



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB - 2 1991

OFFICE OF
WATER

MEMORANDUM

SUBJECT: Marysville Underground Storage Terminal Request for Exclusion from UIC Regulations

FROM: Françoise M. Brasier, Chief *Françoise M. Brasier*
Underground Injection Control Branch

TO: Richard J. Zdanowicz, Chief
Underground Injection Control Section

Based upon the information submitted by the operators of the Marysville Underground Storage Terminal (MUST) the facility is used primarily for natural gas storage. As such, the storage operation would qualify for exclusion from the UIC regulations listed in 40 CFR 144.1(g)(2)(iv).

The nine cavern storage wells contain various mixtures of gases and minor amounts of pentane and heavier hydrocarbons. The only well that has more than 8% n-pentane and hexane+ by volume is FB-007. Since 90+% of the hydrocarbon components in all of the caverns are gases at standard temperature and pressure conditions (60°F. and 14.73 psia), the stored product should be categorized as natural gas mixtures.

With regard to the three questions posed by Mr. Overbeck, our decision to classify the MUST facility as a natural gas storage operation renders them irrelevant. You might inform him that the term "pipeline quality" refers to accepted industry standards and that EPA has not established a percentage (by volume) for less-volatile components (i.e., pentane and higher) that would qualify a well as a Class IIH hydrocarbon storage well. Similarly, since EPA has not set a minimum percentage standard for butane and lighter gases in a gas storage well, the issue of whether higher percentages of the more volatile isopentane is more acceptable is also a moot point. The brine displacement technique is used to facilitate injection and withdrawal of the hydrocarbons in many conventional natural gas storage facilities maintained by interstate pipelines and local distributors for demand "peak shaving."

Per your request, I am providing this formal determination for your files. Should you have any further questions please contact Jeff Smith at (202) 260-5586.

M U S T MARYSVILLE UNDERGROUND STORAGE TERMINAL

2510 BUSHA HIGHWAY, MARYSVILLE, MI 48040
(313) 364-8100

November 12, 1993

RICHARD J ZDANOWICZ
CHIEF UNDERGROUND INJECTION CONTROL SECTION
US EPA, REGION 5
77 WEST JACKSON BLVD
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In recent telephone conversations on November 9 and 10, 1993 with Mr. Chad Kincheloe, we discussed the application of the specific exclusions from the UIC regulations as listed in 40 CFR 144.1(g)(2)(iv) to our storage operation. The regulation states as an exclusion: "Injection wells used for injection of hydrocarbons which are of pipeline quality and are gases at standard temperature and pressure for the purpose of storage."

Our caverns store HD-5 propane, specification isobutane, specification n-butane, mixed butanes which contain some pentanes-plus, a refinery propane-butanes stream with some NGL's, and in the near future we will add storage of western Canadian NGL's.

The propane, isobutane and n-butane of themselves are excluded by definition. A couple questions remain about the mixed butanes and other streams which contain some pentanes-plus. Under the term "pipeline quality" is there some percentage of less-volatiles allowed when mixed with propane and/or butanes? And since isopentane evaporates rapidly at standard temperature and pressure would higher percentages of isopentane be allowed than n-pentane and further hexanes-plus?

A third question concerns our manner of operation. The hydrocarbons are injected and withdrawn by brine displacement (the brine is saturated sodium chloride solution previously solution-mined to form the caverns in the Silurian B-salt layer). The brine is injected and withdrawn through the internal stringer; the hydrocarbons are injected and withdrawn through the annulus. Thus, except on the rare occasion when a cavern is empty, the hydrocarbon, which is under the higher pressure, is in the annulus against the outer tubing of concern for leaks to the groundwater. If there were a leak in the stringer, hydrocarbon would leak into the brine, not brine into the hydrocarbon. Such leaks are easily detected by well-head pressure changes when operation is momentarily idle. Under these circumstances of brine displacement do "gases" still qualify for the exemption from the rules?

