

VERMILION
E N E R G Y



Vermilion Energy Netherlands

NSL-01 Waterinjectie

Jaarrapportage 2023

Versie 1

7 maart 2024

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Vergunning

Vermilion heeft een omgevingsvergunning voor het in werking hebben van waterinjectielocatie Nijensleek-1. Deze vergunning dateert van 10 februari-2010 (kenmerk ET/EM/10012816). Onderdeel van de vergunning is een Ontheffing lozingenbesluit (GS Drenthe) van 09 februari 2010 (kenmerk DO/2010002316).

Op 23 juli 2015 heeft de Minister van Economische Zaken een milieuneutrale wijziging van deze omgevingsvergunning verleend onder kenmerk DGETM-EM/15102502. Op 8 januari 2016 is met een beslissing op bezwaar deze vergunning aangepast (kenmerk WJZ / 15167951). Op 23 augustus 2022 is de vergunning milieuneutraal gewijzigd (kenmerk PDGGO-DTDO / V-28176).

In de voorschriften behorende bij deze vergunning is opgenomen dat de meet en registratie verplichtingen jaarlijks worden geëvalueerd en in de vorm van een jaarrapportage worden ingediend. Dit rapport is een samenvatting van de activiteiten in kalenderjaar 2023.

Volumes geïnjecteerd water

Gedurende het jaar 2023 is productiewater geïnjecteerd in de put Nijensleek-01 (NSL-01).

Tabel 1 is een lijst met de jaarlijkse hoeveelheid geïnjecteerd water in NSL-01 sinds de start van de waterinjectie in 2011.

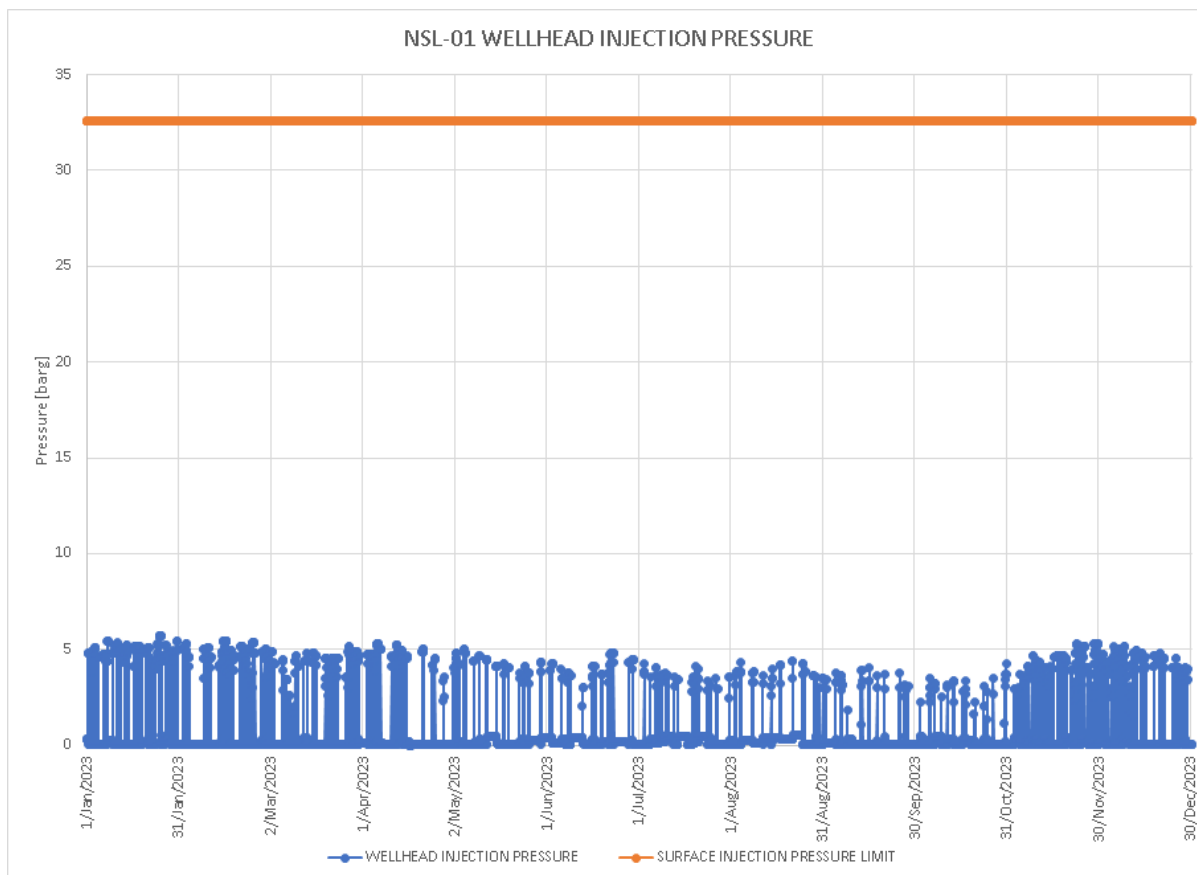
Tabel 1: Jaarlijks geïnjecteerde hoeveelheid water in NSL-01.

