

April 20, 2018

TM-9834

Code #09-LF-009

Siobhan Burland Ross Acting Director, Environmental Approvals Branch Manitoba Sustainable Development 1007 Century Street Winnipeg, Manitoba R3H 0W4

Re: Canadian Kraft Paper Landspreading Pilot Project - Next Steps

Dear Ms. Burland Ross:

In October 2017, Canadian Kraft Paper Industries Ltd. (CKP) received approval from Manitoba Sustainable Development to conduct a Pilot Study for landspreading sludge removed from the north settling basin. We received approval to land apply the sludge on the CKP site, but have not yet received approval to land apply sludge to agricultural lands.

The original intent of this pilot project was to determine the feasibility to land apply sludge generated by the CKP effluent treatment system for pasture production and to reduce the reliance on our onsite landfill. Another key driver of this pilot project is to determine the feasibility of using the sludge to grow grasses on disturbed industrial lands.

Reducing the reliance on landfill fulfils two important factors:

- i. The construction of the next cell of the CKP landfill can be deferred for several years. This will allow CKP to invest more capital back into the mill to ensure its long term viability.
- ii. It also helps the Province meet its GHG reductions target by diverting organic waste from the landfill.

Due to the timing of last year's project, CKP was only able to partially dredge the north settling basin. The south settling basin is now full and we had to switch back to the north settling basin in March. The north settling basin was only partially dredged last year and is almost full again. As a result, both settling basins will need to be dredged in 2018.

The Pilot Study was originally focused on land applying the sludge to agricultural land in a type of fertilizer application. This part of the pilot study has not received approval yet. The portion of the Pilot Study that has received approval is for land application on the CKP site only. This land is considered to

be disturbed industrial land, not agricultural land. In this application, the sludge is being used as a growing media, as opposed to being used as a fertilizer. No harvesting or grazing will take place on the mill site.

At this point, the primary focus of the Pilot Project is to assess the feasibility of using the sludge as a growing media for native grasses. Growing more vegetation on site will help with dust control. Since this is a non-agricultural application, CKP requests that it be looked at through a slightly different lens. CKP would like to expand the Pilot Study to more locations on site and to vary the application rates in order to fully assess the effectiveness of the sludge as a growing media.

Five additional locations on the CKP mill site, as shown on the attached map, have been identified as potential locations for landspreading the sludge:

- Sites II and III capped landfills.
- Sites IV, V and VI similar to Site 2 disturbed soils, with little vegetation growth, mixed with wood chip waste.

Soil testing of these locations was done last fall and the results are summarized in Table One. The soil at these locations is very similar to the soil found at Sites 2A to 2D.

CKP proposes to use various application rates to study the differences in vegetation growth:

- 1. Sludge spread with a manure spreader at the target application rate of 156 tonnes per hectare.
- 2. Sludge spread at a depth of 6 inches.
- 3. Sludge spread at a depth of 1 foot.
- 4. Mix the sludge with yard waste and spread to a depth of 6 inches. Yard waste is a mixture of soil and woody debris.
- 5. Mix the sludge with yard waste and spread to a depth of 1 foot.

Each site will be bermed in order to minimize any potential nutrient run off. Control plots will also be set aside at each location.

As discussed in the Pilot Study, there are only small amounts of nitrogen found in the sludge, therefore the land application rates are based on phosphorus, which is present in a high concentration in the sludge. The testing results for Site 2 show that the plant available phosphorus in the soils is very low (<60 ppm). Thus, there should be no restriction regarding the application of phosphorus. Supplementing soil with plant available phosphorus helps young plants to become established. Mitigating measures (berms) will be implemented in order to minimize any impacts from potential phosphate leaching.

There were also concerns identified in the Pilot Study about elevated molybdenum in the sludge. The levels of molybdenum are over the guideline for agricultural land use, but are well below the CCME soil quality guideline for industrial land use. The levels of molybdenum found in the sludge are not expected to have an impact on plants grown at the application sites.

Bench scale studies are being done at Laurentian University using CKP's sludge mixed with mine tailings. The preliminary results are very promising. They are showing that when mixed with CKP primary sludge, the mine tailings can actually support plant growth. In fact, they showed the higher the sludge

application rate the better the plant growth. The proposed trials on site would provide valuable information for this study, which could be relevant for the mines in Northern Manitoba, as well as for other possible land reclamation initiatives.

