞG-12

 Bor: Óðinn
 Dýptarbil: 11-26 m

 Skolvökvi: Mud, water
 Verkhlutí: 3

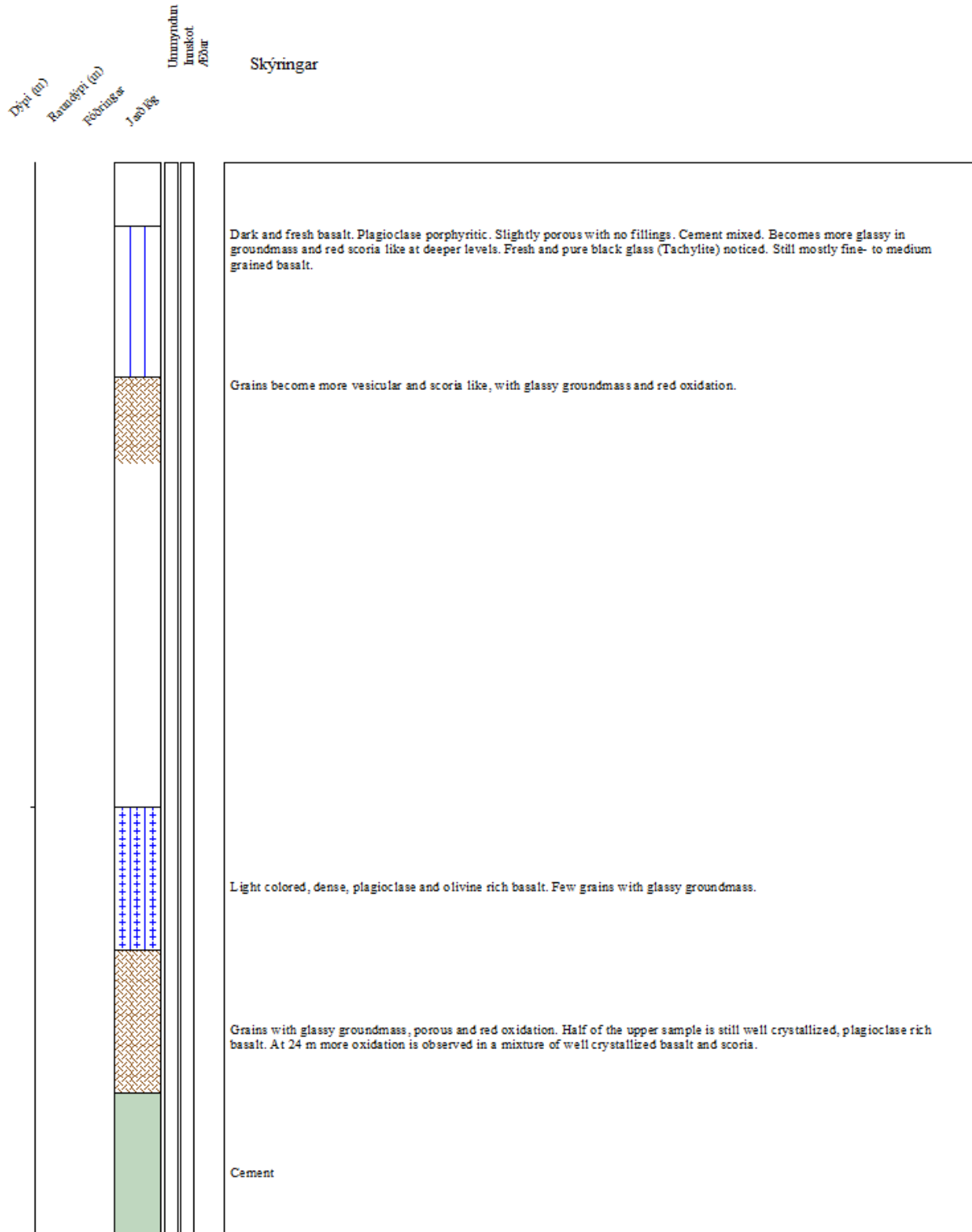
 Staðarnúmer: 60412
 Starfsmenn: SRG


Figure 2. Description of lithology from 11.9-26 m in ÞG-12.

Peistareykir

Report for Workday #7
Preliminary results

Phase 0
(18 5/8" surface casing)

<i>Operator:</i> Landsvirkjun	<i>Drilling Company:</i> Iceland Drilling Company	
<i>Well Name:</i> ÞG-12	<i>Drill-Rig:</i> Óðinn	
<i>Well-Id:</i> 60412	<i>Geologist/Geophysicist:</i> SRG (E-mail: srg@isor.is)	
Last casing size: -	Depth at 24:00. 39.3 m	Hole made last 24 hrs. : 11.5 m
Last casing depth: m	Depth at 8:00. 39.3 m	Drilling time: 7 hrs.
Drilling fluid: Mud, water	Circulation losses at 8:00 13 L/s	Average ROP: 1.6 m/hr

Drilling operation

Drilling into formation started at 11:00 the 9th of August. Drilling was conducted from 28.7-36 m when a total loss of circulation (36 l/s) occurred. Drilling was carried on till depth of 39.3 m and then the well was circulated and the string pulled out. At 22:30 7m³ of cement slurry and 17 L of plastifier were pumped into the well. Top of cement was at 36 m. At 23:30 2m³ of sandy cement were pumped down and top of cement was found at 30 m. At 23:40 the cement job was terminated. At 02:20 this morning (10th of August) the well was filled with water, and 13 l/s losses were noticed. Therefore, it was decided to perform another cementing. That cementing has currently (09:30) just completed. Figure 1 shows the cement truck and the crew at work this morning. Figure 2 shows the drilling progress so far in the well.



Figure 1. The cement truck and crew at work the morning of August 10th.

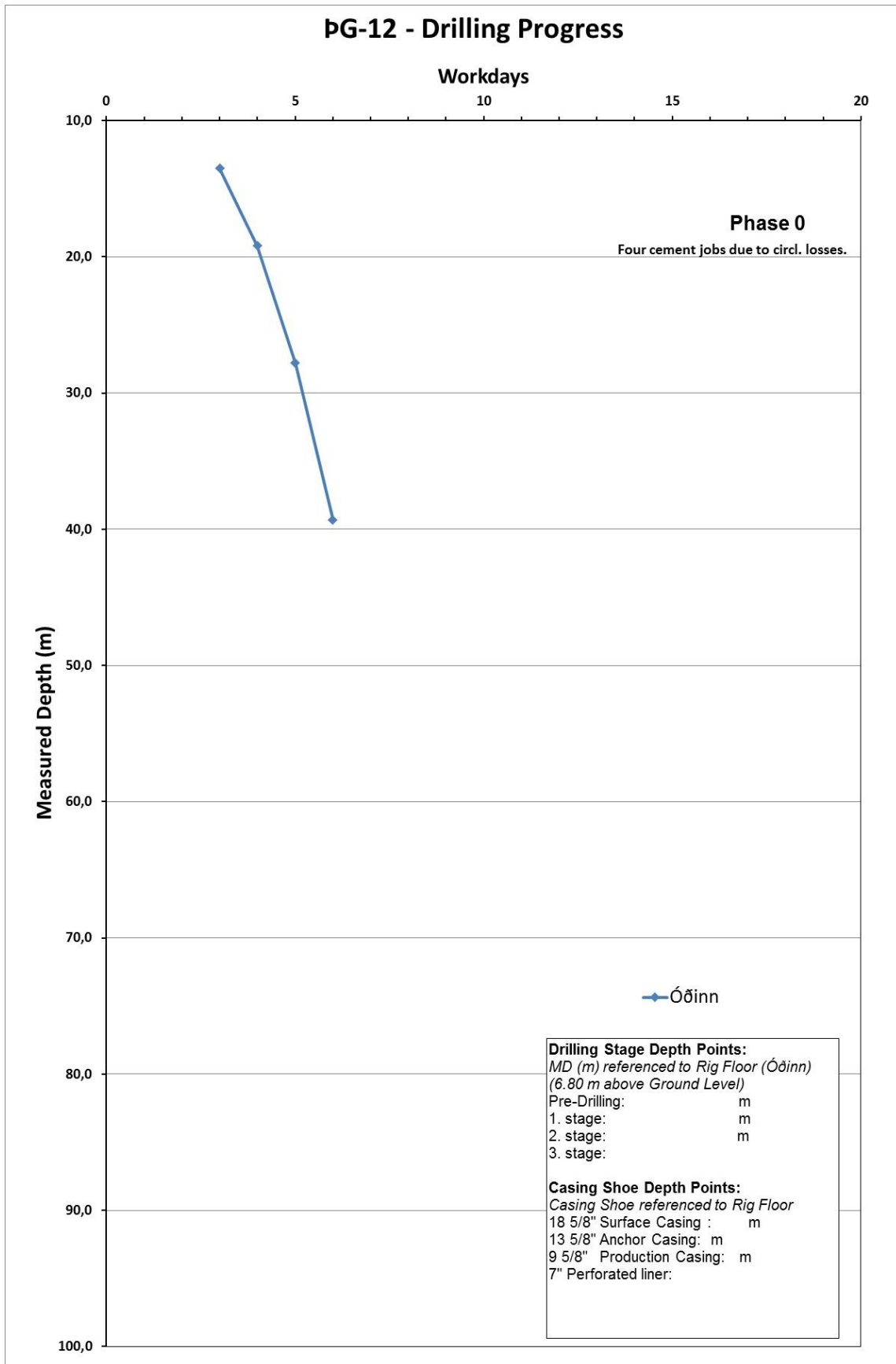


Figure 2. Drilling progress of well PG-12 during drilling of phase 0.

Peistareykir **Report for Workday #8** **Phase 0**
Preliminary results (18 5/8" surface casing)

<i>Operator:</i> Landsvirkjun	<i>Drilling Company:</i> Iceland Drilling Company	
<i>Well Name:</i> ÞG-12	<i>Drill-Rig:</i> Óðinn	
<i>Well-Id:</i> 60412	<i>Geologist/Geophysicist:</i> SRG (E-mail: srg@isor.is)	
Last casing size: -	Depth at 24:00: 39.3 m	Hole made last 24 hrs. : - m
Last casing depth: m	Depth at 8:00: 39.3 m	Drilling time: - hrs.
Drilling fluid: Mud, water	Circulation losses at 8:00: L/s	Average ROP: - m/hr

Drilling operation

Cementing was complete at 08:45 the 10th of August. Total amount of cement was 2.5 m³. Top of cement was at 22.6 m. Waiting on cement was carried out until noon and then the well was filled with water and no circulation losses measured. At 14:00 drilling into cement started at 22.6 m. Drilling went slowly, and at midnight drilling into cement was still ongoing and the depth was 35.5 m, with no losses. Cement report is shown Figure 1.

This night (11th of August) when the drill bit was at 40 m, total losses were measured. Currently at 09:30, the cement truck has just left the scene.

No samples for geological analysis have been retrieved since 36 m.


	Cementing Report Rig: Óðinn Job No: 65138	Iceland Drilling Rig No: 65000 Job Name: Peistareykir ÞG-12
Cement Job Information		
Start Date/Time:	09-águ.-16 21:15	Well Bore: Original Well Bore
Job Type:	PLUG	Cementing Engineer:
Cementing Co:	JARDB	
Plug Job Detail		
Plug Type:	Lekasteypa	
Plug: Top (m):	22,6	Bottom (m): 39,3 Length (m): 16,7
Calc. Displacement Vol (cu m):	11,50	Hole Size at Plug (cm): 53,34
	Volume (cu m)	Pump Time Rate (cu.m./min) Volume (bar)
Conditioning Data:		
Cement Data:		
Displacement Data:		
Slurry Information		
Type	Density	Yield Sacks Volume Rate Additives
No Slurry Information Data		
Post Job Information		
Actual Top of Cmt (m):	22,6	Job Success? No
Misc. Comments:	Steypt 0r 7m3 af sandsteypu kl 22:15, steypuborð í 36m Steypt 0r 2m3 af sandsteypu kl 23:30, steypuborð í 30m Steypt 0r 2,5m3 af sandsteypu kl 08:30, steypuborð í 22,6m Alls var bætt 31 litra af floti í þessar steypingar	

Figure 1. Cement report for cement jobs 9th and 10th of August.

Þeistareykir

Report for Workday #9
Preliminary results

Phase 0
(18 5/8" surface casing)

<i>Operator:</i> Landsvirkjun	<i>Drilling Company:</i> Iceland Drilling Company	
<i>Well Name:</i> ÞG-12	<i>Drill-Rig:</i> Óðinn	
<i>Well-Id:</i> 60412	<i>Geologist/Geophysicist:</i> SRG (E-mail: srg@isor.is)	
Last casing size: -	Depth at 24:00. 46.5 m	Hole made last 24 hrs. : 6.6 m
Last casing depth: m	Depth at 8:00. 46.5 m	Drilling time: 4.5 hrs.
Drilling fluid: Mud, water	Circulation losses at 8:00 L/s	Average ROP: 1.5 m/hr

Drilling operation

Total of 10 m³ of cement were used for the cement plug the 11th of August (Figure 1). Top of cement was found at 36.6 m. Drilling into cement was carried out from 35.9-42 m between 15:00 and 18:15 the 11th of August. Drilling into formation started at 42 m and total circulation losses were encountered for (38 l/s). Drilling was carried on down to 46.5 m and then the well was circulated and the string pulled out. The rest of the night was spent on waiting for the cement truck. Currently at 09:00 the 12th of August, drilling into cement is ongoing.


