
1	.....	1
2	.....	1
2.1	.....	1
2.2	.....	1
2.2.1	.....	1
2.2.2	.....	1
2.2.3	.....	2
3	.....	3
3.1	.....	3
3.1.1	.....	3
3.1.2	.....	4
3.1.3	.....	4
3.1.4	.....	8
3.2	.....	9
3.2.1	.....	9
3.2.2	.....	12
3.3	.....	12
3.4	.....	13
3.4.1	.....	13
3.4.2	.....	13
3.4.3	.....	14
3.5	.....	14
3.6	.....	15
3.6.1	.....	15
3.6.2	.....	16
3.6.3	.....	18
3.6.4	.....	19
3.6.5	.....	20
4	.....	21
4.1	.....	21
4.2	.....	21
4.2.1	H	21
4.2.2	S	22
4.2.3	R	22
4.2.4	.....	24
4.3	.....	24
4.3.1	.....	24
4.3.2	.....	26
4.3.3	I	26

4.3.4	.....	27
4.4	.....	36
4.5	.....	40
4.5.1	.....	40
5	.....	42
1	.....	45
2	.....	54

1

- - 25000t/d
476m 9200 m³ 39m 5km
5km 5.7km

“

”

HJ740-2015

2

2.1

1

2

3

2.2

2.2.1

1

2015 1 1

2

2007 11 1

3

2009 5 1

4

2016 1 1

5

2002 10 1

6

2008 6 1

2017 6 27

7

1997 3 1

8

2015 4 24

9

2011 35

10

[2014]119

11

17

12

32

13

34

14

2018 2

2.2.2

1

(HJ941-2018)

2

3

[2004]69

4		HJ7402015
5		GB182182009
6	2015	
7		GB500162014
8		HJ 5232009
9		[2005]272
10	-	GB5085.32007
11		
Q/SY11902013		
12		2013
13	2015	
14		GB185992001
15		GB38382002
16		GB30952012
17		GB/T148482017
18		GB 156182018
19		GB 42842018
20		GB89781996
21		GB 254672010