# Additional points for clarification:

# Revised schedule for the Pilot Study:

- Sludge removal phase October 2017 and Spring/Summer 2018
- Land application phase October 2017 and Spring/Summer 2018
- Evaluation of effectiveness of land application Fall 2018 and Spring 2019

## Re-spreading sludge:

In the fall of 2017, CKP landspread 690 bdt of sludge on half of Site 2A. A bulldozer was used to spread out the sludge. This process was done under the supervision of our consultant, AECOM. After the land application was completed, the application rate was reviewed and it was found that the sludge had been spread at higher than the recommended rate of 156 tonnes per hectare. A commitment was made at this time to re-spread the sludge in the spring of 2018.

We reviewed with AECOM the issues surrounding the application of sludge to Site 2A during the fall of 2017 and discussed why the recommended application rate of 156 tonnes of sludge per hectare was not met. It was determined that the consistency of the sludge along with the type of equipment used limited how thinly the sludge could be spread out on Site 2A. Due to the "gummy" texture of the material, spreading with a bulldozer proved quite difficult and it was a challenge to get a consistent and even thin layer of sludge. The sludge was spread at an average depth of 6 inches on Site 2A.

As such, we have concluded that respreading the sludge in not feasible. It was spread as thinly as possible last fall. CKP is proposing that the sludge not be re-spread on Site 2A and that this area be considered one of the test plots as discussed above. Site 2A has been bermed in order to minimize any potential nutrient run off.

Although, the trial was very short last fall, we did learn more about how to handle the sludge. We are planning to use a manure spreader to apply the sludge this year. This should enable us to spread the sludge thinner on some of the test plots.

# Two settling basins:

The original Pilot Study proposal specified the removal of sludge from the north settling basin. However, the CKP effluent treatment system includes two settling basins prior to the aerated lagoon. Only one settling basin is operated at a time. The effluent comes from the same source (the mill). Since the north settling basin is back in service, it will be necessary to dredge the south settling basin first this year.

The quality of the sludge is similar in both settling basins as shown in the attached Table#2. CKP is requesting confirmation that the approval for this project applies to the sludge from both settling basins and not just the north settling basin.

It is estimated that there is approximately 3,000 bone dry tonnes of sludge in each settling basin for an estimated total of 6,000 bone dry tonnes. This is equivalent to approximately 32,000 m³ of material.

### Pasture Crops:

Clause 4 of the Approval requires that pasture crops grown after the biosolids are applied. Seeding on the area where the sludge was added last fall will be done in the spring, since the landspreading project was done too late in the year for seeding to be done at that time. As discussed in the September 27, 2017 Pilot Study Proposal, a mixture of grasses native to the local region will be grown on Site 2. Pasture crops were planned for only the agricultural sites (Sites 3 to 5). The seed mixture to be used on Site 2 was developed by our Woodlands Department, in conjunction with Manitoba Infrastructure, for use on areas where roads have been decommissioned. The seed mixture will include Fowl Blue grass (*Poa palustris*), Slender Wheatgrass (*Elymus trachycaulus*), Sheep Fescue (*Festuca ovina*), Red Clover (*Trifolium pretense*), Rough Hair Grass (*Agrostis scabra*), and Timothy (*Phleum pretense*).

### Clause 20 Requirements:

The requirements of Clause 20 pertain to agricultural land only. The grasses grown on Site 2 will not be harvested and we are not planning to add other sources of nutrients, such as fertilizer or manure, to this land. CKP requests confirmation that the Clause 20 annual post harvest soil testing and reporting only applies to agricultural lands and does not apply to Site 2, which is disturbed industrial land. Please note that since no seeding or post harvest activities have occurred, post harvest soil testing has not been done yet and as such, a report was not submitted by March 15<sup>th</sup>, 2018.

# Clause 17 Requirements:

In the fall of 2017, there was only time to landspread some of the sludge before the ground became frozen. This area has not been seeded and field monitoring has not begun. Clause 17 requires the details of the field monitoring program to be submitted to your office by May 31<sup>st</sup>, 2018. Since we have yet to go through a growing season, a report will not be submitted to your office this May. CKP requests confirmation that the first report as required by Clause 17 is not due until May 2019.

