

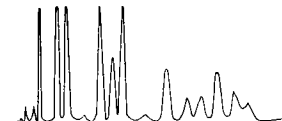
Statoil A/S

Tananger 30/11-84

Rapport:ST-54

Analyse av vannprøver fra
31/6-2.

Att : R.Kleven



LABORATORIE RAPPORT

Statoil-54

Vedlagt følger vannanalyse av 8 vannprøver fra 31/6-2.

Utfelt stoff i prøvene nr. 1-4 er også analysert.

Prøvene nr. 5-8 ble etter analyse nøytralisert med NaOH, utfelt stoff filtrert fra og elementanalyse repetert på vannfasen.

Alle prøver ble nøytralisert med NaOH (phenolftalein som indikator) slik at prøvene har et definert utgangspunkt for klorid titreringen.

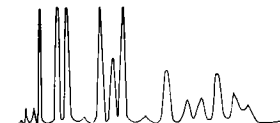
Prøvene er generelt så sure at analyse av bicarbonat er irrelevant. Enkelte prøver har pH under 0, d.v.s. H_3O^+ konsentrasjoner over 1 mol/l. PH verdier i dette området er lite eksakte, og må kun oppfattes som retningsgivende.

Målingene av prøvens resitivitet er også behengt med stor usikkerhet da depolarisering på elektrodene ved lav pH kan inntreffe.

Målingene av prøvens egenvekt er utført ved hjelp av DMA-46 Anton Paar. Resultatene er kontrollert og verdiene er bekreftet med kontrollmålinger ved bruk av pyknometer.

Små prøvevolum og lave pH-verdier har vært grunnlaget for at flest mulig elementer er bestemt ved ICP da forutsetningene for "våt"-kjemiske metoder ikke er tilstede.

Svovel er bestemt (v/ICP) istedet for som SO_4 ved turbiditetsmåling.



Rapport: ST-54

Type: Otis/choke 1
Well: 31/6-2
Test: G.P. clean-up
Depth: 1506-1510
Date: 24/8-84
Hrs.: 00.00 - 01.00

8A Type: Otis/choke 30B
Well: 31/6-2
Test: Vannfase
Depth: 1506-1510
Date: 24/8-84
Hrs.: 08.00

Type: Otis/choke 2
Well: 31/6-2
Test: G.P. clean-up
Depth: 1506-1510
Date: 24/8-84
Hrs.: 02.30

8B Type: Otis/choke 31B
Well: 31/6-2
Test: Vannfase
Depth: 1506-1510
Date: 28/8-84
Hrs.: 09.00

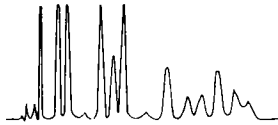
Type: Otis/choke 3
Well: 31/6-2
Test: G.P. clean-up
Depth: 1506-1510
Date: 24/8-84
Hrs.: 04.00

31B lagret for
eventuelle analyser.

Type: Otis/choke 4
Well: 31/6-2
Test: G.P. clean-up
Depth: 1506-1510
Date: 24/8-84
Hrs.: 05.00, 06.00, 08.00, 09.00

Type: Otis/choke 5
Well: 31/6-2
Test: G.P. clean-up
Depth: 1506-1510
Date: 24/8-84
Hrs.: 16.30-17.00

Type: Otis/choke 7
Well: 31/6-2
Test: G.P. clean-up
Depth: 1506-1510
Date: 24/8-84
Hrs.: 19.00



Customer: Statoil A/S		Sample No: 1	Date Sampled:	
Field:	Legal description:		Job no: ST-54	
Lease or Unit:	Well:	Depth:	Formation:	Rate B/D:
Type of Water (Produced, supply, etc.) Formation.		Sampling Point	Sampled by	
Remarks (Any other relevant information)				

DISSOLVED SOLIDS:

OTHER PROPERTIES:

CATIONS

mg/l me/l

Sodium, Na (calc)	1.781
Calcium, Ca	42.189
Magnesium, Mg	669
Barium, Ba	26,4
Iron, Fe	3.954
Strontium	130
Potassium	991

pH	2,03	20°C
Specific Gravity.	1,075	
Resistivity (ohm-meters)	0,149	20°C
Sulfide as H ₂ S mg/l		
Suspended solids mg/l	3.240,9	

