Winsor, Jennifer (CC)

Subject: RE: PADCOM Additional Information Request - File No. 6126.00

From: Shaun Moffatt <smoffatt@kgsgroup.com>
Sent: March 14, 2022 4:22 PM
To: Winsor, Jennifer (CC) <Jennifer.Winsor@gov.mb.ca>; Burland Ross, Siobhan (CC) <Siobhan.BurlandRoss@gov.mb.ca>
Subject: FW: PADCOM Additional Information Request - File No. 6126.00
Importance: High

Jennifer

On behalf of PADCOM below and attached is additional information with regards to subsidence and use of crude oil as you requested and we discussed. Please let us know as soon as possible if you have any further questions regarding these two topics. Thanks.

Subsidence
Regional geological information documenting the stratigraphy in southwestern Manitoba and highlighting the potash potential is provided in the Information Memorandum on the Russel-McAuley Potash Property dated January 26, 2015, prepared for the Manitoba Potash Corporation (MPC) of the Province of Manitoba by MICON International Ltd. The Northern and Southern Blocks are shown on MICON Figures 1.1 and 1.2. MPC had potash rights to approximately 5,959 ha in the Northern Block and withdrew rights for 22,183 ha in the Northern and Southern Blocks. The proposed PADCOM Select Solution Mine (approximately 800 by 1600 m area, or 128 hectares) at Harrowby is located within a small portion of the north east part of the Northern Block. The regional drill holes penetrating the Prairie Evaporites and the Esterhazy Member (sylvite and halite) are shown on MICON Figure 4.6, with wells at approximately 12 to 20 km centres in the Northern block. The interpreted regional economic thickness of sylvinite consisting of sylvite (KCl) and halite (rock salt, NaCl) was interpreted as approximately 3 to 4 m.

Locally at the Harrowby site test drilling of two vertical wells was completed under Well Licenses 11641 and 11642 in December 2021, by RPS Energy Canada Ltd, as per the attached Wellsite Report Summary and Formation Evaluations and geological Formation Tops. Lonestar completed the horizontal drilling at approximate depth 820 m as presented in the attached graphical plots of the cross sectional vertical profile and horizontal alignment of the two holes over the approximately 1800 m lateral extent of the wells. The drilling followed the thin Lower sylvite-rich unit of the Esterhazy Member identified by the high Gamma ray values, establishing the approximate 3 m thick sylvite rich zone at a depth between 823.5 to 825.5 m. The proposed Select Solution potash mine will target the thin (2.5 to 3 m thick) horizontal potash deposit in the Lower sylvite-rich Esterhazy Member.

The Selective Solution mining process for the PADCOM potash mine will consist of pumping a heated saturated salt solution down injection wells into the 820 m depth thin sylvite-rich deposit in the Lower Esterhazy Member. This potash unit is contained by overlying Prairie Evaporite deposits and sedimentary bedrock layers of shale, dolomite and limestone. The circulating fluid will have capacity to preferentially dissolve the potash (KCL), but the saturated salt solution will not be able to dissolve more salt from the formation. An interconnected channel approximately 1 m in

vertical height will be created, and the saturated brine flow will return to surface via wells. The potash will be removed from the saturated brine solution at surface, but the in-situ salt will remain in solid form within the Esterhazy Member.

An interconnected channel opening less than 1 m in height will be developed as a cavern progressively over a period of 20 years resulting in a total footprint approximately 800 m wide by 1600 m long. The cavern channels will remain pressurized by the saline water solution. Any localized collapse of this thin interconnected pressurized channelized zone is anticipated to result in bulking of the immediate overlying bedrock strata. It is unlikely that there will be any surface expression of subsidence extending up 820 m, and if there is, it is anticipated to be very minor surface settlement, possibly less than 10 cm (4 inches). Any subsidence at surface is anticipated to occur very slowly incrementally over time (decades) as the footprint of the mine gradually expands. A 2-D rock mechanics model will be applied, as part of the Mine Closure report, to predict the extent and progressive nature of any subsidence over the 20-year life of the project and beyond.