We would like to have further discussions about what additional information will be required in order to obtain approval for the following trials:

- 1. To conduct a landspreading trial on agricultural land (Sites 3 to 5). This would be a fertilizer type of application.
- 2. To conduct a landspreading trial on the former quarry (Site 1), which is located on land adjacent to the mill site in the Tom Lamb Wildlife Management Area. The former quarry contains dirt and woody debris and is fairly barren. Vegetation has not naturally been re-established on this site. This would be another growing media type of application for the sludge in an effort to reclaim this land. Making this area green again would better support wildlife in this area.
- 3. To landspread secondary sludge removed from the aerated lagoon.

# Summary:

In summary, Canadian Kraft Paper is requesting approval at this time for the following:

- 1. Approval to landspread sludge on other locations on the CKP site Sites II to VI.
- 2. Approval to use different application rates on the different plots of land in order to assess the effectiveness of the sludge as a growing media. This includes leaving the sludge at a depth of 6" on Site 2A.
- Verification that the approval applies to the sludge from both settling basins and not just the north settling basin.
- 4. Verification that the Clause 20 annual post harvest soil testing only applies to agricultural lands since no harvesting will take place on the CKP site.
- 5. Verification that Clause 17 is not applicable until May 2019.

We look forward to holding further discussions with your office about this pilot project and the potential beneficial uses for sludge. The NOA form is attached. For further details about this Pilot Study, please refer to the original report that was submitted to your office on September 27, 2017.

If you have any questions or require any further information, please do not hesitate to contact me at (204) 623-8587 or Tamsin Patience, Technical Manager at (204) 623-8619.

Sincerely,

Jayne Sheppard

**Environmental Superintendent** 

Attach.