We have nine cavern storage wells on-site. These caverns store the products indicated below:

<u>Cavern Designation</u>	<u>Product Stored</u>
FB-7004	Specification Isobutane
FB-7005	Refinery LPG & NGL
FB-7006	Specification n-Butane
FB-7007	Refinery Mixed Butanes
FB-7008	Refinery Mixed Butanes
FB-7009	HD-5 Propane
FB-7010	Refinery Mixed Butanes
FB-7011	HD-5 Propane
FB-7012	HD-5 Propane

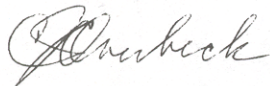
Copies of typical product analyses are attached.

Cavern numbers FB-7004, FB-7005, and FB-7006 have associated pumpout wells. As originally designed and operated in the 1970's, hydrocarbon was injected into the main cavern and pumped out by a down-hole-pump from the adjacent pumpout well. Since the mid 1980's, these wells have been operated by brine displacement. In the near future, FB-7004 and FB-7005 will be returned to pumpout service and brine injection will not be used. FB-7006 will remain in the brine displacement mode. Western Canadian NGL's will be stored in the pumpout caverns, isobutane will be stored in FB-7006, and n-Butane will be stored in FB-7010 (Thus, only two caverns will service refinery mixed butanes.)

Mr. Chad Kincheloe, after consultation with Ms. Lisa Perenchio, has told us that the current requirement upon us to perform mechanical integrity testing on FB-7004, FB-7006, and FB-7008 will be put on hold until the question of the applicability of the exclusion rule is resolved.

We will await your decision concerning these matters. In the meantime, if you have any questions or desire further information, please feel free to telephone me at 313-364-8100.

Thank you for your consideration.



Charles J Overbeck
Environmental Coordinator

cc DELutz, CPCo, Marysville
JCJMunro, CPCO, Marysville
JAGulvas, CPCO, P-22-525

Marysville Underground Storage Terminal

Product: Spec. isoButane Sample No.: 9S011
Origin: Butane Splitter Overhead Batch No.:
Mode of Transport: FA-1203 Inlet Owner: MFP
Destination: FB-7004 Net Volume:
Ticket Nos.:
Car Nos.:
Shipment Date: October 21, 1993 0844 Hrs.

Components	Wt. %	Mol. %	L.V.%
Methane	0.000	0.000	0.000
Ethane	0.005	0.010	0.008
Propane	0.302	0.397	0.335
Propylene	0.000	0.000	0.000
isoButane	96.820	96.675	96.942
n-Butane	0.991	0.993	0.959
Butylene	0.620	0.641	0.581
isoButylene	1.129	1.167	1.060
trans-2-Butene	0.056	0.058	0.052
cis-2-Butene	0.000	0.000	0.000
1,3-Butadiene	0.017	0.018	0.015
isoPentane	0.008	0.006	0.007
n-Pentane	0.019	0.015	0.017
1-Pentene	0.000	0.000	0.000
2-Methyl-1-Butene	0.000	0.000	0.000
trans-2-Pentene	0.000	0.000	0.000
cis-2-Pentene	0.000	0.000	0.000
2-Methyl-2-Butene	0.000	0.000	0.000
Hexanes Plus	0.033	0.020	0.024
Total	100.000	100.000	100.000

Calc'd. Specific Gravity, 60/60 (ASTM D-2598) 0.564
Calc'd. Vapor Pressure @ 100F., psig (ASTM D-2598) 57.6
Calc'd. Vapor Pressure @ 100F., psia 72.3

Marysville Underground Storage Terminal

Product: NGL's
 Origin: Shell-Canada
 Mode of Transport: Salmon Pipeline
 Destination: FB-7005 *This makes up over 80% of FB-7005*
 Ticket Nos.: Autosampler Composite
 Car Nos.:
 Shipment Date: November 1-7, 1993

Sample No.: 3166
 Batch No.: 1533
 Owner: Salmon
 Net Volume:

Components	Wt. %	Mol. %	L.V.%
Methane	0.006	0.018	0.010
Ethane	1.034	1.736	1.561
Propane	46.496	53.243	49.304
Propylene	0.529	0.635	0.546
isoButane	31.270	27.167	29.890
n-Butane	15.453	13.423	14.238
Butylene	0.118	0.107	0.106
isoButylene	0.252	0.227	0.226
trans-2-Butene	0.278	0.251	0.246
cis-2-Butene	0.177	0.159	0.152
1,3-Butadiene	0.014	0.013	0.012
isoPentane	3.732	2.612	3.213
n-Pentane	0.181	0.127	0.154
1-Pentene	0.000	0.000	0.000
2-Methyl-1-Butene	0.059	0.042	0.048
trans-2-Pentene	0.000	0.000	0.000
cis-2-Pentene	0.118	0.085	0.096
2-Methyl-2-Butene	0.005	0.004	0.004
Hexanes Plus	0.278	0.151	0.194
Total	100.000	100.000	100.000

Calc'd. Specific Gravity, 60/60 (ASTM D-2598) 0.538
 Calc'd. Vapor Pressure @ 100F., psig (ASTM D-2598) 121.2
 Calc'd. Vapor Pressure @ 100F., psia 135.9

Marysville Underground Storage Terminal

SECTION REGION V

Product: NGL's

This makes up 11% to 12% of FB-7005

Cavern No.: FB-7005

Origin: Sun-Inkster

Owner: Kinetic Energy

Mode of Transport: Inbound Trucks

Net volume: 29853

Weighted Average Analysis for Accounting Period Six

Components	Wt. %	Mol. %	L.V.%
Methane	0.027	0.098	0.053
Ethane	0.503	0.961	0.824
Propane	26.431	34.441	30.412
Propylene	0.487	0.666	0.546
isoButane	14.394	14.230	14.930
n-Butane	27.691	27.376	27.677
Butylene	1.031	1.056	1.002
isoButylene	1.134	1.161	1.104
trans-2-Butene	1.183	1.212	1.132
cis-2-Butene	0.839	0.860	0.782
1,3-Butadiene	0.026	0.027	0.024
isoPentane	5.456	4.345	5.098
n-Pentane	3.220	2.564	2.979
1-Pentene	0.088	0.072	0.080
2-Methyl-1-Butene	0.105	0.086	0.094
trans-2-Pentene	0.251	0.206	0.225
cis-2-Pentene	0.033	0.027	0.030
2-Methyl-2-Butene	0.342	0.280	0.300
Hexanes Plus	16.759	10.333	12.709
Total	100.000	100.001	100.001

Calc'd. Specific Gravity, 60/60 (ASTM D-2598) 0.584

Calc'd. Vapor Pressure @ 100F., psig (ASTM D-2598) 81.7

Calc'd. Vapor Pressure @ 100F., psia 96.4

Marysville Underground Storage Terminal

UIC SECTION REGION V

Product: NGL's

Cavern No.: FB-7005

Origin: Various

This makes up about 7% of FB-7005

Owner: CSPM

Mode of Transport: Inbound Trucks

Net volume: 18231

Weighted Average Analysis for Accounting Period Six

Components	Wt. %	Mol. %	L.V.%
Methane	0.064	0.212	0.119
Ethane	1.530	2.719	2.406
Propane	44.940	54.443	49.606
Propylene	0.123	0.156	0.132
isoButane	9.225	8.479	9.179
n-Butane	18.214	16.740	17.463
Butylene	0.135	0.128	0.126
isoButylene	0.150	0.143	0.140
trans-2-Butene	0.125	0.119	0.115
cis-2-Butene	0.089	0.085	0.079
1,3-Butadiene	0.043	0.042	0.038
isoPentane	5.105	3.780	4.575
n-Pentane	7.896	5.847	7.010
1-Pentene	0.010	0.008	0.009
2-Methyl-1-Butene	0.015	0.011	0.012
trans-2-Pentene	0.031	0.024	0.027
cis-2-Pentene	0.023	0.018	0.020
2-Methyl-2-Butene	0.040	0.030	0.033
Hexanes Plus	12.244	7.019	8.908
Total	100.002	100.003	99.997

Calc'd. Specific Gravity, 60/60 (ASTM D-2598)

0.560

Calc'd. Vapor Pressure @ 100F., psig (ASTM D-2598)