Surveying is proposed to be done consistent with the Manitoba Mines Petroleum Branch guidelines for salt mines and would be addressed in the terms of the operating license. An initial preconstruction survey is proposed consisting of an aerial drone survey of the proposed mine area limits. A permanent geodetic bench mark would also be established, remote from the mine operation, with a survey tie-in to the brine wells collar elevation at surface. Initially monitoring surveys are proposed at 3-year intervals to check for any subsidence at the mine site. Surveys could be increased or decreased in frequency as warranted. The specifics of the survey would be established as part of the operating license. The aerial drone surveys would determine if differential subsidence is occurring and include features of interest such as the railway tracks, within the mine development footprint limits.

A contingency plan would be presented in the Mine Closure Plan to monitor for progressive subsidence, reflecting the predictions based on the simple 2-D modeling, and address potential remediation requirements, such as periodic adjustment of the railbed or other pertinent structures, if excessive subsidence related to the mine development occurs over time.

Crude Oil

The use of crude oil as a dust suppressant was originally proposed as it is an industry standard and would provide the Gambler First Nation an economic opportunity to supply the crude oil. In response to the concerns raised, however, PADCOM has investigated potential alternative de-dusting products and now proposes to use Sonic De-dusting Oil and will not use crude oil.

Sonic De-Dusting Oil is a biodegradable dust control for fertilizers and potash that is not classified as a hazardous material, carcinogen or environmentally hazardous as described in the attached product sheet and Safety Data Sheet. While Sonic De-Dusting Oil is not classified as environmentally hazardous, as noted in the Safety Data Sheet, this does not exclude the possibility that a large or frequent spills can have a harmful effect if released to the environment. To prevent the potential release to the environment Sonic De-Dusting Oil will only be used within the processing building, which as described in the Environment Act Proposal, has a 1.5 m stub wall and concrete floor sloped to a sump collection to contain any spills. Additionally, PADCOM will keep spill response and clean up materials, such as absorbent pads, in the processing building to immediately clean up any spills should they occur.

Trucks will be loaded outside the processing building in a sheltered structure to contain potential fugitive dust, as described in the Environment Act Proposal. In the event that dust control is required in this truck load area or on the site roadway and parking areas only water will be used. Based on the site drainage, as described in the response to WQMS-2, any potash dust potentially containing residual Sonic De-Dusting Oil would be collected in the process water pond and recirculated into the process.

Shaun Moffatt M.Sc.
SENIOR ENVIRONMENTAL SCIENTIST

P 204-896-1209 ext 467
D 204-318-2054 **C** 204-396-2502

From: Winsor, Jennifer (CC) <Jennifer.Winsor@gov.mb.ca>
Sent: Monday, March 7, 2022 10:36 AM
To: [redacted]
Cc: Shaun Moffatt <smoffatt@kgsgroup.com>; Burland Ross, Siobhan (CC) <Siobhan.BurlandRoss@gov.mb.ca>
Subject: PADCOM Additional Information Request - File No. 6126.00

Good morning Daymon,

The responses to the Technical Advisory Committee (TAC) and public comments submitted by KGS on behalf of PADCOM on February 15, 2022 have been reviewed.

Additional information is required. Please provide a detailed response to the following items such that the review process may continue:

- Attachment 2 of the report presents a subsidence estimation that is general in nature and not based on the site specific geotechnical information of the proposed development. Due to the nature of the risks associated with subsidence, a detailed, site specific engineering assessment and report on subsidence resulting from the proposed mining development and potential effects is required.
- The use of crude oil as a dust suppressant poses an environmental hazard, however the additional information only provides the Safety Data Sheets and a statement that no alternatives are available. Please provide additional information on the potential environmental effects resulting from the use of crude oil on the environment, proposed mitigation measures and rationale as to why alternatives are not being considered.

Please let me know if you have any questions.

