

The Corporation of the City of Kawartha Lakes

Council Report

Report Number PW2017-006

Date: July 11, 2017
Time: 2:00 p.m.
Place: Council Chambers

Ward Community Identifier: All

Subject: Calcium Chloride Roads Application Review / Recommendation

Author Name and Title: Richard Monaghan, Senior Engineering Technician

Recommendation(s):

RESOLVED THAT Report PW2017-006, **Calcium Chloride – Roads Application Review / Recommendation**, be received;

THAT Council direct Staff to include for consideration within the 2018 Operating Budget, \$1,065,000.00 for the Dust Control program to allow for an increased Calcium Chloride application rate and a wider application width; and

THAT Staff reviews the Dust Control program annually to monitor effectiveness of increased Calcium Chloride application rate and width.

Department Head: _____

Financial/Legal/HR/Other: _____

Chief Administrative Officer: _____

Background:

At the Council Meeting of March 21, 2017, Council adopted the following resolution:

CR2017-237

Moved By Councillor Elmslie

Seconded By Councillor Yeo

RESOLVED THAT staff bring forward as part of budget deliberations a report outlining the level of calcium chloride that should be applied to all gravel roads and its impact on the associated costs.

CARRIED

This report addresses that direction.

The City of Kawartha Lakes has an inventory of approximately 890 km of gravel roads. Maintenance of the City's gravel roads is achieved through several operational activities including but not limited to routine road grading, drainage improvements, calcium chloride application, and capital gravel road rehabilitation.

Calcium Chloride is a chemical compound that is hygroscopic in nature, meaning it will absorb moisture from the air. When Calcium Chloride is applied to a gravel surface, it will absorb moisture from the air and keep the gravel in an artificially damp state.

The application of Calcium Chloride to a gravel road surface should be viewed primarily as a surface stabilization procedure, with dust suppression as a beneficial by-product. A gravel surface that has been stabilized through the Calcium Chloride application rate proposed herein will experience reduction in fine particle loss. Excessive loss of fine particle will cause larger material to be left in a loose state and the gravel surface becomes vulnerable to surface defects such as pot holes, wash boarding, and lack of drainage.

Due to budget pressures, during deliberations the City's Operating Budget for Dust Control has been reduced in recent years. The long term effects of this reduction are now realized as our gravel roads are degrading at an accelerated rate and are in poor condition after a severe winter season. The poor condition of our roads is further magnified by frost or excessive spring moisture in the ground preventing effective operational grading.

Currently the approved budget enabled the City to apply Calcium Chloride at a rate of approximately 2000 liters per km, over the center 3.6m width of road. This equates to 0.55 liters per square meter. In 2016, the City applied 1.84 million liters of a 35% Calcium Chloride solution at a cost of \$289 546.13 plus HST.

Appendix C shows historical spending for both the Dust Control program and the Grading program. A trend can be seen where a reduction in the Dust Control program results in an increase in the Grading program. Comparing the two programs historically, there has been a minor reduction in overall budget but this is reflected in the City's gravel road network being increasingly vulnerable to surface defects throughout the year.

In 2009, the Minnesota Department of Transportation completed a comprehensive study (Investigation 842) that evaluated the performance and cost of commonly used dust suppressants using a mobile air sampling technique. Treatments were applied to a variety of subject roads that were located throughout Minnesota with AADT levels between 25 and 700.

In addition to dust control, study participants observed gravel surface stabilization. Treated sections that developed surface stabilization were able to reduce maintenance activities to intersection areas only. It was conservatively estimated that road grading was reduced by 50% on roads treated with Calcium Chloride at the proposed application rate.

This study concluded that a standard application rate of 0.3 gallons per square yard (1.35 Liters per square meter) was most effective. This would equate to approximately 6000 liters per kilometer considering the City's average width of gravel road is 4.45m.

In 2006, the US Department of Agriculture – Forest Service conducted a similar study that came to the same eventual conclusion and recommended application rate.

Rationale:

By utilizing the application rate proposed with this report, the City will achieve surface stabilization and improved gravel road performance. Gravel road maintenance is expected to shift to more of a fine tuning operating as opposed to a complete rebuild of the road.

The following table provides an evaluation of the benefits and risks of increasing application to match rates recommended within the Minnesota DOT study and which are currently being utilized within other municipalities in Ontario.

Increase Calcium Chloride application rate and use a full width application	
Description	<ul style="list-style-type: none"> • The City would increase the application rate from 2000 liters per kilometer to 6000 liters per kilometer for all gravel roads which would increase the overall net budget amount of \$1,065,000 • The City would increase the application width from 3.6 meters to the gravel surface width not including shoulders (average of 4.45 meters) • The effective application density would increase from 0.55 liters per square meter to 1.35 liters per square meter
Benefits	<ul style="list-style-type: none"> • Vastly improved durability and drivability of gravel roads • Potential reduction in operational grading required throughout the year • Reduction in complaints regarding road condition • Potential to extend lifecycle of gravel by protecting integrity of gravel condition (retention of fines) • Will contribute to reduction in resident dust complaints • Annual review will provide staff with knowledge to further improve gravel road maintenance program
Risks	<ul style="list-style-type: none"> • Proposed Operating Budget increase • Because the material binds into the road surface the risk of environmental impact due to the increased application is low

Other Alternatives Considered:

The City has reviewed the following alternatives:

- Option 1: Increase the Calcium Chloride application rate to an effective 6000 liters per kilometer and apply over the full width of gravel roads (Recommended per above)**
- Option 2: Status Quo - Maintain the existing Calcium Chloride program with no change to application rate or width.**
- Option 3: Maintain the existing Calcium Chloride application rate but increase the application width to include full road surface.**
- Option 4: Increase the Calcium Chloride application rate to an effective 6000 liters per kilometer on gravel roads with an AADT above 100, with no changes to application on roads with an AADT below 100.**

Option 1 is reviewed within the Rationale section of this report. The benefits and risk associated with alternatives two thru four are summarized in the following tables below.

