Sustainability Assessment Tool for the Selection of Optimal Site Remediation Technologies for Contaminated Gasoline Sites

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Background/Objectives: Life cycle assessment (LCA) is a powerful tool established by the International Organization for Standardization (ISO) that can be used to assess the environmental impacts of a product or process from cradle-to-grave. As such, many studies have now utilized the LCA methodology within the site remediation field, to compare various decontamination methods such as bioremediation, soil vapour extraction or excavation and off-site disposal to determine the optimal solution. However, through preliminary research, no studies were found that have further established a sustainability tool that can be used to select the best option at any site based on the environmental, economic and social impacts of each technology. Thus, this project was initiated with an overall objective of helping qualified personnel assess different remediation options to select the optimal sustainable technology, which can be applied to any generic gasoline contaminated site.

Approach/Activities: To achieve the overall objective outlined previously, a large amount of data has now been collected from agencies and organizations in Ontario, other provinces in Canada and across the world. Additionally, data was obtained from previous LCA studies that were recently completed on site remediation technologies for contaminated sites. This information was then supplemented by conducting a literature review with assistance from the University of Guelph library services to identify any other applicable LCA studies. This step allowed any knowledge gaps or limitations within the previous project data to be determined. Next, utilizing the data obtained from the literature review and various organizations, an extensive LCA study is currently being completed following the ISO 14040 requirements. Initial technologies that are being compared include bioremediation, excavation and off-site disposal, and a no remediation option. To complete the LCA study, the modelling software SimaPro is being utilized. Furthermore, sensitivity analyses are to be conducted on the LCA results once finished. Here, the site parameters such as the soil type or the media that is contaminated will vary to understand how these factors impact the overall results. After, the economic and social impacts associated with each option will then be reviewed to understand how they can fluctuate at different sites. All of the results will then be summarized, and an interactive tool will be developed that can be used to select the best sustainable site remediation technology.

Results/Lessons Learned: Preliminary LCA results show improved sustainability for the decontamination of a gasoline contaminated site for each technology compared to the no remediation option. Sensitivity analyses are now being completed to determine how the environmental impacts can then fluctuate at other contaminated gasoline sites that may have different parameters. Additionally, the social improvements and overall economic costs associated with each technology are being reviewed. Utilizing these results, the sustainability tool created to assist in the selection of the overall best option for a contaminated gasoline site is being developed using Excel. Refinements to the tool will follow.