

# Waterinjectie Nijensleek

## Jaarrapportage 2016

VERMILION  
ENERGY



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The Netherlands

27-03-2017

## ***Introductie***

Op 9 februari 2010 heeft het Ministerie van Economische Zaken toestemming gegeven om formatie water in de diepe ondergrond te injecteren op locatie Nijensleek (NSL) aan de Bosschasteeg te Nijensleek.

In de voorschriften behorende bij deze beschikking is opgenomen dat de meet en registratie verplichtingen jaarlijks worden geëvalueerd en in de vorm van een jaarrapportage worden ingediend. Gelieve bij deze aan te treffen de jaarrapportage voor 2016.

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## ***Samenvatting***

Gedurende het jaar 2016 is formatiewater van de volgende velden geïnjecteerd in de put Nijensleek-01 (NSL-01):

- Eesveen (put ESV-01)
- Langezwaag (putten LZG-01, LZG-02 en LZG-03)
- Slootdorp (putten SLD-06 en SLD-07)

De maximaal te injecteren hoeveelheid productiewater volgens de beschikking bedraagt 350 m<sup>3</sup>/dag met een maximaal totaal van 240.000 m<sup>3</sup>. Het totale geïnjecteerde water volume in 2016 is 5.750 m<sup>3</sup>.

In totaal zijn de volgende volumes jaarlijks geïnjecteerd in de put Nijensleek-01:

<b>Jaar</b>	<b>Geïnjecteerd volume [in m<sup>3</sup>]</b>
2011	13.314
2012	3.654
2013	2.006
2014	7.640
2015	12.434
2016	5.750
<b>Totaal</b>	<b>32.747</b>

Samen met het productie water wordt er Cortron RN-518 corrosie remmer geïnjecteerd (1 liter per 40 m<sup>3</sup> productie water) Daarnaast worden er geen andere additieven geïnjecteerd.

## ***Afwijkingen in injectiedrukken***

De injectie druk wordt regelmatig genoteerd tijdens routine rondes.

Nijensleek-01	
Datum	WHP (Bar)
14/02/2016	0
21/02/2016	0
06/03/2016	0
21/03/2016	0
29/03/2016	0
05/04/2016	0
12/04/2016	0
04/05/2016	0
21/05/2016	1.22
25/05/2016	0
09/06/2016	0
15/06/2016	0.7
23/06/2016	0
09/07/2016	0
20/07/2016	0
19/09/2016	0
13/10/2016	0.55
28/10/2016	0.74
03/11/2016	0
14/11/2016	0
02/12/2016	0
07/12/2016	0
19/12/2016	0
27/12/2016	0

## ***Afwijkingen in annulaire drukken***

De annulaire druk wordt regelmatig genoteerd tijdens routine rondes.

De onderstaande tabel geeft een overzicht van de annulaire drukken over het jaar 2016.

Nijensleek-01		
Datum	Annulus drukken (Bar)	
	1st	2nd
14/02/2016	0	0
21/02/2016	0	0
06/03/2016	0	0
21/03/2016	0	0
29/03/2016	0	0
05/04/2016	0	0
12/04/2016	0	0
04/05/2016	0	0
21/05/2016	0	0
25/05/2016	0	0
09/06/2016	0	0
15/06/2016	0	0
23/06/2016	0	0
09/07/2016	0	0
20/07/2016	0	0
19/09/2016	0	0
13/10/2016	0	0
28/10/2016	0	0
03/11/2016	0	0
14/11/2016	0	0
02/12/2016	0	0
07/12/2016	0	0
19/12/2016	0	0
27/12/2016	0	0

## ***Mechanische zaken en onderhoud***

De onderstaande tabel geeft een overzicht van de werkzaamheden aan NSL-01 in 2016.

<b>Omschrijving</b>	<b>Datum</b>
Repareren klep SDV 821	08/12/2016
Werkzaamheden aan level transmitter LT701	31/08/2016
Kalibratie flowmeter door Kalibra	01/08/2016
Mechanisch onderhoud	22/06/2016
Repareren klep SDV165A	15/06/2016
Repareren niveau metingen	15/06/2016
Mechanisch onderhoud	14/06/2016
E/I onderhoud	01/05/2016
Werkzaamheden aan septic tank	26/04/2016
Werkzaamheden aan level transmitter	11/04/2016
Werkzaamheden aan corrosion inhibitor pomp	14/03/2016
DCS/PLC werkzaamheden (wegens klep PDV166)	23/02/2016
Schoonmaken van tanken	22/02/2016
PLC werkzaamheden	05/02/2016
Repareren niveau metingen	03/02/2016
Well control unit inspectie	22/01/2016

## ***Incidenten of lekkages***

In 2016 hebben zich geen incidenten of lekkages voorgedaan.

## ***Vloeistof analyses***

De onderstaande tabel geeft de analyses weer van de productiewater monsters die zijn genomen van de putten SLD-06, SLD-07, LZG-01, LZG-02, LZG-03 en ESV-01 waarvan het water is geïnjecteerd in de put Nijensleek-01.

