

EXTENDED NATURAL GAS ANALYSIS (*DHA)

MAIN PAGE

LEASE #: _____ NAME/DESCRIP : **JOHN CRAIG 10-10 SALES GAS**

PROJECT NO. : **201701040** ANALYSIS NO. : **01**

COMPANY NAME : **NIGHTHAWK PRODUCTION CO** ANALYSIS DATE: **JANUARY 19, 2017 09:22**

OFFICE / BRANCH: **HIGHLANDS RANCH, CO** SAMPLE DATE : **JANUARY 10, 2017 13:15**

CUSTOMER REF: _____ TO: _____

PRODUCER : _____ EFFECTIVE DATE: _____

*****FIELD DATA*****

SAMPLE CYCLE: _____ SAMPLE TYPE: **SPOT**

SAMPLE PRES. : **22** psig CYLINDER NO. : **1757**

LAB PRES: _____ psig SAMPLED BY : **GALE MCENDREE**

SAMPLE TEMP. : **67** °f SAMPLING COMPANY: **EMPACT**

AMBIENT TEMP.: _____ °f H2S BY STAIN TUBE: **8** ppm

H2O BY STAIN TUBE: _____ #/mmcf CO2 BY STAIN TUBE: **-** Mol %

FIELD COMMENTS: **NO PROBE**

LAB COMMENTS: _____

<u>COMPONENT</u>	<u>MOLE %</u>	<u>MASS %</u>	<u>GPM @ 14.730</u>	<u>GPM @ 14.650</u>
ALCOHOLS	0.0007	0.0015		
HELIUM	0.30	0.04	---	---
HYDROGEN	0.01	0.00	---	---
OXYGEN/ARGON	0.05	0.06	---	---
NITROGEN	16.9700	17.4200	---	---
CARBON DIOXIDE	0.62	1.00	---	---
HYDROGEN SULFIDE	0.00136	0.00169	---	---
TOTAL OTHER SULFURS	0.00001	0.00004	---	---
METHANE	47.02013	27.64837	---	---
ETHANE	15.3529	16.9207	4.1233	4.1009
PROPANE	12.8481	20.7655	3.5554	3.5361
I-BUTANE	1.3858	2.9523	0.4551	0.4526
N-BUTANE	3.2666	6.9590	1.0341	1.0285
I-PENTANE	0.8813	2.3273	0.3202	0.3184
N-PENTANE	0.6053	1.6007	0.2205	0.2193
HEXANES PLUS	0.6878	2.3029	0.2776	0.2762
TOTALS	100.00000	100.00000	9.9862	9.9320

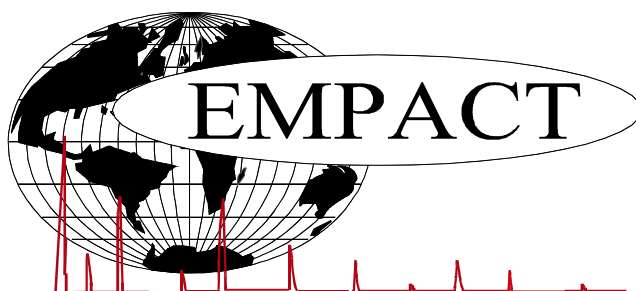
<u>BTEX COMPONENTS</u>	<u>MOLE%</u>	<u>WT%</u>	<u>BTU @</u>	<u>14.730</u>	<u>14.650</u>
BENZENE	0.0424	0.1214	LOW NET DRY REAL :	1207.4 /scf	1200.8 /scf
TOLUENE	0.0212	0.0716	NET WET REAL :	1186.4 /scf	1179.8 /scf
ETHYLBENZENE	0.0014	0.0055	HIGH GROSS DRY REAL :	1322.7 /scf	1315.5 /scf
XYLENES	0.0035	0.0135	GROSS WET REAL :	1299.7 /scf	1292.5 /scf
TOTAL BTEX	0.0685	0.2120	NET DRY REAL :	16812.6 /lb	16721.3 /lb
			GROSS DRY REAL :	18421.7 /lb	18321.7 /lb

(CALC: GPA STD 2145 & TP-17 @14.696 & 60 F)

*(DETAILED HYDROCARBON ANALYSIS/NJ 1993) ; ASTM D6730

RELATIVE DENSITY (AIR=1): 0.9412
COMPRESSIBILITY FACTOR : 0.99544

The data presented herein has been acquired by means of current analytical techniques and represents the judicious conclusion EMPACT Analytical Systems, Inc. Results of the analysis can be affected by the sampling conditions, therefore, are only warranted through proper lab protocol. EMPACT assumes no responsibility for interpretation or any consequences from application of the reported information and is the sole liability of the user. The reproduction in any media of this reported information may not be made, in portion or as a whole, without the written permission of EMPACT Analytical Systems, Inc.