 Cementing Report		Iceland Drilling	
Rig: Óðinn Job No: 65138		Rig No: 65000 Job Name: Þeistareykir ÞG-12	
Cement Job Information			
Start Date/Time:	11-ágú.-16 07:12	Well Bore:	Original Well Bore
Job Type:	PLUG	Cementing Engineer:	
Cementing Co:	JARDB		
Plug Job Detail			
Plug Type:	Lekasteypa		
Plug: Top (m):	36,0	Bottom (m):	42,0
		Length (m):	6,0
Calc. Displacement Vol (cu m):	10,00	Hole Size at Plug (cm):	53,34
	Volume (cu m)	Pump Time	Rate (cu.m./min)
			Volume (bar)
Conditioning Data:			
Cement Data:			
Displacement Data:			
Slurry Information			
Type	Density	Yield	Sacks
			Volume
			Rate
			Additives
No Slurry information Data			
Post Job Information			
Actual Top of Cmt (m):	36,6	Job Success?	Yes
Misc. Comments:	07:12 Steypt úr 7m ³ sandsteypu frá 42m toppur á tappa í 40,3m 08:40 Steypt úr 2m ³ sandsteypu frá 40,3m toppur á tappa í 37,8m 08:50 Steypt úr 1m ³ sandsteypu frá 37,8m toppur á tappa í 36,6m notað 1 þoki salt í steypunna Steypubíll og steypudeila		

Figure 1. Cement report for the cemented plug the 11th of August.

Peistareykir	Report for Workday #10 Preliminary results	Phase 0 (18 5/8" surface casing)
<i>Operator:</i> Landsvirkjun	<i>Drilling Company:</i> Iceland Drilling Company	
<i>Well Name:</i> ÞG-12	<i>Drill-Rig:</i> Óðinn	
<i>Well-Id:</i> 60412	<i>Geologist/Geophysicist:</i> MÁŠ (E-mail: mas@isor.is)	
Last casing size: -	Depth at 24:00. 55 m	Hole made last 24 hrs. : 8.5 m
Last casing depth: m	Depth at 8:00. 55 m	Drilling time: 3.5 hrs.
Drilling fluid: Water	Circulation losses at 8:00 2 L/s	Average ROP: 2.4 m/hr

Drilling operation

At 7 am yesterday morning drilling in cement started and about 10:30 am the bit reached the formation below. No losses were noted. Drilling continued down to 55 m, then drilling was stopped. ROP was about 2.4 m/hour on average but a sharp increase in the ROP was noted at 54.2 m. In the afternoon a loss of about 1.5-2 L/s was estimated.

Before drilling will start again a drilling mud will be mixed (with a density of 1.05 g/cm³) and in order to increase its density further, to 1.34 g/cm³, a barite (BaSO₄, with a density of 4.5 g/cm³) is used. The mixing procedure of the circulation fluid has been ongoing since yesterday afternoon until present. Drilling is expected to start early in the afternoon.

Geology

Samples from 46 to 56 m were retrieved yesterday.

46.5-54 m: MEDIUM-COARSE GRAINED BASALT

Medium to coarse grained basalt, most probably a postglacial lava (from Stórávíti). Fragments of feldspar and olivine are common in the cuttings. The grade of alteration is minor. The rock is moderately oxidized. Pores are not abundant (all empty). The rock is light grayish in color but admixed are some fragments of blackish fine grained crystalline basalt.

54-56 m: SCORIA/INTERBED

Highly oxidized fragments are abundant in the cuttings. Some pieces of vesicular tephra or pumice are seen. This sample most likely represents an interbed/sediment between lava units. Increased ROP was noted at 54.2 m depth.

Peistareykir	Report for Workday #11 Preliminary results	Phase 0 (18 5/8" surface casing)
<i>Operator:</i> Landsvirkjun	<i>Drilling Company:</i> Iceland Drilling Company	
<i>Well Name:</i> ÞG-12	<i>Drill-Rig:</i> Óðinn	
<i>Well-Id:</i> 60412	<i>Geologist/Geophysicist:</i> MÁŠ (E-mail: mas@isor.is)	
Last casing size: -	Depth at 24:00. 81 m	Hole made last 24 hrs. : 26 m
Last casing depth: m	Depth at 8:00. 90 m	Drilling time: 9.3 hrs.
Drilling fluid: Mud/barite	Circulation losses at 8:00 0 L/s	Average ROP: 2.8 m/hr

Drilling operation

Mixing of the drilling mud, including barite, finished at 13 pm yesterday. The density of the fluid was adjusted to 1.34 g/cm³. Then drilling was started. No loss of circulation was noted. At 5:15 pm, with well depth of 70 m, drilling was stopped for conducting a flow test. Pumping was cut off for a while. A minor amount of fluid was found to be effused from the well but hardly detectable. At this time density of the mud had decreased from 1.34 down to 1.31 g/cm³. At 5:30-7:00 pm the crew worked on mixing of the mud, adding barite. Drilling resumed at 7 pm and has been ongoing since then. There are still no losses of circulation in the well.

Geology

Samples down to 90 m have been inspected so far (Figure 1).

46.5-54 m: MEDIUM-COARSE GRAINED BASALT

Medium to coarse grained basalt, most probably a postglacial lava (from Stórávíti). Fragments of feldspar and olivine are common in the cuttings. The grade of alteration is minor. The rock is moderately oxidized. Pores are not abundant (all empty). The rock is light grayish in color but admixed are some fragments of blackish fine grained crystalline basalt.

54-58 m: SCORIA/SEDIMENT

Highly oxidized fragments are abundant in the cuttings. Some pieces of vesicular tephra or pumice are seen. This sample marks the lower boundary of the lava unit described above. Most likely a thin sedimentary layer, possibly a soil. Increased ROP was noted at 54.2 m depth.

58-62 m: BASALTIC BRECCIA

Mixed cuttings, composed of fragments from various types of fine sedimentary tuff, green to brownish in color. Also there is a minor amount of altered crystalline basalt. The grade of alteration increased from above. Fine grained clay, quartz and traces of epidote are found.

62-70 m: NO CUTTINGS

70-76 m: REWORKED TUFF

Sedimentary tuff of several types, fine to coarse grained. The tuff is green to gray in color. A considerable alteration is noted. The tuff becomes more homogenous in the lower part of the unit. Quartz is found. Pyrite is common but calcite is scarce.

76-82 m: SANDSTONE

Fine grained sediment. Composed of glass, crystals and pieces of crystalline basalt. The sandstone becomes coarser in the lower part of the unit.

82-86 m: BASALTIC BRECCIA

Mixed cuttings, composed of reworked tuff, fine grayish sediment and crystalline basalt. Pyrite is abundant.

86-90 m: GLASSY BASALT

Rather homogenous formation, composed of fine brownish crystalline basalt and some minor amounts of glass. The rock is non porphyritic. Glassy rinds are seen on some of the fragments indicating that this unit might represent a pillow lava.

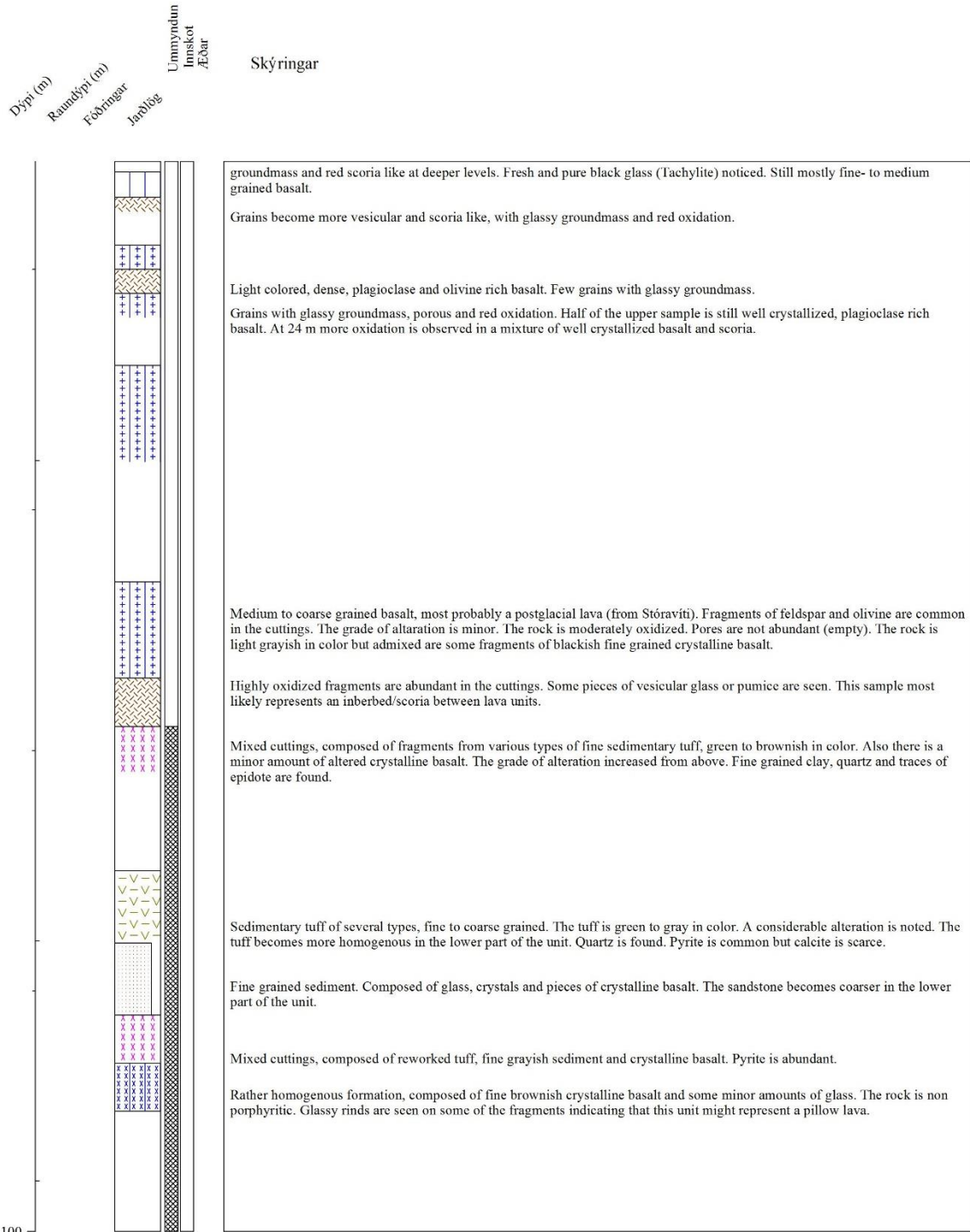


Figure 1. Lithology of ÞG-12 down to 90 m depth.

Peistareykir		Report for Workday #12 Preliminary results		Phase 0 (18 ^{5/8} " surface casing)	
<i>Operator:</i>	Landsvirkjun	<i>Drilling Company:</i>	Iceland Drilling Company		
<i>Well Name:</i>	ÞG-12	<i>Drill-Rig:</i>	Óðinn		
<i>Well-Id:</i>	60412	<i>Geologist/Geophysicist:</i>	MÁS (E-mail: mas@isor.is)		
Last casing size:	-	Depth at 24:00.	120 m	Hole made last 24 hrs. :	39 m
Last casing depth:	m	Depth at 8:00.	120 m	Drilling time:	22 hrs.
Drilling fluid:	Mud/barite	Circulation losses at 8:00	0 L/s	Average ROP:	1.8 m/hr

Drilling operation

Yesterday the drilling of ÞG-12 was going steadily but with low ROP. At 10 pm last night the final depth of phase 0 (pre-drilling) was reached at 120 m depth. During the night the well was circulated and a wiper trip conducted. LOC was minor during drilling yesterday, i.e. in range of 0-1.7 L/s. This morning the 18^{5/8}" casing is being prepared for use. The casing shoe (float shoe) has been attached to the end of the casing. The casing process should start soon.

Figure 1 shows the drilling progress of ÞG-12 since the beginning of drilling until present.

Geology

Samples down to 120 m have been inspected. The lithology of ÞG-12 is shown in Figure 2. Also a mud log from the well ÞG-9 is shown for comparison. In ÞG-12 the postglacial lava cover seems to be about 56 m thick compared to about 96 m in ÞG-9, otherwise they compare well. Descriptions of individual lithological units in ÞG-12 are given below:

46.5-54 m: MEDIUM-COARSE GRAINED BASALT

Medium to coarse grained basalt, most probably a postglacial lava (from the Stóravíti lava shield). Fragments of feldspar and olivine are common in the cuttings. The grade of alteration is minor. The rock is moderately oxidized. Pores are not abundant (all empty). The rock is light grayish in color but admixed are some fragments of blackish fine grained crystalline basalt.

54-58 m: SCORIA/SEDIMENT

Highly oxidized fragments are abundant in the cuttings. Some pieces of vesicular tephra or pumice are seen. This sample marks the lower boundary of the lava unit described above. Most likely a thin sedimentary layer, possibly a soil. Increased ROP was noted at 54.2 m depth.

58-62 m: BASALTIC BRECCIA

Mixed cuttings, composed of fragments from various types of fine sedimentary tuff, green to brownish in color. Also there is a minor amount of altered crystalline basalt. The grade of alteration increased from above. Fine grained clay, quartz and traces of epidote are found.

62-70 m: NO CUTTINGS

70-76 m: REWORKED TUFF

Sedimentary tuff of several types, fine to coarse grained. The tuff is green to gray in color. A considerable alteration is noted. The tuff becomes more homogenous in the lower part of the unit. Quartz is found. Pyrite is common but calcite is scarce.

76-82 m: SANDSTONE

Fine grained sediment. Composed of glass, crystals and pieces of crystalline basalt. The sandstone becomes coarser in the lower part of the unit.

82-86 m: BASALTIC BRECCIA

Mixed cuttings, composed of reworked tuff, fine grayish sediment and crystalline basalt. Pyrite is abundant.

86-100 m: GLASSY BASALT

Rather homogenous formation, composed of fine brownish crystalline basalt and some minor amounts of brownish glass. The rock is non porphyritic. The rock is non-porous. Glassy rinds are seen on some of the fragments indicating that this unit most likely represent a pillow lava. Fractures filled with quartz and pyrite are found.

