

# **Waterinjectie Nijensleek**

## **Jaarrapportage 2015**

**VERMILION**  
**E N E R G Y**



Vermilion Energy Netherlands B.V.  
Zuidwalweg 2, 8861 NV Harlingen  
The Netherlands

## ***Introductie***

Op 09 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 2015.

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## ***Samenvatting***

Gedurende het jaar 2015 is formatiewater van de velden Brakel, Eernewoude, Langezwaag, Middenmeer en Slootdorp in de put Nijensleek-01 (NSL-01) geïnjecteerd.

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 2015 is 12.434 m<sup>3</sup>.

In totaal is er **13.314** m<sup>3</sup> (2011) + **3.654** m<sup>3</sup> (2012) + **2.006** m<sup>3</sup> (2013) + **7.640** m<sup>3</sup> (2014) + **12.434** m<sup>3</sup> (2015) = **39.048** m<sup>3</sup> geïnjecteerd in Nijensleek.

Samen met het productie water wordt er 140 ml/uur Cortron CK-956-G corrosie remmer geïnjecteerd. Daarnaast worden er geen andere additieven geïnjecteerd.

## ***Afwijkingen in injectiedrukken***

De injectie druk wordt regelmatig genoteerd tijdens routine rondes.

Gedurende het jaar 2015 is de put druk eigenlijk altijd 0 bar.

Nijensleek-01	
Datum	WHP (Bar)
09/01/2015	0
16/01/2015	0
21/01/2015	1
29/01/2015	0
19/02/2015	0
22/03/2015	0
05/04/2015	0
26/04/2015	0
23/05/2015	0
30/05/2015	0
07/06/2015	0
21/09/2015	0
13/10/2015	0
30/10/2015	0
09/11/2015	0.9
13/11/2015	0
29/11/2015	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 2015.

Nijensleek-01		
Datum	Annulus drukken (Bar)	
	1st	2nd
09/01/2015	0	0
16/01/2015	0	0
21/01/2015	5	6
29/01/2015	4	3.5
19/02/2015	4	3
22/03/2015	0	0
05/04/2015	2	1.5
26/04/2015	0	0
23/05/2015	0	0
30/05/2015	0	0
07/06/2015	0	0
21/09/2015	0	0
13/10/2015	0	0
30/10/2015	0	0
09/11/2015	0	0
13/11/2015	0	0
29/11/2015	1	0.3

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

Een overzicht van de werkzaamheden aan NSL-01 in 2015 is opgenomen in Bijlage 1.

## ***Incidenten of lekkages***

In 2015 hebben zich geen incidenten of lekkages voorgedaan.

## ***Vloeistof analyses***

Het te injecteren formatiewater wordt periodiek bemonsterd en geanalyseerd.

De analyse rapportages zijn weergegeven in bijlage 2.

## ***Bijlage 1 Rapport van onderhoudswerkzaamheden***

<b>Omschrijving</b>	<b>Datum</b>
Inspectie well control unit	22/12/2015
Onderhouds werkzaamheden tank D165 level metering	03/11/2015
	22/10/2015
	29/09/2015
	30/04/2015
	02/03/2015
29/01/2015	
Onderhouds werkzaamheden aan SDV811	02/10/2015
check injectie pompen nsl	05/06/2015
Kalibratie flowmeter door Kalibra,	11/03/2015
Inspectie well control unit	19/11/2015
Inspectie injectie pompen	03/07/2015



## ***Bijlage 2 Vloeistof analyses***





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NETHERLANDS BV  
Postbus 71  
8861 AB Harlingen

**ANALYTICAL REPORT SR-1624564.01.A01**

**P.1/3**

<u>grade</u>	PROCESWATER
sample 001	Sample received from client Sample packed in glass, quantity approx. 2*1L Sample marked as BRAKEL / 06-01-2015 09:00
<u>date received</u>	12.01.2015