<b>Date</b>	<b>Well</b>	<b>pH</b>	<b>Totaal Ijzer (mg/l)</b>	<b>NaCl op basis van water (g/l)</b>
6/12/16	LZG	6.0	42.8	0.00
5/12/16	LZG	6.3	36.6	0.13
22/11/16	ESV-01	6.72	47.0	70.80
12/11/16	ESV-01	5.8	80.0	191.73
8/11/16	ESV-01	5.58	69.2	192.56
8/10/16	LZG	5.9	21.1	1.38
10/09/16	LZG	6.5	16.0	25.90
28/08/16	LZG	6.4	17.7	28.66
9/07/16	LZG	6.1	14.0	38.29
12/06/16	LZG	6.2	12.9	51.86
26/04/16	LZG	6.3	20.8	103.43
13/03/16	LZG	6.2	1.9	2.46
12/03/16	ESV-01	5.2	43.3	199.84

De resultaten van de uitgebreide analyses van de NSL-01 injectie waterstromen zijn bijgevoegd op de volgende bladzijdes.





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**ANALYTICAL REPORT SR-1777067.01.A01**

**P.1/3**

grade	PROCESWATER
sample 001	Sample received from client Sample packed in plastic, quantity approx. 3 L Sample marked as Location: Slootdorp-1 08-03-2017
date received	09.03.2017

Q Density at 20°C, g/cm3  
(ASTM D 4052) 1.0998

pH at 20°C  
(ASTM E 70) 6.17

Flash point, Pensky Martens closed cup, oC  
(ASTM D 93 procedure A, modified) >80

Chloride as Cl-, mg/L  
(SGS SPI 158) 74800

Ionchromatographic analysis  
(SGS SPI 164)

- Sulphate as  $SO_4^{2-}$ , mg/kg 740

Total Suspended Solids (>5um), mg/kg  
(NEN 872) 2.0

Metals  
(NEN6961/NEN 6966/C1)

- Arsene, µg/l <10  
- Cadmium, µg/l <1.0  
- Chrome, µg/l 130  
- Copper, µg/l 10  
- Iron, µg/l 13000  
- Lead, µg/l 10  
- Nickel, µg/l <10  
- Zinc, µg/l 240

Mercury, µg/L <0.10  
(NEN EN 1483)

Bicarbonate as HCO<sub>3</sub>, mg/L 41  
(WAC/III/A/006)

Carbonate as CO<sub>3</sub>, mg/L <2.5  
(WAC/III/A/006)

PAH, µg/L <20  
(SGS 12-01)

Volatile components  
(SIKB3001 / AS-3130)

- Benzene, µg/l	2500
- Ethylbenzene, µg/l	6.1
- Toluene, µg/l	260
- m,p Xylene, µg/l	30
- o-Xylene, µg/l	39
- sum of Xylenes, µg/l	69
- sum of BTEX, µg/l	2800
- Naphthalenes, µg/l	37

Hardness, mgCaCO<sub>3</sub>/L 18702  
(calculated from Ca/Mg)

Minerals Oil  
(NEN-EN-ISO 9377-2)

- Fraction C10-C12, µg/l	630
- Fraction C12-C22, µg/l	4800
- Fraction C22-C30, µg/l	340
- Fraction C30-C40, µg/l	<250
-Total C10-C40, µg/l	5700

Sum of Arsenic, + Mercury + Benzene, µg/L <2510  
(Calculated)

Total Sulfide as S, mg/L <0.050  
(WAC/III/C/040)

Gaschromatographic analysis

(SGS 2005-18)

- Methylglycol , mg/L	<2.5
- Ethylglycol, mg/L	<2.5
- Isopropylglycol , mg/L	<2.5
- Butylglycol , mg/L	<2.5
- Dimethylglycol, mg/L	<2.5
- Ethyleenglycol, mg/L	<2.5
- Diethyleenglycol, mg/L	<2.5

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<sup>Q</sup> Tests marked with Q are performed under RvA ISO 17025 Accreditation (L092)

Samples will be retained for 3 months unless instructed otherwise.

\*\*\*End of analytical results\*\*\*

Spijkenisse, the 27th March 2017  
**SGS Nederland B.V. - Oil, Gas and Chemicals**

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Laboratory Manager

The results shown in this test report specifically refer to the sample(s) tested as received unless otherwise stated. All tests have been performed using the latest revision of the methods indicated, unless specifically marked otherwise on the report. Precision parameters apply in the determination of the above results. Users of the data shown on this report should refer to the latest published revisions of ASTM D-3244; IP 367; ISO 4259 and Appendix E of IP Standard Methods for Analysis and Testing when utilizing the test data to determine conformance with any specification or process requirement. SGS' sole responsibility is to its client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Warning: The sample(s) to which the findings recorded herein (the "Findings") relate was (were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted.