ANIONS

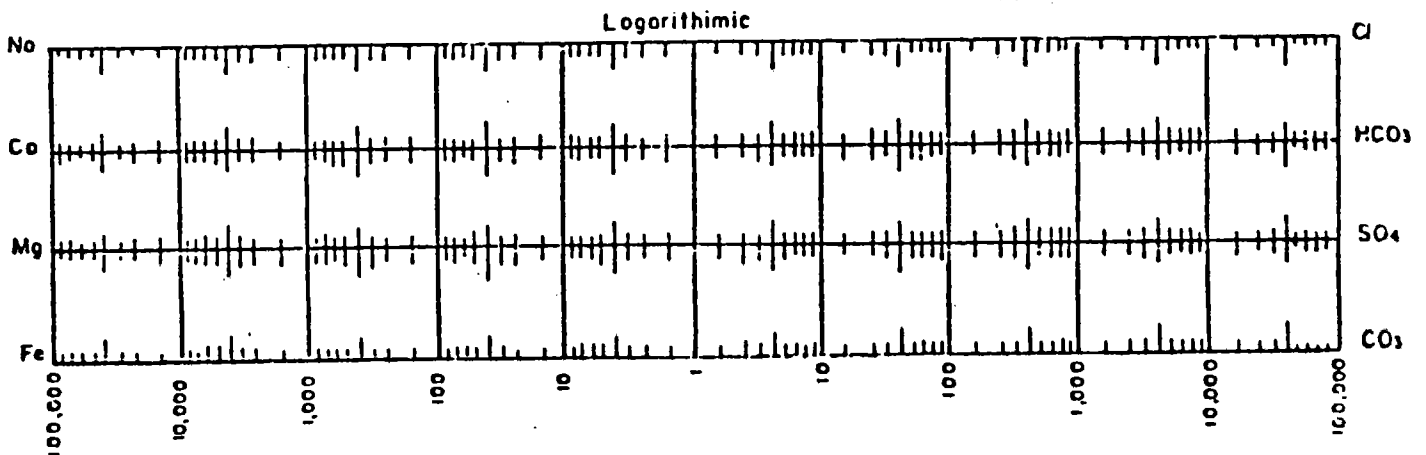
Chloride, Cl	71.000
Sulfur, S	119
Carbonate, CO ₃	-
Bicarbonate HCO ₃	-
Hydroxide	-

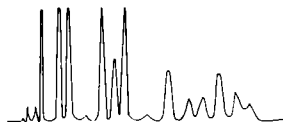
REMARKS & RECOMMENDATIONS

Total Dissolved Solids (calc.) ===== mg/l

Analyses by: T.F/A.M.I.L

WATER PATTERNS _____ me/l





ANALYSIS OF SUSPENDED SOLIDS.

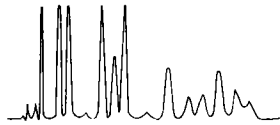
Sample no.: ST-54, no. 1

Element Weight% of ash. Most probable chem form, weight%

<u>Inorganics.</u>		<u>Excess</u>	
Sulphur, S.	2,25	SO ₄	5,57
Zinc, Zn.	0,22	ZnO	0,28
Barium, Ba.	1,54	BaSO ₄	2,61
Iron, Fe.	45,2	Fe ₂ O ₃	64,6
Magnesium, Mg.	0,19	MgCO ₃	0,65
Silicon, Si.	0,55	SiO ₂	1,18
Aluminium, Al.	0,95	Al ₂ O ₃	1,80
Calcium, Ca.	7,47	CaCO ₃	18,6
Sodium, Na.	0,83	NaCl	2,12
Strontium, Sr.	0,10	SrSO ₄	0,22
Potassium, K.	0,44	KCl	0,85
Phosphorus, P.	0,61	P ₂ O ₅	1,40
Manganese, Mn.	0,02	MnO ₂	0,03
Vanadium	0,16	V ₂ O ₅	0,29
Boron, B.	< 0,01		
Tin, Sn.	< 0,01	SnO	
Titanium, Ti.	0,02	TiO ₂	0,03
Chromium, Cr.	0,13	CrO ₃	0,25
<u>Organics:</u> Wt. loss on ignition/500°C Organics by difference & weight	Weight % of tot. sample. 57,9		

Remarks : The solid was dried at 100 deg C and the filters were ignited, prior to ashing at 550 deg C. The ashed material was acid extracted, the acid insoluble residues fused in an alkali medium and all solutions analysed by plasma emission spectrometry.

Sulphur content indicates that some elements are present as a mixture of carbonate and sulphate.



Customer: Statoil A/S		Sample No: 2	Date Sampled:	
Field:	Legal description:		Job no: ST-54	
Lease or Unit:	Well:	Depth:	Formation:	Rate B/D:
Type of Water (Produced, supply, etc.) Formation.		Sampling Point	Sampled by	
Remarks (Any other relevant information)				

DISSOLVED SOLIDS:

OTHER PROPERTIES:

CATIONS

mg/l me/l

Sodium, Na (calc)	1.793
Calcium, Ca	22.833
Magnesium, Mg	772
Barium, Ba	6,67
Iron, Fe	2.538
Strontium	138
Potassium	913

pH	2,34	20°C
Specific Gravity.	1,016	
Resistivity (ohm-meters)	0,341	20°C
Sulfide as H ₂ S mg/l		
Suspended solids mg/l	5.883,3	