cc: Asit Dey, Manitoba Sustainable Development

Tamsin Patience Andre Murphy Vanessa Rosenkranz

EC-19

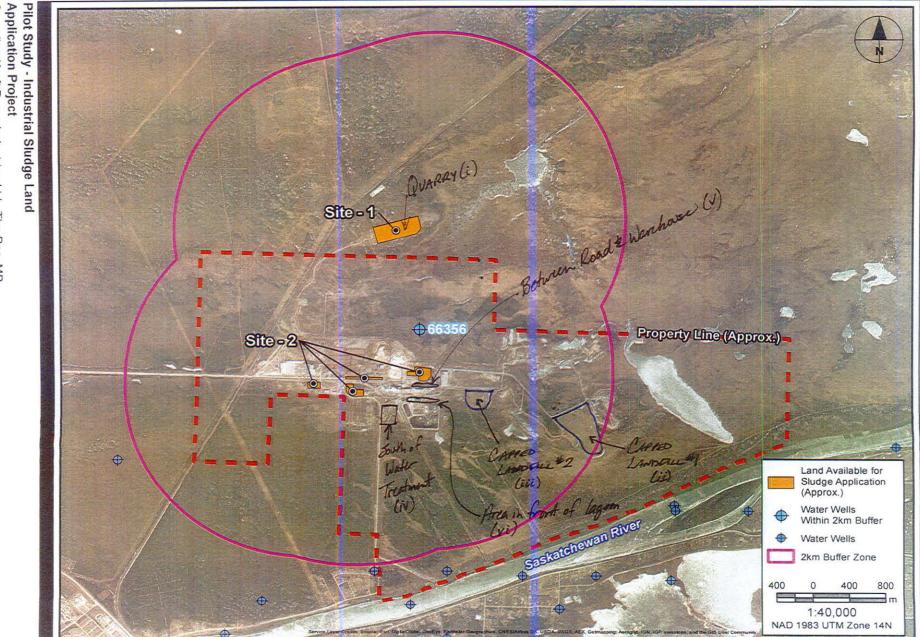


Table One: Soil Testing Results - CKP Locations

| Sample ID:               | Units | Site 2A    | Site 2B    | Site 2C    | Site 2D    | Site II    | Site III   | Site IV    | Site V     | Site VI    | CCME SQG a   |
|--------------------------|-------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------------|
| Date Sampled:            | -     | 10/25/2017 | 10/25/2017 | 10/25/2017 | 10/25/2017 | 10/31/2017 | 10/31/2017 | 10/31/2017 | 10/31/2017 | 10/31/2017 | (Industrial) |
| Miscellaneous Parameters |       |            |            |            |            |            |            |            |            |            |              |
| Available Phosphate-P    | mg/kg |            |            |            |            | 3.6        | 1.6        | 1.6        | 3.6        | 1.5        | NG           |
| Mercury (Hg)             | mg/kg | 0.0169     | 0.0284     | 0.116      | 0.0158     | 0.0281     | 0.0178     | 0.0186     | 0.0922     | 0.0219     | 50           |
| % Moisture               | %     |            |            |            |            | 25.1       | 20.2       | 21.1       | 15.5       | 16.8       | NG           |
| Nitrate-N                | mg/L  |            |            |            |            | <1.0       | <1.0       | <1.0       | <1.0       | <1.0       | NG           |
| % Saturation             | %     |            |            |            |            | 60.0       | 45.0       | 48.0       | 32.0       | 40.0       | NG           |
| pH (1:2 CaCl2)           | рН    |            |            |            |            | 7.56       | 7.80       | 7.76       | 7.95       | 7.88       | 6 to 8       |
| Metals                   |       |            |            |            |            |            |            |            |            |            |              |
| Aluminum (Al)            | mg/kg | 6570       | 6230       | 16300      | 8310       | 24100      | 17700      | 16500      | 6060       | 10700      | NG           |
| Antimony (Sb)            | mg/kg | 117        | 0.22       | 0.18       | 0.23       | 0.16       | 0.16       | 0.17       | 0.12       | <0.10      | 40           |
| Arsenic (As)             | mg/kg | 2.01       | 1.87       | 3.40       | 2.77       | 4.35       | 3.42       | 3.78       | 1.72       | 2.9        | 12           |
| Barium (Ba)              | mg/kg | 51.3       | 69.5       | 122        | 67.0       | 154        | 129        | 121        | 56.9       | 110        | 2000         |
| Beryllium (Be)           | mg/kg | 0.23       | 0.22       | 0.46       | 0.27       | 0.69       | 0.47       | 0.60       | 0.23       | 0.34       | 8            |
| Bismuth (Bi)             | mg/kg | <0.20      | <0.20      | <0.20      | <0.20      | <0.20      | <0.20      | <0.20      | <0.20      | <0.20      | NG           |
| Boron (B)                | mg/kg | 10.9       | 11.4       | 12.4       | 11.5       | 10.2       | 12.1       | 14.0       | 17.6       | 20.2       | ND           |
| Cadmium (Cd)             | mg/kg | 0.128      | 0.182      | 0.136      | 0.129      | 0.112      | 0.131      | 0.160      | 0.265      | 0.149      | 22           |
| Calcium (Ca)             | mg/kg | 92800      | 115000     | 86800      | 110000     | 49700      | 86200      | 102000     | 135000     | 150000     | NG           |
| Chromium (Cr)            | mg/kg | 32.0       | 17.9       | 43.9       | 24.3       | 54.7       | 49.6       | 42.8       | 18.8       | 33.3       | 87           |
| Cobalt (Co)              | mg/kg | 4.26       | 3.91       | 9.10       | 5.61       | 12.9       | 10.1       | 9.67       | 3.95       | 9.56       | 300          |
| Copper (Cu)              | mg/kg | 66.8       | 11.9       | 20.3       | 14.7       | 22.5       | 22.8       | 22.0       | 13.6       | 15.7       | 91           |
| Iron (Fe)                | mg/kg | 10100      | 9510       | 19300      | 12500      | 27100      | 22100      | 21800      | 8770       | 15200      | NG           |
| Lead (Pb)                | mg/kg | 6.96       | 8.91       | 10.0       | 15.6       | 10.3       | 7.00       | 7.29       | 7.2        | 4.17       | 600          |
| Magnesium (Mg)           | mg/kg | 55400      | 58300      | 54200      | 60500      | 34300      | 54100      | 53700      | 65800      | 69200      | NG           |
| Manganese (Mn)           | mg/kg | 250        | 259        | 410        | 302        | 550        | 381        | 431        | 233        | 291        | NG           |
| Molybdenum (Mo)          | mg/kg | 2.14       | 0.51       | 0.33       | 0.24       | 0.22       | 0.18       | 0.29       | 0.47       | 0.96       | 40           |
| Nickel (Ni)              | mg/kg | 24.4       | 13.9       | 28.0       | 19.7       | 37.2       | 34.5       | 29.7       | 16.2       | 31.3       | 89           |
| Phosphorus (P)           | mg/kg | 248        | 234        | 345        | 293        | 343        | 365        | 363        | 253        | 382        | NG           |
| Potassium (K)            | mg/kg | 1180       | 1390       | 3230       | 1990       | 4420       | 3870       | 3470       | 1440       | 1870       | NG           |
| Selenium (Se)            | mg/kg | <0.20      | <0.20      | <0.20      | <0.20      | <0.20      | <0.20      | <0.20      | <0.20      | <0.20      | 2.9          |
| Silver (Ag)              | mg/kg | <0.10      | <0.10      | <0.10      | <0.10      | 0.11       | <0.10      | <0.10      | <0.10      | <0.10      | 40           |
| Sodium (Na)              | mg/kg | 109        | 137        | 248        | 222        | 206        | 283        | 359        | 244        | 460        | NG           |
| Strontium (Sr)           | mg/kg | 29.7       | 62.6       | 34.3       | 38.2       | 28.4       | 41.6       | 41.0       | 35.8       | 45.3       | NG           |
| Thallium (TI)            | mg/kg | 0.083      | 0.087      | 0.204      | 0.131      | 0.306      | 0.242      | 0.231      | 0.068      | 0.114      | 1            |
| Tin (Sn)                 | mg/kg | 1320       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | 300          |
| Titanium (Ti)            | mg/kg | 297        | 253        | 649        | 432        | 776        | 736        | 707        | 309        | 448        | NG           |