100-106 m: NO CUTTINGS

106-120 m: REWORKED TUFF

Fine grained tuff, mostly reworked tuff. Green to green-bluish in color. Seems to be somewhat fractured and brecciated at intervals. Moderately altered. Quartz and green fine grained clay are common. Also pyrite is common but calcite is still scarce.

PG-12 - Drilling Progress

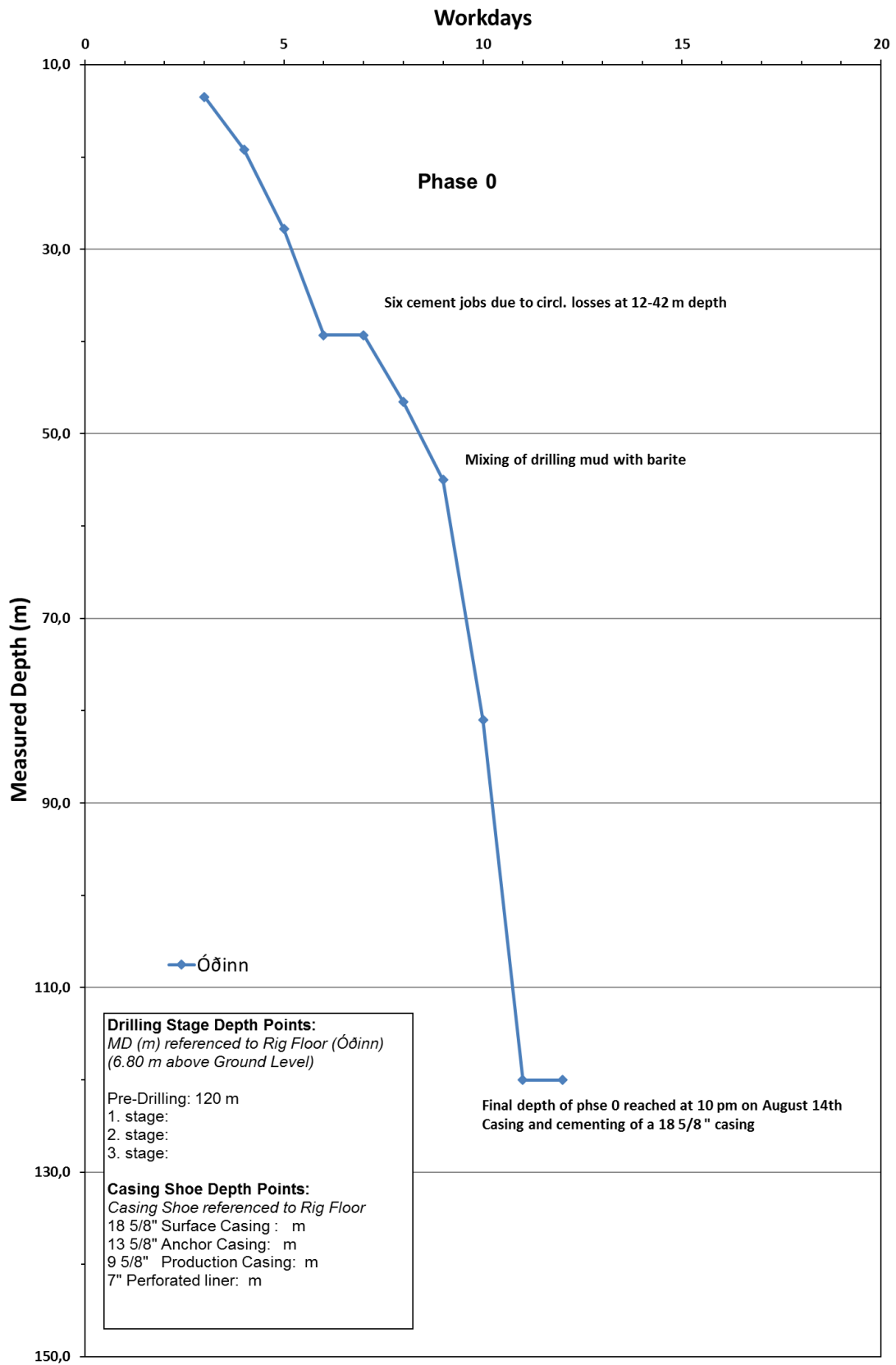


Figure 1. Drilling progress of PG-12 until today.

Location: Peistareykir Drill rig: Óðinn Drilling fluid: Mud UWI: 60412
 Well: ÞG-12 Depth interval: 11-120 m Work phase: Predrilling Geologists: SRG/MÁS

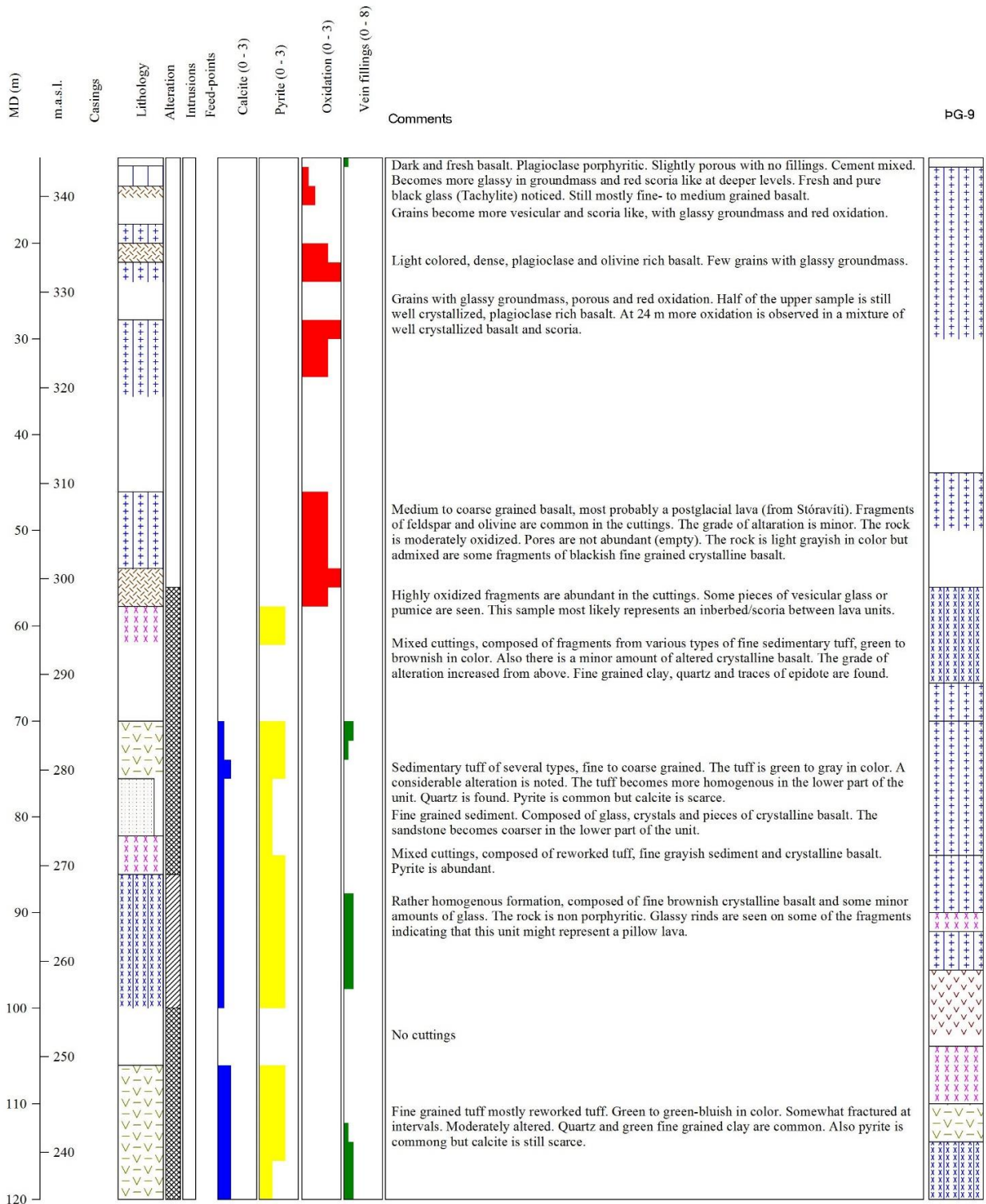


Figure 2. Lithology of ÞG-12 down to 120 m depth, the final depth of phase 0. A mud log from well ÞG-9 is shown for comparison.

Peistareykir		Report for Workday #13 Preliminary results		Phase 0 (18 5/8" surface casing)	
<i>Operator:</i>	Landsvirkjun	<i>Drilling Company:</i>	Iceland Drilling Company		
<i>Well Name:</i>	ÞG-12	<i>Drill-Rig:</i>	Óðinn		
<i>Well-Id:</i>	60412	<i>Geologist/Geophysicist:</i>	MÁS (E-mail: mas@isor.is)		
Last casing size:	-	Depth at 24:00.	120 m	Hole made last 24 hrs. :	m
Last casing depth:	m	Depth at 8:00.	120 m	Drilling time:	hrs.
Drilling fluid:	Mud/barite	Circulation losses at 8:00	0 L/s	Average ROP:	m/hr

Drilling operation

Yesterday morning, until 6:30 am, a wiper trip from 120-20 m depth was carried out. A pump rate of 38 L/s was applied. A minor increase in torque was noted at 20-25 m but otherwise no obstacles were noted. After the wiper trip the well was circulated for three hours. At the same time the crew started to prepare for running the 18^{5/8}" pipes in the well. At 7 am the float shoe/casing shoe was welded on the end of the casing. At noon the drill string was POOH.

Some delays in the casing process were caused by a broken forklift which had a rollover on a road close by. A new one was moved to the site at 8 pm yesterday. At 9 pm last night casing of the well started and has been ongoing since then. This morning, at 7 am, some 60 m had been RIH. The casing process is rather time-consuming as the pipes are welded together. All the 18^{5/8}" pipes should be in place about midday today. Cementing of the casing is planned late in the afternoon.

Figure 1 below shows the lithology of ÞG-12 along with some selected drilling parameters from the automatic data acquisition system of Óðinn.

Geology

There has been no drilling in formation since 10 pm on the 14th of August.

Location	Þeistareykir	Rig	Óðinn	Circ. fluid	Mud	Site Id.	60412
Well name	PG-12	Depth interval	11-120 m	Phase	Predrilling	Geologists	SRG/MÁS

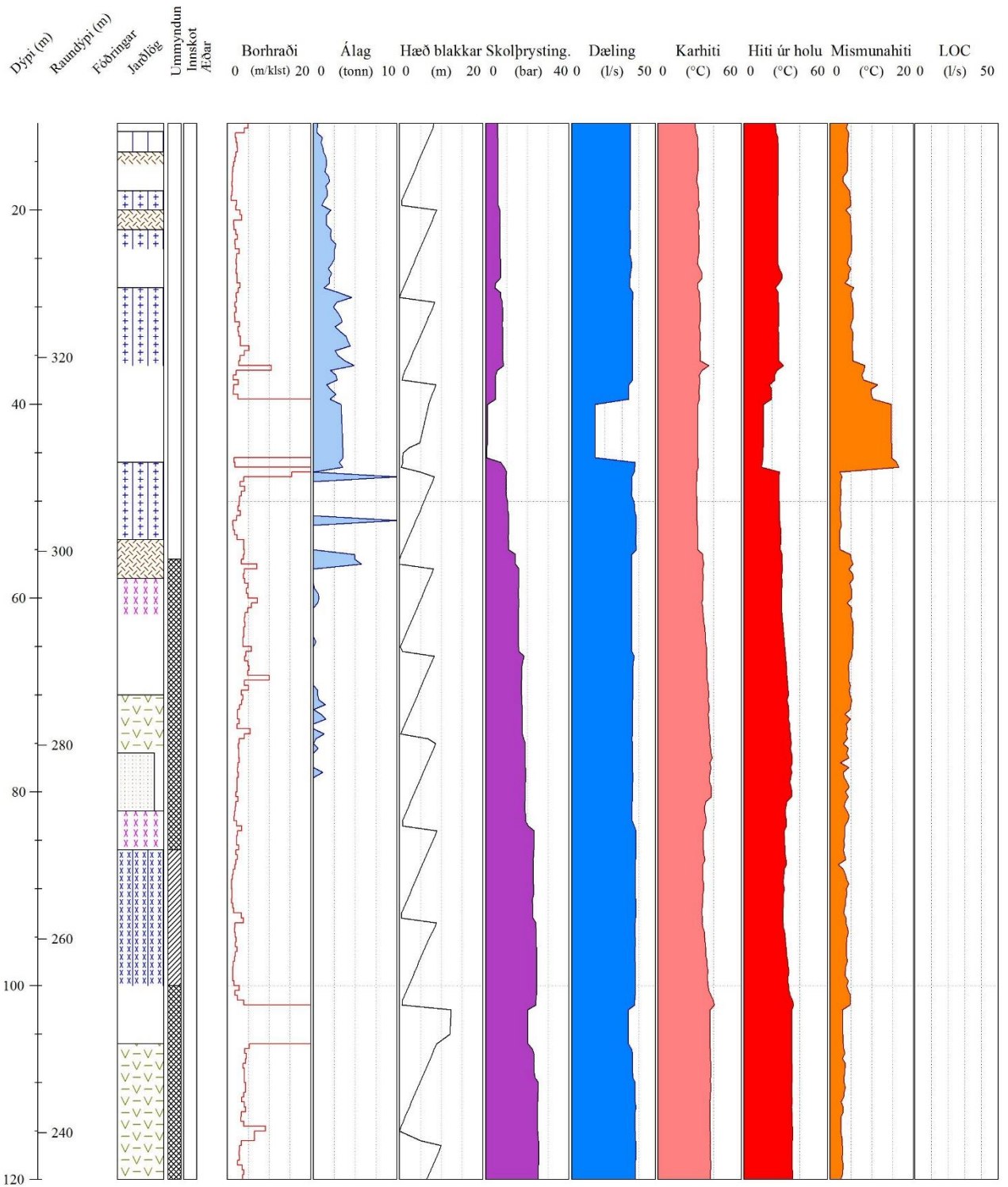


Figure 1. Lithology and some selected drilling parameters.