ANIONS

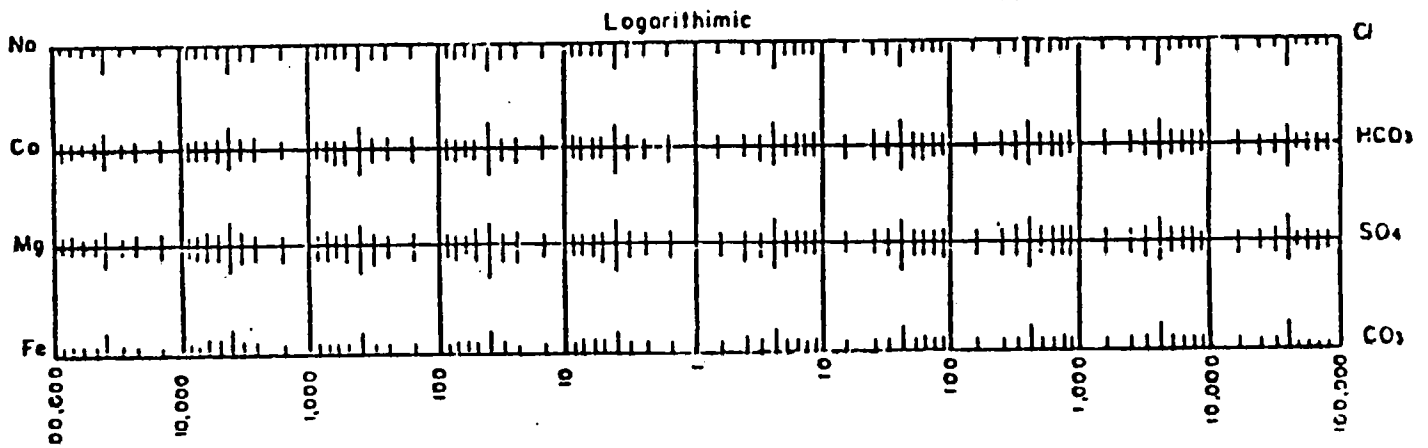
Chloride, Cl	41.819
Sulfate, S	93
Carbonate, CO ₃	-
Bicarbonate HCO ₃	-
Hydroxide	-

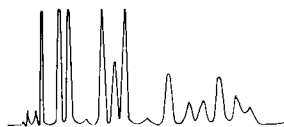
REMARKS & RECOMMENDATIONS

Total Dissolved Solids (calc.) ===== mg/l

Analyses by: T.F/A.M.I.L

WATER PATTERNS _____ me/l





ANALYSIS OF SUSPENDED SOLIDS.

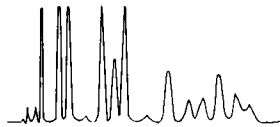
Sample no.: ST-54, no. 2

Element Weight% of ash. Most probable chem form, weight%

<u>Inorganics.</u>		<u>Excess</u>	
Sulphur, S.	1,18	SO ₄	2,92
Zinc, Zn.	0,04	ZnO	0,06
Barium, Ba.	0,85	BaSO ₄	1,44
Iron, Fe.	59,0	Fe ₂ O ₃	84,3
Magnesium, Mg.	0,10	MgCO ₃	0,35
Silicon, Si.	1,28	SiO ₂	2,73
Aluminium, Al.	1,38	Al ₂ O ₃	2,60
Calcium, Ca.	0,71	CaCO ₃	1,78
Sodium, Na.	0,37	NaCl	0,95
Strontium, Sr.	0,04	SrSO ₄	0,09
Potassium, K.	0,17	KCl	0,32
Phosphorus, P.	0,26	P ₂ O ₅	0,66
Manganese, Mn.	0,02	MnO ₂	0,04
Vanadium	0,27	V ₂ O ₅	0,48
Boron, B.	< 0,01		
Tin, Sn.	< 0,01	SnO	
Titanium, Ti.	0,10	TiO ₂	0,17
Chromium, Cr.	0,21	CrO ₃	0,41
<u>Organics:</u> Wt. loss on ignition/500°C Organics by difference & weight	Weight % of tot. sample. 53,6		

Remarks : The solid was dried at 100 deg C and the filters were ignited, prior to ashing at 550 deg C. The ashed material was acid extracted, the acid insoluble residues fused in an alkali medium and all solutions analysed by plasma emission spectrometry.

Sulphur content indicates that some elements are present as a mixture of carbonate and sulphate.



Customer: Statoil A/S		Sample No: 3		Date Sampled:	
Field:		Legal description:		Job no: ST-54	
Lease or Unit:		Well:	Depth:	Formation:	Rate B/D:
Type of Water (Produced, supply, etc.) Formation.			Sampling Point	Sampled by	
Remarks (Any other relevant information)					

DISSOLVED SOLIDS:

OTHER PROPERTIES:

CATIONS

mg/l me/l

Sodium, Na (calc)	2.113
Calcium, Ca	13.952
Magnesium, Mg	428
Barium, Ba	4,03
Iron, Fe	2.267
Strontium	81,9
Potassium	486

pH	-0,22	20°C
Specific Gravity.	1,015	
Resistivity (ohm-meters)	0,089	20°C
Sulfide as H ₂ S mg/l		
Suspended solids mg/l	121,5	