<u>Density at 20°C, g/cm<sup>3</sup></u> (ASTM D 4052)	<u>001</u> 1.1251
<u>pH at 20°C</u> (ASTM E 70)	5.70
<u>Flash point, Pensky Martens closed cup, °C</u> (ASTM D 93 procedure A, modified)	>60
<u>Chloride as Cl<sup>-</sup>, mg/L</u> (SGS SPI 158)	112000
<u>Ionchromatographic analysis</u> (SGS SPI 164)	
- Sulphate as SO <sub>4</sub> <sup>2-</sup> , mg/kg	220
<u>Total Suspended Solids (&gt;5µm), mg/kg</u> (NEN 872)	89
<u>Gaschromatographic analysis</u> (SGS 2005-18)	
- Methylglycol , mg/L	<25
- Ethylglycol, mg/L	<25
- Isopropylglycol , mg/L	<25
- Butylglycol , mg/L	<25
- Dimethylglycol, mg/L	<25
- Ethyleenglycol, mg/L	4400
- Diethyleenglycol, mg/L	<25
<u>Total Sulfide as S, mg/L</u> (WAC/III/C/040)	<0.050

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Metals

(NEN6961/NEN 6966/C1)

- Arsene, µg/l	<10
- Cadmium, µg/l	<1.0
- Chrome, µg/l	30
- Copper, µg/l	38
- Lead, µg/l	44
- Nickel, µg/l	14
- Zinc, µg/l	3800

Mercury, µg/L

(NEN EN 1483)

<0.10

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

(WAC/III/A/006)

200

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

(WAC/III/A/006)

<5.0

PAH, µg/L

(SGS 12-01)

<30

Volatile components

(SIKB3001 / AS-3130)

- Benzene, µg/l	13000
- Ethylbenzene, µg/l	140
- Toluene, µg/l	3500
- m,p Xylene, µg/l	520
- o-Xylene, µg/l	320
- sum of Xylenes, µg/l	830
- sum of BTEX, µg/l	18000
- Naphthalenes, µg/l	<5.0

Hardness, mgCaCO<sub>3</sub>/L

(calculated from Ca/Mg)

30000

Minerals Oil

(NEN-EN-ISO 9377-2)

- Fraction C10-C12, µg/l	6900
- Fraction C12-C22, µg/l	6300
- Fraction C22-C30, µg/l	1900
- Fraction C30-C40, µg/l	580
-Total C10-C40, µg/l	16000

Sum of Arsene, + Mercury + Benzene, µg/L

(Calculating)

13000

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

Samples will be retained for 3 months unless instructed otherwise.

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

Spijkenisse, the 22nd January 2015  
SGS Nederland B.V. - Oil, Gas & Chemicals Services



M. Audier  
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 utilising the test data to determine conformance with any specification or process requirement. This Test Report is issued under the Company's General Conditions of Service (copy available upon request or on the company website at [www.sgs.com](http://www.sgs.com)). Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. This report shall not be reproduced except in full, without the written approval of the laboratory. In case samples are drawn under restricted or closed conditions, SGS cannot guarantee that these samples, and their subsequent test results, are representative of the actual cargo quality.



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NETHERLANDS BV  
Postbus 71  
8861 AB Harlingen

**ANALYTICAL REPORT SR-1680104.01.A01**

P.1/3

grade	PROCESWATER
sample 001	Sample received from client Sample packed in plastic, quantity approx. 2L Sample marked as Location: Slootdorp SLD/6/7 Origin: Baker Tank; 13.10.2015 14.30u
date received	23.10.2015

Density at 20°C, g/cm<sup>3</sup>  
(ASTM D 4052) 001  
1.0679

pH at 20°C  
(ASTM E 70) 6.12

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

Chloride as Cl<sup>-</sup>, mg/L  
(SGS SPI 158) 55500

Ionchromatographic analysis  
(SGS SPI 164)

- Sulphate as SO<sub>4</sub><sup>2-</sup>, mg/kg 400

Total Suspended Solids (>5um), mg/kg  
(NEN 872) 550

Elements with ICP  
(SGS SPI 110)

- Iron as Fe, mg/L 110

Gaschromatographic analysis  
(SGS 2005-18)

- Methylglycol, mg/L <25  
- Ethylglycol, mg/L <25  
- Isopropylglycol, mg/L <25  
- Butylglycol, mg/L <25  
- Dimethylglycol, mg/L <25  
- Ethyleenglycol, mg/L <25  
- Diethyleenglycol, mg/L <25