Jaar	Geïnjecteerd volume [in m³]
2011	13314
2012	3654
2013	2006
2014	7640
2015	12434
2016	5750
2017	1400
2018	0
2019	5035
2020	6038
2021	0
2022	6038
2023	15424
Totaal	78734

Afwijkingen in injectiedrukken

Figuur 1 is een overzicht van de injectiedrukken in NSL-01 in het jaar 2023.

Er zijn geen bijzonderheden. De maximale druk was 5 barg tijdens injectie. Dit is ver onder de limiet van 32.6 barg.



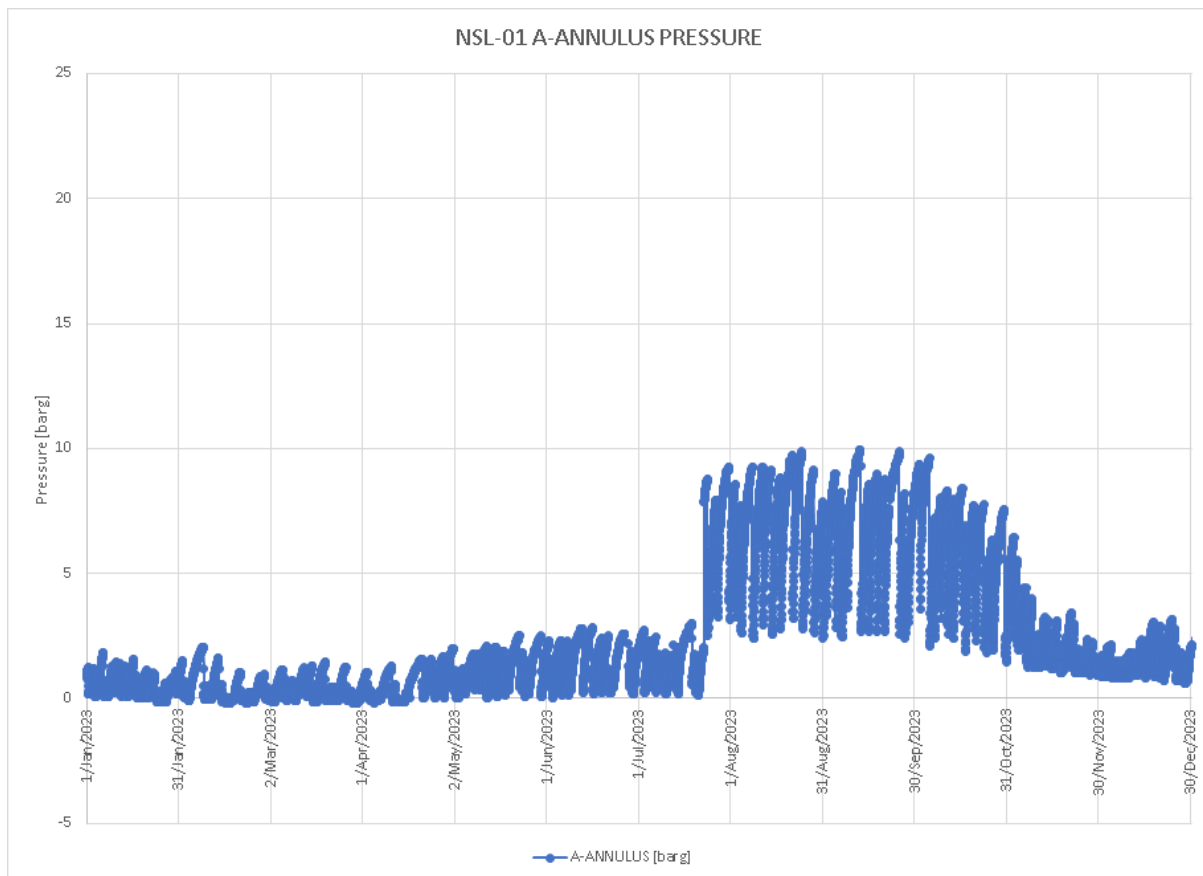
Figuur 1: Overzicht NSL-01 injectiedrukken in 2023.