ANIONS

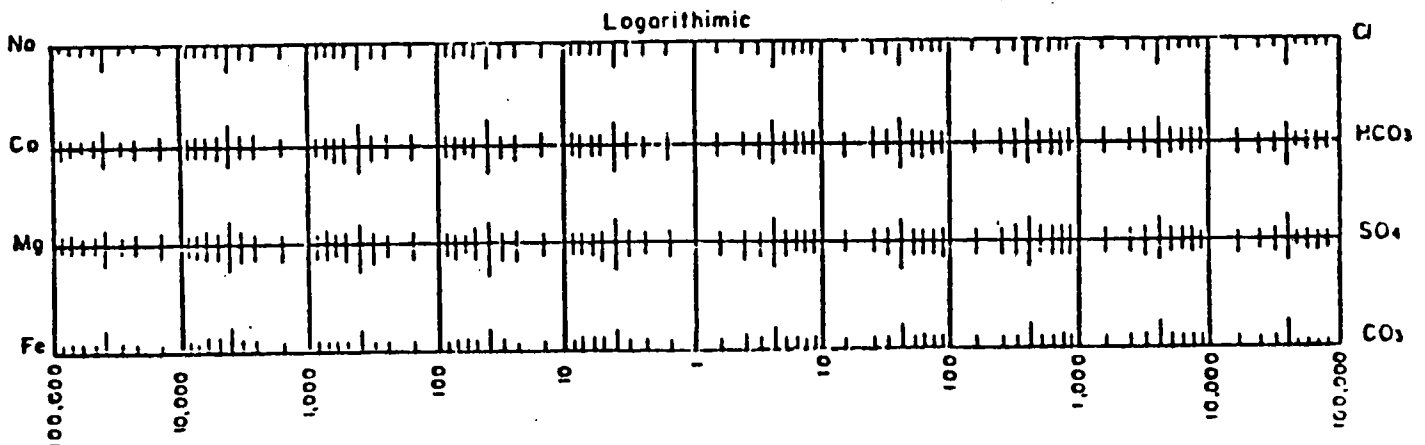
Chloride, Cl	61.983
Sulfate, S	70
Carbonate, CO ₃	-
Bicarbonate HCO ₃	-
Hydroxide	-

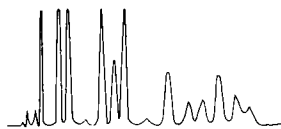
REMARKS & RECOMMENDATIONS

Total Dissolved Solids (calc.) ===== mg/l

Analyses by: T.F/A.M.I.L

WATER PATTERNS _____ me/l





ANALYSIS OF SUSPENDED SOLIDS.

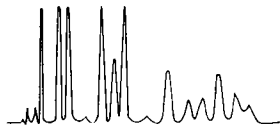
Sample no.: ST-54, no. 3

Element Weight% of ash. Most probable chem form, weight%

<u>Inorganics.</u> Sulphur, S.	4,63	Excess SO ₄	4,43
Zinc, Zn.	0,20	ZnO	0,25
Barium, Ba.	12,6	BaSO ₄	21,4
Iron, Fe.	3,37	Fe ₂ O ₃	5,33
Magnesium, Mg.	0,43	MgCO ₃	1,50
Silicon, Si.	17,8	SiO ₂	38,1
Aluminium, Al.	2,15	Al ₂ O ₃	4,06
Calcium, Ca.	6,25	CaCO ₃	15,6
Sodium, Na.	2,24	NaCl	5,69
Strontium, Sr.	0,62	SrSO ₄	1,29
Potassium, K.	0,98	KCl	1,87
Phosphorus, P.	0,34	P ₂ O ₅	0,79
Manganese, Mn.	0,06	MnO ₂	0,09
Vanadium	0,01	V ₂ O ₅	0,02
Boron, B.	< 0,01		
Tin, Sn.	< 0,01	SnO	
Titanium, Ti.	0,30	TiO ₂	0,50
Chromium, Cr.	0,60	CrO ₃	1,16
<u>Organics:</u> Wt. loss on ignition/500°C Organics by difference & weight	Weight % of tot. sample. 56,2		

Remarks : The solid was dried at 100 deg C and the filters were ignited, prior to ashing at 550 deg C. The ashed material was acid extracted, the acid insoluble residues fused in an alkali medium and all solutions analysed by plasma emission spectrometry.

Sulphur content indicates that some elements are present as a mixture of carbonate and sulphate.