| Sample ID:                       | Units | Site 2A    | Site 2B    | Site 2C    | Site 2D    | Site II    | Site III   | Site IV    | Site V     | Site VI    | CCME SQG 2   |
|----------------------------------|-------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------------|
| Date Sampled:                    | A-    | 10/25/2017 | 10/25/2017 | 10/25/2017 | 10/25/2017 | 10/31/2017 | 10/31/2017 | 10/31/2017 | 10/31/2017 | 10/31/2017 | (Industrial) |
| Uranium (U)                      | mg/kg | 0.882      | 0.475      | 0.548      | 0.469      | 0.681      | 0.720      | 0.828      | 0.368      | 0.446      | 300          |
| Vandium (V)                      | mg/kg | 20.7       | 18.0       | 41.2       | 25.2       | 55.7       | 49.0       | 46.4       | 18.2       | 27.7       | 130          |
| Zinc (Zc)                        | mg/kg | 31.6       | 45.4       | 53.9       | 45.9       | 63.9       | 50.9       | 53.2       | 43.5       | 37.0       | 360          |
| Total N, P, K, S                 |       |            |            |            |            |            |            |            |            |            |              |
| Metals in Soil by CRC ICPMS      |       |            |            |            |            |            |            |            |            |            |              |
| Phosphorus (P)                   | mg/kg |            |            |            |            | 315        | 299        | 280        | 233        | 313        | NG           |
| Potassium (K)                    | mg/L  |            |            |            |            | 3770       | 2540       | 2490       | 1140       | 1630       | NG           |
| Total Nitrogen by combustion met | nod   |            |            |            |            |            |            |            |            |            |              |
| Total Nitrogen by LECO           | %     |            |            |            |            | 0.095      | 0.054      | 0.045      | 0.048      | 0.065      | NG           |
| Total Sulphur by combustion meth | od    |            | HV III     |            |            |            |            |            |            |            |              |
| Sulfur (S) - Total               | mg/kg |            |            |            |            | 600        | 500        | <500       | <500       | 500        | ND           |

#### Notes:

<sup>&</sup>lt;sup>a</sup> Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines (2014) – Industrial Land Use

<sup>1.</sup> All results and soil quality guidelines in mg/kg, unless otherwise noted.

<sup>2.</sup> NG – No guideline.

<sup>3.</sup> ND - Guideline for agricultural land use, but no data for industrial land use.

**Table Two: Sludge Testing Results** 

| Sample ID:                             | Units             |           | rimary Sludg<br>th Settling B |           | Primary<br>Sludge-<br>South<br>Settling<br>Basin   | CCME SQG <sup>8</sup>    | CCME SQG b   |
|--|-------------------|-----------|-------------------------------|-----------|--|--------------------------|--------------|
| Date Sampled:                          | -                 | 7/27/2017 | 7/27/2017                     | 11/1/2017 | 11/1/2017  | (Agriculture)            | (Industrial) |
| Total Carbon, TOC and TIC in Soil      | WILLIAM THE TELE  |           |                               |           |  |                          |              |
| Inorganic Carbon (as CaCO3 Equivalent) | %                 | 14.1      | 14.1                          | 22.0      | 9.30   | NG                       | NG           |
| Total Carbon by Combustion             | %                 | 38.9      | 32.7                          | 39.0      | 46.5   | NG                       | NG           |
| Inorganic Carbon                       | %                 | 1.69      | 1.69                          | 2.64      | 1.12   | NG                       | NG           |
| Total Organic Carbon                   | %                 | 37.2      | 31                            | 36.4      | 45.4   | NG                       | NG           |
| Miscellaneous Parameters               |                   |           |                               |           |  |                          |              |
| Moisture                               | %                 | 79.5      | 78.5                          | 88.6      | 86.5   | NG                       | NG           |
| Available Phosphate-P                  | mg/kg             | 58.3      | 61.8                          | 100       | 143  | NG                       | NG           |
| Specific Gravity                       | kg/m3             | 1040      | 912                           | 1020      | 1010   | NG                       | NG           |
| Nitrate-N                              | mg/L              | <1.0      | <1.0                          | <1.0      | <1.0   | NG                       | NG           |
| Н                                      | pH                | 7.13      | 7.21                          | 7.63      | 7.23   | 6 to 8                   | 6 to 8       |
| Available Micronutrients               |                   |           |                               |           |  |                          |              |
| Copper (Cu)                            | mg/kg             | 1.9       | 1.72                          | 2.2       | 2.1  | NG                       | NG           |
| Iron (Fe)                              | mg/kg             | 333       | 293                           | 734       | 684  | NG                       | NG           |
| Manganese (Mn)                         | mg/kg             | 46.8      | 50.8                          | 66.1      | 62.2   | NG                       | NG           |
| Zinc (Zc)                              | mg/kg             | 50.7      | 53.5                          | 35.9      | 45.5   | NG                       | NG           |
| Metals                                 |                   |           |                               |           |  |                          |              |
| Aluminum (Al)                          | mg/kg             | 5750      | 5370                          | 6360      | 6660   | NG                       | NG           |
| Antimony (Sb)                          | mg/kg             | 0.32      | 0.29                          | 0.31      | 0.88   | 20                       | 40           |
| Arsenic (As)                           | mg/kg             | 0.95      | 0.84                          | 1.00      | 0.87   | 12                       | 12           |
| Barium (Ba)                            | mg/kg             | 111       | 98.8                          | 157       | 105  | 750                      | 2000         |
| Beryllium (Be)                         | mg/kg             | 0.11      | 0.1                           | 0.14      | 0.11   | 4                        | 8            |
| Bismuth (Bi)                           | mg/kg             | 0.038     | 0.032                         | <0.20     | <0.20  | NG                       | NG           |
| Boron (B)                              | mg/kg             | <10       | <10                           | 6.7       | 7.7  | 2                        | ND           |
| Cadmium (Cd)                           | mg/kg             | 1.27      | 1.2                           | 1.2       | 1.27   | 1.4                      | 22           |
| Calcium (Ca)                           | mg/kg             | 34900     | 30900                         | 69800     | 22800  | NG                       | NG           |
| Chromium (Cr)                          | mg/kg             | 16.6      | 15                            | 16.8      | 15.5   | 64                       | 87           |
| Cobalt (Co)                            | mg/kg             | 1.52      | 1.44                          | 1.62      | 1.37   | 40                       | 300          |
| Copper (Cu)                            | mg/kg             | 21.8      | 20                            | 22.9      | 24.3   | 63                       | 91           |
| Iron (Fe)                              | mg/kg             | 3520      | 3230                          | 3780      | 2950   | NG                       | NG           |
| Lead (Pb)                              | mg/kg             | 5.49      | 5.13                          | 4.71      | 5.12   | 70                       | 600          |
| Magnesium (Mg)                         | mg/kg             | 5230      | 4760                          | 5370      | 3280   | NG                       | NG           |
| Manganese (Mn)                         | mg/kg             | 196       | 175                           | 278       | 168  | NG                       | NG           |
| Molybdenum (Mo)                        | mg/kg             | 9.99      | 9.25                          | 8.33      | 13.9   | 5                        | 40           |
| Nickel (Ni)                            | mg/kg             | 15.6      | 15.1                          | 14.2      | 14.6   | 45                       | 89           |
| Phosphorus (P)                         | mg/kg             | 1600      | 1480                          | 1880      | 2570   | NG                       | NG           |
| Potassium (K)                          | mg/kg             | 696       | 646                           | 920       | 630  | NG                       | NG           |
| Selenium (Se)                          | mg/kg             | <0.50     | <0.50                         | <0.20     | 0.23   | 1                        | 2.9          |
| Silver (Ag)                            | mg/kg             | 0.55      | 0.45                          | 0.52      | 0.36   | 20                       | 40           |
| Sodium (Na)                            | mg/kg             | 622       | 607                           | 1320      | 752  | NG                       | NG           |
| Strontium (Sr)                         | mg/kg             | 42.7      | 38.4                          | 54.2      | 26.6   | NG                       | NG           |
| Thallium (TI)                          | mg/kg             | <0.10     | <0.10                         | 0.091     | 0.061  | 1                        | 1            |
|  | The second second | <5.0      | <5.0                          | <2.0      | <2.0   | 5                        |              |
| Tin (Sn)                               | mg/kg             |           | 73.1                          | 99.5      | Communication of the Communica | The second second second | 300          |
| Titanium (Ti)                          | mg/kg             | 80.2      |                               |           | 70.7   | NG                       | NG           |
| Uranium (U)                            | mg/kg             | 1.27      | 1.21                          | 0.913     | 1.11   | 23                       | 300          |

| Sample ID:                        | Units |                 | rimary Sludg<br>th Settling B |           | Primary<br>Sludge-<br>South<br>Settling<br>Basin | CCME SQG a    | CCME SQG <sup>b</sup> (Industrial) |
|-----------------------------------|-------|-----------------|-------------------------------|-----------|--|---------------|------------------------------------|
| Date Sampled:                     |       | 7/27/2017       | 7/27/2017                     | 11/1/2017 | 11/1/2017  | (Agriculture) |                                    |
| Vandium (V)                       | mg/kg | 8.96            | 8.3                           | 8.21      | 8.11   | 130           | 130                                |
| Zinc (Zc)                         | mg/kg | 185 170 187     |                               | 255       | 200  | 360           |                                    |
| Available N, P, and K             |       |                 |                               |           |  |               |                                    |
| Available Nitrate-N               | mg/kg | <15             | <15                           | <15       | 25   | NG            | NG                                 |
| Available Phosphate-P             | mg/kg | 285             | 337                           | 380       | 530  | NG            | NG                                 |
| Available Potassium               | mg/kg | 200 233 541     |                               | 399       | NG   | NG            |                                    |
| Total N, P, K, S                  |       |                 |                               |           |  |               |                                    |
| Total Nitrogen by LECO            | %     | 0.813           | 0.736                         | 0.517     | 0.665  | NG            | NG                                 |
| Sulfur (S) - Total                | mg/kg | 9600 7200 10200 |                               | 10300     | NG   | NG            |                                    |
| Detailed Salinity                 |       |                 |                               |           |  |               |                                    |
| Chloride (CI)                     | mg/kg | 290             | 287                           | 13.4      | 14.5   | NG            | NG                                 |
| Calcium (Ca)                      | mg/kg | 5070            | 4400                          | 5070      | 169  | NG            | NG                                 |
| Magnesium (Mg)                    | mg/kg | 529             | 482                           | 750       | 610  | NG            | NG                                 |
| Potassium (K)                     | mg/kg | 195             | 180                           | 200       | 180  | NG            | NG                                 |
| Sodium (Na)                       | mg/kg | 573             | 521                           | 1030      | 30 770 <b>NG</b>                                 |               | NG                                 |
| Sulfur (S)                        | mg/kg | 1060 969 430    |                               | 130       | 500  | ND            |                                    |
| Nitrate-N                         | mg/kg | <3.9 <3.4 <12   |                               | <12       | NG   | NG            |                                    |
| SAR, Cations and SO4 in Saturated | Soil  |                 |                               |           |  |               |                                    |
| Calcium (Ca)                      | mg/L  | 1300            | 1280                          | 432       | 396  | NG            | NG                                 |
| Potassium (K)                     | mg/L  | 50              | 52                            | 17        | 15   | NG            | NG                                 |
| Magnesium (Mg)                    | mg/L  | 135             | 140                           | 64        | 52   | NG            | NG                                 |
| Sodium (Na)                       | mg/L  | 146             | 151                           | 88        | 65   | NG            | NG                                 |
| SAR                               | SAR   | 1.03            | 1.07                          | 1.04      | 0.82   | 5             | 5                                  |
| Sulfur (as SO4)                   | mg/L  | 271 282 36      |                               | 11        | NG   | NG            |                                    |