Best regards,

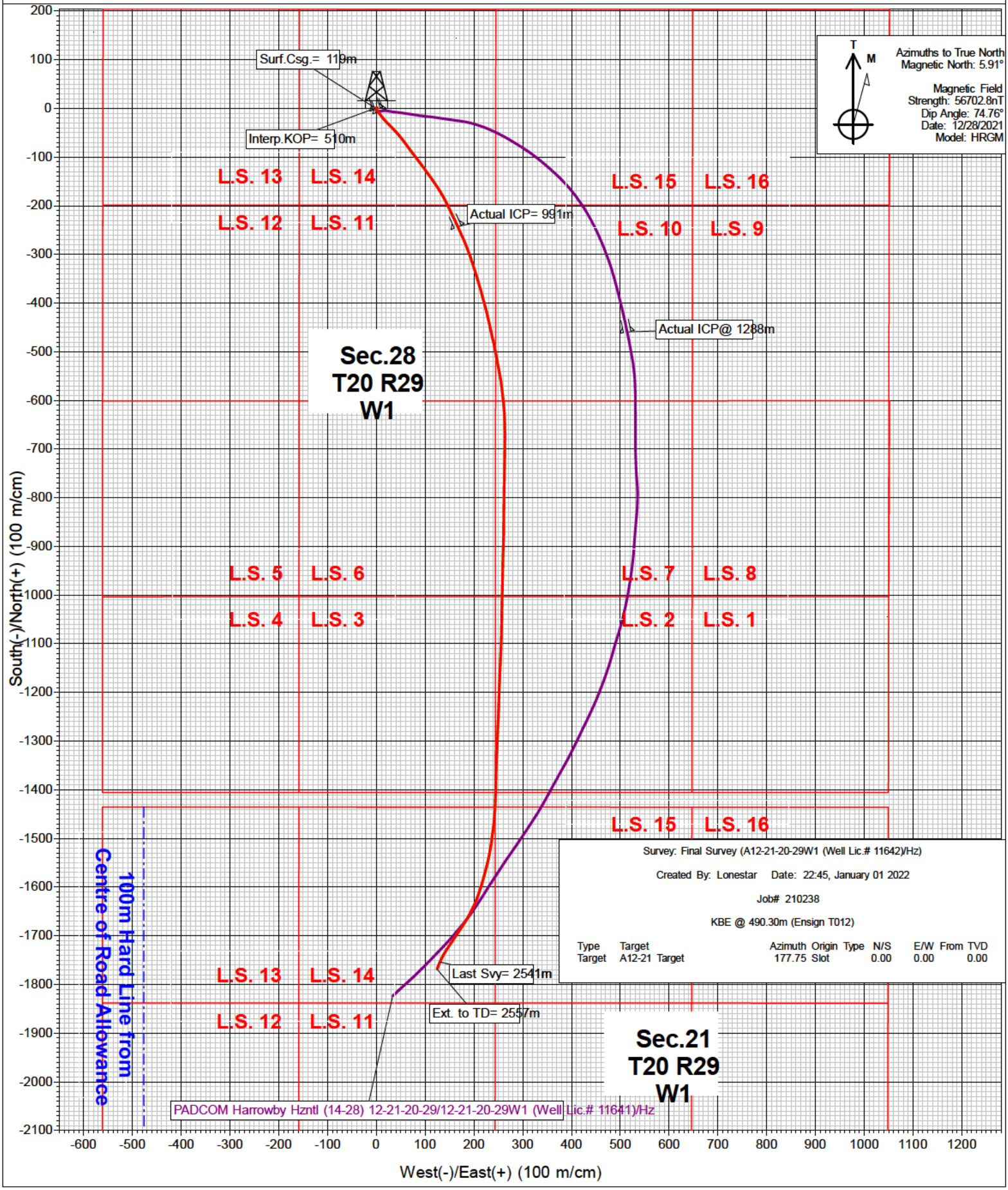
Jennifer Winsor, P.Eng.

Senior Environmental Engineer, Environmental Approvals Branch
Manitoba Environment, Climate and Parks
Jennifer.Winsor@gov.mb.ca / Ph: 204-945-7012
1007 Century Street, Winnipeg, MB R3H 0W4

To report an environmental emergency please call the 24/7 Emergency Response Line at 204-944-4888 or 1-855-944-4888.

PADCOM Resource

Project: Harrowby
Site: PADCOM Harrowby Hzntl (14-28) A12-21-20-29
Well: A12-21-20-29W1 (Well Lic.# 11642)
Wellbore: Hz
Survey: Final Survey



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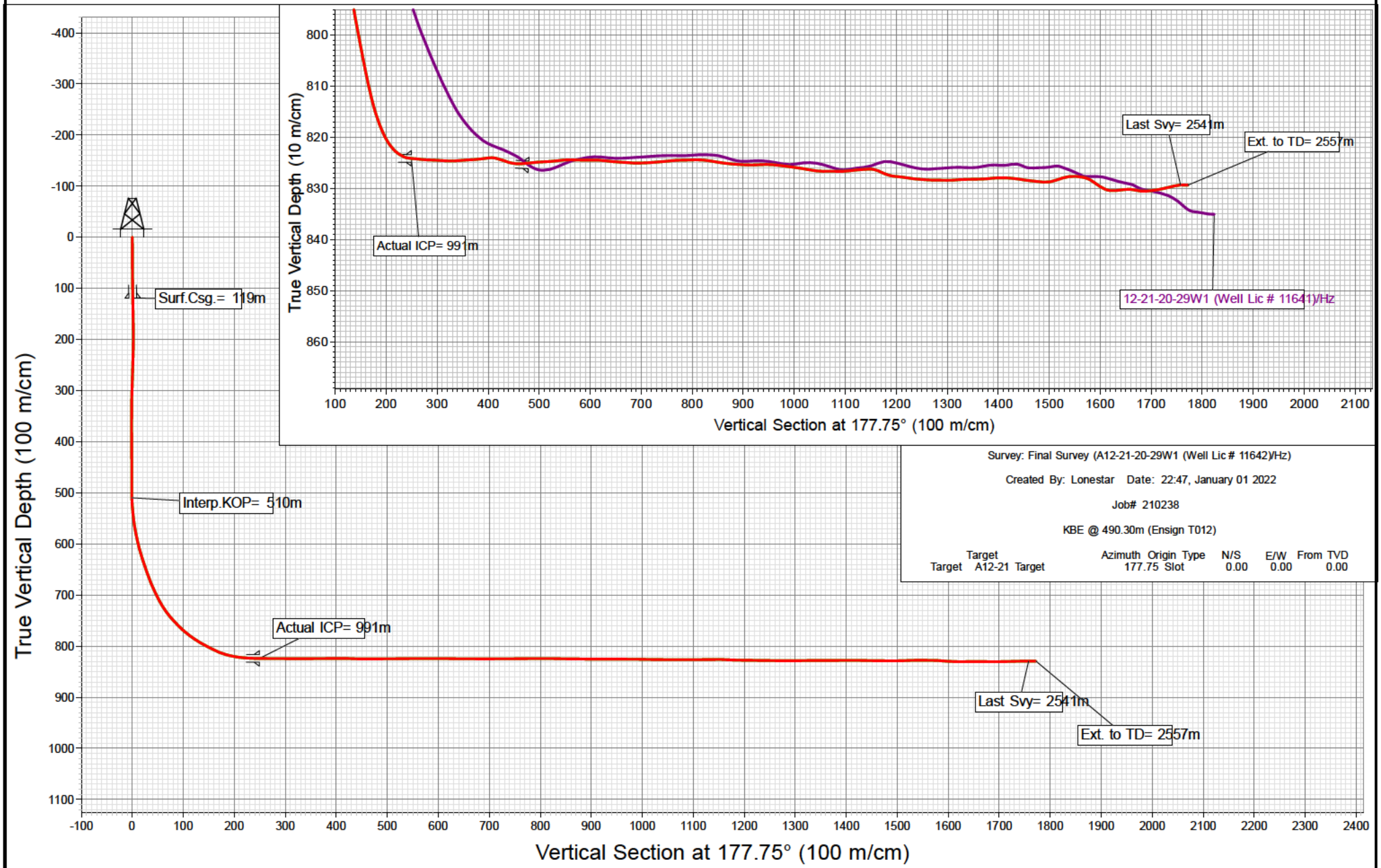

Survey: Final Survey (A12-21-20-29W1 (Well Lic # 11642)/Hz)

Created By: Lonestar Date: 22:47, January 01 2022

Job# 210238

KBE @ 490.30m (Ensign T012)

Target		Azimuth	Origin Type	N/S	E/W	From TVD
Target	A12-21 Target	177.75	Slot	0.00	0.00	0.00

PREMIUM LUBRICANTS

DE-DUSTING OIL

SONIC® DE-DUSTING OIL

ISO 36

PRODUCT DESCRIPTION

SONIC® DE-DUSTING OIL is an inherently biodegradable coating oil used in the control of fugitive dust on products ranging from granulated fertilizer to potash before selling. It coats the product with a fine film that restricts dust formation allowing for safer working conditions and better handling capability. The almost clear colour leaves the product looking distinct and vibrant which allows the quality of the finished product to show through.