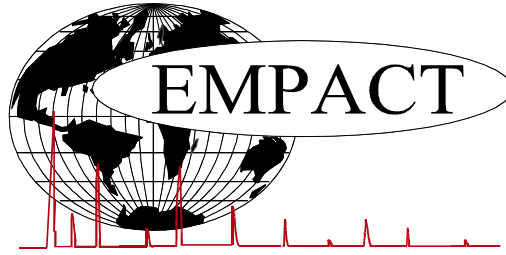
EXTENDED NATURAL GAS ANALYSIS (*DHA)

GLYCALC INFORMATION

PROJECT NO. :	201701040	ANALYSIS NO. :	01
COMPANY NAME :	NIGHTHAWK PRODUCTION CO	ANALYSIS DATE:	JANUARY 19, 2017 09:22
ACCOUNT NO. :		SAMPLE DATE :	JANUARY 10, 2017 13:15
PRODUCER :		CYLINDER NO. :	1757
LEASE NO. :		SAMPLED BY :	GALE MCENDREE
NAME/DESCRIP :	JOHN CRAIG 10-10 SALES GAS		
FIELD DATA		SAMPLE TEMP. :	67
SAMPLE PRES. :	22	AMBIENT TEMP.:	
COMMENTS :	NO PROBE SPOT		

<u>Componet</u>	<u>Mole %</u>	<u>Wt %</u>
Hydrogen Sulfide	0.00136	0.00169
Total Other Sulfurs	0.00001	0.00004
Helium	0.30	0.04
Hydrogen	0.01	0.00
Carbon Dioxide	0.62	1.00
Nitrogen	16.97	17.42
Methane	47.02013	27.64837
Ethane	15.3529	16.9207
Propane	12.8481	20.7655
Isobutane	1.3858	2.9523
n-Butane	3.2666	6.9590
Isopentane	0.8358	2.2103
n-Pentane	0.6053	1.6007
Cyclopentane	0.0455	0.1170
n-Hexane	0.1041	0.3288
Cyclohexane	0.0375	0.1157
Other Hexanes	0.2754	0.8642
Heptanes	0.1132	0.4132
Methycyclohexane	0.0271	0.0975
2,2,4 Trimethylpentane	0.0024	0.0100
Benzene	0.0424	0.1214
Toluene	0.0212	0.0716
Ethylbenzene	0.0014	0.0055
Xylenes	0.0035	0.0135
C8+ Heavies	0.0596	0.2615
<u>Subtotal</u>	<u>99.94930</u>	<u>99.93850</u>
Oxygen/Argon	0.05	0.06
<u>Alcohols</u>	<u>0.0007</u>	<u>0.0015</u>
Total	100.00000	100.00000

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EXTENDED NATURAL GAS ANALYSIS (*DHA)

DHA COMPONENT LIST

PROJECT NO. :	201701040	ANALYSIS NO. :	01
COMPANY NAME :	NIGHTHAWK PRODUCTION CO	ANALYSIS DATE:	JANUARY 19, 2017 09:22
ACCOUNT NO. :		SAMPLE DATE :	JANUARY 10, 2017 13:15
PRODUCER :		CYLINDER NO.:	1757
LEASE NO. :		SAMPLED BY :	GALE MCENDREE
NAME/DESCRIP :	JOHN CRAIG 10-10 SALES GAS		
FIELD DATA		SAMPLE TEMP. :	67
SAMPLE PRES. :	22	AMBIENT TEMP.:	
COMMENTS :	NO PROBE SPOT		