Afwijkingen in annulaire drukken

De druksensor op de A-annulus wordt continu afgelezen. Figuur 2 laat de data voor het jaar 2023 zien. De druk bouwt op en neemt af. Reden is dat tijdens waterinjectie de vloeistof in de A-annulus afkoelt, daardoor een klein beetje krimpt in volume waardoor de positieve druk op de A-annulus afneemt. De temperatuur van de vloeistof in de A-annulus neemt weer langzaam toe nadat injectie is gestopt. Hierdoor zet de vloeistof weer iets uit waardoor de A-annulus druk weer langzaam toeneemt. Dit is een normaal fysisch proces. Er is geen afwijking in de A-annulus druk geconstateerd.

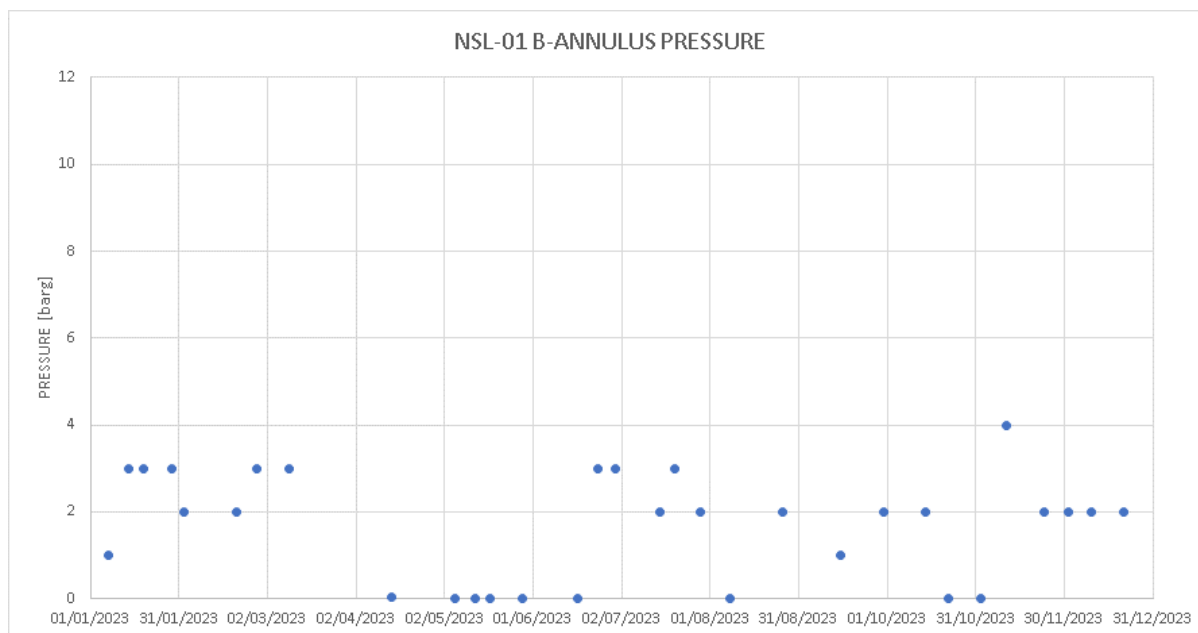
Op 23 juli 2023 is de A-annulus opgedrukt met stikstof; dit verklaart de sprong in druk van ± 3 bar naar ± 8 bar. Dit is een operationele activiteit om de monitoring van de A-annulus druk te verbeteren.