Peistareykir		Report for Workday #14 Preliminary results		Phase 0 (18 5/8" surface casing)	
<i>Operator:</i>	Landsvirkjun	<i>Drilling Company:</i>	Iceland Drilling Company		
<i>Well Name:</i>	ÞG-12	<i>Drill-Rig:</i>	Óðinn		
<i>Well-Id:</i>	60412	<i>Geologist/Geophysicist:</i>	MÁS (E-mail: mas@isor.is)		
Last casing size:	18 ^{5/8} "	Depth at 24:00.	120 m	Hole made last 24 hrs. :	m
Last casing depth:	116.6 m	Depth at 8:00.	120 m	Drilling time:	hrs.
Drilling fluid:	Mud/barite	Circulation losses at 8:00	0 L/s	Average ROP:	m/hr

Drilling operation

At 1:45 pm yesterday the casing of the well with 18^{5/8}" pipes finished. A pumping of 5-10 L/s was applied while lowering the pipes into the hole. The upper annular was kept closed while welding the casing pipes together. The shoe of the casing sits at 116.6 m depth (see Figure 1). At 5:45 pm after the casing operation a cementing-string was run in the hole. At 22:30 pm the drillers started to clean mud from the annulus by using water and soda. Pumping rate was 8 L/s. At 1 am this morning the cementing operation started (see Figure 2). The cement was retrieved at the surface. In total 11.6 m³ of cement slurry (G-mixture) with a density of 1.7 g/cm³ was used. In the end a displacement water of 1200 l was used. At present there is a WOC.

Geology

There has been no drilling in formation since 10 pm on the 14th of August.

ICELAND DRILLING		Casing Information Report		Iceland Drilling				
Rig: Óðinn		Job No: 65138		Rig No: 65000				
				Job Name: Þeistareykir ÞG-12				
Casing Information								
Run Date/Time:	16-ágú.-16 13:45		Leak Off Test (kg/cu m):					
Well Section:	SURF		String Type: FULL					
String Top MD (m):	1,0		String Top TVD (m):					
Casing Shoe MD (m):	116,6		Casing Shoe TVD (m): 116,6					
String Nominal OD (cm):	47,30		String Nominal ID (cm): 45,11					
Bit Diameter (cm):	53,34		Avg. Open Hole Diam. (cm): 53,34					
Centralizers: No:	Manufacturer/Type:							
Depths:								
Hanger Type:			Manufacturer:					
Comments: Transferred from Casing Tally Detail on 17-ágú.-16 07:41								
String Component Details								
Joins	Item	Length (m)	OD(cm)	ID (cm)	Weight (kg)	Grade	Connection	Torque
1	SHOE	0,560	50,80			K-55	WELD	
1	JOINT	11,750	47,31	45,10	87,5	X-56	WELD	
1	FLOAT	0,650	50,80			K-55	WELD	
9	JOINT	104,680	47,31	45,10	87,5	X-56	WELD	
Totals:	12	117,640						

Figure 1. Casing report for the 18^{5/8}" surface casing.

ICELAND DRILLING		Cementing Report		Iceland Drilling		
Rig: Óðinn		Job No: 65138		Rig No: 65000		
				Job Name: Þeistareykir ÞG-12		
Cement Job Information						
Start Date/Time:	17-ágú.-16 01:15		Well Bore: Original Well Bore			
Job Type:	PRIMARY		String OD (cm): 47,30			
Well Section:	INT1		String Type: FULL			
Cementing Co:	JARDB		Cementing Engineer: Andrés Konráðsson			
Primary Job Detail						
	Volume (cu m)	Pump Time	Rate (cu.m./min)	Pressure (bar)		
Conditioning Data:						
Cement Data:	11,6	20	0,6	3		
Displacement Data:	1,2	2	0,6	4		
Calc. Displacement Vol:						
<input type="checkbox"/> Batch Mix?		<input type="checkbox"/> Bump Plug?		Bump Pressure:		
Returns to Surface:	FULL		<input type="checkbox"/> Reciprocate Pipe?		<input checked="" type="checkbox"/> Cement at Surface?	
Calc Top of Cement (m):	Excess (%):		Avg. Hole Size (cm): 53,34			
Slurry Information						
Type	Density	Yield	Sacks	Volume	Rate	Additives
LEAD	1.700,00			11,6	0,6	
Post Job Information						
Liner Top Test (kg/cu m):				Job Success? No		
Actual Top of Cmt (m):				CBL Bond Quality:		
Misc. Comments:	Steyptir 11,6 rúmmetrar af G-blöndu. Eðlisþyngd 1,7. Neðri belgloki lokaður og bakþrýstingi 2 bar haldið á fóðringu með choke loka. Steypa kom upp.					

Figure 2. Cementing report for the surface casing.

Peistareykir		Report for Workday #14 Preliminary results		Phase 1 (13 5/8" anchor casing)	
<i>Operator:</i>	Landsvirkjun	<i>Drilling Company:</i>	Iceland Drilling Company		
<i>Well Name:</i>	ÞG-12	<i>Drill-Rig:</i>	Óðinn		
<i>Well-Id:</i>	60412	<i>Geologist/Geophysicist:</i>	MÁS (E-mail: mas@isor.is)		
Last casing size:	18 5/8"	Depth at 24:00.	120 m	Hole made last 24 hrs. :	m
Last casing depth:	116.6 m	Depth at 8:00.	120 m	Drilling time:	hrs.
Drilling fluid:	Mud/barite	Circulation losses at 8:00	0 L/s	Average ROP:	m/hr

Drilling operation

Cementing of the surface casing finished at 1:45 am yesterday morning. Then the cementing string was POOH. Wait on cement lasted until 7 pm when the top of the surface casing was cut to a desired height. Shortly after midnight a new flange was welded on top of the casing. This morning the BOP stack has been nipped-up and connected. At present preparations for pressure-tests of the blow-out preventers are underway. After that a new BHA will be run in hole for drilling of phase 1 of ÞG-12. The casing depth for the 13 5/8" anchor casing is planned at 300 m depth.

The drilling progress of ÞG-12 until present is shown on Figure 1 below.

Geology

There has been no drilling in formation since 10 pm on the 14th of August.

PG-12 - Drilling Progress

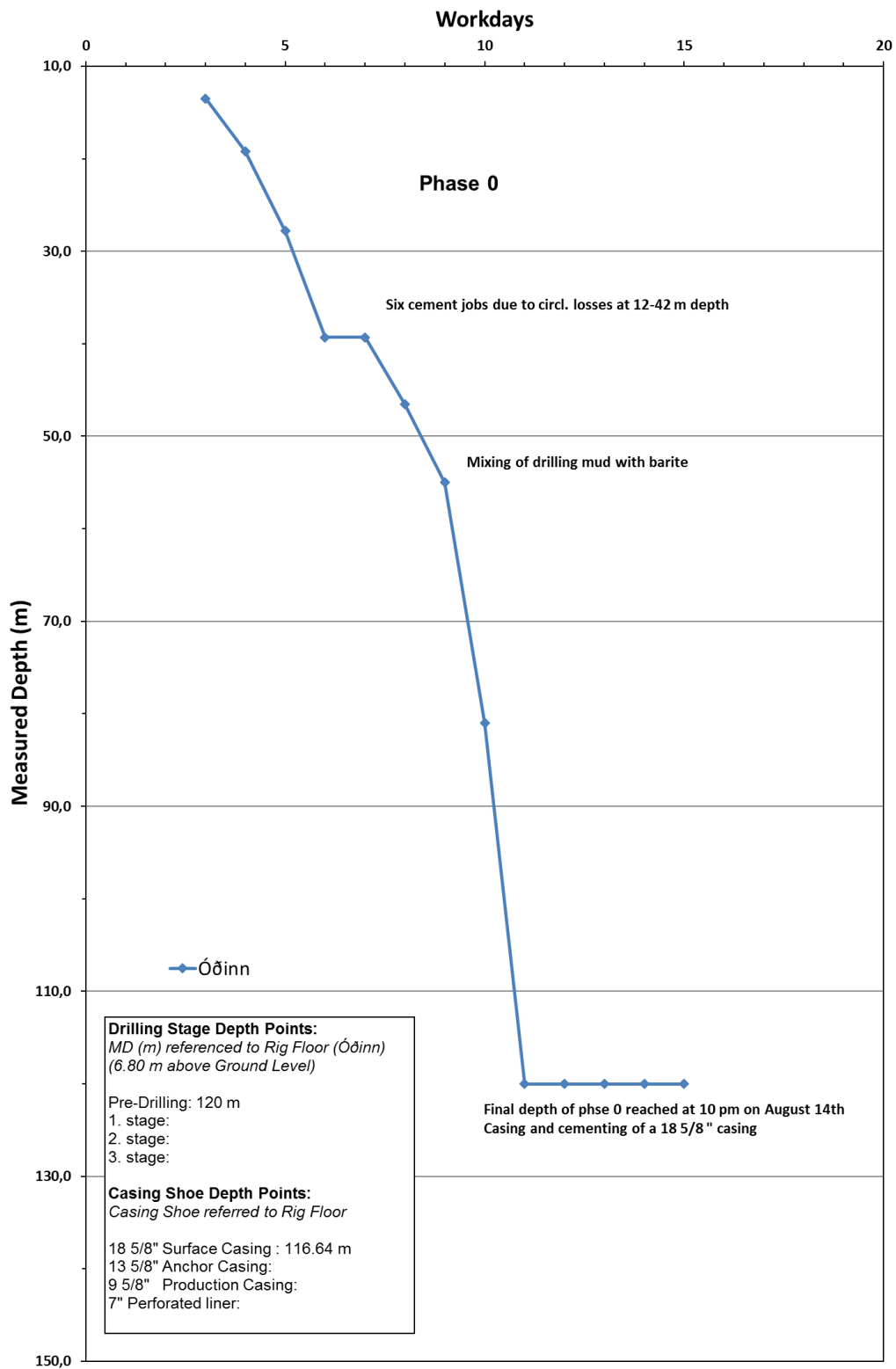


Figure 1. Drilling progress of PG-12 until present.



ÞG-12

Friday

19th of August 2016

Workday #16 of Óðinn

Þeistareykir

Report for Workday #15

Phase 1

Preliminary results

(13 5/8" anchor casing)

<i>Operator:</i> Landsvirkjun	<i>Drilling Company:</i> Iceland Drilling Company	
<i>Well Name:</i> ÞG-12	<i>Drill-Rig:</i> Óðinn	
<i>Well-Id:</i> 60412	<i>Geologist/Geophysicist:</i> MÁŠ (E-mail: mas@isor.is)	
Last casing size: 18 5/8"	Depth at 24:00. 120 m	Hole made last 24 hrs. : m
Last casing depth: 116.6 m	Depth at 8:00. 120 m	Drilling time: hrs.
Drilling fluid: Mud/barite	Circulation losses at 8:00 0 L/s	Average ROP: m/hr

Drilling operation

At 3:30-4:30 am yesterday morning a new flange was welded on top of the 18 5/8" casing. Then at 6 am work on the BOP stack and the flow-line started. At noon preparations for pressure tests of the BOP's started. The pipe-ram and the blind-ram were tested by applying pressure of 20 bar for 8 minutes and also 15 bar for 15 minutes. Both of them passed the tests, no leakage was observed. The Annular blowout preventers, upper and lower, did not pass the tests. The lower Annular was tested by applying variable pressure for closing it, i.e. 900, 1200 and 1400 psi. When applying 1400 psi the Annular remained shut and seemed to be working properly. The upper Annular remained problematic. Despite various attempts and experiments it did not work. A new Annular will be brought from Krafla (the rig Sleipnir) to Þeistareykir this morning. At present the flow line has been disconnected and the upper Annular BOP dismantled and removed. The new Annular is expected to be at the site soon.

Geology

There has been no drilling in formation since 10 pm on the 14th of August. Most likely drilling will resume tonight.