2.2.3

- 1
- 2
- 3
- 4

3

3.1

3.1.1

- - -

5km

2011 5

2012 8

2012 8

3

25000t/d

124 t

117648t/a

1401t/a

3000t/a

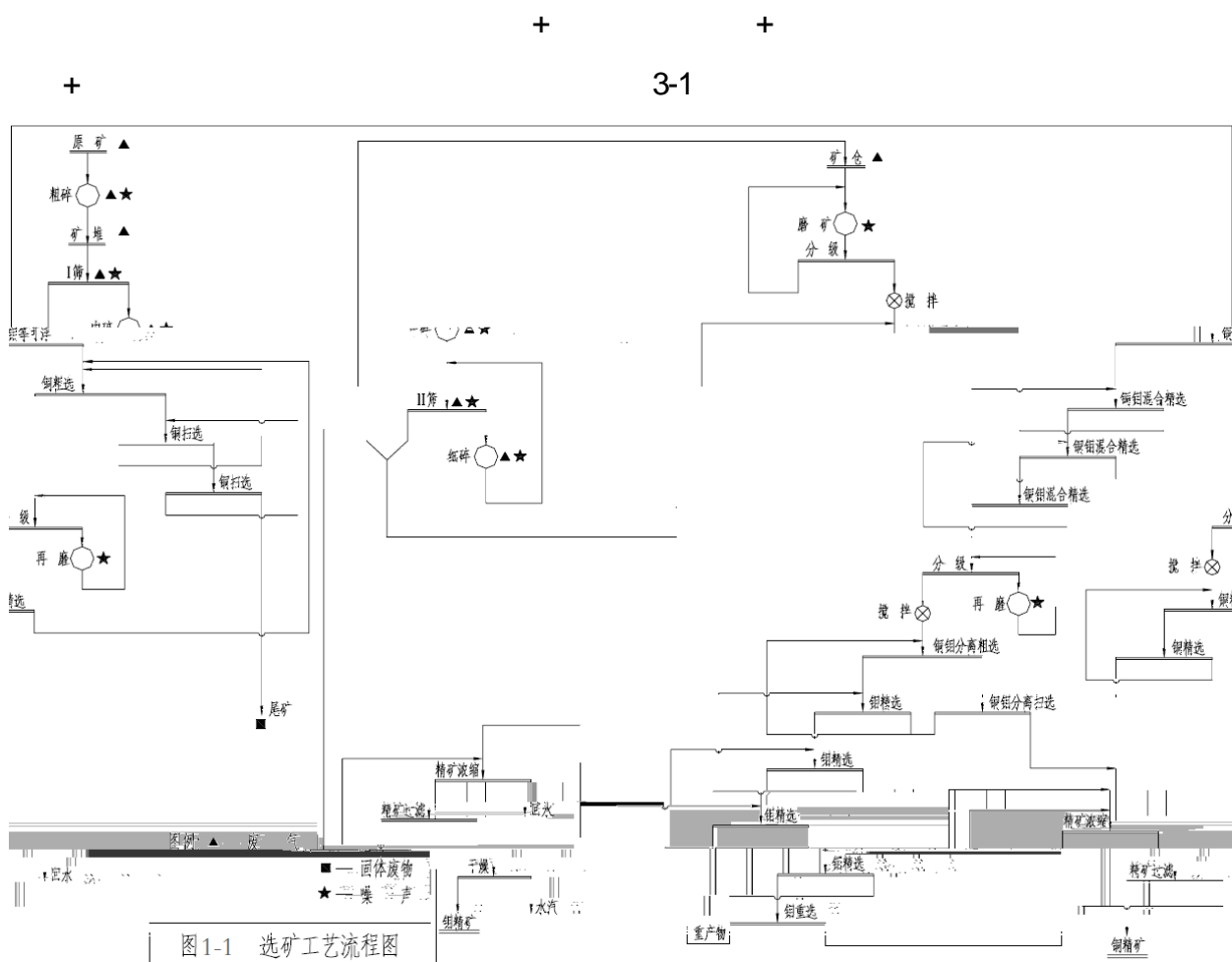
34

3-1

3-1

				17
		$f \cdot \dot{Z}$	$f \cdot \dot{Z}$	$f \cdot \dot{Z}$
			400	
	300	3	8	8
			251	8
			2500 /	
			04567595637	
				04567595600
				04567595559
	2011			20
		2017 3 20		FM
		2020 3 19		[2017]HH3414
		/		/
		2008 6 18		[2008]184
" "				
		2014 7 23		[2014]146
		/		/

3.1.2



3-1

3.1.3

3.1.3.1

5 km

105hm²

476m

9200 m³

39m

3-2

3-2

			04567595600	
	17			
	125°44'41" Ž	f 44" Ž	50°11'26" Ž	50°14'22" Ž
	250 166 6 164 12 40 10km 16km 20km 20km 11km 150km			
	9200 m ³		39m	
	2012			
	Cu Mo Ag Au Cd			
	Hg Cr Pb As			
	738.1 t		202707 15496.18	
	300		19	
	[2008]184	“ ”	[2014]146	
			16	
0456 7595600	0456 7595566	13959058696	15046973787	18724329648

3.1.3.2

1

456m 4m 19m 933m
 1 2.0 1 2.5

2

9200 m³ 6500 m³ &6A' Cp4

A. 1# 2017 3 2#
1# 1500m 2# 2500m
4.5m 15m 1#
448m 2# 462m 2 1m

B. 50m
80m 210m 0.5m 0.6m
2008 2
255 m³ 293 m³

4

A. 6 0.5m
0.6m 1m 20cm
B. 200m 1 4

C. 1#
2m 2500m 0.8-1.12%

5

A. PVE 30mm 50-85m
B. PVE 30mm 45-100m

6

①

1 370m

50% 60%

370m

2461.76m²

Q 41000m³/d

②

3 P 10m

2 300ZBD 530 DCZ AZT

2 65QV SP

2

300ZBG760-DCZ-AZT

2 300ZBG760-DCZ-

AZT

DN500x12

L 9000m

③

18m×18m

250SS132 O

2

Q 864m³/h H 120m

DN500

L 10000m

16900m³/d

④

DN500

DN500

2# 50 m

9 km

20000m

2# 50m 2.5m 2.5m
 10km
 7
 190m
 441.0m 4m 437.0m 4m 470m
 1:2.5 1:1.5 2mm HDPE

0.5m
 10^7 cm/s 2000m³

3km 500m
 423.0m 424.5m 2.0m 4m 10m
 40cm
 D1.5m
 10 m³

3.1.4

738.1 m³/a d(50) 0.021mm
 0.599m²/g 2630kg/m³ 1370kg/m³
 2.33

3-3

3-3

	m ³ /d	m ³ /d	m ³ /d	m ³ /d	
	15166	16900	30332	326	:
	300				:
	360				:

3.2

3.2.1

1

600km
160km
152km
 $f \cdot \check{Z} a$ $f \cdot \check{Z}$ $f \cdot \check{Z} a$ $f \cdot \check{Z}$
6km —
13km —
4km 5km

2

①

420m~430m
10° 20°
490.3m 491.3m
38km² 0.033m³/s 20.033m³/s

164 166

②

• • 7 1
• •
531mm 586mm 6 8 60%
61.2mm 869mm 990mm
4.0m/s 15m/s
105 9 5 0.8m 2.1m 2m 7m

③

GB50011-

2010

GB183062001

6

0.05g

④

3-4

3-4

à	GB38382002	à	pH	6~9
			NH ₃ -N	" mg/L
			COD	" mg/L
				• mg/L
				" mg/L
				" /L
				" mg/L
				" mg/L
				" mg/L
				" mg/L
				" mg/L
				" mg/L
				" mg/L



					" 2 mg/L
					" 07 mg/L
	-	GB 156182018			"65 mg/kg
					"38 mg/kg
					"60 mg/kg
					"18000mg/kg
					"800 mg/kg
					"5.7 mg/kg
					"150 mg/kg
	-	GB 42842018	-		"15 mg/kg
					" mg/kg
					" mg/kg
					" mg/kg
					" mg/kg
					"1500mg/kg
					"3000 mg/kg
					" mg/kg

3.2.2

①

11552 2734 152km 15 16 26931hm² 4928hm²

②

3.3

HJ7402015

10km 80 3km 10km 3km

3-5

3-5

				/m	
1			S		
2			E	10000 m	
3			ES	4200 m	>+10m
4		166	EN	7800 m	>+10m
5		164	EN	6200 m	>+10m
6			WS	3800 m	>+10m
7		S310	S	5000 m	>+10m
8		S208	W	4900 m	>+100m

3.4

500m

1000m 4

pH SS CODcr

8

3.4.3

1 24 8 3

2

3

3.5

GB185992001

I

3-6

GB89781996

GB 254672010

3-7

3-6

mg/L pH

		GB5085.3-2007		GB8978-1996	GB 25467-2010	
pH	6.85	/	/	6 9	6 9	
Cu	0.0006	100		0.5	0.5	
Zn	0.0101	100		2.0	1.5	
Cd	ND	1		0.1	0.1	
Pb	0.0018	5		1.0	0.5	
Cr	ND	15		1.5	/	
Cr⁶⁺	ND	5		0.5	/	
	ND	1			/	
Hg	0.0049	0.1		0.05	0.05	
Be	ND					

		GB5085.3-2007		GB8978-1996	GB 25467-2010	
Ni	0.0010	5		1.0	0.5	
Ag	ND	5		0.5	/	
As	0.0057	5		0.5	0.5	
Se	ND	1		0.1	/	
F ⁻	0.1546	100		/	5	/
CN ⁻	0.003	5		0.5	/	
5535.75 t						

1 “ ” 10ng/L 20ng/L ND

3-7

mg/L pH

		GB8978-1996	GB 25467-2010	
pH	7.3	6 9	6 9	/
Cu	3.25	0.5	0.5	6.5
Zn	0.05 L	2.0	1.5	
Cd	0.0001 L	0.1	0.1	
Pb	0.001 L	1.0	0.5	
Cr	0.257	1.5	/	
Hg	4× 10 ⁵ L	0.05	0.05	
As	0.0003 L	0.5	0.5	
Se	0.0004 L	0.1	/	
F ⁻	3.03	/	5	/
CN ⁻	0.004	0.5	/	

pH 7.3

6.5

3.6

3.6.1

3-8

3-8

1			720m³	/
2		864m³/h	250SS132 O 120m 450kW	Y40034 ²
3			20000m³	
4			230m³	/
5		600m³/h	280kw 125m	4 2
6			10 ⁻⁷ cm/s	
7			2000m³	/
8		100m³/h	7.5kw 50m	
9		3km m³	10	
10			190m	

3.6.2

3-9

3-9

		/	/	/	
		4		/	
		2		/	
		/	/	/	
		/	/	/	
		/	/	/	
		/	/	/	
		50		/	
		40		/	
		/	/	/	
		8		/	
		5		/	
		5		/	
		280		/	
		33		/	