PERFORMANCE FEATURES

- Excellent Dust Control
- Better product appearance
- Greater product handling capability
- Inherently bio-degradable
- Aids in anti-caking of the product

APPLICATIONS

SONIC® DE-DUSTING OIL is used for coating applications on products such as fertilizer and potash prior to sale.

TECHNICAL PROPERTIES

The values listed below are typical of current production. As variations may occur, these numbers do not constitute a specification.

PROPERTIES	TEST METHODS	ISO VG 36
Kinematic Viscosity cSt @ 40°C	ASTM D445	35.8
Kinematic Viscosity cSt @ 100°C	ASTM D445	6.0
Viscosity Index	ASTM D2270	113
Pour Point, °C	ASTM D97	-18°C
Appearance	-	Clear & Bright

PRODUCT SELECTION

Product availability can vary by location. Please contact your local retail co-op for further details.

PRODUCT SIZES	ISO VG 36
1 L Bottle	
5 L Bottle	
10 L Bottle	
20 L Pail	
110 L Drum	
205 L Drum	
1000 L Tote	✓

MATERIAL SAFETY DATA SHEETS

Product-specific material safety data sheets (MSDS) can be obtained by contacting your local retail co-op or Federated Co-operatives Limited (see contact information below) or by going online at coopconnection.ca

RECYCLING OF USED LUBRICANTS AND CONTAINERS

Please protect the environment when disposing of petroleum products. All products should be taken to an authorized collection facility or picked up by a qualified organization. This ensures the products will be disposed of in an environmentally sensitive manner. For additional information on used-oil recycling programs, please see the following:

- Saskatchewan – www.usedoilrecyclingsk.com
- Alberta – www.usedoilrecyclingab.com
- British Columbia – www.bcusedoil.com
- Manitoba – www.usedoilrecycling.com/en/mb

CONTACT INFO

For more information on this or any other CO-OP® lubricant product, please contact your local retail co-operative or Federated Co-operatives Limited.

petroadmin@fcl.crs • www.fuel.crs • www.agro.crs

CO-OP® PREMIUM LUBRICANTS

SAFETY DATA SHEET

1. Identification

Product identifier	**SONIC DE-DUSTING OIL**
Other means of identification	
Product code	2033
Synonyms	Light, Medium, Heavy, 180N
Recommended use	Lubrication oil.
Recommended restrictions	None known.
Manufacturer/Importer/Supplier/Distributor information	
Manufacturer	Consumers' Co-operative Refineries Limited
Address	P.O. Box 260; 9th Avenue North Regina, SK S4P 3A1 Canada
Telephone	(306) 721-5353 -or- (306) 719-4353
Supplier	Federated Co-operatives Limited
Address	P.O. Box 1050, 401 - 22nd Street East Saskatoon SK S7K 3M9 Canada
Telephone	(306) 244-3447
24 Hour Emergency Telephone	(613) 996-6666 - Canutec

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
Environmental hazards	Not classified.
Label elements	
Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from other materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Other hazards	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

The components are not hazardous or are below required disclosure limits.

4. First-aid measures

Inhalation	If fumes or combustion products are inhaled move victim to fresh air. Get medical attention if any discomfort occurs.
Skin contact	Remove contaminated clothing. Wash with soap and water. Get medical attention if irritation develops and persists. Wash contaminated clothing before reuse.
Eye contact	Flush eyes with water as a precaution. Remove contact lenses, if present and easy to do. Get medical attention if symptoms occur.
Ingestion	Rinse mouth thoroughly with water. Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention if any discomfort occurs.

Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation. Prolonged skin contact may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically. Symptoms may be delayed.
General information	If you feel unwell, seek medical advice (show the label where possible). First aid personnel must be aware of own risk during rescue.

5. Fire-fighting measures

Suitable extinguishing media	Extinguish with foam, carbon dioxide or dry powder.
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	By heating and fire, toxic vapors/gases may be formed.
Special protective equipment and precautions for firefighters	Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Use standard firefighting procedures and consider the hazards of other involved materials.
Specific methods	Move container from fire area if it can be done without risk. Cool containers exposed to flames with water until well after the fire is out.
General fire hazards	Material will burn in a fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Wear appropriate protective equipment and clothing during clean-up. In case of spills, beware of slippery floors and surfaces. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Avoid inhalation of vapors and contact with skin and eyes. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Clean contaminated area with oil-removing material. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid release to the environment. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground. Inform appropriate managerial or supervisory personnel of all environmental releases.

7. Handling and storage

Precautions for safe handling	Avoid direct contact with eyes and prolonged skin exposure. Observe good industrial hygiene practices. Use appropriate Personal Protective Equipment.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Keep in a cool, well-ventilated place. Store away from incompatible materials (See Section 10).

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Exposure guidelines	No exposure standards allocated.
Appropriate engineering controls	Provide adequate ventilation and minimize the risk of inhalation of vapors and oil mist. Provide access to washing facilities including soap, skin cleanser and fatty cream.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear approved safety glasses or goggles.
Skin protection	
Hand protection	Wear chemical-resistant, impervious gloves. Suitable gloves can be recommended by the glove supplier.
Other	Wear appropriate clothing to prevent repeated or prolonged skin contact.

Respiratory protection	No personal respiratory protective equipment normally required. If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Oily liquid.
Physical state	Liquid.
Form	Liquid.
Color	Yellow.
Odor	Mild.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	26.6 - -99.4 °F (-3 - -73 °C)
Initial boiling point and boiling range	Not available.
Flash point	> 300.0 °F (> 148.9 °C) Open Cup
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Partially soluble in cold and hot water.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	782.96 °F (417.2 °C)
Decomposition temperature	Not available.
Viscosity	Not available.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Elevated temperatures. Incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	Thermal decomposition of this product can generate carbon monoxide and carbon dioxide.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Prolonged or excessive inhalation may cause respiratory tract irritation.

Skin contact	Prolonged skin contact may cause temporary irritation.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	May cause discomfort if swallowed.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation. Prolonged skin contact may cause temporary irritation.

Information on toxicological effects

Acute toxicity	Not expected to be acutely toxic.
Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Chronic effects are not expected when this product is used as intended.

12. Ecological information

Ecotoxicity	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Oil spills are generally hazardous to the environment.
Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	No data available on bioaccumulation.
Mobility in soil	This product is slightly water soluble and may disperse in soil.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Dispose in accordance with applicable federal, state, and local regulations. Do not incinerate sealed containers. Do not allow this material to drain into sewers/water supplies.
Hazardous waste code	Waste codes should be assigned by the user based on the application for which the product was used.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Empty packaging should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

TDG

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable.

15. Regulatory information

Canadian regulations

This product has been classified in accordance with the hazard criteria of the HPR and the SDS contains all the information required by the HPR.

Controlled Drugs and Substances Act

Not regulated.

Export Control List (CEPA 1999, Schedule 3)

Not listed.

Greenhouse Gases

Not listed.

Precursor Control Regulations

Not regulated.

International regulations

Stockholm Convention

Not applicable.

Rotterdam Convention

Not applicable.

Kyoto protocol

Not applicable.

Montreal Protocol

Not applicable.

Basel Convention

Not applicable.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other Information

Issue date	02-September-2015
Revision date	-
Version #	01
Further information	The classification for health and environmental hazards is derived by a combination of calculation methods and test data, if available.

Disclaimer

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

FORMATION TOPS

G.L.: 486.2 m
K.B: 490.3 m

Formation	Prognosis				Sample				high(+) low(-)
	MD (m)	TVD (m)*	SS (m)	Iso.	MD (m)	TVD (m)	SS (m)	Iso.	
First White Specks	222.0	222.0	268.3	2.7	203.8	203.8	286.5	12.8	18.2
Second White Specks	224.7	224.7	265.6	26.0	216.6	216.6	273.7	35	8.1
Lower Colorado	250.7	250.7	239.6	105.0	250.6	251.6	238.7	100.2	-0.9
Mannville	357.0	355.7	134.6	64.3	353.0	351.8	138.5	86.4	3.9
Three Forks	427.0	420.0	70.3	50.0	446.0	438.2	52.1	26.7	-18.2
Birdbear	480.0	470.0	20.3	30.0	476.6	464.9	25.4	20.6	5.1
Duperow	516.0	500.0	-9.7	150.0	501.0	485.5	4.8	164	14.5
Souris River	728.0	650.0	-159.7	100.0	735.0	649.5	-159.2	94	0.5
First Red Beds	925.0	750.0	-259.7	10.0	809.4	743.5	-253.2	12.7	6.5
Dawson Bay	953.0	760.0	-269.7	46.0	937.6	756.2	-265.9	52.7	3.8
Second Red Beds	1082.0	806.0	-315.7	9.0	1111.4	808.9	-318.6	7	-2.9
Prairie Evaporite	1154.0	815.0	-324.7	5.0	1151.4	815.9	-325.6	4.3	-0.9
Esterhazy Member	1167.0	820.0	-329.7	1.9	1191.4	820.2	-329.9	5.3	-0.2
ICP	1244.7	821.9	-331.6	4.2	1288.0	825.5	-335.2	9.6	-3.6
Total Depth	3321.4	826.1	-335.8	-	2800.0	835.1	-344.8	-	-9.0

**Prognosis TVD's Adjusted to Actual K.B Value.*

WELL SUMMARY & FORMATION EVALUATIONS

The PADCOM HARROWBY HZNTL (14-28) 12-21-20-29(WPM) was spudded by Ensign Drilling Rig #12 on December 8, 2021 from the 14-28-020-29 W1M surface location. The 349.0 mm surface hole was drilled and 244.5 mm surface casing was set at 119.0 m. The 222.0 mm build section was landed in the Devonian Esterhazy Member of the Prairie Evaporite (Prairie Formation, Elk Pointe Group), and 177.8 mm intermediate casing was set at 1288.0 m. The 159.0 mm horizontal section was drilled out from the intermediate casing on December 13, 2021 at 22:00 hours. Final Total Depth of 2800.0 m MD, 835.1 m TVD (-344.8 m SS) was reached on December 17, 2021 at 09:15 hours.

Samples were collected at 5.0 m intervals in the Build and 10.0 m in the Lateral Section. A polymer mud system was used in the build section while the lateral section was drilled with Brine solution in order to avoid the dissolution of the salt from the section into the mud system. Directional and MWD (Measurements While Drilling) services were provided by Lonestar Directional Inc.

Esterhazy Member 1191.4 m MD, 820.2 m TVD (-329.9 m SS)

The primary objective of this horizontal well was to drill into the Lower Sylvite-rich unit of the Esterhazy Member for solution mining to produce fertilizer for agricultural purposes.

The Potash-rich unit is about 3.0 m TVD in thickness with high Gamma ray values up to 760 API near the top, reflecting high K2O content, whereas the average values of 500 to 600 API were seen throughout the lateral section. Samples in the Lower Sylvite unit were predominantly milky to translucent and white to off white in part, massive, crystalline, and moderately hard to soft, brittle to waxy, with rare intercalations of mudstone and shale.

The top of the Lower Sylvite unit was picked at 1258.8 m MD, 823.5 m TVD (-333.2 m SS) and the build section was landed 1.7 m TVD below at 1288.0 m MD, 825.5 m TVD (-335.2 m SS). The formation stayed almost flat from the ICP to 2300.0 m MD and then dropped 4.0 m TVD toward the toe. The lateral section was not cased and was filled with Brine solution.

Conclusion

Open hole completion in the lateral section for solution mining of Esterhazy Member potash.

FORMATION TOPS

G.L.: 486.2 m
K.B: 490.3 m

Formation	Prognosis				Sample				high(+) low(-)
	MD (m)	TVD (m)*	SS (m)	Iso.	MD (m)	TVD (m)	SS (m)	Iso.	
First White Specks	203.8	203.8	286.5	12.8	203.2	203.2	287.1	12.5	0.6
Second White Specks	216.6	216.6	273.7	35.0	215.7	215.7	274.6	34.9	0.9
Lower Colorado	251.6	251.6	238.7	100.2	250.6	250.6	239.7	101.3	1.0
Mannville	350.0	351.8	138.5	86.4	351.9	351.9	138.4	85.1	-0.1
Three Forks	438.1	438.2	52.1	26.7	437.1	437.0	53.3	26.1	1.2
Birdbear	464.0	464.9	25.4	20.6	463.2	463.1	27.2	20.9	1.8
Duperow	520.0	485.5	4.8	164.0	484.5	484.0	6.3	162.4	1.5
Souris River	654.0	649.5	-159.2	94.0	651.2	646.4	-156.1	94.1	3.1
First Red Beds	780.0	743.5	-253.2	12.7	764.0	740.5	-250.2	12.8	3.0
Dawson Bay	810.0	756.2	-265.9	52.7	782.6	753.3	-263.0	52.1	2.9
Second Red Beds	897.0	808.9	-348.6	4.9	884.6	805.4	-315.1	9.2	3.5
Prairie Evaporite	924.7	813.8	-323.5	6.4	911.4	814.6	-324.3	3.9	-0.8
Esterhazy Member	947.7	820.2	-329.9	5.0	927.4	818.5	-328.2	5.6	1.7
ICP	1004.6	825.2	-334.9	4.0	991.0	824.1	-333.8	5.3	1.1
Total Depth	2627.1	829.2	-338.9	-	2557.7	829.4	-339.1	-	-0.2

**Prognosis TVD's Adjusted to Actual K.B Value.*

WELL SUMMARY & FORMATION EVALUATIONS

The PADCOM HARROWBY HZNTL A 12-21-20-29WPM was spudded by Ensign Drilling Rig #12 on December 18, 2021 from the 14-28-020-29W1M surface location. The 349.0 mm surface hole was drilled and 244.5 mm surface casing was set at 119.0 m. The 222.0 mm build section was landed in the Devonian Esterhazy Member of Prairie Evaporite (Prairie Formation, Elk Pointe Group) and 177.8 mm intermediate casing was set at 991.0 m. The 159.0 mm horizontal section was drilled out from the intermediate casing on December 28, 2021 at 19:10 hours. Final Total Depth of 2557.7 m MD, 829.4 m TVD (-339.1 m SS) was reached on December 31, 2021 at 18:15 hours.

Samples were collected at 5.0 m intervals in the Build and 10.0 m in the Lateral Section. A polymer mud system was used in the build section while lateral section was drilled with Brine solution in order to avoid the dissolution of the salt from the section into the mud system. Directional and MWD (Measurements While Drilling) services were provided by Lonestar Directional Inc. and a ranging tool was run by Weatherford wireline.

The plan was to join Well #1 (PADCOM HARROWBY HZNTL 12-21-20-29WPM) and Well #2 (PADCOM Harrowby HZNTL A 12-21-20-29WPM) near the Total Depth so that they could be used as injector and producer wells. A ranging tool was run in Well #1 to guide the well path of Well #2 to meet at the intersection point.

At 2598.7 m (830.2 m TVD), an intersection point was chosen on Well #1 and this point was supposed to be intersected by Well #2 at its measured depth of 2446.0 m (830.2 m TVD). The ranging tool could not go beyond 2300.0 m MD so again the directional tools were used to connect the two wells. At the intersection point the well path of the Well #2 had 830.6 m TVD and the intersection point target was missed by 0.4 m. A one meter long sub with jets was attached at the end of the drill string to wash out the zone between Well #1 and #2 at the intersection point so that they could communicate with each other.

Esterhazy Member 927.4 m MD; 818.5 m TVD (-328.2 m SS)

The primary objective of this horizontal well was to drill into the Lower Sylvite-rich unit of the Esterhazy Member for solution mining to produce fertilizer for agricultural purposes.

The potash-rich unit is about 3.0 m in thickness with high Gamma ray values up to 815 API near the top re fine lowerecting high K2O content, whereas the average values of 600 to 750 API were seen throughout the lateral section. Samples in the Lower Sylvite unit were predominantly milky to translucent and white to off white in part, massive, crystalline, and moderately hard to soft, brittle to waxy with rare intercalations of mudstone and shale.

The top of the Lower Sylvite unit was picked at 960.0 m MD, 822.8 m TVD (-332.5 m SS) and the build section was landed 1.3 m below at 991.0 m MD, 824.1 m TVD (-333.8 m SS). The formation stayed almost fine lowerat from the ICP to 1750.0 m MD and then dropped 4.0 m TVD towards the toe. The Lateral Section was not cased and was filled with Brine solution.

Conclusion

Open hole completion in the lateral section for solution mining of the Prairie Evaporite.