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<u>Total Sulfide as S</u> , mg/L (WAC/III/C/040)	<0.1
<u>Metals</u> (NEN6961/NEN 6966/C1)	
- Arsenic, µg/l	<10
- Cadmium, µg/l	<1
- Chrome, µg/l	120
- Copper, µg/l	360
- Lead, µg/l	140
- Nickel, µg/l	180
- Zinc, µg/l	1200
<u>Mercury</u> , µg/L (NEN EN 1483)	1.3
<u>Bicarbonate as HCO<sub>3</sub></u> , mg/L (WAC/III/A/006)	250
<u>Carbonate as CO<sub>3</sub></u> , mg/L (WAC/III/A/006)	<5.0
<u>PAH</u> , µg/L (SGS 12-01)	<7.1
<u>Volatile components</u> (SIKB3001 / AS-3130)	
- Benzene, µg/l	2900
- Ethylbenzene, µg/l	6.8
- Toluene, µg/l	300
- m,p Xylene, µg/l	20
- o-Xylene, µg/l	28
- sum of Xylenes, µg/l	49
- sum of BTEX, µg/l	3200
- Naphthalenes, µg/l	16
<u>Hardness</u> , mgCaCO <sub>3</sub> /L (calculated from Ca/Mg)	13350
<u>Minerals Oil</u> (NEN-EN-ISO 9377-2)	
- Fraction C10-C12, µg/l	4700
- Fraction C12-C22, µg/l	42000
- Fraction C22-C30, µg/l	5200
- Fraction C30-C40, µg/l	360
-Total C10-C40, µg/l	52000
<u>Sum of Arsenic, + Mercury + Benzene</u> , µg/L (Calculated)	2912

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

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

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



M. Audier  
Laboratory Manager

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NETHERLANDS BV  
Postbus 71  
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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</u> , g/cm <sup>3</sup> (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></u> , mg/l (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></u> , mg/l	<0.5	<0.5 (meq/l)
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<u>Hardness</u> , mgCaCO <sub>3</sub> /l (calculated from Ca/Mg)	74410
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<u>Sulfide as H<sub>2</sub>S</u> , mg/l (WAC/III/C/040)	<1
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**ANALYTICAL REPORT SR-1688647.01.A01**

P.1/2

grade	PROCESWATER
sample 001	Sample received from client Sample packed in glass, quantity approx. 3 L Sample marked as Slootdorp-7 Wellhead dd. 27-11-2015
date received	07.12.2015

Specific Gravity at 20/20°C, g/cm<sup>3</sup> 1.1073<sup>(01)</sup>  
(ASTM D 4052)

pH at 20°C 6.3  
(ASTM E 70)

Chloride as Cl<sup>-</sup>, mg/l 80000 2257 (meq/l)  
(SGS SPI 158)

Ionchromatographic analysis  
(SGS SPI 164)

- Sulphate as SO<sub>4</sub><sup>2-</sup>, mg/kg 730 7.60 (meq/l)

H<sub>3</sub>O<sup>+</sup>, mg/l <0.5 <0.5 (meq/l)

OH<sup>-</sup>, mg/l <0.5 <0.5 (meq/l)

Hardness, mgCaCO<sub>3</sub>/l 19000  
(calculated from Ca/Mg)

Sulfide as H<sub>2</sub>S, mg/l <1  
(WAC/III/C/040)

Metals

(NEN6961/NEN 6966/C1)

- Sodium, mg/l	48000	2088 (meq/l)
- Potassium, mg/l	1000	25.6 (meq/l)
- Calcium, mg/l	6400	160 (meq/l)
- Magnesium, mg/l	770	31.7 (meq/l)
- Barium, mg/l	2.8	0.02 (meq/l)
- Strontium, mg/l	260	2.96 (meq/l)
- Iron, mg/l	19	0.3 (meq/l)

Refractive Index at 20°C 1.3593  
(ASTM D 1218)

Conductivity at 25°C, µS/cm 160000  
NEN ISO 7888

Resistivity at 25°C, ohm-m 0.06

Total Dissolved Solids, mg/l 207500  
(NEN EN 15216)

Total Alkalinity, mg CaCO<sub>3</sub>/l 4650  
(WAC/III/A/006)

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

Bicarbonate as HCO<sub>3</sub>, mg/l 570  
(WAC/III/A/006)

<sup>(01)</sup> Due to matrix, result is indicative only.(particles present)

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

Spijkenisse, the 8th December 2015  
SGS Nederland B.V. - Oil, Gas & Chemicals Services



M. Audier  
Laboratory Manager

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NETHERLANDS BV  
Postbus 71  
8861 AB Harlingen

**ANALYTICAL REPORT SR-1691933.01.A01**

P.1/3

grade	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
date received	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, mgCaCO3/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**



M. Audier  
Laboratory Manager

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