COMPONENT	PIANO #	MOLE %	MASS %	GPM @ 14.730	GPM @ 14.650
Helium	---	0.30	0.04	---	---
Hydrogen	---	0.01	0.00	---	---
Oxygen/Argon	---	0.05	0.06	---	---
Nitrogen	---	16.97	17.42	---	---
Carbon Dioxide	---	0.62	1.00	---	---
Hydrogen Sulfide (H2S)	---	0.00136	0.00169	---	---
Total Other Sulfurs	---	0.00001	0.00004	---	---
Methane	P1	47.02013	27.64837	---	---
Ethane	P2	15.3529	16.9207	4.123	4.101
Propane	P3	12.8481	20.7655	3.555	3.536
i-Butane	I4	1.3858	2.9523	0.455	0.453
n-Butane	P4	3.2666	6.9590	1.034	1.029
2,2-Dimethylpropane	I5	0.0041	0.0109	0.002	0.002
i-Pentane	I5	0.8317	2.1994	0.305	0.303
i-Propanol	X3	0.0007	0.0015	0.000	0.000
n-Pentane	P5	0.6053	1.6007	0.221	0.219
2,2-Dimethylbutane	I6	0.0017	0.0054	0.001	0.001
Cyclopentane	N5	0.0455	0.1170	0.013	0.013
2,3-Dimethylbutane	I6	0.0090	0.0284	0.004	0.004
2-Methylpentane	I6	0.1210	0.3822	0.050	0.050
3-Methylpentane	I6	0.0673	0.2126	0.027	0.027
n-Hexane	P6	0.1041	0.3288	0.043	0.043
2,2-Dimethylpentane	I7	0.0002	0.0007	0.000	0.000
Methylcyclopentane	N6	0.0763	0.2353	0.027	0.027
2,4-Dimethylpentane	I7	0.0018	0.0066	0.001	0.001
2,2,3-Trimethylbutane	I7	0.0003	0.0011	0.000	0.000
Benzene	A6	0.0424	0.1214	0.012	0.012
3,3-Dimethylpentane	I7	0.0004	0.0015	0.000	0.000
Cyclohexane	N6	0.0375	0.1157	0.013	0.013
2-Methylhexane	I7	0.0068	0.0250	0.003	0.003
2,3-Dimethylpentane	I7	0.0091	0.0334	0.004	0.004
1,1-Dimethylcyclopentane	N7	0.0046	0.0166	0.002	0.002
3-Methylhexane	I7	0.0169	0.0621	0.008	0.008
1c,3-Dimethylcyclopentane	N7	0.0065	0.0234	0.003	0.003
1t,3-Dimethylcyclopentane	N7	0.0056	0.0202	0.003	0.003
3-Ethylpentane	I7	0.0025	0.0092	0.001	0.001
1t,2-Dimethylcyclopentane	N7	0.0181	0.0651	0.008	0.008