Alle waarnemingen uit 2023 zijn in Figuur 2 weergegeven. Er zijn geen bijzonderheden geconstateerd.



Figuur 2: NSL-01 A-annulus drukken in het jaar 2023.

De druk van de B-annulus wordt regelmatig genoteerd tijdens routine rondes. Alle waarnemingen uit 2023 zijn in Figuur 3 weergegeven. Er zijn geen bijzonderheden geconstateerd.



Figuur 3: NSL-01 B-annulus drukken in het jaar 2023.

Mechanische zaken en onderhoud

Er zijn verschillende preventieve onderhoudstaken uitgevoerd in 2023. Er zijn geen bijzonderheden te vermelden.

Incidenten of lekkages

Er zijn geen incidenten of lekkages geweest in 2023.

Herkomst injectiewater

Er is productiewater van de volgende productielocaties geïnjecteerd in NSL-01 in 2023:

- Harlingen gasbehandelingsstation
- Productielocatie TID-100
- Productielocatie Noordwolde / Weststellingwerf
- Productielocatie Nijega 1/6/8
- Productielocatie Blesdijke
- Waalwijk gasbehandelingsstation
- Productielocatie Vinkega
- Productielocatie De Blesse
- Productielocatie Eesveen
- Productielocatie Nieuwhorne
- Productielocatie Wapse

Vloeistof analyses

Bijgevoegd zijn de kwartaalanalyses van het injectiewater.



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grade	PROCESWATER
sample 001	Sample received from client Sample packed in plastic, quantity approx. 1 L Sample marked as NSL-01 16-02-2023
date received	23.02.2023

<u>Density at 20°C, g/cm³</u> (ASTM D 4052)	<u>001</u> 1.1300
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<u>pH</u> (ASTM E 70)	5.45
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<u>pH: Temperature of test solution, °C</u> (ASTM E 70)	20
--	----

<u>Flash point</u> , Pensky Martens closed cup, °C (ASTM D 93 procedure A)	>95.0
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<u>Chloride</u> as Cl ⁻ , mg/L (SGS SPI 1022)	118000
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Ionchromatographic analysis
(SGS SPI 164)

- Sulphate as SO ₄ ²⁻ , mg/kg	210
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<u>Total sulphide as S</u> , mg/L (WAC/III/A/040)	<0.1
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<u>Total suspended solids</u> (> 5 µm), mg/kg (NEN 872)	98.6
--	------

Metals
(NEN 6961 / NEN 6966/C1)

- Arsenic as As, µg/L	<10
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- Cadmium as Cd, µg/L	210
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001

- Chromium as Cr, µg/L	30
- Copper, µg/L	<10
- Iron, µg/L	140000
- Lead as Pb, µg/L	13000
- Nickel as Ni, µg/L	40
- Strontium as Sr, µg/L	490
- Zinc as Zn, µg/L	61000

<u>Bicarbonate as CO₃²⁻, mg/L</u> (WAC/III/A/006)	36
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<u>Carbonate as CO₃²⁻, mg/L</u> (WAC/III/A/006)	<2.5
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<u>Mercury as Hg, µg/L</u> (NEN-EN 1483 / external SGS Lab)	0.76
--	------

<u>PAH, µg/L</u> (SGS 12-01)	<9
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Gaschromatographic analysis
(NEN EN ISO 15680)