--	--	--	--	--	--

65

3.6.3

10

4

3-10

3-10

			/	
Cu			250ml 250ml	2.5
Pb				
Zn				
COD				
pH		pH		

				04567595524			

3.6.5

3-12

13km

6km

15min

20t

3-12

3-12

1			04567520027
2			04567534058
3			04567552020
4			04567850234
5			04567850119
6			04567850148

4

4.1

A

4-1

4-1

		/		
		¥	‘	
		¥	‘	
		¥		
		¥	‘	400
		2000	200	

4.2

H

S

R

1

4.2.1

H

B

H

4-2 4-3

4-2

H

1					48	48
2				pH [6 9]	8	0
3				3	14	7
4				10		
5				3 1	6	2
				3000	24	24

4-3

H

	D _H	
	D _H >60	H1
	30<D _H "	H2
	D _H "30	H3

D_H=81 60

H1

4.2.2

S

C

S

4-4 4-5

4-4

S

1					18	0
2				10km	6	0
3				2000 200	54	36
4					9	6
5					6	4
6					4	4
7					3	1.5

4-5

S

	D _S	S
	D _S >60	S1
	30<D _S "	S2
	D _S "	S3

30 D_S=51.5 60

S2

4.2.3

R

D

R

4-6 4-7

4-6

R

1					1.5	0
2					1	1
3					2	1
4				+	1.5	1
5				10000 /	1	1
6				2 10	1.5	0.75
7				+	1	0.5
8				10000 /	0.5	0.5
9				2 10	1	0.5
10					2	1
11					2	1
12				” “	9	0
13					15	0
14				“ ”	8	0
15					3	0
16					1.5	0

4-7

R

DR	R
DR>60	R1
30<DR "	R2
DR "	R3

30 $D_R=33.75$ 60

R2

4.2.4

H

S

R

" H1S2R2 "

4-8

4.9

201008-12		90					80+280	80	200			II		
201106-18							1	1	3000					
							20		10					
201209-07								2.3	200		3.5	600		
									6000					
								1000						
2015-11-23							2.5	2.5			10.8			
								346				257		
										0-40cm		20%		
2017-02-14					6		4					II		
											5	0.07mg/L		
199804-25								500						
								40km		900				
								pH 8.4	4	270mg/L		900mg/L		
									2500ug/L					

4.3.2

H

4.3.3

1

4-10

4-10

		40

4.3.4

4.3.4.1

Q

\$

4-11

	0.1%			1%			10%			50%			80%				
/ m ³	3.864			38.64			386.4			1932			3091.2				
/ m ³	1.656			16.56			165.6			828			1324.8				
/m	69.00			122.69			218.18			326.26			366.94				
/s	11.52			26.45			93.53			211.28			235.47				
/ m ³ /s	1978.17			8616.05			24375.03			53951.48			77454.69				
104m															Cu		
	mg/L		km	mg/L		km	mg/L		km	mg/L		km	mg/L		km		
Cu	3.245	3.245	7.9	3.249	3.249	7.91	3.25	3.25	7.91	3.25	3.25	7.92	3.25	3.25	7.92		
/h		/			/			/			/			/			
	/m	mg/L		/m	mg/L		/m	mg/L		/m	mg/L		/m	mg/L			
		Cu			Cu			Cu			Cu			Cu			
1h	47.52	3.22264414		47.52	3.22604546		47.52	3.22670164		47.52	3.22689836		47.52	3.22694756			
2h	95.04	3.19989773		95.04	3.20327505		95.04	3.20392659		95.04	3.20412193		95.04	3.20417078			
5h	237.6	3.13261729		237.6	3.1359236		237.6	3.13656144		237.6	3.13675267		237.6	3.13680049			
10h	475.2	3.02361212		475.2	3.02680338		475.2	3.02741903		475.2	3.0276036		475.2	3.02764976			
20h	950.4	2.81684891		950.4	2.81982193		950.4	2.82039548		950.4	2.82056743		950.4	2.82061044			
40h	1900.8	2.44477278		1900.8	2.4473531		1900.8	2.44785089		1900.8	2.44800013		1900.8	2.44803745			
60h	2851.2	2.12184399		2851.2	2.12408348		2851.2	2.12451551		2851.2	2.12464504		2851.2	2.12467744			
100h	4752	1.59831857		4752	1.60000551		4752	1.60033095		4752	1.60042852		4752	1.60045292			
150h	7128	1.12163284		7128	1.12281666		7128	1.12304504		7128	1.12311351		7128	1.12313064			
200h	9504	0.78711482		9504	0.78794557		9504	0.78810584		9504	0.78815389		9504	0.78816591			
	47.028kg			470.506kg			4.708t			23.545t			37.672t				

1
 $b = 0.1KW^{1/4}B^{1/4}H^{1/2}$ b m K W m³ B m H m

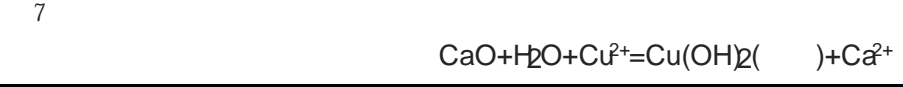
2
 $Q_M = \frac{8}{27} \sqrt{g} \left(\frac{B}{b}\right)^{1/4} bH_0^{3/2}$ b m B m g m/s² H₀ m

3
 $\frac{W}{\lambda} T = u - \frac{1}{g}$ W m³ Q_M m³/s u

4
 $L = \frac{(0.4B - 0.6a)Bu}{(0.058H + 0.0065B)(gHI)^{1/2}}$ L m B m a m u
 m/s H m g 9.8m/s² l %

5
 $C = \frac{C_k Q_k + C_p Q_p}{Q_k + Q_p}$ C mg/L Q_p m³/s C_p mg/L Q_h m³/s C_h
 mg/L

6
 $C = C_0 \exp(-Kx/(86400u))$ C₀ mg/L K l/d u m/s x m C
 x mg/L



GB38382002 à Cu 1mg/L

4.3.4.2

6

190m

1.5h 3h 5h 10h

4-12

1.5h 3h 5h 10h

71.28m 142.56m 237.6m 475.2m

Cu

GB38382002 à

7.05km

Cu

Cu

1.5h 3h

5h 10h

3.21kg 6.43kg 10.71kg 21.42kg

Cu

4-12

h	1.5				3				5				10			
m³/h	856				856				856				856			
m³	1284				2568				4280				8560			
m³	1284				2568				4280				8560			
	104m				7.05km				Cu				Cu			
/m	71.28				142.56				237.6				475.2			
	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Cu	3.25	3.25	2.86	2.86	3.25	3.25	2.86	2.86	3.25	3.25	2.86	2.86	3.25	3.25	2.86	2.86
m	7050				7050				7050				7050			
	321kg				6.43kg				10.71kg				21.42kg			

GB38382002 à

Cu 1mg/L

4.3.4.3

2MPa 2~1.5MPa
1.5~1MPa
1MPa
2~1.5MPa 1.5~1MPa 1MPa
4-13
SS Cu
2~1.5MPa 1.5~1Mpa 1Mpa
Cu GB38382002 à
3500m 5310m 6740m
2~1.5MPa 1.5~1Mpa
1Mpa 12.55kg 16.52kg 20.45kg
Cu

4.3.4.4

	2MPa	2~1.5MPa	
	1.5~1MPa		1MPa
			2~1.5MPa
1.5~1MPa	1MPa		
			4-14
		Cu	2~1.5MPa
1.5~1Mpa	1Mpa		
	Cu		GB38382002 à
3500m	5310m	6740m	
		2~1.5MPa	1.5~1Mpa
		12.55kg	16.52kg
		20.45kg	1Mpa
			Cu

10%

4-14

	2~1.5MPa				1.5~1MPa				1MPa				10%
m ²	10% 0.019625 m ²				20% 0.03925 m ²				50% 0.098125m ²				
kg/m ³	1000				1000				1000				
MPa	1.75				1.25				0.8				
kg/s	34.07				68.14				170.34				
Cu	104m				Cu								
	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		
Cu	3.25	3.25	1.68	1.68	3.25	3.25	2.21	2.21	3.25	3.25	2.73	2.73	
m	3500				5310				6740				
	12.55kg				16.52kg				20.45kg				
$Q_L = C_d A \rho \sqrt{\frac{2(P - P_0) + 2\rho gh}{\rho}}$													
Q _L	kg/s	C _d	0.6~0.64				A	m ²	!	kg/m ³	P	Pa	P ₀
	Pa	g	m/s ²				h	m					

GB38382002 à

Cu 1mg/L

4.3.4.5

3m 15m
6.4×10⁷cm/s 9.4×10⁶cm/s
20m 65m
10⁻⁷cm/s
374m³/d 164
166
pH 6~9 - GB5085.32007
GB8978-1996
GB18599-2001 p
á 2 — 0.45
— 0.13 GB/T14848-2017 à