ÞG-12

Saturday
20th of August 2016
Workday #17 of Óðinn

Peistareykir

Report for Workday #16
Preliminary results

Phase 1
(13 5/8" anchor casing)

<i>Operator:</i> Landsvirkjun	<i>Drilling Company:</i> Iceland Drilling Company	
<i>Well Name:</i> ÞG-12	<i>Drill-Rig:</i> Óðinn	
<i>Well-Id:</i> 60412	<i>Geologist/Geophysicist:</i> SRG (E-mail: mas@isor.is)	
Last casing size: 18 5/8"	Depth at 24:00. 120 m	Hole made last 24 hrs. : m
Last casing depth: 116.6 m	Depth at 8:00. 120 m	Drilling time: hrs.
Drilling fluid: Mud/barite	Circulation losses at 8:00 0 L/s	Average ROP: m/hr

Drilling operation

The annular preventer from Sleipnir arrived to the drill site at 08:30 in the morning of August 19th. Between 11:30 and 12:00 it was tested and worked. Between 12:30 and 17:30 the drill crew was working on the BOP stack and connecting the flow-line. Pressure testing of the BOP's was in action from 17:30-22:00, they all passed. At 22:30 the BHA was run in hole with 17 1/2" drill bit (Figure 1). Currently at 10:00 the 20th of August, drilling into formation is starting, the top of float collar was found at 103.8 m. Table 1 shows the drilling progress of phase 0 in ÞG-12

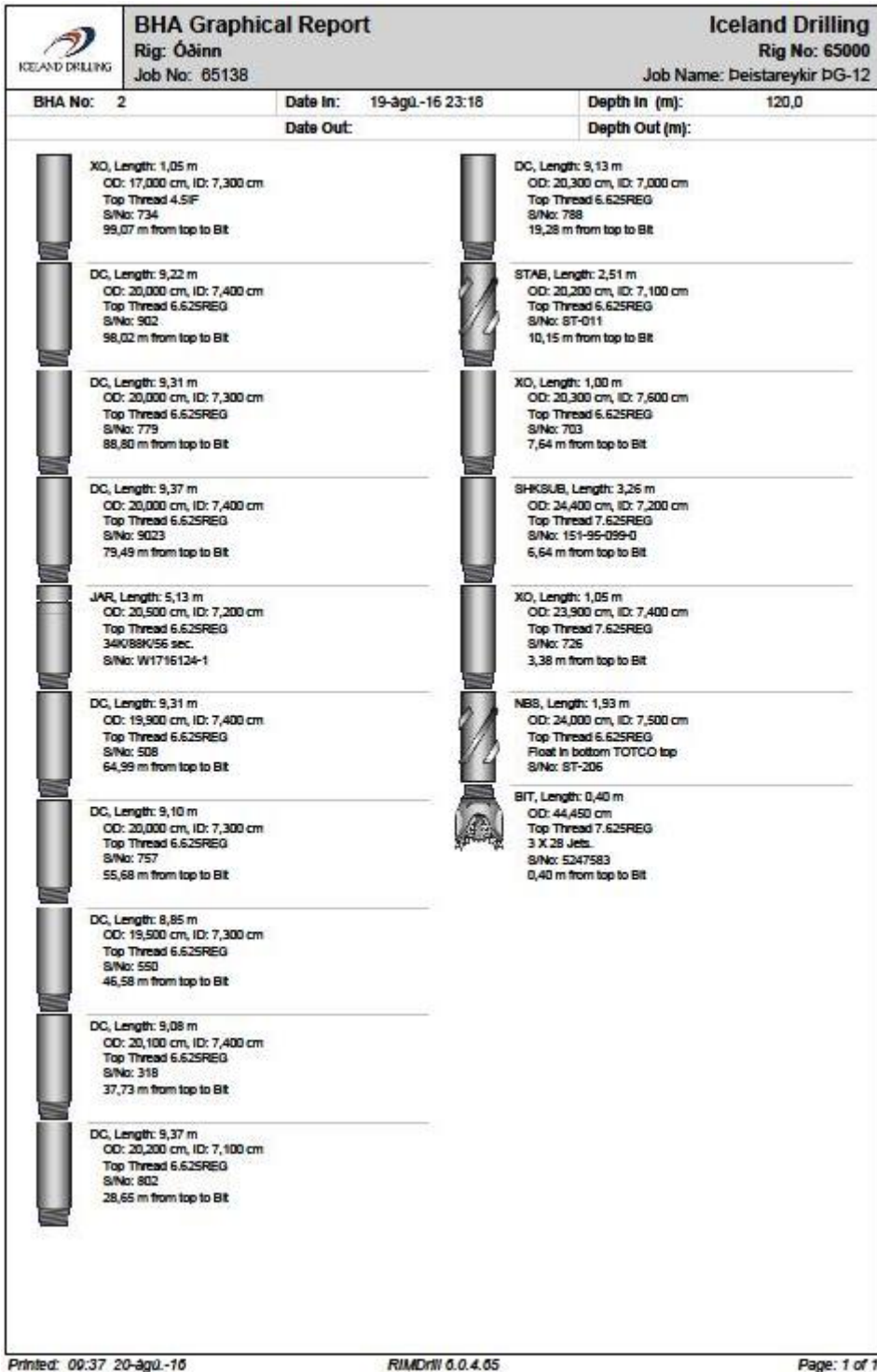


Figure 1. The bottom hole assembly run into ÞG-12 in the beginning of phase 1.

Table 1. *Drilling progress of the pre-drilling phase carried out by Óðinn. Depths are relative to the rig-floor of Óðinn (6.80 m above the ground).*

Day	Drilled Section (m)	Drill Time (h)	ROP (m/h)	Total Depth at 24:00 (m)
6.08.2016	1.6	1.5	1.1	13.5
7.08.2016	5.7	5.75	1.0	19.2
8.08.2016	8.6	6.5	1.3	27.8
9.08.2016	11.5	7	1.6	39.3
11.08.2016	7.2	4.5	1.6	46.5
12.08.2016	8.5	3.5	2.4	55.0
13.08.2016	26	9.3	2.8	81.0
14.08.2016	39	18	2.2	120.0
Total	120	56	1.75	120.0

Geology

Drilling into formation has just started, and the lithology will be updated as soon as samples are achieved.



ÞG-12

Sunday

21st of August 2016

Workday #18 of Óðinn

Peistareykir

Report for Workday #17

Phase 1

Preliminary results

(13 5/8" anchor casing)

Operator: Landsvirkjun

Drilling Company: Iceland Drilling Company

Well Name: ÞG-12

Drill-Rig: Óðinn

Well-Id: 60412

Geologist/Geophysicist: SRG
(E-mail: srg@isor.is)

Last casing size: 18 5/8"

Depth at 24:00. 138 m

Hole made last 24 hrs. : 18 m

Last casing depth: 116.6 m

Depth at 8:00. 191 m

Drilling time: 7.75 hrs.

Drilling fluid: Mud/barite

Circulation losses at 8:00 0 L/s

Average ROP: 2.3 m/hr

Drilling operation

Drilling into formation started at 120 m depth at 11:00 the 20th of August. Drilling was continued down to 122 m when drilling was paused and Washington was put in place. The top drive needed some maintenance for half an hour and then drilling was continued at 13:00. At 14:00 the drill crew noticed a leak in the tanks and a 10" butterfly equalizer was replaced between tanks 4 and 5. When that had been repaired, the drilling fluid was changed from water to gel. Drilling went slowly around 125.6 m with ROP around 0.5 m/hr. That was caused by the stabilizer was still inside the casing. At 22:30 the ROP increased to 8-10 m/hr and the RPM increased to 65. WOB was around 12-13 ton. Figure 1 shows the drilling progress of ÞG-12 from beginning.

PG-12 - Drilling Progress

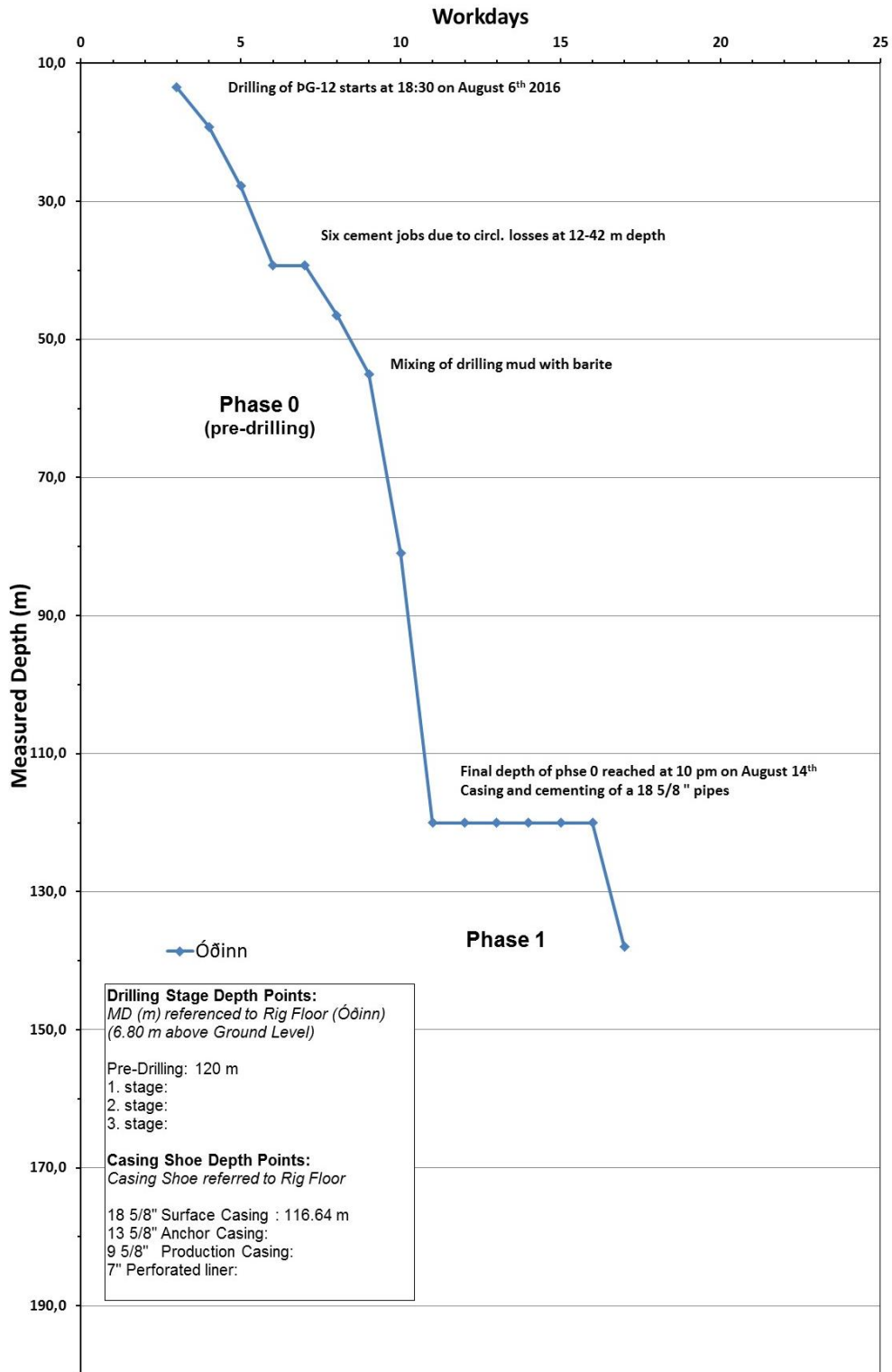


Figure 1. Drilling progress of PG-12

Geology

Today's job will be to analyze drill cuttings from 126 m.

Peistareykir		Report for Workday #18		Phase 1	
		Preliminary results		(13 5/8" anchor casing)	
<i>Operator:</i>	Landsvirkjun	<i>Drilling Company:</i>	Iceland Drilling Company		
<i>Well Name:</i>	ÞG-12	<i>Drill-Rig:</i>	Óðinn		
<i>Well-Id:</i>	60412	<i>Geologist/Geophysicist:</i>	SRG (E-mail: srg@isor.is)		
Last casing size:	18 5/8"	Depth at 24:00.	272 m	Hole made last 24 hrs. :	87 m
Last casing depth:	116.6 m	Depth at 8:00.	300 m	Drilling time:	24 hrs.
Drilling fluid:	Mud/barite	Circulation losses at 8:00	0 L/s	Average ROP:	3.6 m/hr

Drilling operation

Drilling was continuous the whole day and night of 21st of August. Drilling was conducted from 185-272 m with no problems. A circulation loss of 5 l/s were measured at 191 m but no losses were measured at 192 m. The WOB ranged from 7-12 ton. The average ROP was 3.6 m/hr. The anchor casing depth was reached at 06:30 the 22nd of August, and currently at 13:40 ÍSOR's logging engineers are preparing for temperature and caliper measurements. Figure 1 shows the 13 5/8" casing being transported to the drill site. Figure 2 shows an overview of the drill site, picture taken from the top of Mt. Bæjarfjall.



Figure 1. The 13 5/8" casing transported to the drill site.



Figure 2. Overview of the area, seen from top of Mt. Bæjarfjall.

Geology

Samples from 120-300 m have been analyzed. The cuttings are composed of different hyaloclastite formations intersected by fine grained basalt, and intrusions. Alteration is generally high, with abundant of coarse grained clay and quartz in veins and pores. Yellow epidote color was noticed in one sample at 154 m. Figure 3 show the alteration mineral assembly from surface to 300 m in PG-12. Alteration is first noticed at 56 m where light colored clay, quartz and epidote color is noticed. Quartz is seen quite continuously down to the bottom. Coarse grained clay replaces fine grain clay at 158 m and at that depth epidote is seen again. No zeolites are found below 180 m. Stilbite, scolecite and laumontite were the only zeolites analyzed.

120-122 m CEMENT

122-126 m NO CUTTINGS

126-128 m CEMENT

128-158 m BASALTIC TUFF

Dense and grayish tuff grains. Plagioclase seen in groundmass. Cement mixed in the uppermost part. Tuff grains become occasionally more porous and increase in pyrite is observed down the formation. Tuff gets more greenish and white at the bottom of the formation.

158-184 m BASALTIC BRECCIA

Dark and fine grained basalt mixed with highly altered tuff grains. The basalt grains are less altered than the surrounding tuff grains. Becomes more tuff-rich down the formation.

184-188 m BASALTIC TUFF

fractured and pyrite rich white tuff grains, some very dense.

188-190 m BASALTIC BRECCIA

190-194 m BASALTIC TUFF

Similar to the tuff formation above.

194-200 m FINE-MEDIUM GRAINED BASALT

Greenish and highly altered fine grained basalt. Coarse grained clay and quartz in pores. Tuff mixed at the bottom.

2000-212 m GLASSY BASALT

Fine grained basalt and tuff grains in a mixture. Pyrite, clay and quartz seen in pores.

212-214 m FINE-MEDIUM GRAINED BASALT

Slightly fractured, light colored, pyrite rich basalt.

214-216 m BASALTIC BRECCIA

Dark and fresh intrusion like grains, mixed with plagioclase porphyritic grains and tuff grains.

216-224 m GLASSY BASALT

Slightly fractured grains with white/clear fillings. Plagioclase porphyritic and light in color (green or gray). Porous with clay and quartz as pore fillings. Most likely pillow basalt, but could also be a lava formation.

224-228 m BASALTIC BRECCIA

Tuff grains mixed with fine grained basalt, highly altered.

228-236 m FINE-MEDIUM GRAINED BASALT

Fine grained light colored, dense and partly fresh basalt, intrusion? Slight oxidation, and clay in pores. Becomes more altered down the formation.

236-240 m GLASSY BASALT

Almost no intrusion like grains. Mostly green grains, with glass in groundmass, porous and filled with clay. Tuff also seen.

240-250 m FINE-MEDIUM GRAINED BASALT

Plagioclase in groundmass. Still some intrusion like grains mixed in. Slight oxidation and the grains are fine crystallized. Slightly porous with clay in pores. Becomes denser down the formation.

250-252 m BASALTIC BRECCIA

Quartz in pores, grains mostly white but still mixed with dark and fresh basalt grains (dolerite).

252-254 m FINE-MEDIUM GRAINED BASALT

Mostly fresh, intrusion like grains.

254-256 m GLASSY BASALT

White and porous (clay and quartz in pores), seem partly crystallized. Tuff grains also noticed.

256-274 m FINE-MEDIUM GRAINED BASALT

Medium altered basalt grains. light gray in color. Pores filled with clay and quartz. Little amount of oxidation. Becomes intrusion like at 260-262 m, plagioclase porphyritic. Below the grains are various in color and slightly mixed with white tuff. Becomes more oxidized at 268 m and plagioclase needles are noticed in groundmass. could be a boundary between the lava formation and an intrusion below. At 272-274 m the grains become less altered and dense.

274-284 m BASALTIC TUFF

Mostly tuff grains, likely reworked sedimentary tuff. Large pyrite crystals noticed. Few fine grained basalt grains mixed in.

284-288 m BASALTIC BRECCIA

Reworked tuff and fine grained basalt in a mixture.

288-292 m GLASSY BASALT

Green and light colored basalt with pores mixed with tuff grains.

292-294 m FINE-MEDIUM GRAINED BASALT

light colored and greenish fine grained basalt. Pores filled with clay. Slightly plagioclase porphyritic.

294-296 m BASALTIC BRECCIA

Tuff mixed with fresh and oxidized basalt grains.

296-300 m FINE-MEDIUM GRAINED BASALT

Clay in pores. Fresh and fine grained basalt. Medium oxidation. Possibly intrusion. Becomes variously altered at 300 m, green, grey and dark grey.

Area/field: Peistareykir
 Well name: PG-12

 Rig: Óðinn
 Depth interval: 11-300 m

 Drilling fluid: Mud
 Drill-stage: Phase 0-1

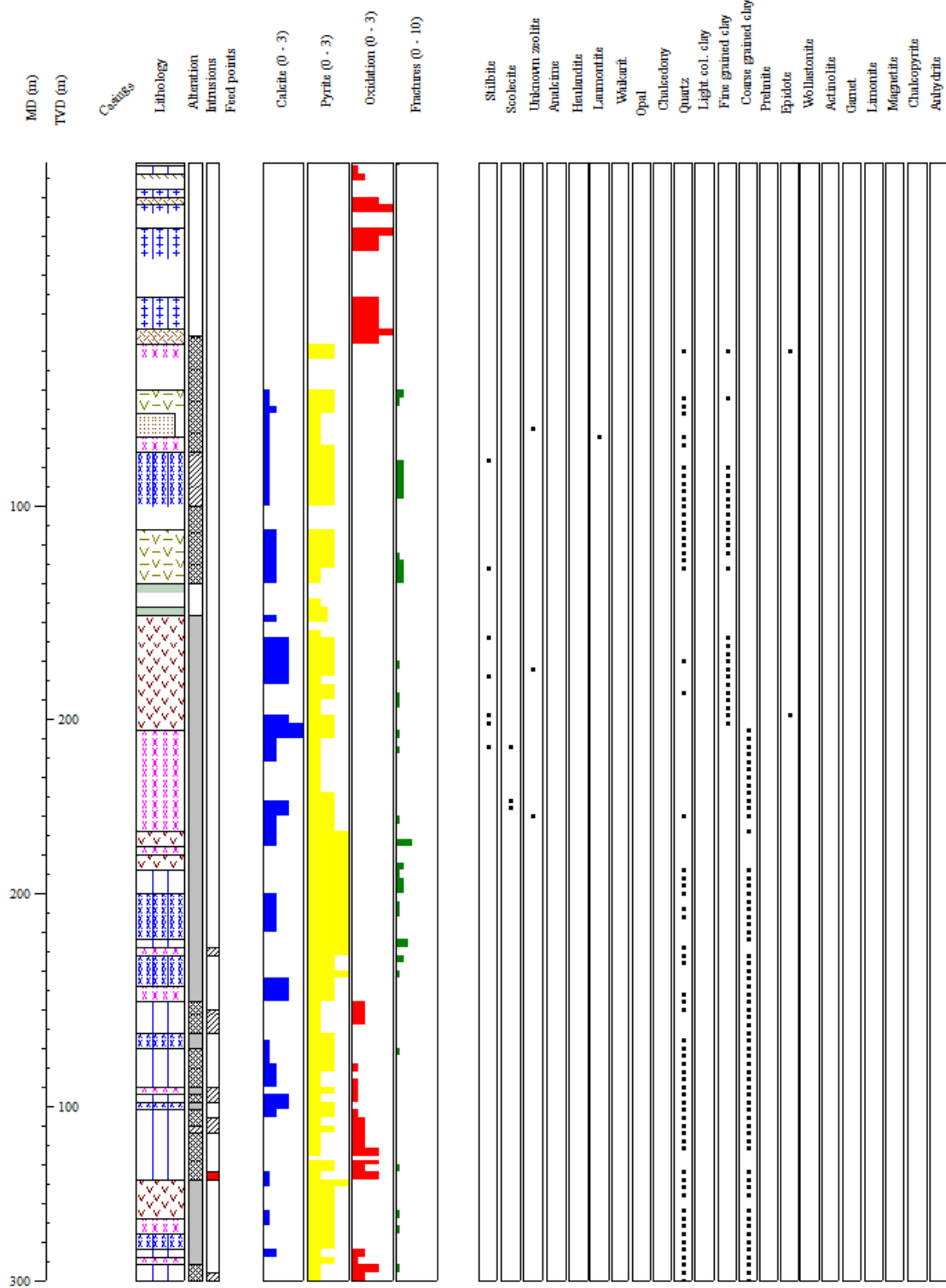
 Well id.: 60412
 Geologist: SRG/MÁS


Figure 3. Alteration mineral assembly in PG-12.

Peistareykir		Report for Workday #19 Preliminary results		Phase 1 (13 5/8" anchor casing)	
<i>Operator:</i> Landsvirkjun		<i>Drilling Company:</i> Iceland Drilling Company			
<i>Well Name:</i> ÞG-12		<i>Drill-Rig:</i> Óðinn			
<i>Well-Id:</i> 60412		<i>Geologist/Geophysicist:</i> SRG (E-mail: srg@isor.is)			
Last casing size:	18 5/8"	Depth at 24:00.	300 m	Hole made last 24 hrs. :	28 m
Last casing depth:	116.6 m	Depth at 8:00.	300 m	Drilling time:	6.5 hrs.
Drilling fluid:	Mud/barite	Circulation losses at 8:00	0 L/s	Average ROP:	4.3 m/hr

Drilling operation

The anchor casing depth was reached at 06:30 the 22nd of August, at 300 m. The well was circulated for 1.5 hours. A wiper trip was performed and bottom hole deposit was 1 meter. The string was pulled out of the well, and that was complete at 15:00. ÍSOR's logging engineers carried out temperature and caliper logging in the well (Figures 1 and 2). Due to high amount of mud in the well, that compacted on the heat sensor on the instrument, causing it to react slowly to heat changes, the temperature measurement does not give the right image on the condition in the well. The same can be said on the caliper measurement, where it seems that the mud has covered the walls in the well, making it look like there are no voids. The only void seen on the caliper measurement is just below the surface casing, which is a well-known phenomenon, where drill bit size is changed from larger to smaller, and also due to circulation processes, connected to the casing job. Based on the caliper log, the cementing of the anchor casing requires 20.6 m³ of cement slurry, but we may expect that the true volume will exceed that.

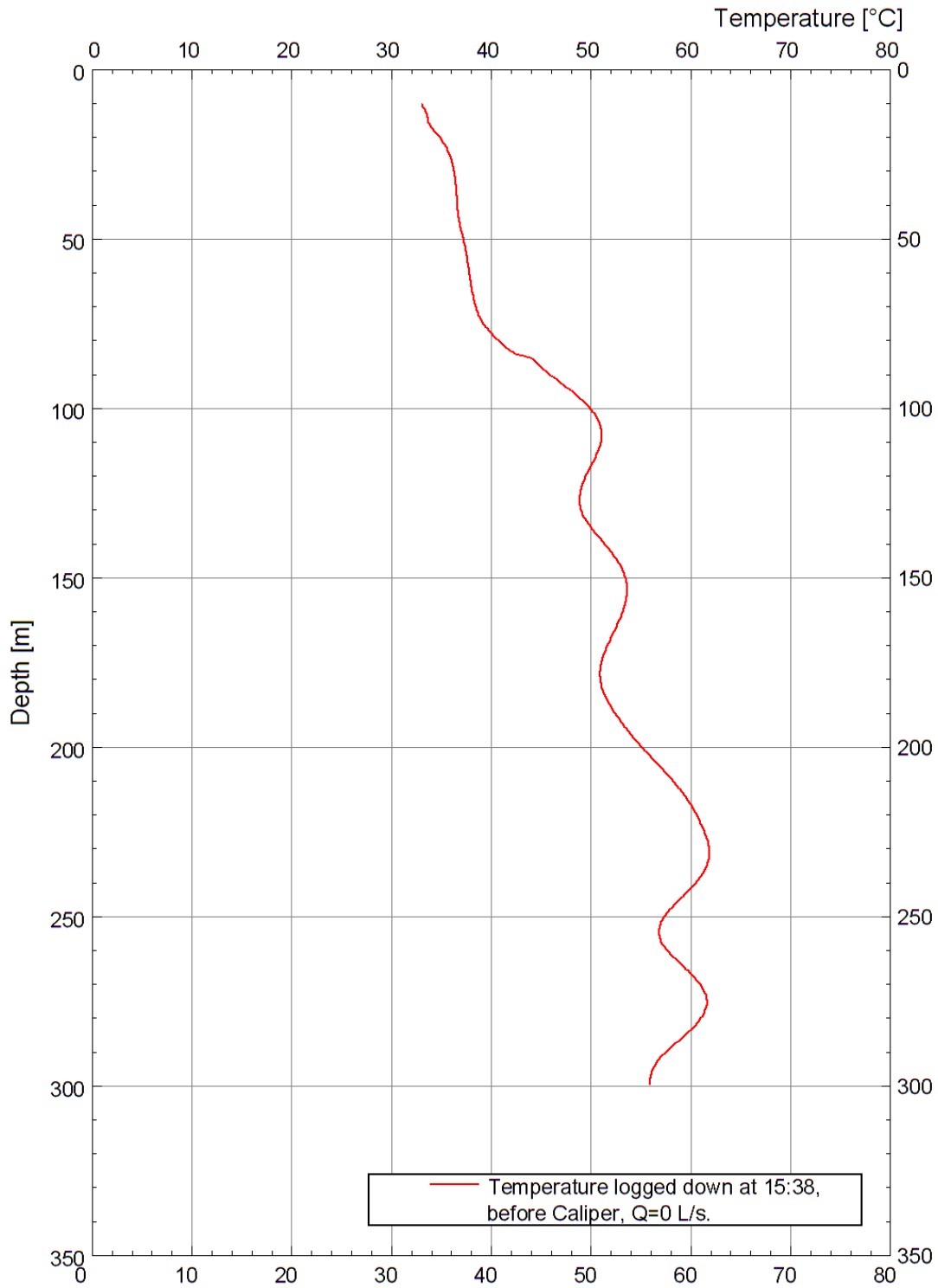


Figure 1. Temperature log in ÞG-12, from August 22nd.

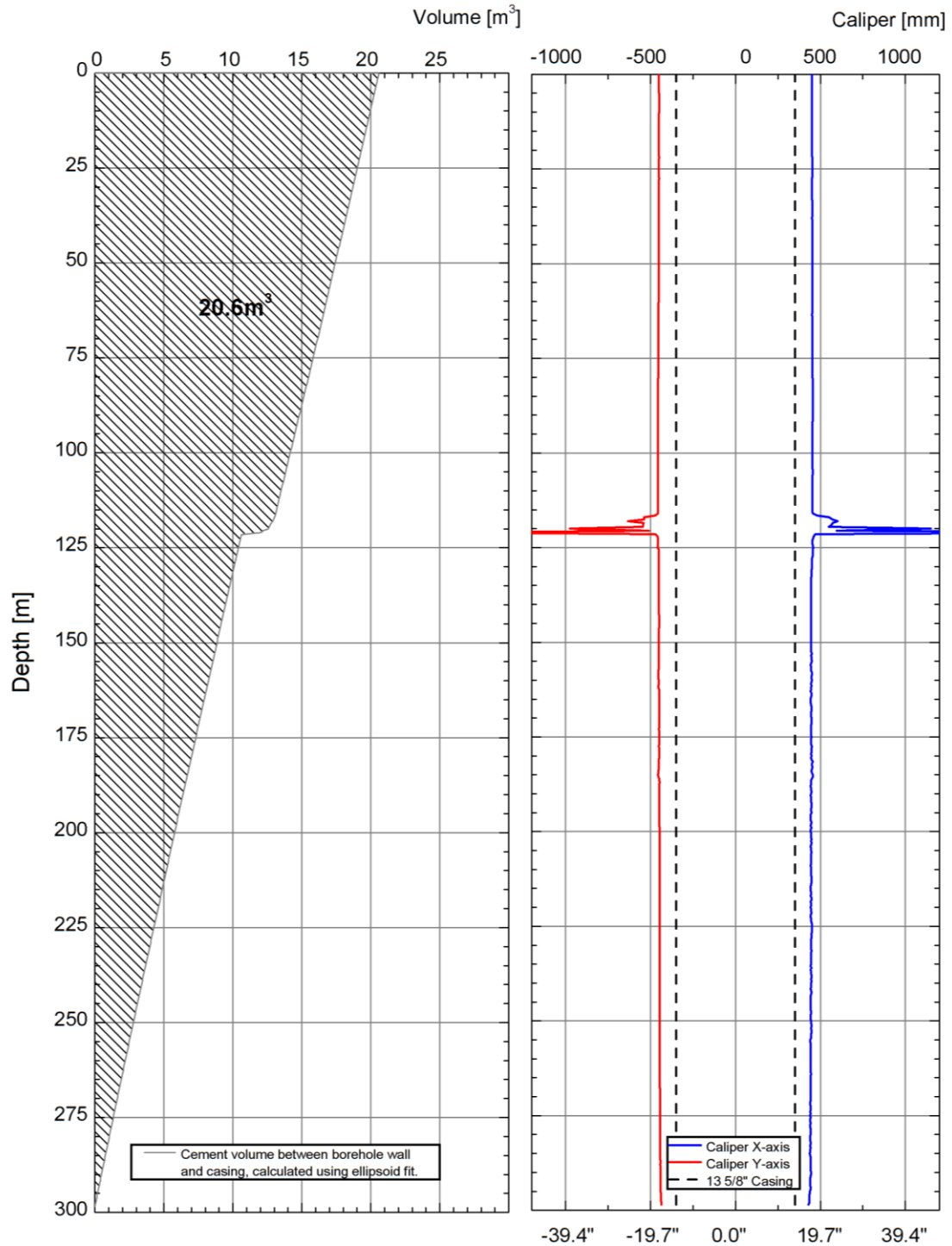


Figure 2. The caliper log carried out the 22nd of August.

Geology

Figure 3 shows description of the lithology in well ÞG-12 during drilling of phase 1.

Staður: Beistareykir
 Holunafni: ÞG-12

 Bor: Óðinn
 Dýptarbil: 120-300 m

 Skolvökvi: Mud
 Verkluti: Phase 1

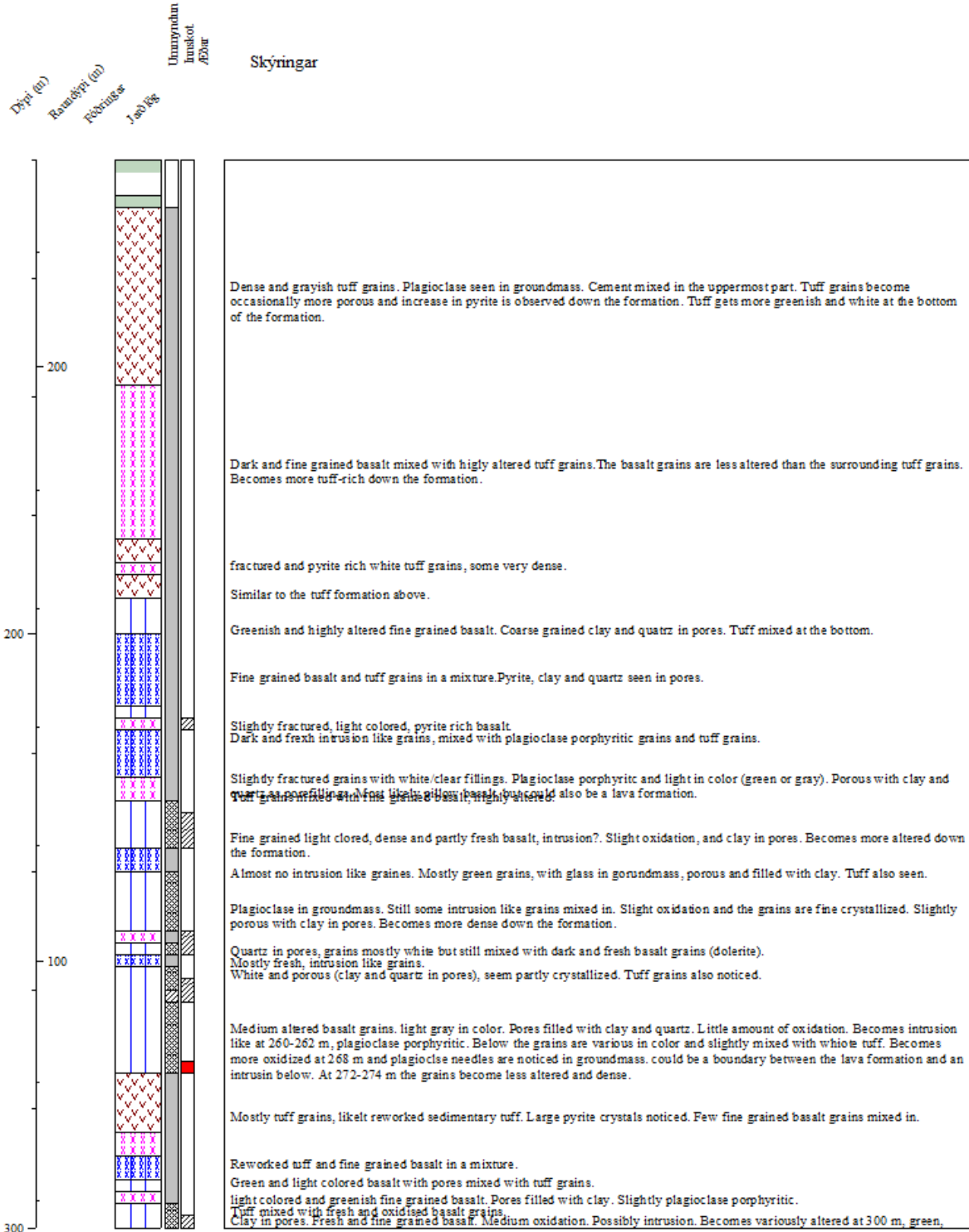
 Staðarnúmer: 60412
 Starfsmenn: SRG/MÁS


Figure 3. Description of the lithology in well ÞG-12 from 120-300m.

Peistareykir **Report for Workday #20** **Phase 1**
Preliminary results (13 5/8" anchor casing)

<i>Operator:</i> Landsvirkjun	<i>Drilling Company:</i> Iceland Drilling Company
<i>Well Name:</i> ÞG-12	<i>Drill-Rig:</i> Óðinn
<i>Well-Id:</i> 60412	<i>Geologist/Geophysicist:</i> SRG (E-mail: srg@isor.is)
Last casing size: 13 5/8"	Depth at 24:00: 300 m Hole made last 24 hrs. : - m
Last casing depth: 292.2 m	Depth at 8:00: 300 m Drilling time: - hrs.
Drilling fluid: Mud	Circulation losses at 8:00: 0 L/s Average ROP: - m/hr

Drilling operation

The drill crew was running in the casing between 00:00 and 12:00 at noon the 23rd of August. The maximum temperature reached up to 57°C. The final casing depth was 292.2 m and then the well was circulated for 2 hours. The cement string was run in hole in the afternoon and then the well was circulated for 2.5 hours. The pressure rose up to 52 bar but decreased rapidly when the circulation was turned on. Maximum temperature was 66.3°C. The well was circulated for additional 1.5 hours' trough poorboy, with water and soda. Figure 1 shows the casing report for the 13 5/8" anchor casing.

Run Joint		Item		Length	Top	Bottom	Description	Comments	Cnt	Ser
1		SHOE	0,840	291,320	292,160	0,00 x 0,00	BUTT			
2	25	JOINT	11,440	279,880	291,320	34,61 x 0,00	K-55 BUTT		2	
3	24	JOINT	11,420	268,460	279,880	34,61 x 0,00	K-55 BUTT			
4	23	JOINT	11,440	257,020	268,460	34,61 x 0,00	K-55 BUTT			
5		FLOAT	0,500	256,520	257,020	0,00 x 0,00	BUTT			
6	22	JOINT	11,430	245,090	256,520	34,61 x 0,00	K-55 BUTT		1	
7	21	JOINT	10,980	234,110	245,090	34,61 x 0,00	K-55 BUTT			
8	20	JOINT	11,440	222,670	234,110	34,61 x 0,00	K-55 BUTT			
9	19	JOINT	11,420	211,250	222,670	34,61 x 0,00	K-55 BUTT		1	
10	18	JOINT	10,840	200,410	211,250	34,61 x 0,00	K-55 BUTT			
11	17	JOINT	11,440	188,970	200,410	34,61 x 0,00	K-55 BUTT			
12	16	JOINT	11,280	177,690	188,970	34,61 x 0,00	K-55 BUTT		1	
13	15	JOINT	11,420	166,270	177,690	34,61 x 0,00	K-55 BUTT			
14	14	JOINT	11,200	155,070	166,270	34,61 x 0,00	K-55 BUTT			
15	13	JOINT	11,440	143,630	155,070	34,61 x 0,00	K-55 BUTT		1	
16	12	JOINT	11,410	132,220	143,630	34,61 x 0,00	K-55 BUTT			
17	11	JOINT	11,430	120,790	132,220	34,61 x 0,00	K-55 BUTT			
18	10	JOINT	11,400	109,390	120,790	34,61 x 0,00	K-55 BUTT		1	
19	9	JOINT	11,420	97,970	109,390	34,61 x 0,00	K-55 BUTT			
20	8	JOINT	11,400	86,570	97,970	34,61 x 0,00	K-55 BUTT			
21	7	JOINT	11,420	75,150	86,570	34,61 x 0,00	K-55 BUTT			
22	6	JOINT	11,000	64,150	75,150	34,61 x 0,00	K-55 BUTT		1	
23	5	JOINT	11,010	53,140	64,150	34,61 x 0,00	K-55 BUTT			
24	4	JOINT	11,230	41,910	53,140	34,61 x 0,00	K-55 BUTT			
25	3	JOINT	11,430	30,480	41,910	34,61 x 0,00	K-55 BUTT			
26	2	JOINT	11,160	19,320	30,480	34,61 x 0,00	K-55 BUTT			
27	1	JOINT	11,400	7,920	19,320	34,61 x 0,00	K-55 BUTT			

Figure 1. Casing report for the 13 5/8" casing.

PG-12 - Drilling Progress

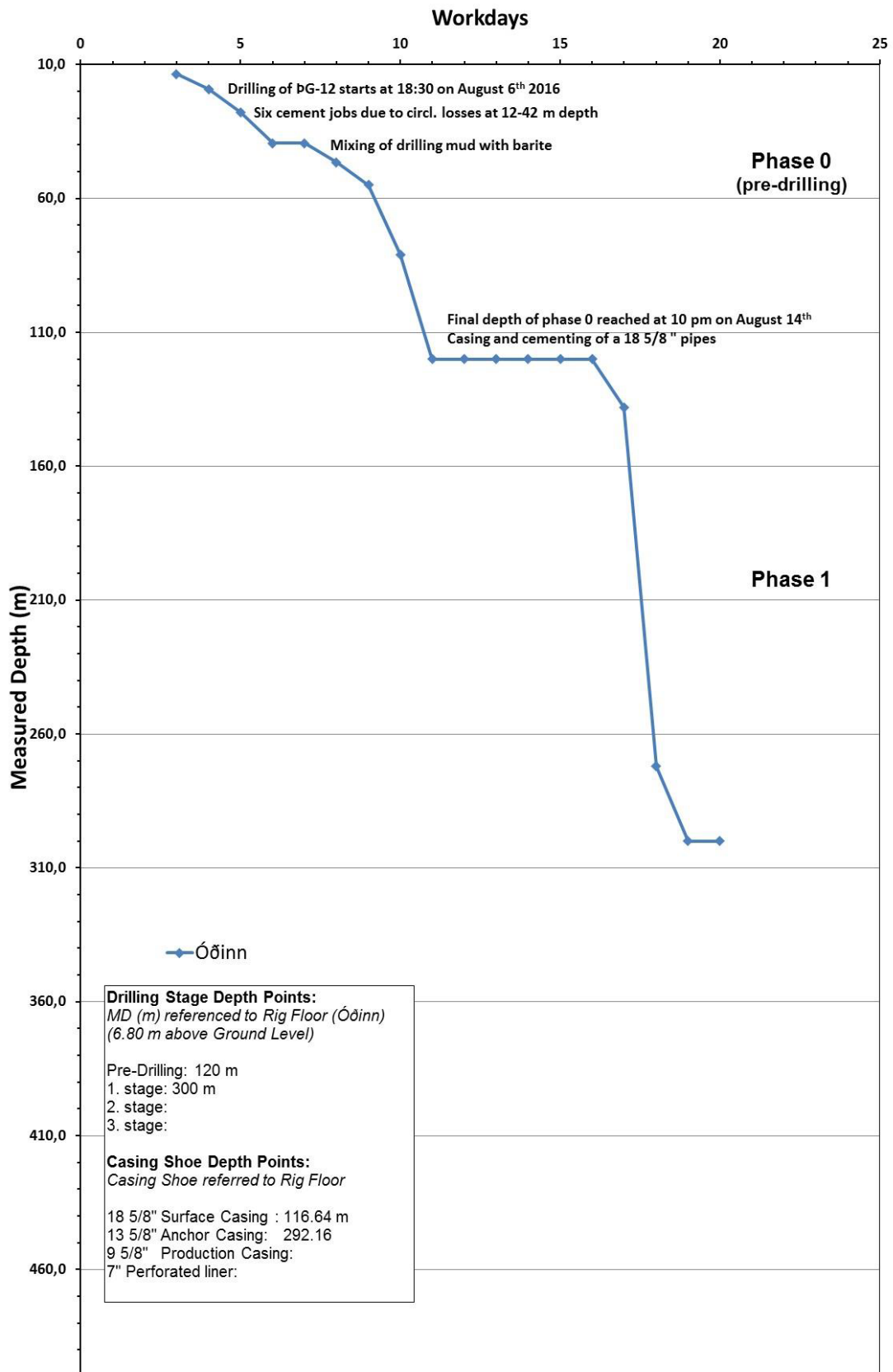


Figure 2. Drilling progress of PG-12 from beginning until present.