2,2,4-Trimethylpentane	I8	0.0024	0.0100	0.001	0.001
UnknownC6s	U6	0.0001	0.0003	0.000	0.000
n-Heptane	P7	0.0273	0.1003	0.013	0.013
1c,2-Dimethylcyclopentane	N7	0.0011	0.0040	0.001	0.001
Methylcyclohexane	N7	0.0271	0.0975	0.011	0.011
2,2-Dimethylhexane	I8	0.0016	0.0067	0.001	0.001
1,1,3-Trimethylcyclopentane	N7	0.0003	0.0013	0.000	0.000
Ethylcyclopentane	N7	0.0042	0.0151	0.002	0.002
2,5-Dimethylhexane	I8	0.0005	0.0021	0.000	0.000
2,2,3-Trimethylpentane	I8	0.0003	0.0013	0.000	0.000
2,4-Dimethylhexane	I8	0.0010	0.0042	0.001	0.001
1c,2t,4-Trimethylcyclopentane	N8	0.0019	0.0078	0.001	0.001
3,3-Dimethylhexane	I8	0.0002	0.0008	0.000	0.000
1t,2c,4-Trimethylcyclopentane	N8	0.0003	0.0013	0.000	0.000
2,3,4-Trimethylpentane	I8	0.0008	0.0033	0.000	0.000
2,3,3-Trimethylpentane	I8	0.0003	0.0013	0.000	0.000
Toluene	A7	0.0212	0.0716	0.007	0.007
2,3-Dimethylhexane	I8	0.0007	0.0029	0.000	0.000
2-Methyl-3-ethylpentane	I8	0.0003	0.0013	0.000	0.000
1,1,2-Trimethylcyclopentane	N8	0.0001	0.0004	0.000	0.000
2-Methylheptane	I8	0.0057	0.0239	0.003	0.003
4-Methylheptane	I8	0.0012	0.0050	0.001	0.001
3-Methyl-3-ethylpentane	I8	0.0007	0.0029	0.000	0.000
3,4-Dimethylhexane	I8	0.0004	0.0017	0.000	0.000
1c,2c,4-Trimethylcyclopentane	N8	0.0024	0.0099	0.001	0.001
1c,3-Dimethylcyclohexane	N8	0.0001	0.0004	0.000	0.000
3-Methylheptane	I8	0.0002	0.0008	0.000	0.000
1c,2t,3-Trimethylcyclopentane	N8	0.0037	0.0152	0.002	0.002
3-Ethylhexane	I8	0.0017	0.0071	0.001	0.001
1t,4-Dimethylcyclohexane	N8	0.0011	0.0045	0.001	0.001
1,1-Dimethylcyclohexane	N8	0.0004	0.0017	0.000	0.000
2,2,5-Trimethylhexane	I9	0.0001	0.0005	0.000	0.000
3t-Ethylmethylcyclopentane	N8	0.0008	0.0033	0.000	0.000
1,1-Methylethylcyclopentane	N8	0.0017	0.0070	0.001	0.001
1t,2-Dimethylcyclohexane	N8	0.0012	0.0050	0.001	0.001
1c,2c,3-Trimethylcyclopentane	N8	0.0003	0.0013	0.000	0.000
1t,3-Dimethylcyclohexane	N8	0.0001	0.0004	0.000	0.000
UnknownC7s	U7	0.0075	0.0276	0.003	0.003
n-Octane	P8	0.0056	0.0235	0.003	0.003
1c,4-Dimethylcyclohexane	N8	0.0008	0.0033	0.000	0.000
2,4,4-Trimethylhexane	I9	0.0002	0.0010	0.000	0.000
2,2,3,4-Tetramethylpentane	I9	0.0002	0.0010	0.000	0.000
1c,2-Dimethylcyclohexane	N8	0.0001	0.0004	0.000	0.000
2,2-Dimethylheptane	I9	0.0001	0.0005	0.000	0.000
1,1,4-Trimethylcyclohexane	N9	0.0019	0.0088	0.001	0.001
2,4-Dimethylheptane	I9	0.0001	0.0005	0.000	0.000
4,4-Dimethylheptane	I9	0.0005	0.0024	0.000	0.000
Ethylcyclohexane	N8	0.0015	0.0062	0.001	0.001
n-Propylcyclopentane	N8	0.0002	0.0008	0.000	0.000
1c,3c,5-Trimethylcyclohexane	N9	0.0001	0.0005	0.000	0.000
2,5-Dimethylheptane	I9	0.0002	0.0010	0.000	0.000
3,3-Dimethylheptane	I9	0.0001	0.0005	0.000	0.000
1,1,3-Trimethylcyclohexane	N9	0.0001	0.0005	0.000	0.000
Ethylbenzene	I8	0.0014	0.0055	0.001	0.001
1c,2t,4t-Trimethylcyclohexane	N9	0.0009	0.0042	0.001	0.001
2,3-Dimethylheptane	I9	0.0002	0.0010	0.000	0.000
1,3-Dimethylbenzene (m-Xylene)	A8	0.0015	0.0058	0.001	0.001
1,4-Dimethylbenzene (p-Xylene)	A8	0.0005	0.0019	0.000	0.000
3,4-Dimethylheptane	I9	0.0001	0.0005	0.000	0.000
3,4-Dimethylheptane (2)	I9	0.0002	0.0010	0.000	0.000
4-Ethylheptane	I9	0.0001	0.0005	0.000	0.000