### Notes:

<sup>&</sup>lt;sup>a</sup> Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines (2014) – Agriculture Land Use

<sup>&</sup>lt;sup>b</sup> Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines (2014) – Industrial Land Use

<sup>1.</sup> All results and soil quality guidelines in mg/kg, unless otherwise noted.

<sup>2.</sup> NG - No guideline.

<sup>3.</sup> ND - Guideline for agricultural land use, but no data for industrial land use.

<sup>4.</sup> Sludge samples - composite sample collected from three locations within the north basin approximately 2-3 feet in depth.

# Notice of Alteration Form



| Client File No.: Environment Act Licence No.: 1339R   |                                    |   |  |  |  |  |  |
|---|------------------------------------|---|--|--|--|--|--|
| Legal name of the Licencee: Canadian Kraft Paper Industries Ltd.  |                                    |   |  |  |  |  |  |
| Name of the development: Canadian Kraft Paper Industries Ltd.   |                                    |   |  |  |  |  |  |
| Category and Type of development p  | per Classes of Develo              | opment Regulation:  |  |  |  |  |  |
| orestry Pulp and paper mills  |                                    |   |  |  |  |  |  |
| Licencee Contact Person: Jayne<br>Mailing address of the Licencee: p  |                                    | nental Superintendent   |  |  |  |  |  |
| City: The Pas<br>Phone Number: (204) 623-8587   | Province:  <br>Fax: (204) 623-5995 |   |  |  |  |  |  |
| Name of proponent contact person  | for purposes of the e              | nvironmental assessment (e.g. consultant):  |  |  |  |  |  |
| Phone:  | Phone: Mailing address:            |   |  |  |  |  |  |
| Fax:  |                                    |   |  |  |  |  |  |
| Email address:  |                                    |   |  |  |  |  |  |
| Short Description of Alteration (ma.  | x 90 characters):                  |   |  |  |  |  |  |
| Landspreading Pilot Project next  | steps - additional tes             | st sites & varied application rates.  |  |  |  |  |  |
| Alteration fee attached: Yes:   | No: ✓                              |   |  |  |  |  |  |
| If No, please explain: Continuation   | of existing pilot proj             | ect. Reduction in landfill GHG emissions.   |  |  |  |  |  |
| Date: 2018-04-18  | Signature:                         | re: Jayne Prypper 1   |  |  |  |  |  |
|   | ne Sheppard                        |   |  |  |  |  |  |
| A complete Notice of Alteration (Notice of Alteration)  Cover letter  Notice of Alteration Form  4 hard copies and 1 electro the NOA detailed report (see | nts:  nic copy of  "Information    | Submit the complete NOA to:  Director EnvironmentalApprovalsBranch Manitoba Sustainable Development Box 80, Suite 160, 123 Main Street Winnipeg, Manitoba R3C 1A5  Formore information: |  |  |  |  |  |
| Bulletin - Alteration to Devewith Environment Act Licence  \$500 Application fee, if appayable to the Minister of F                                       | es") plicable (Cheque, inance)     | Phone: (204) 945-8321 Fax: (204) 945-5229 http://www.gov.mb.ca/sd/eal   |  |  |  |  |  |
| submission of an Environment  | Act Proposal Forn                  | n (see "Information Bulletin – Environment Act  |  |  |  |  |  |

Proposal Report Guidelines")