Geology

Figure 3 shows a comparison of the lithology in wells ÞG-12 and ÞG-6. In both the wells medium grained basalt is dominant in the uppermost 40-50 meters, where a thick unit of hyaloclastite formations (e.g. tuff, breccia and pillow basalt) takes over below. The hyaloclastite unit seems to be thicker in ÞG-12, where it reaches down to approximately 190 m depth, but 130 m in ÞG-6. Below the hyaloclastite unit, in both the wells, a section of fine grained basalt (intrusions in some cases), intersected by variously thick pillow basalt formations is seen down to approximately 280 m. Below that, breccia and tuff formations seem to become more dominant.



24.08.2016

Location: Þeistareykir
Well Name: ÞG-12

Drill Rig: Óðinn
Depth Interval: 11-300 m

Circulation fluid: Mud
Drill-stage: Phase 0-1

Geologist: SRG/MÁS

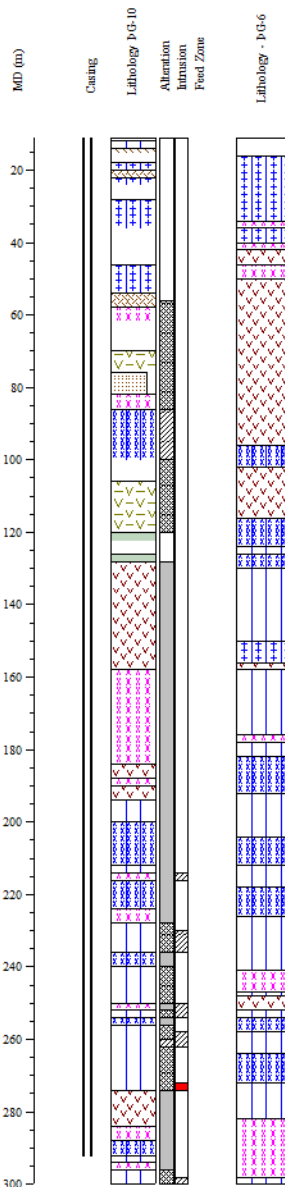


Figure 3. Comparison of lithology in wells ÞG-12 and ÞG-6.

Peistareykir

Report for Workday #21
Preliminary results

Phase 1
(13 5/8" anchor casing)

<i>Operator:</i> Landsvirkjun	<i>Drilling Company:</i> Iceland Drilling Company	
<i>Well Name:</i> ÞG-12	<i>Drill-Rig:</i> Óðinn	
<i>Well-Id:</i> 60412	<i>Geologist/Geophysicist:</i> SRG (E-mail: srg@isor.is)	
Last casing size: 13 5/8"	Depth at 24:00: 300 m	Hole made last 24 hrs. : - m
Last casing depth: 292.2 m	Depth at 8:00: 300 m	Drilling time: - hrs.
Drilling fluid: Mud	Circulation losses at 8:00: 0 L/s	Average ROP: - m/hr

Drilling operation

The well was circulated clean with water and soda with 15 l/s pumping between 00:00 and 02:30 the 24th of August. Afterwards, the cementing of the 13 5/8" casing was carried out. In total, 21.5 m³ of cement slurry were used in the operation (Figure 1). Cement returns were noticed and the string was pulled out at 03:30. Waiting on cement was carried out until 22:30, when ÍSOR's logging engineers performed temperature and cement bond logging measurements (Figure 2 and 3). The CBL log revealed good bonding above 130 m, but below the amplitude from the instrument was greater, indicating less bonding. However, mud was noticed on the instruments and could have affected the measurement, by giving bad signal.

ÍSOR ICELAND DRILLING		Cementing Report		Iceland Drilling		
		Rig: Óðinn		Rig No: 65000		
		Job No: 65138		Job Name: Peistareykir ÞG-12		
Cement Job Information						
Start Date/Time:	24-ágú.-16 02:38	Well Bore:	Original Well Bore			
Job Type:	PRIMARY	String OD (cm):	34,61			
Well Section:	INT1	String Type:	FULL			
Cementing Co:	JARDB	Cementing Engineer:	Sveinbjörn / Andrés			
Primary Job Detail						
	Volume (cu m)	Pump Time	Rate (cu.m./min)	Pressure (bar)		
Conditioning Data:						
Cement Data:	21,5	31	0,7			
Displacement Data:	3,5	6	0,6			
Calc. Displacement Vol:						
<input type="checkbox"/> Batch Mix?		<input type="checkbox"/> Bump Plug?		Bump Pressure:		
Returns to Surface:	FULL	<input type="checkbox"/> Reciprocate Pipe?		<input checked="" type="checkbox"/> Cement at Surface?		
Calc Top of Cement (m):		Excess (%):	Avg. Hole Size (cm):		44,45	
Slurry Information						
Type	Density	Yield	Sacks	Volume	Rate	Additives
LEAD	1.730,00			21,5	0,7	
Post Job Information						
Liner Top Test (kg/cu m):		Job Success?		Yes		
Actual Top of Cmt (m):		CBL Bond Quality:				
Misc. Comments:	13 5/8" Föðringar steyping					

Figure 1. Cement report for cementing of the 13 5/8" casing.

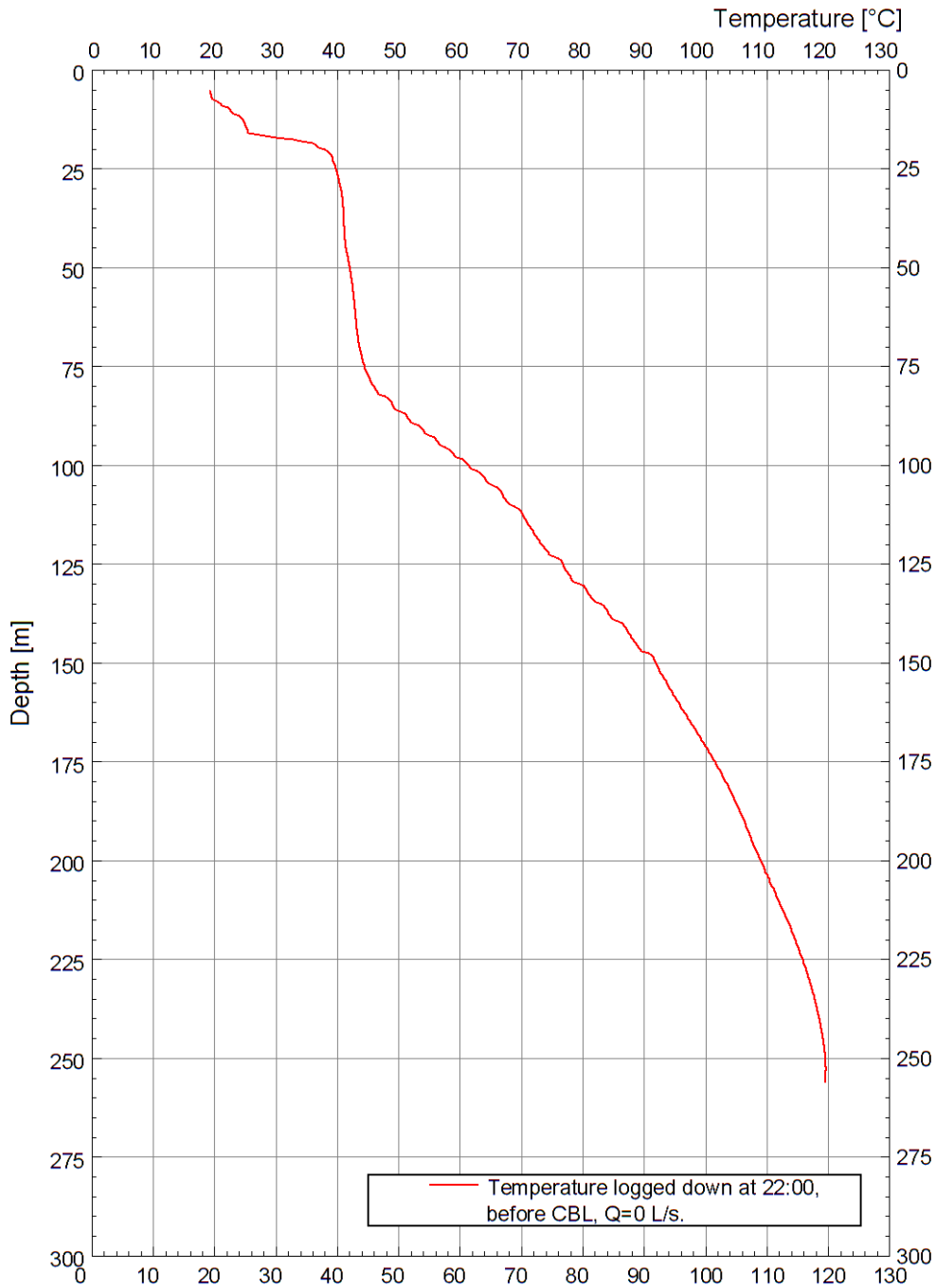


Figure 2. Temperature measurement carried out the 24th of August.

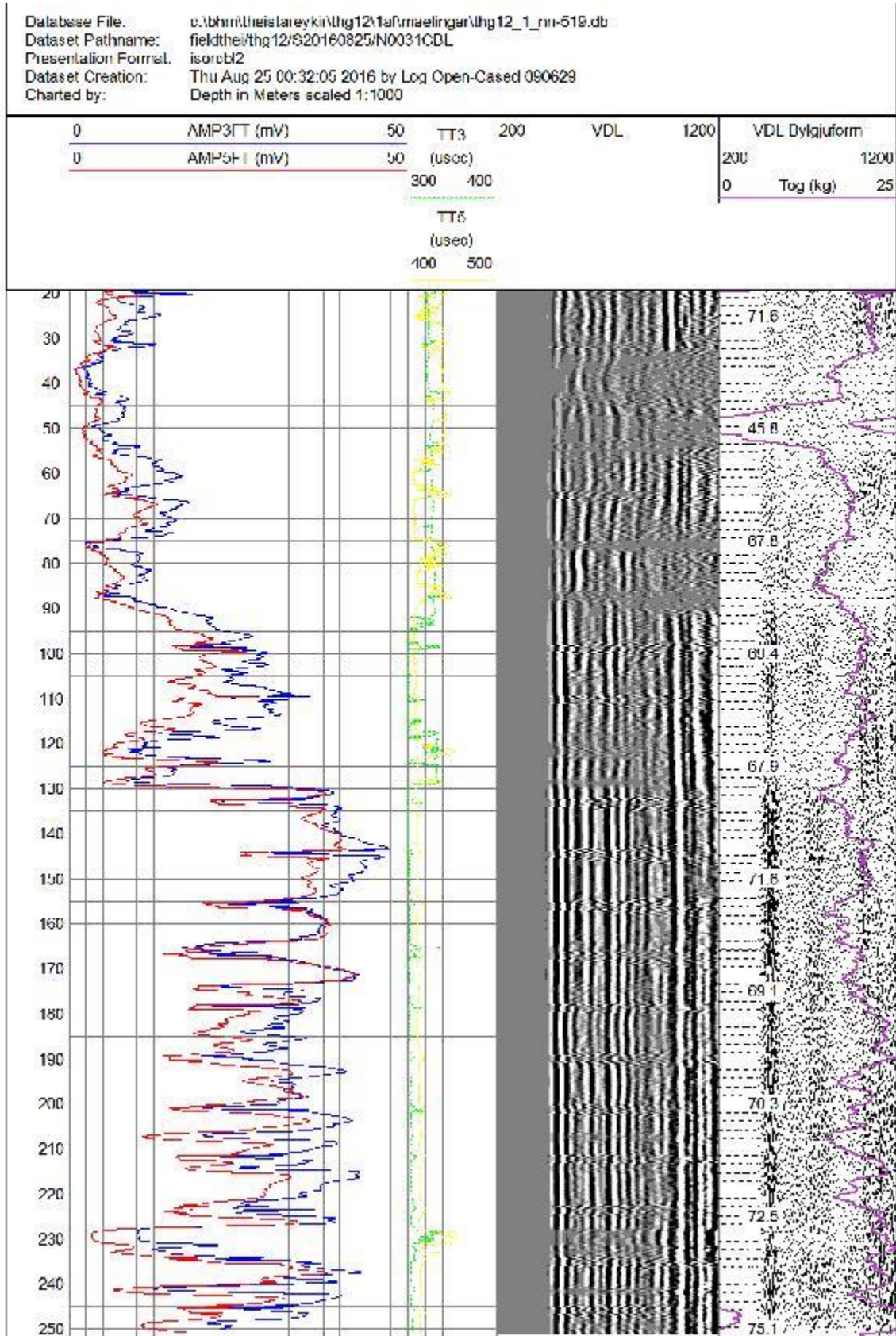


Figure 3. CBL measurement in PG-12, after cementing of the anchor casing.



ÞG-12

Friday

26th of August 2016

Workday #23 of Óðinn

Þeistareykir

Report for Workday #22

Phase 1

Preliminary results

(13 5/8" anchor casing)

<i>Operator:</i> Landsvirkjun	<i>Drilling Company:</i> Iceland Drilling Company	
<i>Well Name:</i> ÞG-12	<i>Drill-Rig:</i> Óðinn	
<i>Well-Id:</i> 60412	<i>Geologist/Geophysicist:</i> SRG (E-mail: srg@isor.is)	
Last casing size: 13 5/8"	Depth at 24:00. 300 m	Hole made last 24 hrs. : - m
Last casing depth: 292.2 m	Depth at 8:00. 300 m	Drilling time: - hrs.
Drilling fluid: Mud	Circulation losses at 8:00 0 L/s	Average ROP: - m/hr

Drilling operation

ÍSOR's logging engineers completed their temperature and CBL measurements around 02:00 25th of August. WOC was carried out until 04:00 and at 04:30 the flow-line was disconnected and the BOP stack taken down. The 18 5/8" casing was cut between 12:30 and 16:00. The 12x1500 psi flange was screwed on top of the 13 5/8" casing, and that operation was finished at 18:00. Afterwards, the drill crew started to rebuild the BOP stack, and currently at 09:00 the 26th of August, this operation is still ongoing.



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