Customer: Statoil A/S		Sample No: 4		Date Sampled:	
Field:		Legal description:		Job no: ST-54	
Lease or Unit:		Well:	Depth:	Formation:	Rate B/D:
Type of Water (Produced, supply, etc.) Formation.			Sampling Point		Sampled by
Remarks (Any other relevant information)					

DISSOLVED SOLIDS:

<u>CATIONS</u>	mg/l	me/l
Sodium, Na (calc)	1.120	
Calcium, Ca	16.620	
Magnesium, Mg	510	
Barium, Ba	6,29	
Iron, Fe	2.125	
Strontium	94,9	
Potassium	755	
<u>ANIONS</u>		
Chloride, Cl	29.039	
Sulfur, S	99	
Carbonate, CO ₃	-	
Bicarbonate HCO ₃	-	
Hydroxide	-	

OTHER PROPERTIES:

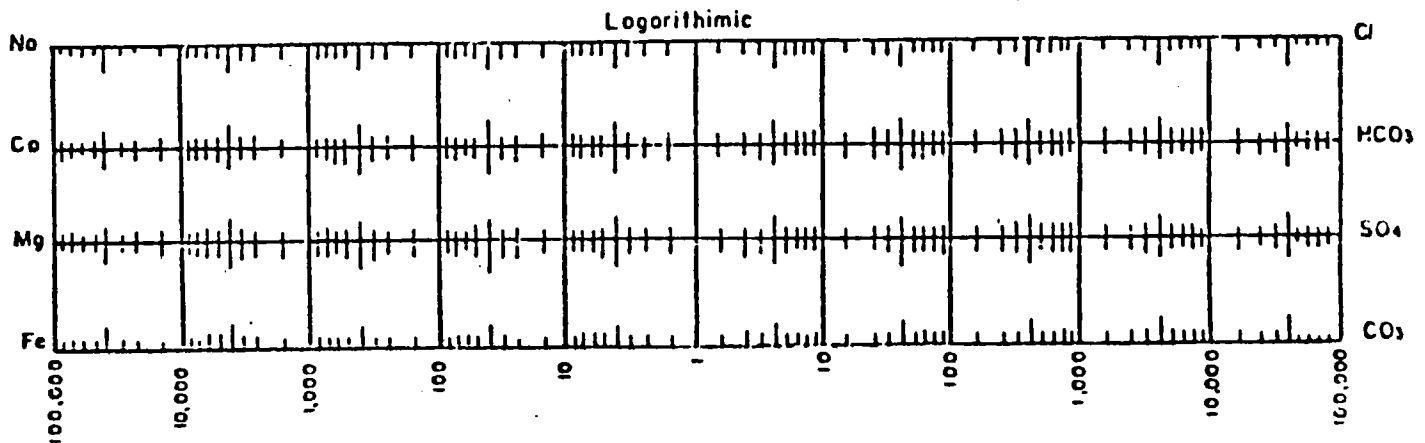
pH	2,56	20°C
Specific Gravity.	0,9916	
Resistivity(ohm-meters)	0,460	20°C
Sulfide as H ₂ S mg/l		
Suspended solids mg/l	1.927,7	

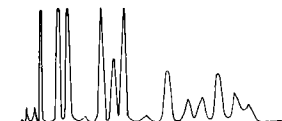
REMARKS & RECOMMENDATIONS

Total Dissolved Solids(calc.) ===== mg/l

Analyses by: T.F/A.M.I.L

WATER PATTERNS _____ me/l





ANALYSIS OF SUSPENDED SOLIDS.

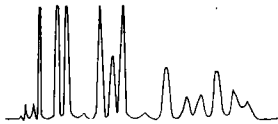
Sample no.: ST-54, no. 4

Element Weight% of ash. Most probable chem form, weight%

<u>Inorganics.</u> Sulphur, S.	1,21	Excess SO ₄	3,28
Zinc, Zn.	0,14	ZnO	0,17
Barium, Ba.	0,47	BaSO ₄	0,79
Iron, Fe.	55,2	Fe ₂ O ₃	79,0
Magnesium, Mg.	0,15	MgCO ₃	0,51
Silicon, Si.	2,14	SiO ₂	4,59
Aluminium, Al.	1,86	Al ₂ O ₃	3,52
Calcium, Ca.	1,27	CaCO ₃	3,16
Sodium, Na.	1,02	NaCl	2,58
Strontium, Sr.	0,02	SrSO ₄	0,05
Potassium, K.	0,40	KCl	0,76
Phosphorus, P.	0,27	P ₂ O ₅	0,63
Manganese, Mn.	0,01	MnO ₂	0,02
Vanadium	0,48	V ₂ O ₅	0,86
Boron, B.	< 0,01		
Tin, Sn.	< 0,01	SnO	
Titanium, Ti.	0,11	TiO ₂	0,19
Chromium, Cr.	0,23	CrO ₃	0,44
<u>Organics:</u> Wt. loss on ignition/500°C Organics by difference & weight	Weight % of tot. sample. 48,1		

Remarks : The solid was dried at 100 deg C and the filters were ignited, prior to ashing at 550 deg C. The ashed material was acid extracted, the acid insoluble residues fused in an alkali medium and all solutions analysed by plasma emission spectrometry.

Sulphur content indicates that some elements are present as a mixture of carbonate and sulphate.