- Benzene, µg/L	4900
- Ethylbenzene, µg/L	15
- Toluene, µg/L	540
- m + p- Xylene, µg/L	69
- o-Xylene, µg/L	63
- Sum of xylenes, µg/L	130
- Sum of BTEX, µg/L	5600
- Naphthalenes, µg/L	8

Gaschromatographic analysis
(NEN EN ISO 9377)

- Fraction C10 – C12, µg/L	520
- Fraction C12 – C22, µg/L	810

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- Fraction C22 – C30, µg/L	<u>001</u> <25
- Fraction C30 – C40, µg/L	<25
- Total C10 – C40, µg/L	<1400

Gaschromatographic analysis (SGS 2005-18)

- 1,2-Propyleneglycol, mg/L	<2.5
- 1,3-Propyleneglycol, mg/L	<5
- Diethyleneglycol, mg/L	100
- Monoethyleneglycol, mg/L	710
- Triethyleneglycol, mg/L	28
<u>Total hardness</u> , mg CaCO ₃ /L (Calculation)	43900
<u>Sum of Arsene + Mercury + Benzene</u> , µg/L (Calculation)	4900

End of analytical results

Spijkenisse, the 2nd March 2023
SGS Nederland B.V. - Oil, Gas and Chemicals



M. Audier
 Business Unit Manager, Laboratories Rotterdam

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ANALYTICAL REPORT SR-6215127.02.A01

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grade	PROCESWATER
sample 001	Sample received from client
	Sample marked as NSL-01 16-02-2023
date received	23.02.2023

Dissolved oxygen, µg/L
(ASTM D 5543/A, modified)

001
>100

End of analytical results

Spijkenisse, the 2nd March 2023
SGS Nederland B.V. - Oil, Gas and Chemicals

M. Audier
Business Unit Manager, Laboratories Rotterdam

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ANALYTICAL REPORT SR-6234647.01.A02

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grade PROCESWATER

sample 001 Sample received from client
Sample packed in plastic, quantity approx. 3 L
Sample marked as Nijensleek TA 165 19-06-2023 14:00h
date received 26.06.2023

Norm 001

Density at 20°C, g/cm³
(ASTM D 4052) 1.0380

pH
(ASTM E 70) 5.56

pH: Temperature of test solution, °C
(ASTM E 70) 20

Flash point, Pensky Martens closed cup, °C
(ASTM D 93 procedure A) >95.0

Chloride as Cl⁻, mg/L
(SGS SPI 1022) 32850

Ionchromatographic analysis
(SGS SPI 164)

- Sulphate as SO₄²⁻, mg/kg 230

Total sulphide as S, mg/L
(WAC/III/A/040) <0.1

Total suspended solids (> 5 µm), mg/kg
(NEN 872) 39.9

Metals
(NEN 6961 / NEN 6966/C1)

- Arsenic as As, µg/L <10

- Cadmium as Cd, µg/L <1

- Chromium as Cr, µg/L 8.9

- Copper, µg/L 12

- Iron, µg/L 41000

- Lead as Pb, µg/L 73

- Nickel as Ni, µg/L 25

- Strontium as Sr, µg/L 120000

- Zinc as Zn, µg/L 1300

Bicarbonate as CO₃²⁻, mg/L
(WAC/III/A/006) 28000

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<u>Carbonate as CO₃²⁻, mg/L</u> (WAC/III/A/006)	<750
<u>Mercury as Hg, µg/L</u> (NEN-EN 1483 / external SGS Lab)	1.1
<u>PAH, µg/L</u> (SGS 12-01)	<26
<u>Gaschromatographic analysis</u> (NEN EN ISO 15680)	
- Benzene, µg/L	26000
- Ethylbenzene, µg/L	190
- Toluene, µg/L	1900
- m/p-Xylene, µg/L	130
- o-Xylene, µg/L	220
- Sum of xylenes, µg/L	340
- Sum of BTEX, µg/L	28000
- Naphthalenes, µg/L	25
<u>Gaschromatographic analysis</u> (NEN EN ISO 9377)	
- Fraction C10 - C12, µg/L	1000
- Fraction C12 - C22, µg/L	1600
- Fraction C22 - C30, µg/L	36
- Fraction C30 - C40, µg/L	42
- Total C10 - C40, µg/L	2700
<u>Gaschromatographic analysis</u> (SGS 2005-18)	
- 1,2-Propyleneglycol, mg/L	<2.5
- 1,3-Propyleneglycol, mg/L	<5
- Diethyleneglycol, mg/L	57
- Monoethyleneglycol, mg/L	130
- Triethyleneglycol, mg/L	7.9
<u>Total hardness, mg CaCO₃/L</u> (Calculation)	11750
<u>Sum of Arsene + Mercury + Benzene, µg/L</u> (Calculation)	26000
<u>Dissolved oxygen, µg/L</u> (ASTM D 5543/A, modified)	>100

End of analytical results



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Spijkenisse, the 14th July 2023
SGS Nederland B.V. - Oil, Gas and Chemicals

M. Audier
Business Unit Manager, Laboratories Rotterdam

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ANALYTICAL REPORT SR-6240357.05.A01

P. 1/3

grade PROCESWATER

sample 001 Sample received from client
Sample packed in plastic, quantity approx. 1 L
Sample marked as Nijensleek TANK 22-06-2023 10:00h
date received 21.07.2023

Norm 001

Density at 20°C, g/cm³
(ASTM D 4052) 1.0445

pH
(ASTM E 70) 4.83

pH: Temperature of test solution, °C
(ASTM E 70) 19

Flash point, Pensky Martens closed cup, °C
(ASTM D 93 procedure A) >95.0

Chloride as Cl⁻, mg/L
(SGS SPI 1022) 39000

Ionchromatographic analysis
(SGS SPI 164)

- Sulphate as SO₄²⁻, mg/kg 260

Total sulphide as S, mg/L
(WAC/III/A/040) <0.1

Total suspended solids (> 5 µm), mg/kg
(NEN 872) 36.4

Metals
(NEN 6961 / NEN 6966/C1)

- Arsenic as As, µg/L <10

- Cadmium as Cd, µg/L 6.9

- Chromium as Cr, µg/L 12

- Copper, µg/L 15

- Iron, µg/L 38000

- Lead as Pb, µg/L 210

- Nickel as Ni, µg/L 26

- Strontium as Sr, µg/L 140000

- Zinc as Zn, µg/L 4600

Bicarbonate as CO₃⁻, mg/L 44
(WAC/III/A/006)

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<u>Carbonate as CO₃²⁻, mg/L</u> (WAC/III/A/006)	<2.5
<u>Mercury as Hg, µg/L</u> (NEN-EN 1483 / external SGS Lab)	0.30
<u>PAH, µg/L</u> (SGS 12-01)	<21
<u>Gaschromatographic analysis</u> (NEN EN ISO 15680)	
- Benzene, µg/L	5900
- Ethylbenzene, µg/L	<20
- Toluene, µg/L	950
- m/p-Xylene, µg/L	130
- o-Xylene, µg/L	130
- Sum of xylenes, µg/L	260
- Sum of BTEX, µg/L	<7100
- Naphthalenes, µg/L	30
<u>Gaschromatographic analysis</u> (NEN EN ISO 9377)	
- Fraction C10 - C12, µg/L	540
- Fraction C12 - C22, µg/L	630
- Fraction C22 - C30, µg/L	37
- Fraction C30 - C40, µg/L	82
- Total C10 - C40, µg/L	1300
<u>Gaschromatographic analysis</u> (SGS 2005-18)	
- 1,2-Propyleneglycol, mg/L	<2.5
- 1,3-Propyleneglycol, mg/L	<5.0
- Diethyleneglycol, mg/L	88
- Monoethyleneglycol, mg/L	44
- Triethyleneglycol, mg/L	3.9
<u>Total hardness, mg CaCO₃/L</u> (Calculation)	13870
<u>Sum of Arsene + Mercury + Benzene, µg/L</u> (Calculation)	5900