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**ANALYTICAL REPORT SR-1684211.01.A01 A**

**P.1/3**

grade	PROCESWATER
sample 001	Sample received from client Sample packed in plastic, quantity approx. 4L Sample marked as Location: Langezwaag 2 / Vlieland water 06-11-2015
date received	13.11.2015

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<u>Density at 20°C, g/cm<sup>3</sup></u> (ASTM D 4052)	1.1825
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<u>pH at 20°C</u> (ASTM E 70)	5.6
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<u>Chloride as Cl<sup>-</sup>, mg/l</u> (SGS SPI 158)	166000	4682 (meq/l)
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Ionchromatographic analysis  
(SGS SPI 164)

- Sulphate as SO <sub>4</sub> <sup>2-</sup> , mg/kg	130	1.35 (meq/l)
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<u>H<sub>3</sub>O<sup>+</sup>, mg/l</u>	<0.5	<0.5 (meq/l)
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<u>Hardness, mgCaCO<sub>3</sub>/l</u> (calculated from Ca/Mg)	74410
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<u>Sulfide as H<sub>2</sub>S, mg/l</u> (WAC/III/C/040)	<1
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Metals

(NEN6961/NEN 6966/C1)

- Sodium, mg/l	66000	2870 (meq/l)
- Potassium, mg/l	1600	40.9 (meq/l)
- Calcium, mg/l	25000	624 (meq/l)
- Magnesium, mg/l	3100	127.5 (meq/l)
- Barium, mg/l	5.4	0.04 (meq/l)
- Strontium, mg/l	1100	12.6 (meq/l)
- Iron, mg/l	65	1.2 (meq/l)

Refractive Index at 20°C                      1.3796  
(ASTM D 1218)

Conductivity at 25°C, µS/cm                      200000  
NEN ISO 7888

Resistivity at 25°C, ohm-m                      0.05

Total Dissolved Solids, mg/l                      263000  
(NEN EN 15216)

Total Alkalinity, mg CaCO<sub>3</sub>/l                      6615  
(WAC/III/A/006)

\*\*\*End of analytical results\*\*\*

Spijkenisse, the November 30th, 2015  
**SGS Nederland B.V. - Oil, Gas & Chemicals Services**

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Laboratory Manager

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**ANALYTICAL REPORT SR-1691933.01.A01**

**P.1/3**

<u>grade</u>	PROCESWATER
sample 001	Sample received from client Sample packed in plastic, quantity approx. 4 L Sample marked as Field: Steenwijk / Location: Eesveen Origin: DS 100 (sep) / Date: 17-12-2015 15.30u
<u>date received</u>	22.12.2015

Density at 20°C, g/cm<sup>3</sup> 1.1124  
(ASTM D 4052)

pH at 20°C 5.87  
(ASTM E 70)

Flash point, Pensky Martens closed cup, °C >80  
(ASTM D 93 procedure A, modified)

Chloride as Cl<sup>-</sup>, mg/L 93300  
(SGS SPI 158)

Ionchromatographic analysis  
(SGS SPI 164)

- Sulphate as SO<sub>4</sub><sup>2-</sup>, mg/kg <10

Total Suspended Solids (>5µm), mg/kg 34.0  
(NEN 872)

Metals

(NEN6961/NEN 6966/C1)

- Arsene, µg/l	<10
- Cadmium, µg/l	6.7
- Chrome, µg/l	<5
- Copper, µg/l	15
- Iron, µg/l	120
- Lead, µg/l	10
- Nickel, µg/l	15
- Zinc, µg/l	6700

Mercury, µg/L

<0.10

(NEN EN 1483)

Bicarbonate as HCO<sub>3</sub>, mg/L

180

(WAC/III/A/006)

Carbonate as CO<sub>3</sub>, mg/L

<2.5

(WAC/III/A/006)

PAH, µg/L

<3.7

(SGS 12-01)

Volatile components

(SIKB3001 / AS-3130)

- Benzene, µg/l	5000
- Ethylbenzene, µg/l	13
- Toluene, µg/l	440
- m,p Xylene, µg/l	96
- o-Xylene, µg/l	52
- sum of Xylenes, µg/l	148
- sum of BTEX, µg/l	5749
- Naphthalenes, µg/l	27

Hardness, mgCaCO<sub>3</sub>/L 19675  
(calculated from Ca/Mg)

Minerals Oil  
(NEN-EN-ISO 9377-2)

- Fraction C10-C12, µg/l 1200  
- Fraction C12-C22, µg/l 3900  
- Fraction C22-C30, µg/l 590  
- Fraction C30-C40, µg/l 300  
-Total C10-C40, µg/l 5990

Sum of Arsene, + Mercury + Benzene, µg/L 5000  
(Calculated)

Total Sulfide as S, mg/L <0.1  
(WAC/III/C/040)

Gaschromatographic analysis  
(SGS 2005-18)

- Methylglycol , mg/L <2.5  
- Ethylglycol, mg/L <2.5  
- Isopropylglycol , mg/L <2.5  
- Butylglycol , mg/L <2.5  
- Dimethylglycol, mg/L <2.5  
- Ethyleenglycol, mg/L <2.5  
- Diethyleenglycol, mg/L <2.5

<sup>Q</sup> Tests marked with Q are performed under RvA ISO 17025 Accreditation (L092)

\*\*\*End of analytical results\*\*\*

Spijkenisse, the 4th January 2016  
**SGS Nederland B.V. - Oil, Gas & Chemicals**

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Laboratory Manager

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