Customer: Statoil A/S		Sample No: 5		Date Sampled:	
Field:		Legal description:		Job no: ST-54	
Lease or Unit:		Well:	Depth:	Formation:	Rate B/D:
Type of Water (Produced, supply, etc.) Formation.			Sampling Point	Sampled by	
Remarks (Any other relevant information)					

DISSOLVED SOLIDS:

OTHER PROPERTIES:

<u>CATIONS</u>	mg/l	me/l
Sodium, Na (calc)	2.565	
Calcium, Ca	33.325	
Magnesium, Mg	599	
Barium, Ba	12,9	
Iron, Fe	4.627	
Strontium	119	
Potassium	539	
<u>ANIONS</u>		
Chloride, Cl	115.517	
Sulfur, S	31	
Carbonate, CO ₃	-	
Bicarbonate HCO ₃	-	
Hydroxide	-	

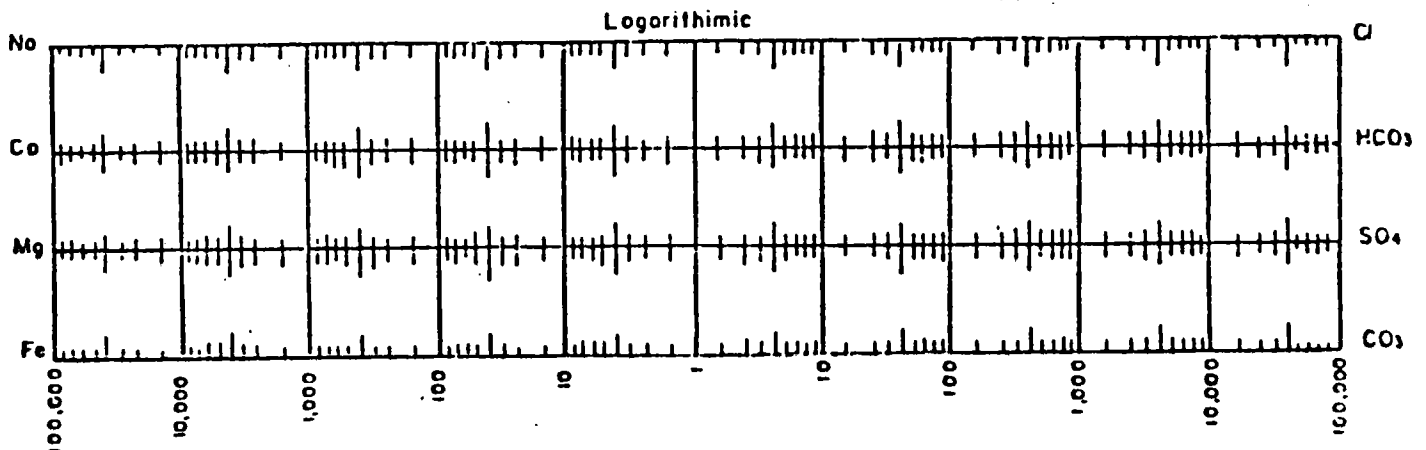
pH	-0,52	20°C
Specific Gravity.	1,102	
Resistivity (ohm-meters)	0,037	20°C
Sulfide as H ₂ S mg/l		
Suspended solids mg/l	175,2	

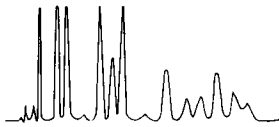
REMARKS & RECOMMENDATIONS

Total Dissolved Solids (calc.) ===== mg/l

Analyses by: T.F/A.M.I.L

WATER PATTERNS _____ me/l





Customer: Statoil A/S		Sample No: 6	Date Sampled:	
Field:	Legal description:		Job no: ST-54	
Lease or Unit:	Well:	Depth:	Formation:	Rate B/D:
Type of Water (Produced, supply, etc.) Formation.		Sampling Point	Sampled by	
Remarks (Any other relevant information)				

DISSOLVED SOLIDS:

<u>CATIONS</u>	mg/l	me/l
Sodium, Na (calc)	2.237	
Calcium, Ca	28.618	
Magnesium, Mg	1.294	
Barium, Ba	4,08	
Iron, Fe	7.987	
Strontium	114	
Potassium	870	
<u>ANIONS</u>		
Chloride, Cl	74.408	
Sulfur, S	57	
Carbonate, CO ₃	-	
Bicarbonate HCO ₃	-	
Hydroxide	-	

OTHER PROPERTIES:

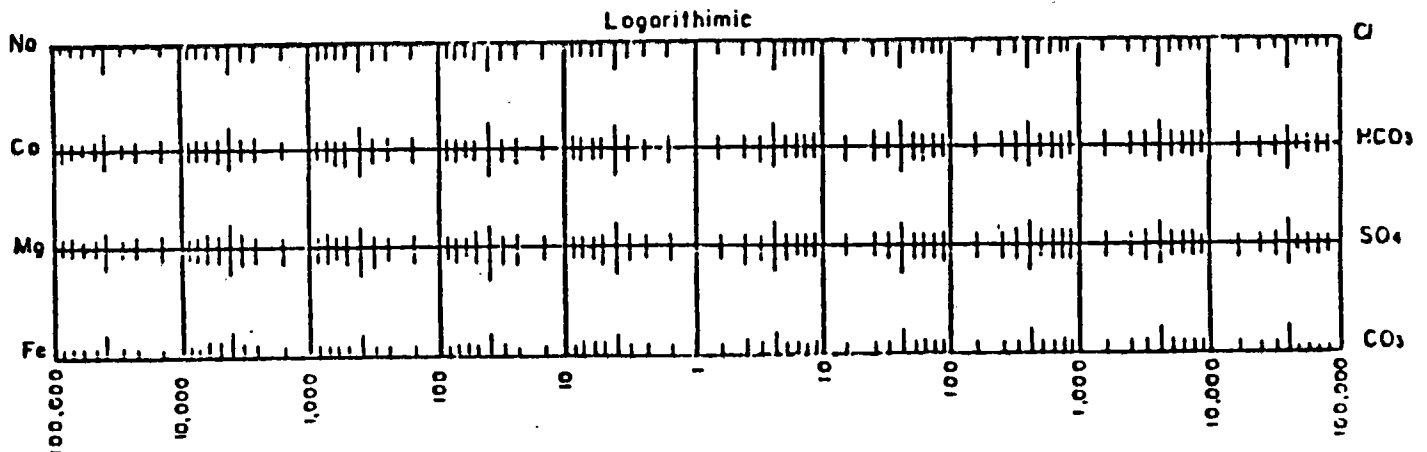
pH	0,12	20°C
Specific Gravity.	1,075	
Resistivity (ohm-meters)	0,116	20°C
Sulfide as H ₂ S mg/l		
Suspended solids mg/l	247,6	

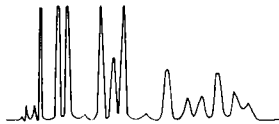
REMARKS & RECOMMENDATIONS

Total Dissolved Solids (calc.) ===== mg/l

Analyses by: T.F/A.M.I.L

WATER PATTERNS _____ me/l





Customer: Statoil A/S		Sample No: 7		Date Sampled:	
Field:		Legal description:		Job no: ST-54	
Lease or Unit:		Well:	Depth:	Formation:	Rate B/D:
Type of Water (Produced, supply, etc.) Formation.			Sampling Point		Sampled by
Remarks (Any other relevant information)					

DISSOLVED SOLIDS:

OTHER PROPERTIES:

<u>CATIONS</u>	mg/l	me/l
Sodium, Na (calc)	2.611	
Calcium, Ca	18.289	
Magnesium, Mg	976	
Barium, Ba	36,1	
Iron, Fe	3.710	
Strontium	55,0	
Potassium	475	
<u>ANIONS</u>		
Chloride, Cl	112.393	
Sulfur, S	58	
Carbonate, CO ₃	-	
Bicarbonate HCO ₃	-	
Hydroxide	-	

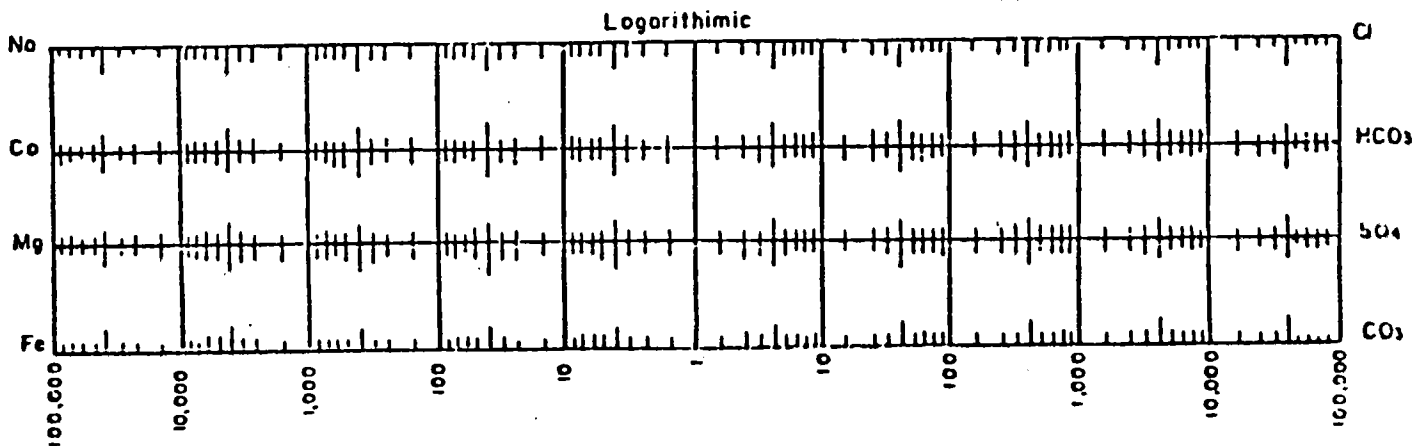
pH	-0,62	20°C
Specific Gravity.	1,087	
Resistivity (ohm-meters)	0,032	20°C
Sulfide as H ₂ S mg/l		
Suspended solids mg/l	190,6	

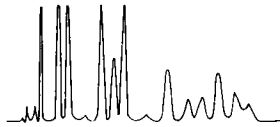
REMARKS & RECOMMENDATIONS

Total Dissolved Solids (calc.) ===== mg/l

Analyses by: T.F/A.M.I.L

WATER PATTERNS _____ me/l





Customer: Statoil A/S		Sample No: 8		Date Sampled:	
Field:		Legal description:		Job no: ST-54	
Lease or Unit:		Well:	Depth:	Formation:	Rate B/D:
Type of Water (Produced, supply, etc.) Formation.			Sampling Point	Sampled by	
Remarks (Any other relevant information)					

DISSOLVED SOLIDS:

<u>CATIONS</u>	mg/l	me/l
Sodium, Na(calc)	957	
Calcium, Ca	11.053	
Magnesium, Mg	968	
Barium, Ba	10,9	
Iron, Fe	7.311	
Strontium	38,2	
Potassium	627	
<u>ANIONS</u>		
Chloride, Cl	44.020	
Sulfur, S	28	
Carbonate, CO ₃	-	
Bicarbonate HCO ₃	-	
Hydroxide	-	

OTHER PROPERTIES:

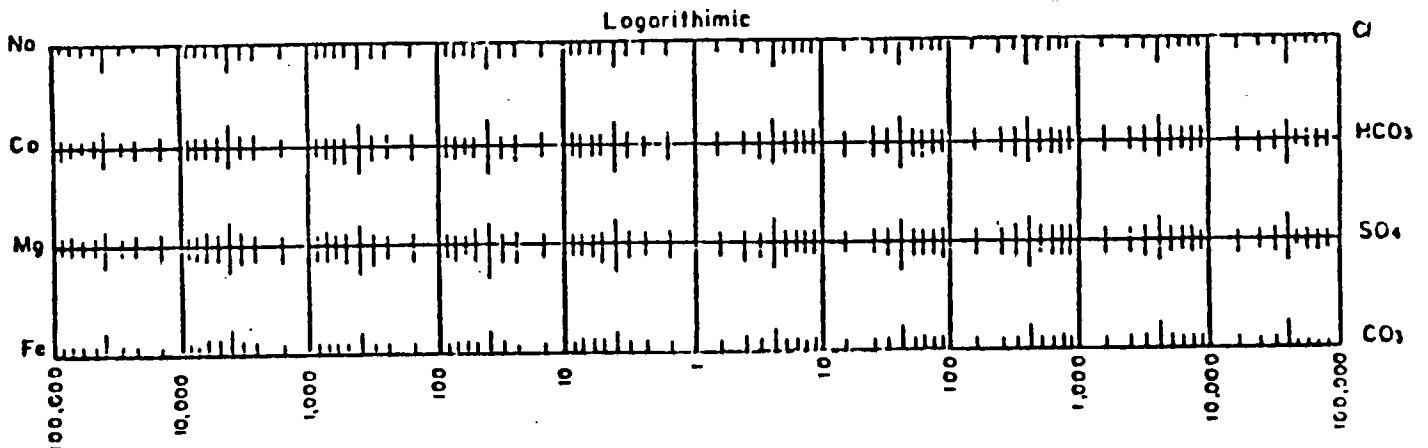
pH	0,99	20°C
Specific Gravity.	1,054	
Resistivity(ohm-meters)	0,128	20°C
Sulfide as H ₂ S mg/l		
Suspended solids mg/l	100,0	

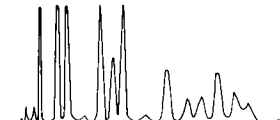
REMARKS & RECOMMENDATIONS

Total Dissolved Solids(calc.) ===== mg/l

Analyses by: T.F/A.M.I.L

WATER PATTERNS _____ me/l





LABORATORIE RAPPORT

Element analyse av prøvene 5 - 8, før og etter
pH-nøytralisering (pH=7)

(Benevning for alle resultat er mg/l)

Prøve nr.:	5		6	
	Før	Etter	Før	Etter
Na	2.565	39.035	2.237	23.306
Ca	33.325	34.177	28.618	32.410
Mg	599	177	1.294	587
Ba	12,9	9,8	4,08	3,04
Fe	4.627	102	7.987	56,5
Sr	119	99,2	114	103
K	539	520	870	843
Cl	115.517	117.505	74.408	84.703

	7		8	
	Før	Etter	Før	Etter
Na	2.611	55.548	957	15.519
Ca	18.289	17.340	11.053	11.871
Mg	976	391	968	589
Ba	36,1	3,04	10,9	7,68
Fe	3.710	139	7.311	2,44
Sr	55,0	44,0	38,2	33,4
K	475	509	627	618
Cl	112.393	114.168	44.020	46.896

I prinsippet skulle verdiene for ikke-utfelt stoff være like før og etter nøytralisering, men volumendringer p.g.a. tilsatt NaOH og utfelt stoff vil gi noe variasjon, f.eks. for Ca og Cl.