End of analytical results



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Spijkenisse, the 1st August 2023
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ANALYTICAL REPORT SR-6240357.02.A01

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grade PROCESWATER

sample 001 Sample received from client
Sample marked as NSL na pomp 29-06-2023 13:00u
date received 20.07.2023

001
>100

Dissolved oxygen, µg/L
(ASTM D 5543/A, modified)

End of analytical results

Spijkenisse, the 20th July 2023
SGS Nederland B.V. - Oil, Gas and Chemicals

M. Audier
Business Unit Manager, Laboratories Rotterdam

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ANALYTICAL REPORT SR-6264202.04.A02v2

P. 1/3

grade PROCESWATER

sample 002 Sample received from client
Sample packed in plastic, quantity approx. 1 L
Sample marked as Steenwijk NSL 07-11-23
date received 16.11.2023

Norm	002
Density at 20°C, g/cm ³ (ASTM D 4052)	1.0393
pH (ASTM E 70)	4.73
pH: Temperature of test solution, °C (ASTM E 70)	20
Flash point, Pensky Martens closed cup, °C (ASTM D 93 procedure A)	>95.0
Chloride as Cl ⁻ , mg/L (SGS SPI 1022)	34100
Ionchromatographic analysis (SGS SPI 164)	
- Sulphate as SO ₄ ²⁻ , mg/kg	120
Total sulphide as S, mg/L (WAC/III/A/040)	<0.1
Total suspended solids (> 5 µm), mg/kg (NEN 872)	157.6
Metals (NEN 6961 / NEN 6966/C1)	
- Arsenic as As, µg/L	<10
- Cadmium as Cd, µg/L	6
- Calcium, µg/L	4850000
- Chromium as Cr, µg/L	12
- Copper, µg/L	<10
- Iron, µg/L	37000
- Lead as Pb, µg/L	460
- Magnesium, µg/L	670000
- Nickel as Ni, µg/L	30
- Strontium as Sr, µg/L	51000

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- Zinc as Zn, µg/L	3600
<u>Bicarbonate as CO₃⁻, mg/L</u> (WAC/III/A/006)	58
<u>Carbonate as CO₃²⁻, mg/L</u> (WAC/III/A/006)	<2.5
<u>Mercury as Hg, µg/L</u> (NEN-EN 1483 / external SGS Lab)	2.3
<u>PAH, µg/L</u> (SGS 12-01)	<6.3
<u>Gaschromatographic analysis</u> (NEN EN ISO 15680)	
- Benzene, µg/L	28000
- Ethylbenzene, µg/L	47
- Toluene, µg/L	3100
- m/p-Xylene, µg/L	320
- o-Xylene, µg/L	350
- Sum of xylenes, µg/L	670
- Sum of BTEX, µg/L	32000
- Naphthalenes, µg/L	4.8
<u>Gaschromatographic analysis</u> (NEN EN ISO 9377)	
- Fraction C10 - C12, µg/L	4800
- Fraction C12 - C22, µg/L	14000
- Fraction C22 - C30, µg/L	280
- Fraction C30 - C40, µg/L	120
- Total C10 - C40, µg/L	19000
<u>Gaschromatographic analysis</u> (SGS 2005-18)	
- 1,2-Propyleneglycol, mg/L	<2.5
- 1,3-Propyleneglycol, mg/L	<5.0
- Diethyleneglycol, mg/L	87
- Monoethyleneglycol, mg/L	170
- Triethyleneglycol, mg/L	<2.5
<u>Total hardness, mg CaCO₃/L</u> (Calculation)	14860
<u>Sum of Arsene + Mercury + Benzene, µg/L</u> (Calculation)	28000
<u>Dissolved oxygen, µg/L</u> (ASTM D 5543/A, modified)	6000

End of analytical results



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Spijkenisse, the 27th November 2023
SGS Nederland B.V. - Oil, Gas and Chemicals

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Business Unit Manager, Laboratories Rotterdam

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