4.3.4.6

4-15

4-15

			8h

3

6.5km

4.5

2

4.5.1

1

“ ”

2

1

“ ”

2

3

“ ”

4

“ ”

164 166

Þ

3

8h

2

“U”

150m³

250m³

			pH	1.	| >	4		8		
			8	2.	| >	6		6		
									0	

22

28

28

1-2

24	18	1. |		18	0
		2. |		12	
		3. |		6	
		4. |		3	
		5. |		0	
	6	1. | NP		6	0
		2. | NP 5km		4	
		3. | NP 10km		2	
		4. | 10km		0	
	54		1. ' |		54	36
		2. ' |			
		3. ' 1		54	
		4. ' | 2000			
		5. ' |		36	
		6. ' | 15 /			
		7. ' | 2.5			
		8. ' | 100			
		9. ' | 2000			
		10. ' | 15 /		18	
		11. ' | 2.5			
		12. ' | 100			
		13. ' | 2000		54	

				14.	2000	200		
				15. ' 4A			36	
				16. ' 1000				
				17. ' 200				
				18. ' 4A			18	
				19. ' 1000				
				20. ' 2000			36	
				21. ' 100			18	
				22. ' 2000				
				23. ' 100				
				24. ' 100				
22	15	9	1.				9	6
			2.				6	
			3.				3	
			4.				0	
			5.				9	
		'	1.				6	
			2.				4	
			3.				2	
			4.				0	
			5.				0	
	6	1.				6	4	
		2.				4		
		3.				2		
		4.				0		
5.					0			

	4	1.		4	4
		2.	|	3	
		3.	|	1	
	3	1.	|	3	1.5
		2.		1.5	
		3.	|	0	

1

10km

2

1 “ ” 4 24 2 “ ” 3 “ ” ” 4

3

“ ” “ ” “ ”

4

5

6

7

8

3 ‘ ‘

1-3

15	4.5	1.5	1. |	1.5	0	
			2. [redacted]	0		
		1	1. [redacted]	1	1	
			2. |	0		
		2	1. |	2	1	
			2. [redacted]	1		
	3.		0			
	4	1.5	1. | +	1.5	1	
			2. [redacted] +	1		
			3. | +	0.5		
			4. | 5. |	0		
		1	1. [redacted] 10000 /	1	1	
			| 1000 / 10000 /	0.5		
			3. | 1000 /	0		
		1.5	1. | 10	1.5	0.75	
			2. [redacted] 2 10	0.75		
	3. | 2		0			
	2.5	1	1. | +	1	0.5	
			2. [redacted] +	0.5		
			3. | +	0		
		0.5	1. [redacted] 10000 /	0.5	0.5	
2. | 1000 / 10000 /			0.25			
3. | 1000 /			0			
1		1. | 10	1	0.5		
		2. [redacted] 2 10	0.5			
3. | 2	0					

	4	2	1. |		2	1		
			2. [redacted]		1			
			3. |		0			
		2	1. |		2	1		
			2. [redacted]		1			
			3. |		0			
	9	1.	|	1-A |	9	0		
			[redacted]		1-B. [redacted]		0	
		2.	|	2-A. |	9			
			[redacted]		2-B. [redacted]		0	
		15	15	1. |			15	0
				2. |			11	
	3. |				7			
	4. [redacted]				0			
	8	" 8 "	1. |		8	0		
			[redacted]		0			
	8.5	3	1. |		3	0		
			2. |		1.5			
			3. |		0.75			
			4. [redacted]		0			
50	8.5	1.5	1. |		1.5	0		
			2. [redacted]		0			

26.5	8.5	5	1.		5	5	
			2.	|	3		
			3.	|	0		
		2	1.		2	2	
			2.	|	1		
			3.	|	0		
		1.5	1.		1.5	1.5	
			2.	|	1		
			3.	|	0		
	6.5				6.5	6.5	
	2				2	1.5	
	4			2	2	2	
				2	2	1.5	
	5.5			3	3	2.5	
				2.5	2.5	1.5	

	7	7	1. |	7	0	
			2. |	0		
11	11	8	1. |	8	0	
			2. |	6		
			3. |	4		
			4. |	0		
		3	1. |	3	0	
			2. |	1.5		
3. 0	0					

2

1							

2

” “

7							1
8						8h	
9							
10							
11							3
12							
13							
14							
15							
16							
17							15
18							

29							
30							
31							3

32

“U”

150m³

250m³

37				-			
38							
39							7
40							
41							
42							
43							
44							