4-Methyloctane	I9	0.0004	0.0019	0.000	0.000
2-Methyloctane	I9	0.0003	0.0014	0.000	0.000
1c,2t,3-Trimethylcyclohexane	N9	0.0002	0.0009	0.000	0.000
3-Ethylheptane	I9	0.0001	0.0005	0.000	0.000
3-Methyloctane	I9	0.0003	0.0014	0.000	0.000
1c,2t,4c-Trimethylcyclohexane	I9	0.0001	0.0005	0.000	0.000
1,1,2-Trimethylcyclohexane	N9	0.0001	0.0005	0.000	0.000
3,3-Diethylpentane	I9	0.0001	0.0005	0.000	0.000
1,2-Dimethylbenzene (o-Xylene)	A8	0.0015	0.0058	0.001	0.001
i-Butylcyclopentane	N9	0.0004	0.0018	0.000	0.000
UnknownC8s	U8	0.0021	0.0088	0.001	0.001
n-Nonane	P9	0.0017	0.0080	0.001	0.001
1,1-Methylethylcyclohexane	N9	0.0003	0.0014	0.000	0.000
i-Propylbenzene	A9	0.0004	0.0018	0.000	0.000
i-Propylcyclohexane	N9	0.0001	0.0005	0.000	0.000
2,2-Dimethyloctane	I10	0.0001	0.0005	0.000	0.000
n-Butylcyclopentane	N9	0.0002	0.0009	0.000	0.000
3,3-Dimethyloctane	I10	0.0002	0.0010	0.000	0.000
n-Propylbenzene	A9	0.0003	0.0013	0.000	0.000
3,6-Dimethyloctane	I10	0.0003	0.0016	0.000	0.000
3-Methyl-5-ethylheptane	I10	0.0001	0.0005	0.000	0.000
1,3-Methylethylbenzene	A9	0.0002	0.0009	0.000	0.000
1,3,5-Trimethylbenzene	A9	0.0002	0.0009	0.000	0.000
5-Methylnonane	I10	0.0004	0.0021	0.000	0.000
1,2-Methylethylbenzene	A9	0.0001	0.0004	0.000	0.000
3-Methylnonane	I10	0.0001	0.0005	0.000	0.000
t-Butylbenzene	A10	0.0005	0.0025	0.000	0.000
i-Butylcyclohexane	N10	0.0002	0.0010	0.000	0.000
sec-Butylbenzene	A10	0.0002	0.0010	0.000	0.000
UnknownC9s	U9	0.0031	0.0146	0.002	0.002
n-Decane	P10	0.0006	0.0031	0.000	0.000
1,2,3-Trimethylbenzene	A9	0.0003	0.0013	0.000	0.000
Sec-Butylcyclohexane	A10	0.0002	0.0010	0.000	0.000
3-Ethylnonane	I10	0.0001	0.0006	0.000	0.000
1,3-Methyl-n-propylbenzene	A10	0.0001	0.0005	0.000	0.000
1,3-Dimethyl-5-ethylbenzene	A10	0.0001	0.0005	0.000	0.000
1,4-Dimethyl-2-ethylbenzene	A10	0.0001	0.0005	0.000	0.000
1,4-Methyl-t-butylbenzene	A11	0.0001	0.0006	0.000	0.000
UnknownC10s	U10	0.0015	0.0078	0.001	0.001
n-Undecane	P11	0.0002	0.0011	0.000	0.000
1,2,4,5-Tetramethylbenzene	A11	0.0001	0.0005	0.000	0.000
1,3-Di-i-propylbenzene	A11	0.0001	0.0006	0.000	0.000
UnknownC11s	U11	0.0002	0.0011	0.000	0.000
n-Dodecane	P12	0.0001	0.0006	0.000	0.000
TOTAL		100.00000	100.00000	9.9862	9.9320

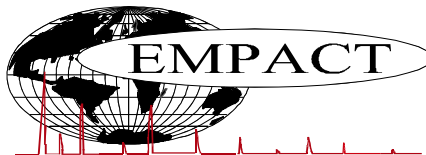
BTEX COMPONENTS	MOLE%	WT%	BTU @	14.730	14.650
BENZENE	0.0424	0.1214	LOW NET DRY REAL :	1207.4 /scf	1200.8 /scf
TOLUENE	0.0212	0.0716	NET WET REAL :	1186.4 /scf	1179.8 /scf
ETHYLBENZENE	0.0014	0.0055	HIGH GROSS DRY REAL :	1322.7 /scf	1315.5 /scf
XYLENES	0.0035	0.0135	GROSS WET REAL :	1299.7 /scf	1292.5 /scf
TOTAL BTEX	0.0685	0.2120	NET DRY REAL :	16812.6 /lb	16721.3 /lb
			GROSS DRY REAL :	18421.7 /lb	18321.7 /lb

RELATIVE DENSITY (AIR=1): 0.9412
 COMPRESSIBILITY FACTOR : 0.99544

(CALC: GPA STD 2145 & TP-17 @14.696 & 60 F)

*(DETAILED HYDROCARBON ANALYSIS/NJ 1993) ; ASTM D6730

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SULFUR IN NATURAL GAS ANALYSIS

LEASE #:		NAME/DESCRIP :	JOHN CRAIG 10-10 SALES GAS
PROJECT NO. :	201701040	ANALYSIS NO. :	01
COMPANY NAME :	NIGHTHAWK PRODUCTION CC	ANALYSIS DATE:	JANUARY 13, 2017 07:18
OFFICE / BRANCH:	HIGHLANDS RANCH, CC	SAMPLE DATE :	JANUARY 10, 2017 13:35
CUSTOMER REF:		TO:	
PRODUCER :		EFFECTIVE DATE:	

*****FIELD DATA*****

SAMPLE CYCLE:		SAMPLE TYPE:	SPOT
SAMPLE PRES. :	22 psig	CYLINDER NO. :	1L TEDLAR
LAB PRES:	psig	SAMPLED BY :	GALE MCENDREE
SAMPLE TEMP. :	67 °f	SAMPLING COMPANY:	EMPACT
AMBIENT TEMP.:	°f	H2S BY STAIN TUBE:	<u>8</u> ppm
H2O BY STAIN TUBE:	- #/mmcf	CO2 BY STAIN TUBE:	- Mol %
FIELD COMMENTS:	NO PROBE		
LAB COMMENTS:			

<u>COMPONENT</u>	SULFUR		
	ppm mole (ul/L)	ppm wt (ug/g)	
Hydrogen Sulfide (H2S)	13.6	15.9	
Carbonyl Sulfide (COS)/Sulfur Dioxide (SO2)	BDL		
Methanethiol (MeSH)	BDL		
Ethanethiol (EtSH)	0.1	0.2	
Dimethylsulfide (DMS)	BDL		
Carbon Disulfide (CS2)	BDL		
i-Propanethiol (i-PrSH)	BDL		
t-Butanethiol (t-BuSH)	BDL		
n-Propanethiol (n-PrSH)	BDL		
Methylethylsulfide (MES)	BDL		
s-Butanethiol (s-BuSH)	BDL		
i-Butanethiol (i-BuSH)	BDL		
Thiophene (TP)	BDL		
Diethylsulfide (DES)	BDL		
n-Butanethiol (n-BuSH)	BDL		
Dimethyldisulfide (DMDS)	BDL		
Unidentified Sulfurs - Light Ends	BDL		
Methylthiophenes (MTP)	BDL		
2-Ethylthiophene (2-ETP)	BDL		
Methylethylsulfide (MEDS)	BDL		
Dimethylthiophenes (DMTP)	BDL		
Diethylsulfide (DEDS)	BDL		
Benzothiophene (BzTP)	BDL		
Unidentified Sulfurs - Mid Range	BDL		
Methylbenzothiophenes (MBzTP)	BDL		
Dimethylbenzothiophenes (DMBzTP)	BDL		
Trimethylbenzothiophenes (TMBzTP)	BDL		
Dibenzothiophenes (DBzTP)	BDL		
Methyldibenzothiophenes (MDBzTP)	BDL		
<u>Unidentified Sulfurs - Heavy Ends</u>	<u>BDL</u>	<u>BDL</u>	
TOTAL SULFUR	13.7	16.1	
GRAINS OF H2S	0.8540 / 100 scf	TOTAL GRAINS OF SULFUR	0.8136 / 100 scf
POUNDS OF H2S	0.0012 / 1000 scf	TOTAL POUNDS OF SULFUR	0.0012 / 1000 scf
WT% OF H2S	0.00159 / 1000 scf	TOTAL WT% OF SULFUR	0.00161 / 1000 scf

* ASTM D5504 ** DETECTION LIMIT DETERMINED TO BE 0.1 ppm (ul/L) Sulfur - BDL (BELOW DETECTION LIMIT)

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