120.1

Calc'd. Vapor Pressure @ 100F., psia

134.8

Marysville Underground Storage Terminal

Product: NGL's Sample No.: 3170
 Origin: Lakehead Batch No.:
 Mode of Transport: Lakehead Pipeline Owner: MUST
 Destination: FB-7005 Net Volume:
 Car Nos.: *Typical of future western*
 Car Nos.: *Canadian NGL's*
 Shipment Date: November 1, 1993

Components	Wt. %	Mol. %	L.V.%
Methane	0.000	0.000	0.000
Ethane	0.926	1.636	1.450
Propane	44.488	53.588	48.881
Propylene	0.181	0.229	0.194
isoButane	15.773	14.414	15.622
n-Butane	19.179	17.525	18.304
Butylene	0.031	0.030	0.029
isoButylene	0.114	0.108	0.106
trans-2-Butene	0.040	0.038	0.037
cis-2-Butene	0.025	0.023	0.022
1,3-Butadiene	0.000	0.000	0.000
isoPentane	4.960	3.652	4.426
n-Pentane	3.611	2.659	3.191
1-Pentene	0.000	0.000	0.000
2-Methyl-1-Butene	0.000	0.000	0.000
trans-2-Pentene	0.000	0.000	0.000
cis-2-Pentene	0.057	0.043	0.048
2-Methyl-2-Butene	0.025	0.019	0.021
Hexanes Plus	10.590	6.036	7.669
Total	100.000	100.000	100.000

Calc'd. Specific Gravity, 60/60 (ASTM D-2598) 0.558
 Calc'd. Vapor Pressure @ 100F., psig (ASTM D-2598) 110.7
 Calc'd. Vapor Pressure @ 100F., psia 125.4

Marysville Underground Storage Terminal

Product: Mixed Butane

Sample No.: 3154

Origin: FB-7007

Batch No.: 1530

Mode of Transport: Sun-Inkster Pipeline

Owner: BP Oil

Destination: BP Oil

Net Volume:

Ticket Nos.:

Car Nos.:

Shipment Date: October 29-31, 1993

Components	Wt. %	Mol. %	L.V.%
Methane	0.001	0.005	0.003
Ethane	0.004	0.007	0.006
Propane	0.288	0.404	0.339
Propylene	0.064	0.094	0.073
isoButane	14.059	14.986	14.910
n-Butane	51.873	55.297	53.018
Butylene	0.817	0.902	0.812
isoButylene	1.050	1.160	1.045
trans-2-Butene	1.006	1.111	0.985
cis-2-Butene	0.685	0.757	0.653
1,3-Butadiene	0.025	0.028	0.023
isoPentane	21.705	18.638	20.735
n-Pentane	4.756	4.084	4.500
1-Pentene	0.082	0.072	0.076
2-Methyl-1-Butene	0.050	0.044	0.045
trans-2-Pentene	0.071	0.062	0.065
cis-2-Pentene	0.101	0.089	0.091
2-Methyl-2-Butene	0.115	0.101	0.103
Hexanes Plus	3.248	2.159	2.518
Total	100.000	100.000	100.000

Calc'd. Specific Gravity, 60/60 (ASTM D-2598) 0.597

Calc'd. Vapor Pressure @ 100F., psig (ASTM D-2598) 31.4

Calc'd. Vapor Pressure @ 100F., psia 46.1

Marysville Underground Storage Terminal

Product: Mixed Butane

Sample No.: 3142

Origin: FB-7008

Batch No.:

Mode of Transport: Outbound Railcars

Owner: NGL Supply

Destination: NGL Supply

Net Volume: 2948

Car Nos.: ACFX 19972, CITX 35803, POTX 110, UTLX 81559

Car Nos.:

Shipment Date: October 30, 1993

Components	Wt. %	Mol. %	L.V.%
Methane	0.007	0.027	0.014
Ethane	0.009	0.018	0.015
Propane	0.491	0.665	0.569
Propylene	0.042	0.060	0.047
isoButane	16.591	17.034	17.333
n-Butane	68.698	70.532	69.166
Butylene	0.466	0.496	0.456
isoButylene	0.602	0.641	0.590
trans-2-Butene	0.564	0.600	0.544
cis-2-Butene	0.385	0.410	0.361
1,3-Butadiene	0.006	0.006	0.005
isoPentane	7.364	6.091	6.930
n-Pentane	1.829	1.513	1.705
1-Pentene	0.016	0.014	0.015
2-Methyl-1-Butene	0.014	0.012	0.013
trans-2-Pentene	0.020	0.017	0.018
cis-2-Pentene	0.034	0.029	0.031
2-Methyl-2-Butene	0.012	0.010	0.011
Hexanes Plus	2.850	1.825	2.177
Total	100.000	100.000	100.000

Calc'd. Specific Gravity, 60/60 (ASTM D-2598) 0.588

Calc'd. Vapor Pressure @ 100F., psig (ASTM D-2598) 38.3

Calc'd. Vapor Pressure @ 100F., psia 53.0

Marysville Underground Storage Terminal

UIC SECTION
EPA - REGION

Product: HD-5 Propane

Sample No.: 3137

Origin: FB-7009/11/12

Batch No.:

Mode of Transport:

Owner: Various

Destination: Truck/Rail Skid

Net Volume:

Car Nos.: Propane Dryer Outlet

Car Nos.:

Shipment Date: October 27, 1993 2100 Hrs.

	Wt. %	Mol. %	L.V.%
Methane	0.027	0.074	0.045
Ethane	1.458	2.131	2.068
Propane	95.573	95.264	95.191
Propylene	1.105	1.155	1.071
isoButane	1.324	1.001	1.189
n-Butane	0.458	0.345	0.396
isoPentane	0.018	0.011	0.014
n-Pentane	0.008	0.005	0.007
Hexanes Plus	0.029	0.014	0.019
Total	100.000	100.000	100.000

Calc'd. Specific Gravity, 60/60 (ASTM D-2598) 0.505

Calc'd. Vapor Pressure @ 100F., psig (ASTM D-2598) 185

Copper Strip Corrosion (ASTM D-1838) 1a

Residue in LPG, mL. (ASTM D-2158)

Residue in LPG (GPA 2140-86) PASS

Residue, ppm wt.

Oil Stain Observation, mL. (ASTM D-2158)

Oil Stain Observation (GPA 2140-86) PASS

Freeze Valve Dryness, (ASTM D-2713) PASS

Marysville Underground Storage Terminal

Product: Mixed Butane

Sample No.: 3143

Origin: FB-7010

Batch No.:

Mode of Transport: Outbound Railcars

Owner: Ashland

Destination: Ashland

Net Volume: 1474

Car Nos.: GATX 92576, ACFX 77164

Car Nos.:

Shipment Date: October 30, 1993

Components	Wt. %	Mol. %	L.V. %
Methane	0.006	0.024	0.013
Ethane	0.047	0.091	0.077
Propane	1.207	1.607	1.393
Propylene	0.471	0.658	0.529
isoButane	9.037	9.129	9.402
n-Butane	79.328	80.128	79.532
Butylene	0.526	0.551	0.513
isoButylene	0.416	0.435	0.406
trans-2-Butene	0.910	0.952	0.874
cis-2-Butene	0.624	0.653	0.583
1,3-Butadiene	0.003	0.003	0.003
isoPentane	4.485	3.650	4.204
n-Pentane	1.271	1.034	1.180
1-Pentene	0.050	0.042	0.045
2-Methyl-1-Butene	0.027	0.023	0.024
trans-2-Pentene	0.027	0.023	0.025
cis-2-Pentene	0.027	0.023	0.024
2-Methyl-2-Butene	0.024	0.020	0.021
Hexanes Plus	1.514	0.954	1.152
Total	100.000	100.000	100.000

Calc'd. Specific Gravity, 60/60 (ASTM D-2598) 0.586

Calc'd. Vapor Pressure @ 100F., psig (ASTM D-2598) 40.5

Calc'd. Vapor Pressure @ 100F., psia 55.2