Option 2:

Status Quo - Maintain the existing Calcium Chloride program with no change to application rate or width	
Description	<ul style="list-style-type: none"> The City would continue to apply Calcium Chloride at an effective rate of 2000 liters per kilometer and apply over the center 3.6m of a road
Benefits	<ul style="list-style-type: none"> Provides short term dust suppression on gravel roads No significant impact to Operating Budget
Risks	<ul style="list-style-type: none"> Application rate is inadequate to achieve gravel surface stabilization Operating budget for gravel road maintenance activities will continue to increase with no tangible improvement in the general condition of the City's gravel roads

If Option 2 is selected, the second Council Resolution proposed within this report should be replaced with:

“THAT the City's current Dust Control program be maintained with no changes; and”.

Option 3:

Maintain the existing Calcium Chloride application rate but apply of the full width of the road	
Description	<ul style="list-style-type: none"> The City would continue to apply Calcium Chloride at the current rate but increase the application width to an average width of 4.45 meters from the current 3.6 meters The City's average width of gravel road is 4.45 meters and the effective application rate would be approximately 2450 liters per kilometer
Benefits	<ul style="list-style-type: none"> The edge of road (beyond the center 3.6 meters) would be treated A general reduction in nuisance dust would be realized over a similar duration as the current process
Risks	<ul style="list-style-type: none"> Application rate is inadequate to achieve surface stabilization Increase to Operating Budget for minimal improvement to gravel road No reduction in operational maintenance would be realized on gravel roads

If Option 3 is selected, the second resolution proposed within this report should be replaced with:

“THAT Council direct Staff to include for consideration within the 2018 Operating Budget \$435,000 for the Dust Control program to allow for no increase in Calcium Chloride application rate but apply over the entire road surface; and”.

Option 4:

Increase the Calcium Chloride application rate to an effective 6000 liters per kilometer on gravel roads with an AADT above 100, with no changes to application on roads with an AADT below 100	
Description	<ul style="list-style-type: none"> • The City would increase the application rate as described in Option 1 for roads with an AADT above 100 only • No change in process for gravel roads below 100
Benefits	<ul style="list-style-type: none"> • Provides all the benefits of Option 1 on the City’s higher volume gravel roads • Less impactful Operating Budget increase
Risks	<ul style="list-style-type: none"> • Creates a two tier level of service for the City’s gravel roads • Lower volume roads will not achieve surface stabilization and would not see any improvement • Increased contract administration required for the Calcium Chloride program and the Capital Gravel Resurfacing program (word better)

If Option 4 is selected, the second resolution proposed within this report should be replaced with:

“**THAT** Council direct Staff to include for consideration within the 2018 Operating Budget \$715 000 for the Dust Control program to allow for an increased Calcium Chloride application rate and a wider application width on specified roads; and”.

Financial/Operation Impacts:

There are significant potential operational benefits resulting from the recommendations in this report. However, those recommendations also come with a significant increase in annual operating budget (estimated at \$1,065,000).

The resulting operating benefits include:

- Vastly improved durability and drivability of gravel roads
- Reduction in complaints regarding road condition
- Likely to reduce operational grading required throughout the year
- Likely to extend lifecycle of gravel by protecting integrity of gravel condition (retention of fine material in roadway)
- Will contribute to reduction in resident dust complaints
- Annual review will provide staff with knowledge to further improve gravel road maintenance program

Relationship of Recommendation(s) To The 2016-2019 Strategic Plan:

Goal 3.1.7 – Protect Prime Agriculture Land: This will be achieved through reduction of nuisance dust entering fields.

Goal 3.1.9 – Manage Aggregate Resources: This will be achieved through the potential of the City requiring less gravel through the lifecycle of our gravel roads.

Goal 1.1.3 - Enhanced Tourism: Providing a stable and improved road network will enable and promote enhanced tourism within the City.

Review of Accessibility Implications of Any Development or Policy:

No accessibility implications are associated with this recommendation.

Servicing Implications:

No servicing implications are associated with this recommendation.

Consultations:

Manager, Roads Operations
Supervisor, Public Works

Attachments:

Appendix A – Best Practices for Dust Control on Aggregate Roads by Minnesota Department of Transportation



Appendix B – Surface-Aggregate Stabilization with Chloride Materials by United States Department of Agriculture



Appendix C – Financial Evaluation of Historical Spending on Gravel Road Maintenance



Department Head E-Mail: brobinson@city.kawarthalakes.on.ca

Department Head: Bryan Robinson, Director of Public Works

Department File: