Soil Reuse Study

Prepared For:

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1.0 INTRODUCTION

Hennepin County retained Minnesota Brownfields to evaluate the potential for cost savings associated with the off-site reuse of soil at brownfield sites and the legal framework surrounding soil reuse. Current Minnesota regulations allow on-site reuse of marginally contaminated soils[1] at redevelopment sites under the oversight of the Minnesota Pollution Control Agency (MPCA) Brownfield Program. However, on a site-specific basis, the opportunity for on-site soil reuse may be limited by lack of space, geotechnical conditions, or other variables. In situations where soil cannot be reused on-site, excess soils with low-level impacts are usually transported to landfills for disposal, thereby increasing project costs and vehicle air emissions,[2] and consuming landfill capacity. The additional costs are either borne by the developer or by public brownfield grant programs. Recent MPCA programmatic developments allow for some off-site soil reuse of marginally contaminated soils. However, it appears that these changes have not been sufficient to encourage further expansion of off-site reuse. Additionally, limited documentation exists on the potential economic and environmental benefits of off-site soil reuse.

About Minnesota Brownfields

Minnesota Brownfields is a 501(c)(3) non-profit organization founded in 2006 to support and promote reuse and redevelopment of contaminated lands throughout the state of Minnesota through education, research and partnerships. Minnesota Brownfields was formed by an interdisciplinary group of public and private sector individuals with the express goal of reinvigorating policy and practices to facilitate the cleanup, reuse and redevelopment of contaminated land throughout the state. Minnesota Brownfields regularly identifies and works to remove barriers and inefficiencies in current redevelopment regulations and practices.

This study was performed in conjunction with the partners and contributors acknowledged in Appendix A. The objectives of this study were the following:

- Gather site-specific data on soil-reuse activities, costs, and limiting factors in Minnesota.
- Examine and quantify the economic impacts of off-site soil disposal versus off-site soil reuse of marginally contaminated soil.
- Examine and quantify environmental impacts of off-site soil disposal versus off-site soil reuse.
- Summarize the current regulatory and policy framework for off-site soil reuse in Minnesota.
- Define the barriers to off-site soil reuse in Minnesota, both in policy and in practical application.
- Recommend solutions to encourage and increase off-site reuse of marginally contaminated soil.

1.1 BACKGROUND INFORMATION

In practice, most brownfield sites are redevelopment sites, and brownfield cleanup is generally conducted in tandem with redevelopment construction. At any construction project, it is necessary to bring a project to the correct grade and/or to remove soils that are structurally unfit

[1] In this project, "marginally contaminated soil" is defined as fill material determined through laboratory analysis to meet the MPCA definitions of "unregulated" or "regulated" fill, or fill material meeting site-specific risk-based criteria for on-site management, as further discussed in Appendix C, footnote 1.
[2] Vehicle air emissions associated with soil disposal are primarily diesel emissions.

for the proposed use. At a non-brownfield construction site, excess fill soils can be reused at nearby construction sites, thereby reducing hauling costs and eliminating landfill fees. Excess fill soils from regulated brownfield sites, however, are stigmatized and are typically disposed of off-site at landfills as daily cover or waste. This is true, whether the soils meet the MPCA's definition of "unregulated fill" or the MPCA's less stringent criteria for commercial or industrial land uses, because there is little market for soil coming from property with a "regulatory history."

The MPCA's Voluntary Investigation and Cleanup (VIC) Program and Petroleum Brownfields Program (PBP), collectively referred to as the "MPCA Brownfield Program," provide assurances, including statutory liability protection and site closure documents, to parties that voluntarily assess and cleanup sites under MPCA oversight. Currently, the statutory liability assurances do not extend to exporting marginally contaminated soil to an off-site property or property owners who are willing to accept such soil. The resulting lack of regulatory closure and exposure to liability serve as barriers to off-site soil reuse.

Hauling and disposing of soil at a landfill adds significant costs to brownfield redevelopment (from tens of thousands to hundreds of thousands of dollars for an individual site). Most Minnesota cleanup grant programs consider the excavation, transportation, and landfill disposal of soil – including unregulated fill – to be a grant-eligible expense. Therefore, the amount of grant funds spent on hauling and disposal of soils from brownfield sites can be considerable.

The concept of off-site reuse of excess fill soils from brownfield redevelopment has been discussed in Minnesota for many years amongst developers, consultants, and government entities. The topic was identified in 2007 by Minnesota Brownfield members as one of several barriers to more efficient and effective brownfield redevelopment. In 2008, Minnesota Brownfields held a forum titled "Reuse of Fill Soils from Brownfield Sites: National Models and the Minnesota Experience," which defined the issue and explored possibilities.

Since 2008, the MPCA policy on the off-site reuse of fill from brownfield sites has evolved. MPCA guidance distinguishes between "unregulated fill" and "regulated fill" and provides for the off-site reuse of both unregulated and regulated fill. In practice, however, the regulated fill guidance has not been implemented. Appendix B provides a summary of the current status and evolution of policy affecting the reuse of soils from brownfield sites in Minnesota.

The off-site reuse of marginally contaminated soils from brownfield sites appears to be a viable alternative to landfill disposal. There are many potential environmental and economic benefits to implementing policies that would permit the movement of marginally contaminated soil between brownfield sites, including:

- Significant cost savings for individual site cleanups.
- More efficient use of public brownfield grant funds and private investment capital that are currently spent on soil disposal and purchase of clean fill material.
- Conservation of landfill space by avoiding disposal of soils that can safely be reused.
- Preservation of greenfield space that would otherwise be mined for clean fill.

- Reduction of the carbon footprint of individual brownfield projects due to decreased hauling distances.

To date, there is no documentation of the magnitude of these potential benefits. This study strives to: a) provide this missing documentation, b) analyze barriers to realizing these potential benefits, and c) propose potential solutions to these barriers.

1.2 STUDY OVERVIEW

The Soil Reuse Study is comprised of three components: cost analysis, environmental impact analysis, and policy analysis. The cost and environmental impact analysis portions of the study focus on examining a set of redevelopment case studies to determine the economic and enviromental benefits of off-site resue of marginally contaminated soils as compared to landfill disposal. The policy analysis portion of the study assesses regulatory and statutory barriers to off-site soil reuse and evaluates potential regulatory and statutory changes to encourage off-site reuse of marginally contaminated soil.

2.0 SOIL REUSE - COST ANALYSIS

The cost analysis portion of the study sought to examine the economic impact of current soil reuse practices at brownfield redevelopment projects in Minnesota by analyzing the soil disposal, on-site reuse, and off-site reuse patterns at a set of eleven brownfield sites where remediation had occurred in the past 10 years (2004 – 2013). The eleven sites that were evaluated were distributed between the Twin Cities (8), Twin Cities suburbs (2), and out-state metro areas (2) (Appendix C - Figure 1).

Details on the soil reuse study methods, site selection process, data interpretation, site-specific findings, study limitions, results, and conclusions are presented in the text, tables, and figures in Appendix C. For purposes of analysis and discussion, the project team identified five categories of fill from brownfield sites, based on the level of contamination and presence of debris, as further defined in Appendix C. Off-site reuse was implemented at four of the eleven brownfield sites, and on-site reuse was implemented at eight of the sites. All projects relied on landfill disposal for at least a portion of the soil management.

The study clearly indicates that signficant cost savings were realized by on-site and off-site reuse of soils, which avoided hauling material off-site (in the case of on-site reuse) or shortened the hauling distance compared to landfilling the material (in the case of all four off-site reuse instances evaluated in this study). Actual cost savings realized differed between sites based upon the size of the project, the volume of soils involved, and, for off-site reuse, the difference in the hauling distances between the remediation site and the landfill and reuse locations.

For off-site reuse, the cost savings realized at the case study sites ranged from $49,736 to $1,066,540 (i.e., 42% to 99%) when compared directly to the alternative cost of landfilling. Large-scale sites reaped the largest savings, but small scale sites benefited as well. Despite the opportunity for cost savings, and despite the MPCA's development of off-site reuse guidance, off-site soil reuse was not widely implemented.

On-site reuse offers the greatest opportunity for savings, where possible. The cost savings realized at the case study sites ranged from $21,293 to $6,249,674 (i.e., 78% to 92%) when

compared to the alternative cost of landfilling. While on-site reuse resulted in cost savings several of the case study sites, in practice, on-site reuse is not always possible. Some sites have excess soils that cannot be reused on-site due to time and space constraints. This is especially true for small sites and for sites in the later stages of combined cleanup/redevelopment when multiple activities may occur on-site concurrently, leaving less space to stage soils.

Nine of the eleven case study sites received brownfield remediation grant funds from one or more grantors, and for eight of the nine grant-funded sites, grant funds were used for off-site diposal or reuse (Appendix C, Table 3). Where grant funds were used for off-site disposal or reuse, the total grant funds used for these purposes ranged from $206,429 to $2,176,077 (i.e., 42% to 100%) of the total grant funds awarded for these sites. This indicates that the opportunity for cost savings represented by off-site reuse has implications not only for developers but for grantors as well.

The cost analysis portion of this study indicates that the following continue to be the major limiting factors for off-site reuse of unregulated fill:

- Identifying a reuse location where the soil can be used within an appropriate time frame for the redevelopment site generating the excess marginally contaminated soil.
- The lack of availability of publicly- or privately-owned and managed locations where soils can be intermediately staged, segregated, screened and stored for reuse.
- The presence of debris in otherwise reusable unregulated fill. This fill appears to almost always be landfilled, even though it presents a low environmental risk.
- The geotechnical quality of the unregulated fill.

The case studies indicate that the following elements increase the likelihood that off-site soil reuse will be implemented at a site: a) the opportunity for significant cost savings as indicated by large excess fill volumes and/or long hauling distances to the disposal site; b) a motivated development team; and c) a willing MPCA staff assigned to the site. In general, additional sampling was required to confirm that soil was sufficiently clean for reuse.

The MPCA's evolving policy has made the soil reuse process clearer and more practical. To some degree, consultants, developers, and excavation contractors are still at various points on the learning curve regarding the practical application of the evolved guidance. Nonetheless, the study results clearly illustrate that regulated fill is not commonly being reused off-site, and the issuance of the MPCA's new policy in 2012 has had no effect on this status.

3.0 SOIL REUSE - ENVIRONMENTAL IMPACT ANALYSIS

This study also sought to assess the environmental benefit provided by off-site soil reuse by comparing greenhouse gas (GHG) production between soil management strategies. Carbon Dioxide (CO_2) is the primary GHG produced during excavation and hauling activities as a product of the combustion of diesel fuel; therefore, CO_2 was selected as the marker compound for this study. CO_2 production was estimated for each soil remediation strategy implemented at the eleven case study sites using hauling distance, mileage, and number of trips. See Appendix D for detailed information on data results and analysis methods.

Study results show that on-site reuse offers the biggest potential decrease in CO_2 production, since soil is generally moved on-site less than 500 feet from the point of excavation to the point of reuse or to a stockpile for temporary storage prior to reuse. Either method results in a round-trip haul of less than 1000 feet per load, as opposed to round-trip hauling distances of miles or tens of miles typical of landfilling and off-site reuse (see Table 7 in Appendix D).

Study results indicate that off-site reuse also provides savings in CO_2 production, because hauling distances are typically shorter. In the four case study sites where off-site reuse was implemented, hauling distances to the reuse sites were 21% - 88% shorter than to the alternative landfill disposal option; CO_2 production savings consequently ranged from 21% - 88% for these sites. In absolute terms, estimated CO_2 production savings per site ranged from 5,600 kg – 217,500 kg; absolute savings is dependent upon the volume of soil reused and the difference in hauling distances between the source site and the disposal and reuse sites.

4.0 LEGAL AND POLICY BARRIERS

There are several regulatory barriers facing the off-site reuse of marginally contaminated soil at redevelopment sites in Minnesota. Current MPCA policies provide an initial foundation for a regulatory framework that could not only allow but also encourage off-site reuse of marginally contaminated soils in lieu of landfilling. However, amendments to the current policy and supporting statutes and rules are needed to fully achieve this goal. Complete details on the analysis of the legal and policy barriers to off-site soil reuse are presented in Appendix E. The barriers identified in this portion of the study are summarized below; potential solutions are presented in Section 5.0.

Liability Assurances and Site Closure

Liability assurances, for parties associated with both the importing and exporting sites, are essential to encouraging off-site soil reuse. Currently, liability assurance options are too limited to encourage reuse.

For the reuse of soil impacted with hazardous substances, pollutants, or contaminants, MPCA liability protection options that could potentially be useful include:

- No Action Determination Letters, for both the importing site and exporting sites, relative to the contaminants identified in the exported fill. Although the MPCA's current Off-site Use of Regulated Fill Policy allows for the provision of a No Action Letter for both the exporting and importing sites, none have been issued to date.

- No Association Determination (NAD) letters that state that the MPCA has determined that specific actions taken at a site will not serve to "associate" the named parties undertaking these actions with a known release at the site for purposes of MERLA liability.[3] Under current policy, a NAD is not available for the acts of exporting regulated fill from the source site or importing regulated fill to a receiving site. The MPCA has taken the position that current Minnesota Statues do not authorize the MPCA to issue No Association Determinations for the off-site reuse of contaminated soil.

[3] MPCA. VIC program assurance guide. page 7.

The current MPCA assurance options available for petroleum-contaminated soil do not apply to soil reuse. Currently, the MPCA only offers an Implementation Report Approval Letter for importing or exporting sites. The MPCA does offer a "General Liability Letter for Petroleum," but this speaks to the definition of a "responsible party" under Minn. Stat. 115C and states that if a person comes into possession of a property after petroleum tanks were removed, and where a petroleum tank release attributable to those tank(s) had previously occurred, that person is not a responsible party and cannot be ordered to take corrective action. The MPCA has taken the position that current Minnesota Statutes do not authorize the MPCA to issue a General Liability Letter for petroleum contamination that does not originate from a tank release. Furthermore, the General Liability Letter is focused on the site where the original release occurred and does not address reuse of petroleum-impacted soils.

MPCA Soil Reuse Guidance

MPCA's current guidance, "Off-site Reuse of Regulated Fill," provides an avenue to regulatory approval of off-site reuse and even the provision of No Action Determinations for both the importing and exporting sites. However, developers, consultants, and earthwork contractors have not been willing to utilize this guidance for off-site reuse. A survey performed as part of this study, entitled "Survey on Off-site Use of Regulated Fill Policy" (Appendix G), indicates that failure to implement off-site reuse of regulated fill is due to a) a lack of sufficient liability protection from the MPCA, b) resulting complications from the required sign-off by a local government entity, c) the inability to locate an appropriate importing site in time, d) a lack of knowledge of the MPCA's new policies, and e) the sense that landfilling is more practical, and quicker and easier to plan for and implement, since it avoids the potential need to stockpile and simplifies site operations. Items a-c could be addressed by adjustments to the current guidance. Items d and e have to do with where consultants, developers, and earthwork contractors are on the learning curve for the new guidance and the concept of off-site reuse.

Elements of the current guidance that serve as barriers to soil reuse include:

- **Regulated Fill Definition and Risk-Based Decision Making**: Under current guidance, the MPCA defines "regulated fill" for hazardous substances as being characterized by contaminant concentration between residential and industrial soil reference values (SRVs) for metals and semi-volatile organic compounds and between Tier 1 and site-specific Tier 2 soil leaching values (SLVs) for volatile organic compounds (VOCs) at the importing site. In general, the MPCA's guidance for the site assessment and cleanup is based upon a risk-based evaluation and decision-making rubric, which works exceptionally well and is consistent across the majority of its guidance documents. The current definition of "regulated fill" is an exception to this risk-based approach. Under a risk-based framework, decisions about fill placement would be driven by conditions at the receiving site and the requirements of the receiving site Response Action Plan (RAP).

- **Local Unit of Government Signature Requirement**: The guidance currently requires that a representative of a local unit of government (LUG) provide a signature as part of the Local Government Notification step. Although the MPCA did not intend that LUGs would need to "approve" Regulated Fill applications, the signature requirement essentially transforms the notification into an approval. Most LUGs have neither the

expertise nor the organizational structure to support this requirement. Notification is reasonable and appropriate, but the signature requirement is unnecessary.

- **Intermediate Staging**: Current guidance does not allow for intermediate staging of soils at an off-site location or at the receiving site. In many cases, space and time constraints are barriers to off-site soil reuse; most brownfield redevelopment projects are highly time-sensitive. While larger sites can overcome this problem, it is often impossible for smaller sites to pursue off-site soil reuse due to space and time constraints and the economies of scale.

- **The Problem of Debris-Containing Fill**: Currently, most unregulated debris-containing fill is being disposed of in landfills, even though doing so offers little to no reduction of environmental risk. Current MPCA guidance allows for unregulated fill to contain a "de minimis" amount of inert debris, but it does not provide a clearly defined percentage of the amount of debris that unregulated fill can contain. Furthermore, the current interpretation of the Solid Waste Rules excludes the possibility of reusing fill with larger quantities of debris, which would be possible if the soil could be mechanically screened or sorted and the debris crushed to prepare the material for off-site reuse. The failure to allow for intermediate staging also inhibits opportunities for stockpiling, screening, sorting, and crushing operations.

5.0 RECOMMENDATIONS

Based upon the cost, environmental, and legal/policy analyses performed for this study, Minnesota Brownfields has concluded that, in order to facilitate off-site reuse of marginally contaminated soil, adjustments to current Minnesota Statutes are necessary and current MPCA off-site reuse policy for regulated fill needs to be simplified and made more practical. Minnesota Brownfields provides the following recommendations to improve the opportunities for and implementation of off-site reuse of marginally contaminated fill from brownfield sites in Minnesota:

1. The Receiving-Site RAP Should Drive Reuse Limitations. Off-site soil reuse policy should be modified to allow the MPCA to approve the RAP governing the receiving (i.e., importing) site to dictate soil reuse conditions and criteria. Fill material originating from a brownfield site exported to another brownfield site must meet cleanup standards and soil management criteria established in the receiving site's RAP. This would also serve to expand the definition of "regulated fill" for hazardous substances as being characterized by contaminant concentrations greater than Tier 1 SRVs (or, for mobile organic compounds, SLVs) but less than or equal to site-specific (Tier III) SRVs (or, for mobile organic compounds, site-specific SLVs) at the receiving site.

2. Provide No Association Determinations for Exporting and Importing Fill. The MPCA should expand the liability protection options provided to entities involved in importing and exporting regulated fill. Specifically, the MPCA should offer a No Association Determination for the acts of exporting, importing, and placing fill consistent with the receiving site's RAP. This may involve amending the Minnesota Land Recycling Act and/or MERLA to provide for such assurances. Perhaps the most direct way to ensure liability protection for contaminated soil reuse would be to: a) modify the definition of

"release," b) include the off-site reuse of soil as a permissible component of a response action, and c) create a legal defense to liability through amending portions of MERLA. Detailed examples of possible amendments to encourage soil reuse are included in Appendix E.

3. Provide Stronger Liability Protection for the Reuse of Soil Containing Petroleum Impacts. The current MPCA liability protections available for soils contaminated with petroleum do not advance the implementation of off-site soil reuse. The MPCA has taken the position that current Minnesota Statutes, do not authorize the MPCA to issue a General Liability Letter for petroleum contamination that does not originate from a tank release. Furthermore, the General Liability letter is focused on the site where the original release occurred and does not address soil reuse. In order to encourage off-site soil reuse, the MPCA should offer a General Liability Letter that states that if a person reuses petroleum contaminated soil in a manner consistent with MPCA guidance, and/or with an approved RAP or Soil Reuse Plan, that person is not a responsible party and cannot be ordered to take corrective action. This would likely require an amendment to Minn. Stat. § 115C.

4. Exclude the Requirement for a Signature from the LUG Notification Provision. The MPCA's Off-site Reuse of Regulated Fill Policy currently requires a signature from a LUG as part of the local government notification process. This is essentially equivalent to a local government approval. The requirement is impractical and burdensome. Most LUGs have neither the expertise nor the organizational infrastructure to support this requirement. The signature requirement is unnecessary and should be dropped. Some form of local government notification is appropriate, but without the requirement for approval or signature.

5. Encourage the Reuse of Debris-Containing Fill. Currently, most debris-containing unregulated fill is being disposed of in landfills, even though doing so offers little to no reduction of environmental risk. A distinction should be made allowing debris-containing unregulated fill that includes a clearly defined, and practical, percentage of debris to be reused. Regulatory changes should be made to allow for the reuse of unregulated and regulated fill with debris if screening or crushing the debris is feasible. This could take the form of a reinterpretation of, or relief or exclusion from, the Solid Waste Rules (i.e. a standing Beneficial Use Determination).

6. Allow for Intermediate Off-site Staging Sites and Services. Policy and/or statutory authority should be developed that would allow marginally contaminated fill from brownfield sites to be stored at an off-site location before it is transported to the receiving site and/or to allow for temporary staging of fill soils at the receiving site. Intermediate off-site staging would allow for mechanical treatment of geotechnically unsuitable fill (such as screening, sorting, crushing, or drying), thereby increasing the possibility for reuse of such soils. It would also ease the burden of matching schedules and timing needs of the export and import sites. Intermediate staging would require appropriate soil management and documentation guidelines. Intermediate staging facilities could be managed by public- or private- entities. A pilot project would be a sensible first step. It

would also be beneficial for the MPCA to provide a No Association Determination for the act of intermediate staging for the staging properties.

On a practical level, any time soil needs to be moved, the associated financial and environmental costs and concerns increase. Importing and exporting marginally contaminated soil introduces further communication and timing complications. The intermediate staging of contaminated soil would help alleviate these issues. A website service or database that listed and matched sites with excess marginally contaminated soil could ease soil exchanges and allow for more efficient redevelopment of brownfield sites.

7. Quantify Contamination Cleanup Grant Funds and Private Funds used for Hauling. Currently, there is no clear and concise understanding of the amount of grant or private funds expended on landfill-disposal of soils that could otherwise be reused on- or off-site. It is generally understood that grant dollars are currently used to landfill marginally contaminated fill soils that could potentially be reused under existing MPCA soil reuse policies. However, the magnitude of grant dollars used this way has not been quantified. It would be beneficial to compile data from existing grantor files and/or require this data to be collected for future grants.

6.0 NEXT STEPS

Based upon the findings of this study, Minnesota Brownfields recommends the following next steps:

A) Request that State and local grant programs gather, as part of their standard reporting, information on the disposal and reuse of the soil categories A-D listed in Appendix C. Information should be collected on the total estimated volumes of and unit cost for each soil category reused off-site and disposed of in landfills.

B) Work with the MPCA to pursue improved liability options, as discussed in Recommendations 2 and 3; clarification regarding the movement of soils containing de mimimis concentrations of debris and listed hazardous wastes; and resolution of Solid Waste Rule issues described in Recommendation 5.

C) Work with the MPCA to pursue the improvements to the existing off-site reuse guidance for regulated fill that are listed in Recommendations 1 and 4.

D) Investigate the possibility of a pilot intermediate staging facility coupled with a soil exchange website. Several issues need to be explored, including appropriate fee structures, appropriate tracking methodology, and relief from the Solid Waste Rules. Potential partners in this endeavor, in addition to the MPCA, could include the grantors, landfill operators, and earthwork contractors. The last two entities are likely operators for the pilot facility, since they may have the available acreage and existing tracking mechanisms that could be adapted to this use.

APPENDIX A:

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APPENDIX B:

SOIL REUSE STUDY
BACKGROUND: EVOLUTION AND CURRENT STATUS OF MINNESOTA OFF-SITE REUSE POLICY

SOIL REUSE – BACKGROUND: EVOLUTION AND CURRENT STATUS OF MINNESOTA OFF-SITE RE-USE POLICY

Minnesota Brownfields Involvement:
The concept of off-site reuse of marginally contaminated soil in connection with brownfield redevelopment has been discussed in Minnesota for many years amongst developers, consultants, and government entities. The topic was identified in 2007 by Minnesota Brownfield members as one of several barriers to the more efficient and effective brownfield redevelopment. In April 2008, Minnesota Brownfields held a forum titled "Reuse Of Fill Soils From Brownfield Sites: National Models And The Minnesota Experience," which defined the issue and explored the possibilities of off-site soil reuse in Minnesota.

Evolution of MPCA Off-site Reuse Policy:
In 2008, in part in response to the Minnesota Brownfields forum, the MPCA convened a group of stakeholders to evaluate on- and off-site soil reuse at brownfield sites in Minnesota and to assist the MPCA in developing policy to facilitate environmentally safe and economically efficient soil reuse. This process resulted in the development of the following guidance documents, which establish a baseline for MPCA on off-site soil reuse policy:

- In April 2010, the MPCA released a guidance document entitled "*Best Management Practices for the Off-site Reuse of Excess Fill from Development Sites.*" This document defined "un fill" for the first time and provided "best practices" guidance for its off-site reuse. "Unregulated fill" is defined as "…excess soil in which a release of contaminants has been identified at concentrations less than the most conservative risk-based values." Such soils were determined to be "not of regulatory concern to the MPCA" and "not a solid waste." This document was superseded by the February 2011 document described below; however, it set a baseline for the MPCA's policy, and established a distinction between soil that can easily be used off-site ("unregulated fill") and other, non-categorized soils, which, by reader's inference, is "regulated fill." Notably, this document doesn't provide for the issuance of liability assurances or technical review letters for the presence of the soil placed at the importing site, or for the acts of importing or exporting soils.

  "Unregulated fill" is described as "excess soil that meets all of the following field screening and contaminant concentration criteria:

  - Free from solid waste, debris, asbestos-containing material, visual staining, and chemical odor.
  - No organic vapors above background, as measured by a photoionization detector (PID).
  - For petroleum-impacted soil, less than 10 mg/kg diesel range organics (DRO)/gasoline range organics (GRO).
  - For contaminants detected in soil, less than the MPCA's Residential Soil Reuse Values (SRVs) and Tier 1 Soil Leaching Values (SLVs)". The document acknowledges that naturally-occurring concentrations of some metals can exceed

the SRV or SLV, and allows for such soils to be considered unregulated in the absence of other evidence of a release."

- In February 2011, the MPCA released a guidance document entitled "*Best Management Practices for the Off-site Reuse of Unregulated Fill.*" This guidance document supplants the 2010 *Best Management Practices* document. Most notably, the definition of "unregulated fill" is enhanced by increasing the level of petroleum contamination allowed in unregulated (from 10 mg/Kg to 100 mg/Kg for petroleum measured as DRO or GRO). However, the guidance doesn't offer any new closure letters, liability assurances, or technical review letters for off-site soil reuse:

  - The organic vapor field screening criterion is changed from background to less than 10 parts-per-million (ppm) as measured by PID.
  - The petroleum-impacted soil GRO/DRO criterion changed from less than 10 mg/kg to less than 100 mg/kg by laboratory analysis.

- In March 2012, the MPCA released a third soil reuse guidance document entitled *Off-site Use of Regulated Fill Policy*. The *Regulated Fill* document provides the first official guidance for the reuse of marginally contaminated soil in Minnesota. The guidance document uses the term "Regulated Fill," which is defined as soil that has any of the following contaminant characteristics:

  - diesel range organics (DRO)/gasoline range organics (GRO) 100 milligrams per kilogram (mg/kg) or greater from a known or likely petroleum source.
  - metals or semi-volatile organic compounds **(SVOCs)** between the MPCA's residential and industrial **SRVs.**
  - volatile organic compounds **(VOCs)** between the MPCA's default Tier 1 Soil Leaching Values **(SLVs)** and the Site-specific Tier 2 **SLVs** for the importing site.

  The document allows for the reuse of Regulated Fill as long as both the importing and exporting sites are enrolled in the MPCA's Voluntary Investigation and Cleanup (VIC) and/or Petroleum Brownfields (PB) Programs, and are restricted commercial or industrial properties. A Soil Management Plan or Response Action Plan must be prepared for both sites, and the soil at the importing site must contain similar types of contaminants at similar contamination ranges when compared to the imported soil.

  The Regulated Fill document requires that a "Regulated Fill Application" be submitted to the MPCA for review and approval, and that a local unit of government sign a "Local Government Notification" form, which must be submitted to the MPCA along with the application. The guidance allows for the MPCA to provide certain approvals and assurances. The Response Action Plan and/or Soil Management Plan can be approved as can the Regulated Fill Application. For a site that exports or imports petroleum-impacted Regulated Fill, the PB program can issue an "Implementation Report Approval Letter." For a site that exports or imports Regulated Fill impacted by hazardous substances, the VIC Program can issue an Implementation Report Approval Letter and a No Action/No Further Action Letter for the site.

As of March 2014, the MPCA has received no Regulated Fill Applications. This status is further explored in the Cost Analysis and Legal/Policy Analysis portions of this study.

The Potential Benefits of Off-site Reuse:

The off-site reuse of marginally contaminated excess fill soils from brownfield sites appears to be a viable alternative to landfill disposal. Public and private entities involved with brownfield redevelopment have proposed a number of potential environmental and economic benefits to policies that would permit the movement of regulated fill between brownfield sites:

- Significant cost savings for individual site cleanups, especially for sites involving large volumes of excess soils and for those located in an area with a demand for fill soils.
- More efficient use of public brownfield grant funds and private investment capital that are currently spent on soil disposal and purchase of clean fill material, resulting in the ability to fund a greater number of brownfield cleanup projects.
- Conservation of landfill space by avoiding disposal of soils that can safely be reused.
- Preservation of greenfield space that would otherwise be mined for clean fill.
- Reduction of the carbon footprint of individual brownfield projects due to the consumption of less fuel and production of fewer greenhouse gasses in the transport of clean fill material and marginally contaminated soils. Note that this will also reduce road wear.[4]

To date the benefits have been discussed on a conceptual basis. However, there is no documentation of the magnitude of these potential benefits. The Cost and Environmental Impact Analysis (Appendices C and D) components of this study attempt to provide this missing documentation. The Legal and Policy Analysis Section (Appendix E) analyzes barriers to realizing these potential benefits and proposes solutions to these barriers.

[4] MPCA, Program Management Decision on Regulated Fill. http://www.pca.state.mn.us/index.php/view-document.html?gid=15526

APPENDIX C:

SOIL REUSE STUDY
COST ANALYSIS COMPONENT

1.0 SOIL REUSE – COST ANALYSIS INTRODUCTION

The cost analysis portion of the study focuses on eleven brownfields redevelopment case studies, examining the economic impacts of on-site and off-site disposal of marginally contaminated soils[1].

1.1 DEFINITIONS: SOIL CATEGORIES AND SOIL MANAGEMENT OPTIONS

In order to evaluate the economic and environmental impacts of the current regulatory policies guiding contaminated soil management, including on- and off-site soil reuse and landfill disposal, the project team developed soil contamination categories based on practical application, MPCA's definition of unregulated fill, and MPCA's risk-based guidance for soil cleanup.

A. Unregulated fill: Soil that contains no debris, staining or chemical odors, displays no organic vapors above background levels, contains equal to or less than 10 parts per million (ppm) organic vapors and, for petroleum impacted soils, contains less than 100 mg/kg diesel- or gasoline- range organics by laboratory analysis, and has contaminant concentrations less than or equal to the MPCA's generic residential (Tier 1) Soil Reference Values (SRVs) for metals and semi-volatile organic compounds, and less than or equal to generic residential (Tier 1) Soil Leaching Values (SLVs) for volatile organic compounds. This is consistent with the MPCA definition of unregulated fill.

B. Debris-Containing Fill: Soil that contains debris, but otherwise meets the above definition of unregulated fill. The presence of debris, whether from building demolition or from waste disposal, complicates soil reuse. While Category B soils are generally disposed off-site in landfills, doing so typically does not significantly reduce environmental risk.

C. Regulated Fill – Current Policy: Soil with contamination concentrations above that of unregulated fill, but less than or equal to the MPCA's generic industrial (Tier 2) SRVs for metals and semi-volatile organic compounds, and less than or equal to Tier 2 site-specific SLVs for volatile organic compounds. This type of soil can be reused at the source-site under current MPCA guidelines without restriction and without engineering controls. Category C soils are addressed by the MPCA's "Off-site Re-use of Regulated Fill" guidance.

D. Regulated Fill – Revised: Soil with contamination concentrations above generic, use-based site cleanup standards, but which may be managed on-site in a manner consistent with site-specific, use-based cleanup standards, as authorized by an MPCA approved Response Action Plan and consistent with MPCA risk-based guidance for site cleanup. Generally, on-site management of Category D soils involves some type

[1]In this project, "marginally contaminated soil" has been defined as fill material determined through laboratory analysis to meet the MPCA definitions of "unregulated" or "regulated" fill, or fill material meeting site-specific risk-based criteria for on-site management. The conclusions to this study suggest that Category A-D soils could be reused off-site if policy adjustments are made. For this reason, in this study "marginally contaminated soils" includes Category A-D soils. The potential for reuse is driven by the risk-based criteria for soil management at the importing site.

of engineering control such as covering with a clean soil buffer and/or impervious surface, which may include pavement or building floor. At this time, the MPCA's "Off-site Reuse of Regulated Fill" guidance does not apply to this category.

E. Contaminated Fill – Landfill Disposal: Soil with contamination concentrations significantly above required cleanup standards (Tier 1, 2 or 3 SLVs or SRVs) and which may not be managed at the source redevelopment site specifically due to the magnitude of the soil contaminant concentrations. These soils must be treated and/or disposed of off-site at a regulated landfill.

Furthermore, for the purposes of this study, it became necessary to clearly define the terms "on-site reuse," "on-site management," "off-site reuse" and "off-site management" in order to accurately track potential cost-savings. For the purposes of this study, the following definitions apply:

A. On-site soil reuse: Actions that allow fill soils to remain on-site, avoiding the need to landfill the material. At a minimum, actions must include moving the material from one location on-site to another location on-site, or excavating soil and replacing it at the same location, with compaction. Movement can be laterally across a site and/or vertically from one horizon to another horizon (i.e., flipping soils to relocate the material to depths allowed by MPCA guidance). A recorded institutional control may be required on the property or portions of the property (i.e., hazardous substance affidavit or environmental covenant). Examples of on-site reuse: 1) geotechnical unsuitable soils with contaminant levels below appropriate SRVs that are moved to locations outside the building footprint and reused elsewhere on-site in green space or parking areas; 2) contaminated soils exceeding SRVs that are moved (laterally and/or vertically) to another location, and managed with engineering and recorded institutional controls; and 3) contaminated soils that are mechanically treated (e.g., screened, sorted, crushed, dried, and/or re compacted) to correct geotechnical unsuitability of the soils.

   Note that, for the purposes of this study, it is not considered reuse if a site development plan is configured in such a way that a building or impervious surface covers a hot spot, precluding the need to excavate and reuse or dispose of the hot-spot soils. This action avoids landfilling (which is crucial to our reuse definition) but does not require soil movement. In order to be conservative in our cost-savings estimates, we elected to exclude such actions from the definition of re-use.

B. On-site soil management: The use of engineering and/or recorded institutional controls in order to allow soils to remain on-site. Note that soils can be managed and re-used on-site, but can also be managed without being reused. For example, when a site redevelopment plan is configured to allow contaminated soils to remain in-place beneath a parking lot or building, conditioned on the placement of a recorded institutional control on the property deed.

C. Off-site soil reuse: Moving regulated or unregulated excess soil and/or geotechnically-unsuitable soil to another development site where the soils are used to

help meet the required grade for the development plan at the importing site. Off-site reuse avoids the need to landfill marginally contaminated soils.

D. Off-site management: The use of engineering and/or recorded institutional controls in order to enable the reuse of regulated fill soils at an off-site location. Note that soils can be managed and re-used at an off-site location, but cannot be managed without reuse.

2.0 CASE STUDIES – SITE IDENTIFICATION AND DATA COLLECTION

To examine the economic and environmental impact of soil reuse practices currently implemented at brownfield redevelopment projects in Minnesota, eleven brownfield redevelopment project case studies were evaluated. The project team identified twenty-five potential sites with the help of:

- Roundtable discussions with Minnesota Brownfields Board Members
- Solicitation of sites from the Minnesota Brownfields membership
- Requests for recommendations from brownfield granting agencies in Minnesota, including Hennepin County, Ramsey County, the Minnesota Department of Employment and Economic Development (DEED), and Metropolitan Council
- A Focus Group session with stakeholders involved in brownfields redevelopment
- Recommendations of MPCA staff

After initial identification of a potential case study site, a brief interview was held with the property owners and/or environmental consultants that managed the cleanup planning and implementation at the proposed site to determine the availability of data and the suitability of the site to the study. Timing and availability of data were key factors in selecting the eleven case study sites.

A range of soil mitigation strategies were employed at the study sites, including on-site soil management and reuse, off-site soil reuse, and landfill disposal of contaminated soils of all five soil contamination categories. Figure 1 shows the location of these sites. Six sites are located in Minneapolis, two sites are located in St. Paul, two sites are located in Twin Cities area suburban municipalities, one site is located in Duluth and one in Moorhead. Appendix F includes a narrative describing each of the case study sites and providing additional detail, and in some instances, commentary provided by the consultant.

To quantify economic and environmental impacts, the project team worked with the environmental consultants responsible for contaminated soil management at each of the case study sites to collect the following information:

- Volume of soils managed (reused on-site, reused off-site, managed on-site, or landfilled) by soil category
- Cost of landfill-disposal of contaminated soil (includes hauling and disposal costs)
- Cost of off-site reuse (includes hauling and disposal costs)
- Location of the landfill where soil was deposited
- Location of off-site reuse location(s)

- Type of truck(s) used, gas mileage, and capacity, if known
- For on-site reuse, distance that soil was moved on-site, and cost of compaction and placement, if available
- Amount and type of grant funding used for project, if applicable

As the data were being analyzed, it became clear that data holes existed, in part due to confusing nomenclature used in the original data sheets. In general, consultants had categorized all regulated fill that was disposed of at landfills as Category E soils ("Contaminated Fill – Landfill Disposal"). This necessitated the project team returning to the consultants to ask follow-up, clarifying questions to better categorize the landfilled soil. Data for which this follow-up information was not available are indicated in the data tables presented in the Findings Section (3.0).

3.0 COST ANALYSIS - FINDINGS

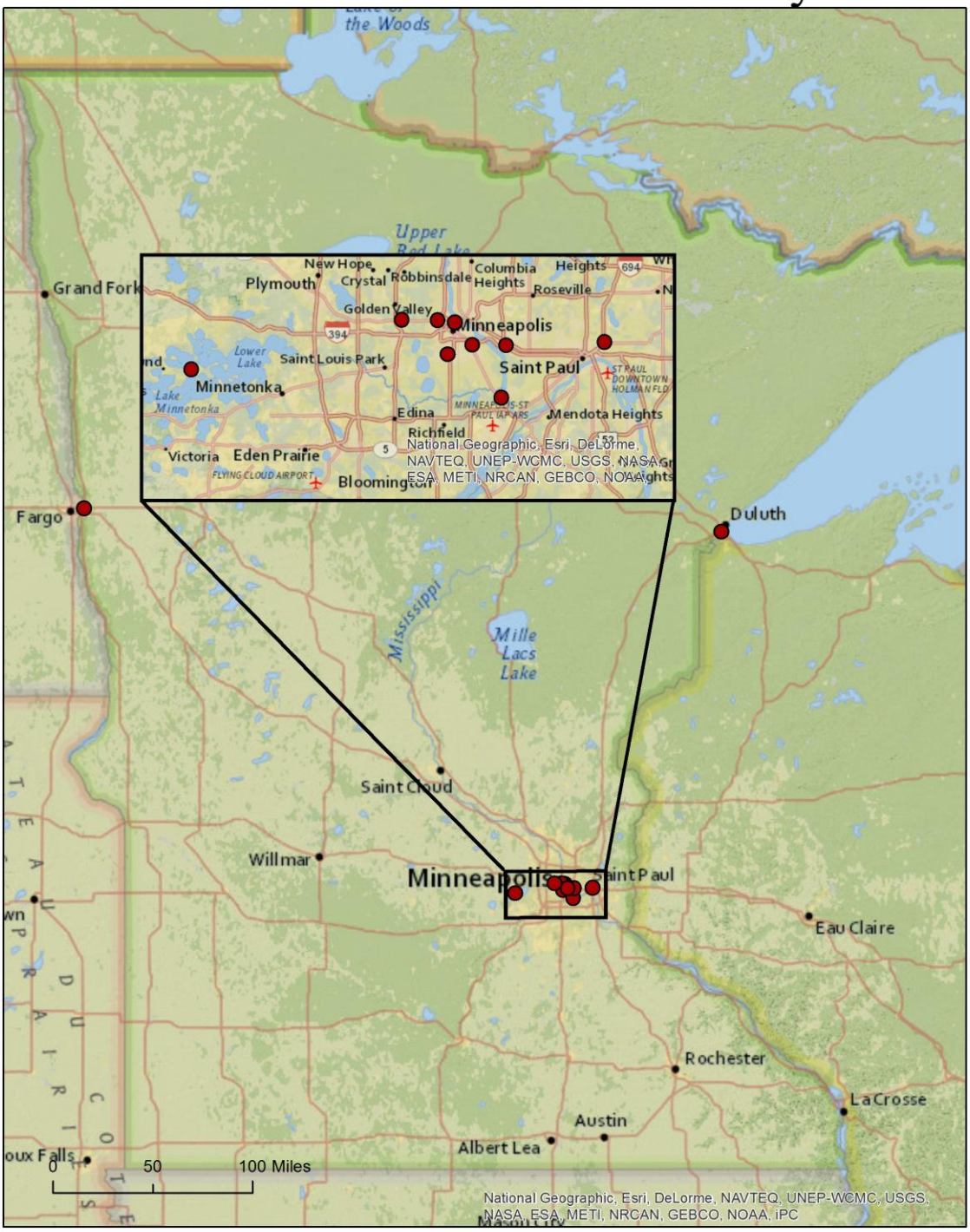
The eleven sites analyzed for this study represent a diversity of project sizes and soil management practices (Table 1). Additionally, the eleven sites were remediated and redeveloped over a ten-year time span that coincides with an evolution in off-site reuse policy within the MPCA's voluntary cleanup programs. As is common in brownfield redevelopment, conditions and constraints encountered at each site were unique. Site descriptions, Appendix F, provide site-specific details and further explanation of site constraints, where provided. While the limited number of sites precludes meaningful statistical analyses of the data, the sites do present a snapshot of the status of, barriers to, and potential for soil reuse in Minnesota today.

Table 1: Summary of Sites – Year, Size, Soil Volume and Excess Soil Management Practices

Site Name	Year Completed (Soil Cleanup / Redevelopment)	Size (Acres)	Total Volume of Soil Involved – All Categories (C.Y.)	Soil Management Practices Used		
				On-site Reuse or Management (Soil Categories)	Off-site Reuse (Soil Categories)	Landfill (Soil Categories)
222 Hennepin	2012/2013	2.5	33,055			B, C
Beacon Bluff	2010/Ongoing	46	410,533	A, C		D, E
Clyde Ironworks	2007/Ongoing	10.0	16,590	C, D	A	C, D, E
Gateway Gardens	2010/2010	1.3	5,800	A	A	C, D, E
HCMC Clinic	2010/2011	3.1	26,300	A		A, C, E
Heritage Park	2011/2012	2.3	12,785	A		A, B, C, E
Minnesota Veterans'	2010/2010	5.2	35,406	A, C	A	B, C

Site Name	Year Completed (Soil Cleanup / Redevelopment)	Size (Acres)	Total Volume of Soil Involved – All Categories (C.Y.)	Soil Management Practices Used		
				On-site Reuse or Management (Soil Categories)	Off-site Reuse (Soil Categories)	Landfill (Soil Categories)
Home						
Pelham	2011/2013	6.0	37,400			A, B, D E
Seward Commons	2012/2013	0.7	15,800	A		A, C, D
Sunrise Assisted Living	2005/2005	2.9	14,000	A		A, D, E
The Mist	2006/2006	4.0	62,748		A	C, D, E

Figure 1: Location of Minnesota Brownfields Soil Reuse Case Study Sites



Study sites were remediated and redeveloped between 2004 and 2013 (Table 1). Sites ranged from large-scale, high profile, multi-phase, multi-year projects (Beacon Bluff, 46 acres) to smaller-scale sites that were completed within a single season (222 Hennepin, 2.54 acres). Total soil volumes excavated and either reused or disposed ranged from 5,800 cubic yards (c.y.) (Gateway Gardens) to 410,533 c.y. (Beacon Bluff).

All projects relied on landfill disposal for at least a portion of the soil management. Two sites relied solely on landfill disposal for all soil categories (Pelham, 222 Hennepin); these two sites were amongst the most recently completed projects. Eight of the eleven sites were able to reuse at least a portion of the soils on-site. At five of these sites, only Category A soils were reused on-site. Category C soils were reused on-site at three sites; Category D soils at only one site. Category B Soils (unregulated fill containing debris) were always disposed in landfills.

At four sites, Category A soils were reused off-site; for three of these sites, off-site reuse was planned and implemented prior to the issuance of the MPCA's Unregulated Fill Policy. Only Category A soils (unregulated fill) were re-used off-site. At all four sites, off-site reuse, sometimes in combination with on-site reuse, consumed all Category A soils, avoiding landfilling this category altogether. The consultants involved in all four of these sites went to additional effort to locate off-site reuse locations because of the potential for cost-savings. In general, additional sampling was required to confirm that the soil was sufficiently clean for reuse in the selected setting. At the Minnesota Veterans' Home site, the consultant located five off-site reuse locations to consume almost 25,000 c.y. of Category A soil. For three of the four sites, the consultants specifically stated that a particularly engaged MPCA staff willing to assess the data and the proposed re-use location was an important element in accomplishing the off-site reuse.

At six of the sites, some combination of on-site and/or off-site reuse consumed all Category A soils, avoiding landfill disposal of unregulated fill. At the Clyde Site, where space constraints were relevant, the consultant found locations for the off-site reuse of Category A soils, leaving the available on-site reuse locations for Category C and D soils. The cost-savings associated with off-site reuse at these four sites are further discussed below.

It is difficult to compare cost data between and amongst sites, since they vary in size, location, distribution of contaminated soil between the soil categories, and selected remediation strategies. Total costs of management under each soil category are summarized for all sites in Table 2.

Nine of the sites received brownfield remediation grant funds from one or more grantors, and for all but one of these sites, grant funds were used for off-site disposal or reuse (Table 3). Where grant funds were used for off-site disposal or reuse, the total grant funds used for these purposes ranged from $206,429 to $2,176,077, or from 42% to 100% of the total grant funds awarded for these sites. Clearly, a signficant proportion of the brownfield remediation grant funds awarded in Minnesota are used for soil disposal.

Table 2: Cost of Soil Remediation (by Soil Type and Remediation Strategy)

Site	A: Unregulated Fill			B: Debris-Containing Fill	C: Regulated Fill – Current Policy			D: Regulated Fill - Revised			E: Contaminated Fill-Landfill Disposal	Total Fill Remediation Costs
	Reused on-site	Reused Off-site	Disposed	Disposed	Managed On-site	Reused On-site	Disposed	Managed On-site	Reused On-site	Disposed	Disposed	
222 Hennepin				$575,377			$134,965					$710,342
Beacon Bluff	$182,424					$702,014				$486,592	$1,889,854	$3,260,884
Clyde Ironworks		$36,960			$16,000	$27,000	$511,560		$8,400	$202,272	$50,568	$852,760
Gateway Gardens	$7,695	$5,805					$12,869			$158,102	$12,869	$197,340
HCMC Clinic[6]	NA		$177,941				$232,228				$142,087	$552,256
Heritage Park	$1,913		$10,920	$233,006			$40,950				$40,950	$327,739
Minnesota Veterans' Home	$24,500	$382,102		$91,733		$140	$7,076					$505,551
Pelham			$162,000	$864,000						$232,290	$25,810	$1,284,100
Seward Commons	$34,300		$39,760				$139,160			$19,880		$233,100
Sunrise Assisted Living	$6,857		$110,140							$22,980	$91,919	$231,896
The Mist		$11,000					$7,800			$2,600	$2,600	$24,000

[6] The reported soil data for the HCMC site had to be reconciled with the grantors' disbursement information as cost information was not available from the consultant. This drove a need to reconcile the grantors' volume information with the consultants' volume estimates. The volume and cost distribution information presented in the report represents the authors' best efforts to reconcile these two information sources. Although unregulated soils were reused on site, no cost estimate information was available for this project component.

Table 3: Total Remediation Grant Amounts Awarded and Amount of Grant Funds Used for Soil Disposal

Site Name	Grant Funds Awarded			Total Grant $ Awarded	Grant Funds Used for Landfill Disposal of Soils			Total Grant $ Used for Landfill Disposal	% Total Grant Funds Used for Disposal
	DEED	TBRA	ERF		DEED	TBRA	ERF		
222 Hennepin	$436,881	$442,900	-	$879,781	$405,410	$0	-	$405,410	46%
Beacon Bluff	$4,362,142	$559,200	$250,000	$5,171,342	$1,806,077	$120,000	$250,000	$2,176,077	42%
Clyde Ironworks	$1,380,537	-	-	$1,380,537	$764,400	-	-	$764,400	55%
Gateway Gardens	$275,239	-	-	$275,239	$206,429	-	-	$206,429	75%
HCMC Clinic	$444,498	-	$76,854	$521,352	$444,498	-	$76,854	$521,352	100%
Heritage Park	$310,875	$417,843	$194,493	$923,211	$105,794	$417,843	$181,343	$704,980	76%
MNVeterans' Home	-	-	-	-	-	-	-	-	-
Pelham	$600,000	$100,000	-	$700,000	$217,704	$100,000		$317,704	45%
Seward Commons	$150,500	-	$245,322	$395,822	$105,501	-	$124,428	$229,929	58%
Sunrise Assisted Living	-	-	$75,281	$75,281	-	-	$0	$0	0%
The Mist	-	-	-	-	-	-	-	-	-
Totals	$7,960,672	$1,519,943	$841,950	$10,322,565	$4,055,813	$637,843	$632,625	$5,326,281	52%

Grant types referenced in this table:

- "DEED" = Minnesota Department of Employment and Economic Development Contamination Cleanup Grant Program.
- "TBRA" = Metropolitan Council Tax Base Revitalization Account Grant Program.
- "ERF" = County Environmental Response Fund Grant Program. For Beacon Bluff, this is the Ramsey County ERF. For remaining listings (HCMC Clinic, Heritage Park, and Seward Commons), this is the Hennepin County ERF.

Table 4 illustrates the cost savings incurred by implementing off-site reuse in place of landfill disposal at the four sites where off-site reuse was implemented. Cost savings were estimated by comparing the actual off-site reuse costs to an estimate of the costs to landfill the same soils. Landfill disposal cost estimates were derived using the site-specific landfill disposal costs supplied for each site by the consultant. The cost to landfill in this table may be slightly exaggerated, as the Category A soils may have been suitable for disposal as daily cover at a reduced rate, depending upon the soils involved and the policies of the landfill.

Off-site reuse provided significant cost savings at all four sites ($49,736 to $1,066,540, or 42% - 99% cost savings as compared to the alternative of landfilling). The magnitude of the cost savings appears to be dependent on the scale of the project, as indicated by the total volume of all soils categories managed (Table 1), and the differential distance difference between the site and the landfill location and the site and the off-site reuse location (Table 7). At the Clyde site, the cost of landfill disposal was especially high, because at the time of the redevelopment, there was only one landfill servicing the Duluth region; for this reason the moderate soil volume reused off-site garnered large cost savings. At Gateway, the cost of off-site reuse was provided as a bulk cost (not per unit volume rate) and was exceptionally low, also offering a significant cost savings for a relatively small volume of soil. The other two sites exhibited large off-site reuse soil volumes, with resultant large cost savings. In the case of The Mist, the consultant arranged for a very large volume to be reused off-site (62,000 c.y.), leaving only 748 c.y. of regulated fill to be landfilled.

Table 4: Estimated Cost Savings of Implementing Off-site Reuse at Four Sites:

Site Name[7]	Volume Reused Off-site (C.Y.)	Cost of Off-site Reuse ($)	Cost to Landfill Same Soil[8] ($)	Cost Savings ($)	Cost Savings as a % of Alternative Landfill Costs	Cost Savings as % of Total Contaminated Fill Costs[9]
Clyde	2,640	$36,960	$206,976	$170,016	82%	20%
Gateway	1,200	$5,805	$55,541	$49,736	90%	25%
MN Veterans' Home	24,652	$382,103	$655,738	$273,635	42%	54%
The Mist	62,000	$11,000	$1,077,540	$1,066,540	99%	4444%

On-site reuse offers even greater opportunities for cost savings. Table 5 illustrates the cost savings incurred by implementing on-site reuse in place of landfill disposal at the sites where on-site reuse was implemented. Cost savings were estimated by comparing the on-site reuse costs to an estimate of the costs to landfill the same soils. The cost savings realized at case study sites

[7] Of the eleven study sites, the four sites listed here featured off-site reuse.
[8] Based on lowest landfill disposal rate used at each site multiplied by volume of soils reused off-site.
[9] Cost savings due to off-site reuse divided by total soil management costs (Table 2).

ranged from $21,293 to $6,249,674, or from 78% to 92% when compared to the alternative cost of landfilling. It is no surprise that the cost savings derived from on-site reuse can be significant. The cost savings realized at each site is dependent upon the size of the source site and volume of soils reused on-site. At large sites, such as Beacon Bluff, the greater acreage provides increased opportunities for on-site reuse. In contrast, smaller sites, like 222 Hennepin, have excess soil that could potentially be reused, but they do not have the capacity to accommodate on-site reuse. Additionally, sites with sufficient space can accommodate crushing, sorting, and screening operations, in addition to intermediate staging activities, enabling the potential reuse of Category B soils, and soils where contaminated zones are spottily mixed with uncontaminated zones. Smaller sites are generally not able to accommodate this type of activity. At Heritage Park, for instance, both intermittent contamination and debris pockets were encountered, and there was not sufficient space for stockpiling, segregating, and screening.

Table 5: Estimated Cost Savings of Implementing On-site Reuse at Seven Sites:

Site Name[10]	Volume Reused On-site (C.Y.)	Cost of On-site Reuse ($)	Cost to Landfill Same Soil[11] ($)	Cost Savings ($)	Cost Savings as a % of Alternative Landfill Costs	Cost Savings as % of Total Contaminated Fill Costs[12]
Beacon Bluff	311,732	$884,438	$7,134,112	$6,249,674	88%	192%
Clyde Ironworks	4,200	$51,400	$329,280	$277,880	84%	33%
Gateway Gardens	1,600[13]	$7,695	$74,054	$66,359	90%	34%
HCMC Clinic	6,300	Information unavailable	$171,990	NA	NA	NA
Heritage Park	850	$1,912.50	$23,205	$21,293	92%	6%
Minnesota Veterans' Home	7,040	$24,640	$187,264	$162,624	87%	32%
Seward Commons	7,000	$34,300	$158,130	$123,830	78%	53%
Sunrise Assisted Living	1,959	$6,857	$36,614	$29,757	81%	13%

[10] Of the eleven study sites, eight featured on-site reuse. On-site reuse cost information was not available for HCMC Clinic.
[11] Based on lowest landfill disposal rate used at each site multiplied by volume of soils reused on-site.
[12] Cost savings due to on-site reuse divided by total soil management costs (Table 2).
[13] Of this 1,600 c.y., 200 c.y. was stockpiled at the earthwork contractor's yard for future unrestricted reuse. The remaining 1,400 c.y. was reused on-site.

4.0 COST ANALYSIS – CONCLUSIONS

This study sought to examine the economic and environmental impact of soil reuse practices currently implemented at brownfield redevelopment projects in Minnesota by analyzing the soil disposal, on-site reuse, and off-site reuse patterns at a set of brownfield sites where remediation had occurred in the past 10 years. The study clearly indicates that both off-site and on-ite reuse provide signficant cost savings compared to the alternative of landfilling. The study results also illustrate that landfill disposal costs consume large amounts of brownfield cleanup grant funds. Finally, the study results indicate that the MPCA's policy for off-site resue of regulated fill is not being implemented.

Data were voluntarily compiled by consultants who worked on the sites, representing a considerable time investment for all involved since the cleanups were already completed and the data often long cold. As the data that the study sought were not necessarily data that had been directly collected at the time of site cleanup (or at least not in the same context), the consultants generally had to interpolate, extrapolate, and average site data to provide estimates of the numbers this study sought.

The study clearly indicates that cost savings were realized by on-site and off-site reuse of soils, which avoids hauling material off-site (in the case of on-site reuse) or shortens the hauling distance compared to landfilling the material (in the case of all four off-site reuse instances evaluated in this study). Actual cost savings realized differed between sites based upon the size of the project, the volume of soils involved, and, for off-site reuse, the difference in the hauling distances between the site and the landfill and reuse locations. For off-site reuse, the cost savings ranged from 22% to over 100% of the total actual cost of managing excess soil from a brownfields site. Even a small scale project, represented by Gateway Gardens, realized cost savings benefits of 28%. Landfill disposal consumed a signficant portion of brownfield remediation grant funds awarded for the study sites, indicating that the opportunity for cost savings represented by off-site reuse has implications not only for developers, but for grantors as well.

On-site reuse offers the greatest savings, where possible. However, some sites have excess soils that cannot be reused on-site. Consultants often identified space constraints as precluding the option of reusing excavated soils on-site. This appears to be especially true in the small sites and in the later stages of combined cleanup/redevelopment when multiple activities are occurring concurrently on-site and less space is available to accommodate on-site reuse. For sites where on-site reuse cannot be accomodated due to space constraints, the potential for off-site as a viable alternative would be strengthened if intermediate staging locations were avaiable. This would allow for sorting and segregating as well as for screening debris.

The MPCA's evolving off-site reuse policy has had some effect on the implementation of off-site reuse of marginally contaminated soil. The consultants involved in this study indicated that the clear definition of "unregulated fill" makes it much easier for earthwork contractors to accept soils for reuse at appropriate construction sites, or even to stage it within their yards for future use. Also significant was the change in the definition of unregulated fill to include soils containing less than 100 mg/Kg DRO or 100 mg/Kg GRO. These changes have made it much easier to reuse unregulated soils at off-site locations, if the earthwork contractor and the consultant are able to locate a receiving site within the time frame specific to a cleanup. It

appears that both consultants and contractors are in the midst of a learning curve. Some consultants seemed to seek out the opportunity for off-site reuse as a cost savings mechanism on a regular basis even prior to the issuance of the MPCA's unregulated fill guidance. Likewise, the willingness to accept or even seek off-site reuse of unregulated fill from brownfield sites as a viable option differs between earthwork contractor firms.

The limiting factors for off-site reuse of unregulated fill currently appear to be:

- Identifying a reuse location that can use the soil within the time frame appropriate to the source site.
- Alternatively, the availability of publicly- or privately- owned and managed locations where soils could be intermediately staged, segregated, screened and stored for reuse.
- The presence of debris in otherwise reusable unregulated fill.
- The geotechnical quality of the unregulated fill.

Clearly, even soils meeting the MPCA's current definition of "regulated fill" (Category C soils), are not being reused off-site, and the issuance of the MPCA's new policy in 2012 has had no effect on this status. This study's "Survey on Off-site Use of Regulated Fill Policy" indicates that failure to implement off-site reuse of regulated fill may be due to a) lack of knowledge of the MPCA's new policies, b) lack of availability of sufficient liability protection from the MPCA, c) inability to locate an appropriate importing site in time, d) the required sign-off by a local entity, and e) the sense that landfilling is more practical, and quicker and easier to plan for and implement, avoiding the potential need to stockpile and simplifying site operations.

APPENDIX D:

ENVIRONMENTAL IMPACT ANALYSIS

1.0 SOIL REUSE – ENVIRONMENTAL IMPACT ANALYSIS - INTRODUCTION

This study sought to assess the environmental benefit provided by off-site soil reuse by comparing greenhouse gas (GHG) production between soil management strategies. This section of the study used data from the same eleven case study sites identied for the Cost Analsyis section (Appendix C).

Soil reuse in-lieu of landfill disposal is attractive from a cost-savings standpoint precisely because shorter haul distances are possible. The shorter haul distances translate directly to a reduction in diesel emissions, and a reduction of the carbon footprint of individual brownfield cleanup projects. Clearly, on-site reuse presents the largest opportunity to reduce haul distances, since soil need only be at most excavated, stockpiled, placed and recompacted on-site, and can sometimes simply be excavated and placed. With off-site reuse, the magnitude of GHG reduction is tied to the degree to which the haul distance is shortened, when compared to the landfill altnerative. This study did not seek to quantify the other environmental benefits to soil reuse, which include conservation of landfill space and preservation of greenfield space that would otherwise be mined for clean fill.

2.0 CASE STUDIES – DATA COLLECTION AND FINDINGS

Carbon Dioxide (CO_2) is the primary GHG produced during excavation and hauling activities as a product of the combustion of diesel fuel, and was selected as the marker compound for this study. CO_2 production was estimated for each soil remediation strategy at each site, using the distance that the soil was hauled off-site or the distance the soil was moved on-site, the number of trips made to haul the volume of each category of soil, and the mileage of the hauling trucks. In general, the truck-type data was of inconsistent quality. At most sites, several types of trucks were used and these data were not necessarily recorded by the consultant. Consultants generally provided a range of truck capacities; in these instances, the average capacity was used to estimate the number of loads moved. The gas mileage of the trucks used were generally not known; in these instances, a default value of 6 miles/gallon was used, as further discussed in the footnotes to Table 6. Carbon production estimates were calculated as described in the footnotes to Table 6.

Table 6: Environmental Impact – Estimated Greenhouse Gas Emissions for Landfill Disposal and Off-site Reuse (CO_2 Generated Hauling Soil Off-site)

Site Name	Distance to Landfill or Reuse Location (round trip in miles)	Number of Trips by Soil Type[14]					CO_2 Generation (in kilograms)[15, 16]
		A	B	C	D	E	
222 Hennepin	Soil Type B, C: 60		1,200	281			153,700
Beacon Bluff Business Center	All Soil Types: 32				811	4,129	228,800
Clyde Iron Works	Soil Type A: 20 Other Soil Types : 54	230		567	224	56	83,500
Gateway Gardens[17]	Soil Type A: 5 Soil Type C, D, E: 40	100		23	285	23	22,100
HCMC Clinic	All Soil Types: 51	421		550		457	116,600
Heritage Park	All Soil Types: 52	32	683	120	0	120	79,800
Minnesota Veterans' Home	Soil Type A: 27 – 83 Soil Type C: 30 – 104	1,643	230	18			180,400
Pelham	All Soil Types: 30	237	1,263		422	47	81,300
Seward Commons	All Soil Types: 20	104		362	52		16,600
Sunrise Assisted Living	All Soil Types: 84	393			28	328	114,000
The Mist	Soil Type A: 30 Soil Types C, D, E: 66	3,647		26	9	9	185,000

The difference in greenhouse gas production between off-site reuse and landfilling is dependent on the difference between the distance from the brownfield site to the reuse site and landfill site. Table 7 illustrates the mileage and CO_2 production differences between off-site reuse and landfill disposal for the four sites where off-site reuse was implemented. The mileage "savings" for off-site reuse 21% to 88% of the alternative landfilling distance; the CO_2 production savings is directly related to the mileage savings. In absolute terms, estimated CO_2 production savings per site ranged from 5,600 kg – 217,500 kg; absolute savings is dependent upon the volume of soil

[14] Determined by dividing the volume of soil by the average capacity of the truck(s) used to haul soil, unless number of loads provided by consultant.

[15] Used 6 miles per gallon as standard unless more specific truck fuel consumption was provided. Six miles per gallon is the midpoint of the fuel consumption identified by the Center for Transportation Analysis, available at http://cta.ornl.gov/vtmarketreport/pdf/chapter3_heavy_trucks.pdf.

[16] To determine carbon production, projects occurring before September 29, 2005, used unblended diesel fuel, those between September 30, 2005, and April 30, 2009, used a 2% biodiesel blend, and those occurring on or after May 1, 2009, used a 5% biodiesel blend. Minnesota diesel fuel standards are available at http://www.pca.state.mn.us/index.php/air/air-quality-and-pollutants/general-air-quality/motor-vehicle-pollution/cleaner-fuels-help-clean-air-in-minnesota.html and http://www.afdc.energy.gov/laws/law/MN/5452. The carbon emission factors used were 10.15 kg/gallon, 9.94 kg/gallon, and 9.64 kg/gallon, respectively. Carbon emission factors are available at http://www.eia.gov/oiaf/1605/coefficients.html#tbl2.

[17] Number of loads of regulated fill transported to landfill provided by contractor.

reused and the difference in hauling distances between the source site and the disposal and reuse sites. In the case of The Mist, the CO_2 production savings is greater than the total CO_2 production for the site (Table 6) because the volumes reused off-site greatly exceed the volume of soil landfilled (748 c.y.), and because the reuse site was much closer than the landfill to the brownfield site.

Table 7: Estimated Greenhouse Gas Production Savings due to Off-site Reuse in Lieu of Landfilling

Site Name	Volume Reused Off-site (C.Y.)	Distance to Landfill(s) (miles)	Distance to Reuse Site(s) (miles)	Mileage Difference as % of Landfill Distance	CO_2 Generation Savings per Load (kg)	Total CO_2 Generation Savings (kg)
Clyde	2,640	27	10	63%	56	12,900
Gateway Gardens	1,200	20	2.5	88%	56	5,600
MN Veterans' Home	24,652	52, 15 (34 ave)	22, 31, 26, 14, 42 (27 ave)	21%	22	35,300
The Mist	62,000	33	15	55%	60	217,500

Clearly, on-site reuse offers the biggest potential savings in CO_2 production, since soil is generally moved on-site less than 500 feet from the point of excavation to the point of reuse, or in order to stockpile for temporary storage prior to reuse. Either method results in a round-trip haul of less than 1000 feet per load (based on this study) as opposed to round-trip hauling distances of miles or tens of miles typical of landfilling and off-site reuse, as illustrated in Table 7.

3.0 ENVIRONMENTAL IMPACT ANALYSIS - CONCLUSIONS

The study results indicate that both off-site and on-site soil reuse result in a significant reduction of CO_2 production at brownfield cleanup projects. The magnitude of the reduction is associated with the volume of soil involved and the reduction of mileage required to haul soil to its final destination.

Off -site reuse provides savings in CO_2 production because hauling distances are shorter. In the four case study sites where off-site reuse was implemented, hauling distances to the reuse sites were 21% - 88% shorter than to the alternative landfill disposal option; CO_2 production was consequently 21%-88% less for these sites. In absolute terms, estimated CO_2 production savings per site ranged from 5,600 kg – 217,500 kg. Off-site reuse was implemented at these sites as a cost savings measure, yet the environmental benefits are clearly demonstrated in this study.

On-site reuse offers the biggest potential savings in CO_2 production, since soil is generally moved on-site less than 500 feet from the point of excavation to the point of reuse, or in order to form stockpiles for temporary storage prior to reuse. Either method results in a round-trip haul

of less than 1000 feet per load as opposed to round-trip hauling distances of miles or tens of miles typical of landfilling and off-site reuse.

APPENDIX E:

SOIL REUSE STUDY
LEGAL/POLICY ANALYSIS

1.0 LEGAL/POLICY ANALYSIS

The regulatory framework governing contaminated sites forms the basis for allowing and restricting soil reuse in Minnesota. This section of the Soil Reuse Study explores legal and policy barriers under existing federal and Minnesota statutes and MPCA policy. Suggested remedies are offered in this section to overcome the current legal/policy barriers to environmentally safe and economically efficient soil reuse in Minnesota.

2.0 EXISTING LEGAL BARRIERS IN MINNESOTA

In Minnesota there are several existing legal barriers facing the off-site reuse of marginally contaminated soil in lieu of landfill disposal. Such barriers include elements of the federal Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9601 *et seq*. ("CERCLA"); the Minnesota Environmental Response, and Liability Act, Minn. Stat. §§ 115B.01 *et seq*. ("MERLA"); the Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901 *et seq*. ("RCRA"); Petroleum Tank Release Cleanup Act (Minn. Stat. §§115C); MPCA regulations; and potential tort and common law liability.

CERCLA & MERLA Liability

The federal CERCLA statute, also known as the Superfund statute, imposes strict joint and several liability for the release or threatened release of hazardous substances into the environment. Minnesota's analogous statute, MERLA, imposes similar (and in some cases broader) liabilities for response costs and damages resulting from a release or threatened release of a hazardous substance.[18] Under CERCLA and MERLA, strict, joint and several liability is established for owners, operators, arrangers, and transporters of hazardous substances. With regard to the reuse of contaminated soil, both exporters and importers of contaminated soil have liability concerns under CERCLA and MERLA because:

- An importer or exporter may be held liable regardless of compliance with the law or lack of negligence; and
- An importer or exporter could potentially be held liable for the entire cost of future cleanup at the importing site, no matter the size of their contribution to the contamination.

Minnesota Statutes § 115B.03, subd. 3, clauses (1) through (5), describe when an owner of real property can be held responsible under MERLA for the release of a hazardous substance. Under clauses (1) - (3), if a property owner engages in "generating, transporting, storing, treating or disposing of a hazardous substance or disposing of waste at the facility" or "knowingly permitted others to engage in such a business at the facility" that property owner can be held responsible for cleanup. Clause (4) expands this liability to owners who "knew or reasonably should have known that a hazardous substance was located at the facility at the time of acquisition and engaged in conduct associating that person with the release." Clause (5) states that a landowner who "took action which significantly contributed to the release after that person knew or reasonably should have known that a hazardous substance was located in or on the facility" is potentially liable.

[18] Eileen M. Roberts, *Minnesota Practice Series: Real Estate Law* vol. 25, §9.20, 480-81. (West 2007).

Currently, parties that wish to reuse contaminated soil are faced with a host of potential liabilities under MERLA given that:

- Both the importer and exporter of contaminated soil would be involved in the transport, storage, treatment and/or disposal of a hazardous substance.
- The reuse of contaminated soil would involve an exporter who knowingly disposed of hazardous substances and an importer who knowingly permitted this disposal.
- Any subsequent purchaser of a site that has imported contaminated soil will likely have knowledge of this release, or it will be determined that the purchaser should have known of its presence if proper due diligence had been taken.
- The placement of contaminated soil may be seen to have "significantly contributed" to the release on the importing site where a hazardous substance is located.

Considering the above, regulatory or statutory change is needed in order to exempt soil reuse from cleanup liability concerns under MERLA.

Petroleum Tank Release Cleanup Act Liability

The current MPCA assurance options available for petroleum-contaminated soil do not apply to soil reuse. Currently, the MPCA only offers an Implementation Report Approval Letter for importing or exporting sites. The MPCA offers a "General Liability Letter for Petroleum," but this speaks to the definition of a "responsible party" under Minn. Stat. 115C and states that if a person comes into possession of property after petroleum tanks were removed, and where a petroleum tank release attributable to those tank(s) had previously occurred, "that person is not a responsible party and cannot be ordered to take corrective action." There are two limitations to this assurance relative to soil reuse: a) the General Liability Letter does not address petroleum contamination that does not originate from at tank release, and b) the General Liability Letter is focused on the site where the original release occurred and does not address reuse of petroleum-impacted soil.

It is common for petroleum compounds to be detected in soil samples during investigations at brownfield sites. The petroleum compounds are sometimes related to a release from a tank (or tanks) that is still located at the property. However, petroleum compounds found in soils at brownfield sites quite often are related to a release **not** directly attributable to a tank (or tanks), or are related to a tank that was removed under the tenure of a prior property owner.

Under Minn. Stat. § 115C, a person is responsible for a petroleum release from a tank if the person is an owner or operator of the tank at any time during or after the release except for certain exclusions. Minn. Stat. § 115C does not include any language that defines a responsible party or a responsible person with respect to petroleum releases that are **not** from a tank (e.g., releases related to small or large spills, releases related to the presence of contaminated fill, or releases from a previous tank, which was removed many years ago and it is not possible to conclusively demonstrate that the release is related to the former tank). As a result, the MPCA Petroleum Brownfields Program has taken the position that they have the authority to only issue a liability protection letter for a petroleum release from a tank (or related to a LEAK# assigned to the property).

RCRA Liability

RCRA is a federal statute designed to manage and control hazardous waste from "cradle to grave" in an industrial or commercial setting. Hazardous wastes subject to RCRA include: (1) specifically listed industrial process waste streams; (2) individual, specifically listed chemicals that have been discarded; and (3) any other wastes that are shown to possess EPA-defined hazardous characteristics (*See* 40 Code of Federal Regulations § 261.3). Contaminated soils are deemed RCRA hazardous wastes under two circumstances: a) if soils contain any amount of "listed" industrial process waste streams or discarded chemicals; or b) if soils contain contaminant concentrations exceeding RCRA "characteristic waste" levels for certain contaminants.

Fill soils that meet the definition of RCRA hazardous waste must either be managed on-site (under the RCRA area of contamination (AOC) policy) or disposed of at a RCRA facility. Importers and exporters of contaminated soil containing RCRA hazardous substances risk RCRA liability because such soil, while able to be managed on-site according to AOC policy, is considered to be hazardous waste as soon as it is excavated. The uncertainty, lack of guidance, and potential liability concerns created by RCRA deter alternative uses for excess fill soils.

Solid Waste Rules

Minn. Rule Chapter 7035, Solid Waste Rules, defines "solid waste" as: "… garbage, refuse, sludge from a water supply treatment plant or air contaminant treatment facility, and other discarded waste materials and sludges, in solid, semisolid, liquid, or contained gaseous form, resulting from industrial, commercial, mining and agricultural operations, and from community activities, but does not include hazardous waste; animal waste used as fertilizer; earthen fill, boulders, rock;..."

The MPCA's "Best Management Practices for the Off-site Reuse of Unregulated Fill" defines unregulated fill as being "free from solid waste, debris, asbestos-containing material,…" The MPCA's "Off-site Reuse of Regulated Fill Policy" explains that "While the goal is for Regulated Fill to be as free of debris as practicable, Regulated Fill may contain a de minimis amount of inert debris such as fragments of brick, concrete, glass, metal, etc."

The presence of debris in unregulated fill or regulated fill from brownfield sites potentially limits the possibility of off-site reuse, depending upon the interpretation of "de minimis amount." This neglects the possibility of sorting, screening, or other mechanical separation of the debris from the soil, and crushing or pulverizing concrete, pavement or bricks. All of these could potentially be employed either at the receiving site or at an intermediate staging destination.

Minn. Rule 7035.2860, governing the Beneficial Use of Solid Waste, was developed "... to establish a system that will **assist persons generating wastes to identify beneficial uses for those wastes rather than sending them to a landfill.** The beneficial use of solid waste will save landfill capacity for materials that do not have alternative uses…[19]" The reuse of unregulated fill and regulated fill containing debris would seem to be consistent with this goal.

[19] http://www.pca.state.mn.us/index.php/waste/waste-and-cleanup/waste-management/solid-waste-utilization/index.html#utilization

Minn. Rule Ch. 7035.2860 identifies three different conditions under which wastes can be used rather than disposed of. Two of these could be used to allow the off-site reuse of excess fill soils containing debris: standing beneficial use determinations (SBUD) and case specific beneficial use determinations (BUD). It would preferable to have a blanket determination allowing for the reuse of some clearly defined fill-with-debris category in order to allow for intermediate staging and mechanical separation.

3.0 EXISTING POLICY BARRIERS

The off-site reuse policy currently in practice with the MPCA employs a series of guidance documents issued in April 2010, February 2011 and March 2012. The history of soil reuse in Minnesota and the current MPCA soil reuse policy is explained in more detail in Appendix B. The establishment in 2010 of a clear definition of marginal contaminated soil for which the MPCA expresses no regulatory concern (i.e., "unregulated fill") was an important first step towards environmentally safe and economically efficient reuse of excess soils generated during brownfields redevelopment. The definition of unregulated fill was further enhanced in 2011 by raising the level of petroleum contamination allowed as unregulated (from 10 mg/Kg to 100 mg/Kg for petroleum measured as DRO or GRO). The current definition of unregulated fill helps brownfields developers and earthwork contractors facilitate reuse of soils with very low to non-existent impacts.

However, the case studies discussed in the cost analysis in Appendix C suggest that the reuse of unregulated fill soils during brownfields redevelopment remains an underutilized option. While some unregulated fill is being implemented, it appears that landfill disposal remains the primary means of managing unregulated excess fill soils generated during brownfields redevelopment. Furthermore, the case studies indicate that that current "Off-site Reuse of Regulated Fill" policy has not advanced soil reuse in Minnesota. As of March 2014, the MPCA has received no Regulated Fill Applications for off-site reuse. Although the MPCA has made great strides in its soil reuse policy, off-site reuse of regulated fill is not being implemented under the existing policies.

To gain a better understanding as to why limited interest has been shown in the MPCA's off-site reuse of regulated fill program, Minnesota Brownfields developed a short, online survey and sent it to the membership of Minnesota Brownfields (the survey questions and results are in Appendix G). Of fifty-two total survey respondents, thirty-six had been involved in a VIC-enrolled brownfield redevelopment project since the commencement of the MPCA guidance on soil reuse. One-third of those respondents said that they had considered seeking MPCA approval for off-site reuse of regulated fill. In answering the question why MPCA approval for off-site reuse was not pursued, one in five of all respondents and three of the thirty-six of those involved in recent VIC-site redevelopment activity said that they did not know about the off-site reuse application process. Some of the important factors cited for choosing to not move forward with the off-site reuse option for regulated fill offered by the MPCA included: a) the inability to find a compatible site, b) the timing of cleanup/redevelopment activities did not line up at the source and potential receiving sites (the guidance requires that fill be moved from the source site to the receiving site with no interim storage), and c) the MPCA does not provide sufficient liability assurances to mitigate the risk involved. Twenty-seven percent of respondents said that hauling

soil to a landfill was quicker and less complicated and that the cost of landfilling was necessary to expedite the completion of the project.

The comments offered by the survey respondents provide additional detail and echo concerns expressed by the consultants involved in the case study sites. While the regulated fill policy was viewed as a positive step, it was still viewed as "unrealistically conservative." The following factors limiting the utility of the off-site reuse of regulated fill policy were identified in the survey and by the case study consultants:

a) The policy does not allow for temporary staging at an intermediate site.
b) The local government notification signature requirement should be removed. Requiring a signature is a likely roadblock because most local government units do not have a centralized authority or the knowledge base (about contaminant types, concentration ranges, brownfield reuse, VIC program specifics) to provide what amounts to an approval.
c) Too many elements need to be in alignment to make this policy work. The policy requires that both the receiving and source sites have similar contaminants, and disallows intermediate staging of soils, even at the receiving site.
d) Liability protection is not sufficient, especially for the receiving site and its owners/operators.

There was also some sentiment expressed that simply landfilling such soil involves fewer complications and expedites projects in the long run. Consultants who regularly reuse unregulated fill, however, stated that they see this type of resistance as representative of the early stages of the learning curve. They cite increasing willingness of earthwork contractors to reuse unregulated fill as evidence that behavior is changing as the development community moves along the learning curve. It is believed that a practical off-site reuse policy will result in an increase in off-site reuse over time.

Existing Policy Barriers to Soil Reuse:

1. Liability Assurances: The MPCA's lack of statutory authority to offer liability protection for soil reuse continues to be one of the primary gaps in MPCA soil reuse policy. A conservative view of the environmental liability associated with the reuse of marginally contaminated soil can even raise concerns over potential liabilities that may be triggered when unregulated fill soil is reused off-site. Neither CERCLA or MERLA or RCRA recognizes the policy definition of "unregulated fill." Many generators of marginally contaminated fill, which meets criteria for unregulated established by the MPCA, may still be wary of the possibility of triggering Superfund or RCRA liability by depositing contaminated soil, even at very low concentrations. Likewise, many landowners/developers in need of fill material remain skeptical of soils coming from a site with known contamination issues. Expansions of available liability assurances under Minn. Stat. §§115C and §§115B that would address this policy barrier are discussed above.

2. Need for Intermediate Staging Facilities (Brokering Facilities): Current MPCA policy also lacks the discretion to accommodate smaller projects with significant space constraints. The case study analysis illustrates the disparity faced by smaller sites under current policy. Large sites, such as Beacon Bluff, have the advantage of considerable acreage and varying topography to utilize more on-site soil reuse opportunities. For example, excess soil on one part of the nearly 50-acre Beacon Bluff site could be relocated to another part of the site in need of fill soil.

The Beacon Bluff project could also take advantage of the economies of scale. Not only did the site have the room to stockpile and treat geotechnically unsuitable material on-site it was also economically feasible to utilize mechanical treatment methods (e.g., sorting, screening, crushing, and drying techniques). The vast majority of geotechnically unsuitable material encountered at the Beacon Bluff site was mechanically treated by sorting, screen, crushing, and/or drying to make it available for on-site reuse. If there had been excess material at the site, the treated unregulated fill soils would have been geotechnically suitable for off-site reuse.

Smaller sites, such as the 222 Hennepin Avenue site, often do not have capacity to reuse or manage marginally contaminated soil on-site. These sites also do not have the space to mechanically treat geotechnically unsuitable fill material (e.g., stockpile and sort and/or crush soil mixed with debris). Even if the 222 Hennepin Avenue site had the space, it would not have been economically feasible to bring in the necessary equipment to manage the small amount of material encountered at the site during redevelopment. In some instances stockpiling and further testing may be required to separate impacted soils from non-impacted soils. Again, smaller sites do not have the space and often the time to stockpile, sort, test, treat, etc. If impacts are scattered throughout the site, often all material that must be removed for redevelopment is simply excavated and hauled to a landfill. Because of space and time constraints and the regulatory restrictions requiring mechanical treatment of impacted material to be confined to the site boundaries, a site similar in scale to 222 Hennepin Avenue site is unable to pursue off-site reuse of the excess material it generates.

3. The Problem of Debris-Fill: As a practical matter, most urban fill soils contain some degree of solid waste. It would be helpful to create a distinction allowing Category B (debris-containing fill) soils that include a clearly defined, and practical, percentage of debris to be reused. Currently, most Category B soil is being disposed of in landfills, even though doing so offers little to no reduction of environmental risk. Reusing this type of fill may be relatively feasible where there is the opportunity for staging and screening either at the importing site or at an intermediate staging facility. Regulatory changes should be made to allow for the reuse of unregulated fill with debris if screening or crushing the debris is feasible. This could take the form of relief or exclusion from the Solid Waste Rules.

4.0 LEGAL AND POLICY BARRIERS - CONCLUSIONS

If Minnesota wishes to provide a practical avenue to not only allow but to encourage the off-site reuse of marginally contaminated soil at redevelopment sites, an appropriate regulatory framework is needed. The current MPCA policies provide an initial foundation for this framework. It may be necessary to amend current policy and supporting statutes to fully achieve this goal.

Legal Barriers

Liability assurances, for parties associated with both the importing and exporting sites, are essential to encouraging off-site soil reuse. This is especially true in Minnesota, where the availability of a variety of liability assurances from the MPCA VIC Program has been part of the land recycling landscape since the early 1990s. While No Action Letters are currently available for importing sites, No Association Determinations are not available. Furthermore, there is ambiguity surrounding the solid waste status of exported soil from regulated sites. Additionally, clarification is needed regarding the movement of soils containing even *de minimis*

concentrations of contaminants that are listed hazardous waste (including perchloroethylene). Protection from RCRA and MERLA liability would require a formal exemption or policy that excludes marginally contaminated soil from being designated as hazardous or solid waste.

Liability protection options for parties involved in soil reuse involving non-petroleum hazardous substances, contaminants or pollutants may include:

- A No Action Determination Letter, which is an MPCA assurance that can be issued at the discretion of the commissioner. A No Action Determination Letter states that upon review of submitted documents the MPCA commissioner will refrain from taking specific administrative or enforcement action. A No Action Letter does not contain any certain liability protection for the recipient but constitutes a promise by the MPCA to refrain from further action requiring additional investigation and cleanup presuming no new information is presented that would warrant such actions. Under their Off-site Use of Regulated Fill Policy, the MPCA will provide a No Action Letter for both the exporting and importing sites, relative to the contaminants identified in the exported fill.

- A No Association Determination (NAD) Letter, which provides a person or legal entity with statutory protection against MERLA liability for specific actions. The NAD is a determination that certain proposed actions at a site where a release has been identified will not serve to "associate" the person with "ownership" liability under MERLA.[20] Under this approach, it would be possible for a party who wishes to obtain regulated fill for reuse on a brownfield site or wishes to provide contaminated soil for reuse on a brownfield site to receive assurance that MPCA has determined that the placement of such soil will not "associate" the party with the known release for purposes of MERLA liability.[21]

The MPCA has taken the position that current Minnesota Statues do not authorize the MPCA to issue No Association Determinations for the off-site reuse of contaminated soil. It will, therefore, be necessary to amend the Minnesota Land Recycling Act and/or MERLA to provide for such assurances. Perhaps the most direct way to ensure liability protection for contaminated soil reuse would be to modify the definition of "release" to include the off-site reuse of soil as a permissible component of a response action and to create a legal defense to liability through amending portions of MERLA. Examples of possible amendments to encourage soil reuse include:

- Section 115B.02, Subd. 15 Release – Add a clause excepting from the definition of "Release": "The placement of approved fill soils meeting a standard (or according to a plan) approved by the Commissioner pursuant to Section 115B.17, subdivision 2a."
- Section 115B.175 Subd. 4 Performance of response actions does not associate persons with release – Add a clause to this subdivision to incorporate the reuse of approved fill so that the subdivision reads (underlined sentence added): "Persons

[20] MINN STAT ANN §115B.178, subd. 1(a), subd. 3(4). Eileen M. Roberts, *Minnesota Practice Series: Real Estate Law* vol. 25, §9.20, 487. (West 2007).

[21] MPCA. VIC program assurance guide. pg 7.

specified in subdivision 6 or 6a, paragraph (c), do not associate themselves with, or aggravate or contribute to, any release or threatened release identified in an approved voluntary response action plan for the purpose of subdivision 7, clause (1), or section 115B.03, subdivision 3, clause (4), as a result of performance of the response actions required in accordance with the plan and the direction of the commissioner. Such response actions may include the excavation of fill soils from an identified real property and placement of such soils at another identified real property according to a plan approved by the commissioner."

- Section 115B.04, Subd. 9 Releases subject to certain permits or standards – Add a clause excepting approved fill soils from this section imposing cleanup liability, so that the Subdivision reads: "It is a defense to liability under this section that: . . . The release or threatened release was from fill soils placed at a redevelopment site according to a plan approved by the Commissioner (or pursuant to a permit issued by the Commissioner)" under sections 115B.17-175.
- Section 115B.05, Subd. 8 Releases subject to certain permits or standards – Add a clause excepting approved fill soils from this section imposing bodily injury and property damage liability, so that the Subdivision reads: "It is a defense to liability under this section that: . . . The release or threatened release was from fill soils placed at a redevelopment site according to a plan approved by the Commissioner (or pursuant to a permit issued by the Commissioner)" under sections 115B.17-175.

While the MPCA greatly enhanced the opportunity to reuse marginally contaminated soil impacted with petroleum by raising the level of petroleum contamination allowed as unregulated fill, the current MPCA assurance options available for petroleum-contaminated soil do not apply to soil reuse. Currently, the MPCA only offers an Implementation Report Approval Letter for importing or exporting sites. The MPCA offers a "General Liability Letter for Petroleum," but this speaks to the definition of a "responsible party" under Minn. Stat. 115C and states that if a person comes into possession of property after petroleum tanks were removed, and where a petroleum tank release attributable to those tanks had previously occurred, that person is not a responsible party and cannot be ordered to take corrective action. The MPCA has taken the position that current Minnesota Statutes do not authorize the MPCA to issue a General Liability Letter for petroleum contamination that does not originate from at tank release and does not address reuse of petroleum-impacted soil.

The MPCA has taken the position that Minn. Stat. § 115C does not authorize the Agency to issue a General Liability Letter for petroleum contamination that does not originate from a tank release; furthermore, the General Liability Letter is focused on the site where the original release occurred and does not address the possibility of soil reuse. In order to encourage off-site soil reuse, the MPCA should offer a General Liability Letter that states that if a person reuses petroleum contaminated soil in a manner consistent with MPCA guidance and/or with an approved Response Action Plan or Soil Reuse Plan, that person is not a responsible party and cannot be ordered to take corrective action. This would likely require an amendment to Minn. Stat. § 115C.

Policy Barriers
The MPCA has taken initial steps toward removing policy barriers via the issuance of the Off-site Reuse of Unregulated Fill and Off-site Reuse of Regulated Fill guidance documents. The guidance documents provide an important baseline for establishing policy that promotes soil reuse in Minnesota while continuing to maintain the mandate of protecting human health and the environment, which was entrusted to the MPCA over forty-five years ago.

Before the "Best Management Practices for the Off-site Reuse of Excess Fill from Developed Sites" policy document was issued in 2010 by the MPCA, there was no practical regulatory guidance for reuse of contaminated soil in Minnesota. The safest approach to handle excess contaminated soil was to dispose of it in a landfill, regardless of contaminant concentrations. The guidance document, which was supplanted by the 2011 Best Management Practices of Off-site Reuse of Unregulated Fill, defined "unregulated fill" and provided an opinion that soils defined as unregulated had been determined to "not be a regulatory concern" and "not a solid waste." While this determination was comforting, it lacked statutory liability protection to back the determination: protections that the regulated community involved with brownfields sites had come to expect.

Liability Assurances:
In order to maximize environmentally safe and economically efficient off-site soil reuse of marginally contaminated fill soils, it will be necessary for the MPCA to offer liability protection for the importing and exporting of marginally contaminated soils. Specifically, a No Association Determination for hazardous substance components is needed, and the Petroleum Brownfields Program "General Liability Letter" should be enhanced to address petroleum releases that did not originate from tank releases.

Intermediate Staging Facilities:
In many cases, space and time constraints are barriers to off-site soil reuse. While larger sites can overcome this problem, it is often impossible for smaller sites to pursue off-site soil reuse due to space and time constraints and the economies of scale. To level the playing field for small sites and increase opportunities for off-site reuse it will be necessary for the development of policy that will allow off-site stockpiling, sorting, testing, and mechanical treatment of excess fill soil in order to prepare the material for off-site reuse. This may be done on an individually permitted basis or by permitting private or public soil brokering facilities that manage excess fill soils generated at brownfields sites.

On a practical level, most brownfield redevelopment projects are highly time-sensitive. Any time soil needs to be moved, the financial and environmental costs and concerns associated with the fill increase. Importing and exporting marginally contaminated soil introduces further communication and timing complications. The intermediate staging of contaminated soil could also be effective at alleviating these issues. Additionally, a website or database that listed and matched sites with excess marginally contaminated soil could ease soil exchanges and allow for more efficient redevelopment of brownfield sites.

Off-site Soil Reuse Guidance Revisions:
The second guidance document issued by the MPCA concerning marginally contaminated soil reuse dealt with the off-site reuse of regulated fill. Developers, consultants and earthwork

contractors have not been willing to utilize this guidance for off-site reuse, stating that it is too restrictive and cumbersome from their perspective. In order to promote more environmentally safe and economically efficient regulated fill reuse, the current off-site reuse policy should be revised to make the policy more practical.

A simple and more practical approach to off-site reuse of regulated fill would allow the MPCA approved RAP for the receiving site to dictate how soil can be reused at the receiving site and what levels of contamination can be allowed at the Site. For example, if the receiving site has an MPCA approved RAP with cleanup goals established at the Tier 2 industrial Soil Reference Values, then soil imported from another brownfields site to the receiving site should meet industrial SRVs. If the receiving site's RAP allows management of certain contaminants at certain concentrations with institutional and/or engineering controls, then imported soil meeting the RAP criteria should be allowed under those same conditions.

The policy also needs to allow for intermediate staging and stockpiling, as described above. Finally, the requirement for a Local Government Notification signature should be removed. Most local government units have neither the expertise nor the organizational infrastructure to support this requirement.

Encouraging the Reuse of Debris-Fill Where Practical:
Currently, most Category B soil is being disposed of in landfills, even though doing so offers little to no reduction of environmental risk. As a practical matter, most urban fill soils contain some degree of solid waste. It would be helpful to create a distinction allowing Category B (debris-containing fill) soils that include a clearly defined, and practical, percentage of debris to be reused. Reusing this type of fill may be relatively feasible where there is the opportunity for staging and screening either at the importing site or at an intermediate staging facility. Regulatory changes should be made to allow for the reuse of unregulated fill with debris if screening or crushing the debris is feasible. This could take the form of relief or exclusion from the Solid Waste Rules.

APPENDIX F:

CASE STUDIES

222 Hennepin Avenue

Location: Minneapolis (Hennepin County)

Property Size: 2.5 acres

Cleanup/ Redevelopment Timeframe:
Fall 2012

Previous Use(s):

- Automobile sales and service facility developed in 1964 (Jaguar Car Dealership).
- Prior to the dealership, and since 1885, several commercial buildings had been located at the site.

Current/Planned Use(s):
A mixed used development, inclusive of a residential component (287 luxury rental apartments in two interconnected, 6-story buildings), a retail component, (a 40,000 s.f. grocery store) and an underground parking ramp

General Site Conditions:
The following contaminants were identified in site soils: volatile organic compounds (VOCs), metals, semi-volatile organic compounds (SVOCs) and petroleum impacts. Due to the spotty distribution of contaminated soils at the site, and the lack of space to stockpile soils for further characterization, it was determined that the most time- and cost-effective method to handle excess soils was to dispose the soils at a permitted landfill. Unregulated fill encountered at the site was intermixed with regulated fill. The fill material also contained building debris, which may have affected its geotechnical suitability for reuse. There was no room at the site to segregate fill soils mixed with debris from other soils at the site, or to stockpile and sort out regulated fill material from unregulated fill material. As a result, all soils were disposed off-site, including 26,774 c.y. of debris- containing fill (Category B) and 6,280 c.y. of Category C (regulated fill) soils.

Grants Received | Used for Off-site Disposal: $879,781 | $405,410

- $436,881 | $405,410 DEED Cleanup Grant
- $442,900 | $0 Metropolitan Council TBRA Grant

Beacon Bluff Business Center

Location: St. Paul (Ramsey County)
Property Size: Approximately 46 acres
Cleanup/Redevelopment Timeframe: 2009-2012
Previous Use(s):

- Former 3M Company St. Paul Campus used for manufacturing, chemical and petroleum storage, and offices

Current/Planned Use(s):
Saint Paul Port Authority Business Center

General Site Conditions:
3M Company occupied property from the early 1900's until 2009 when decommissioning of 3M's St. Paul Campus was completed. Soil, soil vapor, and groundwater impacts identified at the site attributable to 3M's operations have been/are being addressed by 3M. These impacts include a solvent release impacting soils and groundwater, and lead and polynuclear aromatic hydrocarbons (PAHs) contaminated soils. Urban fill predating 3M's use of the property affected a significant portion of the site. Low to moderate levels of contaminants were associated with the urban fill material including PAHs, RCRA metals, volatile organic compounds, ash, and petroleum compounds.

This site was well suited for on-site soil reuse for several reasons: a) it is a very large site; b) cut and fill activities and geotechnical corrections were required over a large area; c) there were significant volumes of marginally contaminated soil located throughout the site that could be reused without restriction; and d) cleanup and redevelopment was phased across several parcels over several years. Time and space were not limiting factors to the extent that they were for the other study sites. Economies of scale allowed for mitigation of geotechnically unsuitable soils on-site. Separation, screening, crushing, and drying activities were all performed on-site, along with fill and compaction to correct unsuitable soils. All unregulated fill and Category C soils were reused on-site. Only Category D and E soils were disposed off-site. While at least a portion of the 16,222 c.y. of Category D soils could have been used on site, doing so would have required the imposition of institutional controls on the site, limiting future land uses—restrictions the Saint Paul Port Authority deemed economically unfeasible for the project.

Grants Received | Used for Off-site Disposal: $5,171,342 | $2,176,077

- $250,000 | $250,000 Ramsey County ERF
- $559,200 | $120,000 Metropolitan Council TBRA
- $4,362,142 | $1,806,077 DEED Cleanup Grant

Clyde Park Site

Location: Duluth, Minnesota (St. Louis County)

Property Size: 10 acres

Cleanup Timeframe: 2007

Previous Use(s):

- Clyde Ironworks Foundry and heavy machining shop. Vacant from 2002 until reuse.

Current/Planned Use(s):
A mixed-use, commercial-community center development including a restaurant and event center venue (Clyde Iron), a youth sports programming arena and pavilion (Duluth Heritage Center at Clyde), a Boys and Girls Club, and the Duluth Children's Museum.

General Site Conditions:
Redevelopment was hampered by contamination associated with the site's long history of heavy industrial use, first as an iron foundry and heavy machining ship from the 1890's until the 1970's. Issues identified at the site included filled areas containing foundry sand and furnace slag materials, and petroleum-contaminated soil from former underground storage tanks and an adjacent bulk facility. Chemicals of concern included petroleum compounds, petroleum-related VOCs, arsenic, lead and polynuclear aromatic hydrocarbons (PAHs).

The consultant was able to reuse 2,640 c.y. of unregulated fill off-site as "restoration cover" to re-fill two gravel pits located approximately 10 miles away from the site. This was possible in part because the fill soils designated for reuse were demonstrably native soils, and because additional verification sampling was conducted to demonstrate that the soils were clean. Another factor in making off-site reuse possible was the involvement of a flexible MPCA staff who was willing to look into the data to make site-specific decisions.

There were significant volumes of highly contaminated soils that required off-site disposal, including localized pockets of characteristically-hazardous (metals) soils requiring stabilization-treatment prior to disposal. Where possible, Category C and D soils were reused on-site (a total of 3,500 c.y.). However, severe space constraints after the early phases of redevelopment precluded staging soil for reuse. It was possible to reuse soils on-site early in the overall redevelopment process, but as the site became busier with multiple, concurrent large-scale operations, time and space constraints precluded this option. Large-scale operations included the installation of a 48" storm sewer down the center of the site, construction of two large buildings (Heritage Arena and Heritage Hall), demolition operations on multiple buildings.

Grants Received | Used for Off-site Disposal: $1,380,537 | $764,400

- **$1,380,537 | $764,400** DEED Cleanup Grant

Gateway Garden

Location: Moorhead (Clay County)

Property Size: 1.29 acres

Cleanup/Redevelopment Timeframe: 2009-2010

Previous Use(s):

- Railroad facilities
- Petroleum tank farm
- Habitat for Humanity building materials "ReStore" operation

Current/Planned Use(s):
A 24-unit affordable apartment building

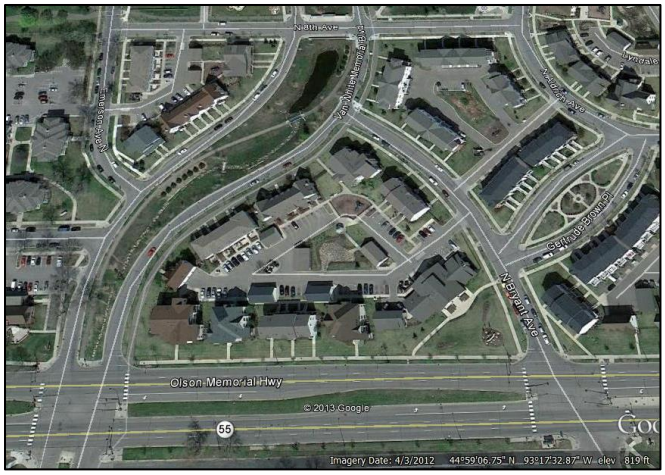
General Site Conditions:
From the late 1800's to the early 1900's, this site was part of the Great Northern Railroad grounds; from the early 1950's through the 1990's a bulk petroleum tank farm facility operated at the site, and is believed to be the main cause of the contamination. Most recently a Habitat for Humanity building materials "ReStore" operation occupied the site. Two vacant building structures remained on the site: part of the tank farm facility, and a slab-on-grade outbuilding. Exterior space on the site consisted of asphalt, gravel and dirt driveway and parking areas, and an abandoned railway spur that previously serviced the site. Located at the west end of the site was a depression area filled with rainwater where the petroleum tank farm was formerly located.

A total of 5,800 c.y. of material was excavated and either reused on- or off- site, or disposed of off-site. There were 2,800 c.y. of unregulated fill, of which 1,600 c.y. was clean sand. Of the clean sand, 1,400 c.y. was reused on site, and 200 c.y. was stored at the contractor's yard for future reuse. The remaining 1,200 c.y. of unregulated fill contained low levels of contamination (below cleanup standards) and was reused off-site; this soil was used to fill the foundations of abandoned houses in a flood-plain as part of a City flood mitigation project. The remaining 3,000 c.y. of fill excavated from the Site were disposed of in the Clay County Landfill. This included approximately 2,580 c.y. of Category D soils, with the remaining 420 c.y. equally split between Category C and Category E soils.

Grants Received | Used for Off-site Disposal: $275,239 | $206,429

- $275,239 | $206,429 DEED Cleanup Grant

Heritage Park



Location: Minneapolis (Hennepin County)

Property Size: 2.29 acres

Cleanup/Redevelopment Timeframe:
October 2010 to June 2012

Previous Use(s):
The site had been used for residential purposes from at least the 1890's until approximately 2000. In about 2000, the Minneapolis Public Housing Authority demolished the public housing buildings on the site as the Near Northside/Heritage Park Redevelopment Project began. The site remained vacant until redevelopment began in October 2010.

Current/Planned Use(s):

- 48 units of affordable housing for frail elderly seniors at a Memory Care Facility.
- Senior Center with medical facility, adult day services, therapy pool, YMCA, and support services for residents.
- This phase will serve as an anchor to facilitate development of subsequent phases, which will include ownership housing, and additional rental housing anticipated in the Heritage Park Master Plan.

General Site Conditions:
The site is located within the original Bassett Creek Valley in Minneapolis. When the site was initially developed in the late 1800's, lower areas of the site were brought up to grade with uncontrolled fill. Fill soil also was brought to the site in the late 1990's following demolition of public housing units. The thickness of the fill soil varied from about 6 feet on the eastern side of the site to about 12 feet on the western side of the site. Debris, including ash, concrete, and brick, was present in the fill soil. Building foundations left in-place during historical demolition activities had been backfilled with demolition debris, sometimes containing asbestos and ash. Several of the former buildings were supported on timber pilings that were treated with creosote and the creosote had leached into surrounding soil. Analytical testing of the fill soil at the site indicated the presence of arsenic, lead, mercury, naphthalene and PAHs at elevated concentrations relative to Industrial SRVs. DRO impacts are also present across the site in the fill soils. An estimated 850 c.y. of unregulated fill soil (Category A soils) was re-used on-site; 8,535 c.y. of debris-containing fill (Category B soils) was directly disposed at a landfill. Remaining Category A soils, and all Category C soils and Category E soils were also landfilled.

Grants Received | Used for Off-site Disposal: $923,211 | $704,980

- $194,493 | $181,343 Hennepin County ERF
- $417,843 | $417,843 Metropolitan Council TBRA
- $310,875 | $105,794 DEED Cleanup Grant

HCMC Whittier Clinic

Location: Minneapolis (Hennepin County)

Property Size: 3.11 acres (a city block)

Cleanup/Redevelopment Timeframe:
December 2008 – June 2011

Previous Use(s):

- An industrial food warehouse that included office space, a garage, and a meat-processing plant warehouse.
- A creamery was on-site prior to the meat processing plant.
- The property was originally residential into the early 1900s.

Current Use(s):
The primary use is a two-story, 60,000 s.f. medical clinic offering primary care and many specialties, and a pharmacy. The site design incorporates green space and above- and below-ground parking for patients. The 1.44-acre south portion will be transferred to the City for mixed-use retail, office and residential development.

General Site Conditions:
Contamination was associated with historic fill of unknown origin and long-term industrial site uses, including storage tanks, garage, and floor drains. Contaminants included polynuclear aromatic hydrocarbons (PAHs), PCBs (low levels in one sample), metals (lead, mercury, and cadmium), petroleum, and organic vapors. Much of the contamination exceeding MPCA Tier 1 SRVs was located in the uppermost four feet of the subsurface.

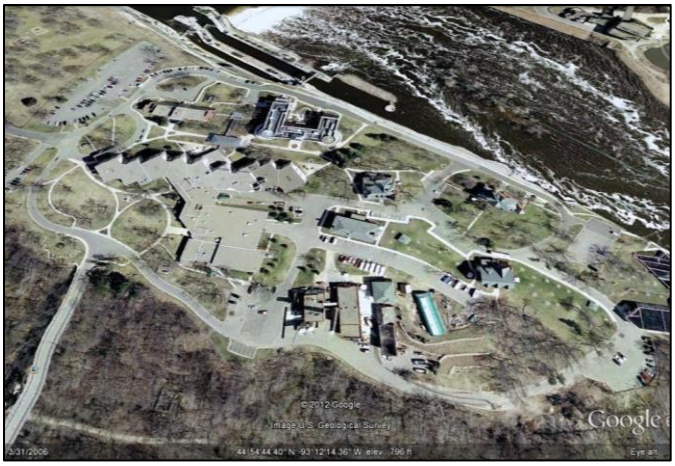
Approximately 6,300 cubic yards of unregulated fill were reused on-site, and 5,900 cubic yards of unregulated fill were hauled to a landfill and used as daily cover. Approximately 7,700 cubic yards of Category C and 6,400 cubic yards of Category E soils were landfilled. The excavation to correct for the new building extended into natural soils, which were deemed geotechnically unsuitable. During the excavation to prepare the building footprint, the natural soils were not readily separated from the overlying fill soils. The result was a mixture containing native soil, mixed fill materials, organic material, and some debris.

The project schedule precluded temporary storage and testing to isolate regulated fill soils from unregulated fill soils. At the time of cleanup, the unregulated fill standards were more stringent, and it was considered unlikely that the soils would fulfill unregulated fill criteria. Debris was encountered in the site fill soils impacted with low to high levels of contamination. Debris was not present in the unregulated fill until it was entrained during the excavation process.

Grants Received | Used for Off-site Disposal: $521,352 | $521,352

- $76,854 | $76,854 Hennepin County ERF
- $444,498 | $444,498 DEED Cleanup Grant

Minnesota Veterans Home



Location: Minneapolis (Hennepin County)

Property Size: 5.2 acres

Cleanup Timeframe: Fall 2010

Previous Use(s):

- Parking lot
- Former "building 9"

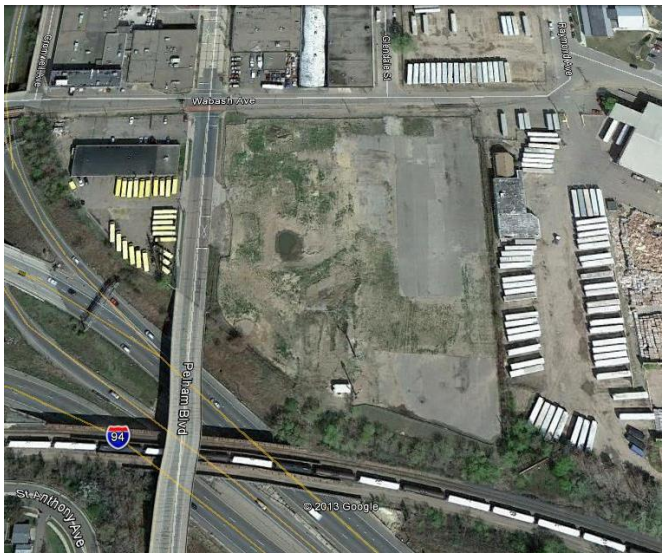
Current/Planned Use(s):
A 100-bed nursing-care facility

General Site Conditions:
The chemicals of concern identified at this site were petroleum (measured as DRO) and polynuclear aromatic hydrocarbons (PAHs). Much of the soil anticipated to be excavated during site remediation/redevelopment was initially thought to be "regulated fill" and was planned to be disposed at a landfill. However, through additional sampling, a large portion of the material was found to be unregulated fill, and nearly 25,000 c.y. was reused at five properties in the cities of Blaine, Elko, Spring Park, Burnsville, and Elk River. Off-site reuse provided an approximate total cost savings of $273,635. The unregulated fill encountered at the Site that was not reused off-site contained debris, rendering it geotechnically unsuitable (i.e., Category B soils).

Approximately 7,000 c.y. of unregulated fill soil (Category A soils) were reused onsite. All but 40 cubic yards of the Category C soils were disposed of off-site (266 cubic yards were landfilled). All of the regulated fill could have been safely reused on-site based on contaminant concentrations. However, to eliminate the need for filing a property notification/affidavit with Hennepin County, it was recommended that the soil be excavated and transported off-site to a permitted landfill (as daily cover) and remaining clean soil be transported to another property for reuse if possible. The 40 cubic yards that was reused on-site was placed beneath the building and the MPCA determined that the placement of this small a volume didn't warrant the filing of an affidavit.

Grants Received | Used for Off-site Disposal: None

Pelham Business Center



Location: St. Paul (Ramsey County)

Property Size: Approximately 6 acres

Cleanup/Redevelopment Timeframe: Summer 2011 to Spring 2012 for cleanup; 2012 to 2013 for redevelopment

Previous Use(s): Motor freight and vehicle maintenance operations

Current/Planned Use(s): Saint Paul Port Authority Business Center

General Site Conditions:
Site soils contained mixed debris in addition to contaminants at concentrations exceeding industrial Soil Reference Values (SRVs). Soils were cleaned up to industrial SRVs and to levels meeting petroleum cleanup standards for industrial use. Urban fill (i.e., marginally contaminated soils with mixed debris) was removed from beneath the building pad and replaced with clean fill in order to complete geotechnical correction for the newly constructed building. Off-site reuse of Category B (debris-containing fill) soils would have required separation and/or screening of the mixed debris and liability protection. Because removal of the debris was not economically feasible, both regulated and unregulated excess fill was disposed in a permitted landfill. The following volumes of soil were landfilled: unregulated fill – 4,000 c.y.; Category B soils – 24,000 c.y.; Category D soils – 8,010 c.y., Category E soils – 890 c.y.

Grants Received | Used for Off-site Disposal: $700,000/$345,797

- $100,000/ $100,000 Metropolitan Council TBRA
- $600,000/ $217,704 DEED Contamination Cleanup

Seward Commons Phase 1

Location: Minneapolis (Hennepin County)

Property Size: This study considers Phase 1 of the Seward Commons Development. Phase 1 includes 0.70 acres. The total Seward Commons Site is approximately 4 acres.

Cleanup/Redevelopment Timeframe:
Fall 2012/Winter 2013

Previous Use(s):
The Phase 1 site was formerly Bystrom Brothers: a metal turning manufacturer of machine products, components, and assemblies.

Current/Planned Use(s):
This case study site includes only Phase 1 of this project, which is the first of six phases of a transit-oriented development that will ultimately encompass 4 acres and include a mix of 300 multifamily units and approximately 20,000 SF of commercial space. The case study project includes a 4-story, 60-unit supportive housing project developed in partnership with Project for Pride in Living. Each phase is being developed independently; the acres comprising the subsequent phases are not available for staging soils or to consume excess fill from a prior phase.

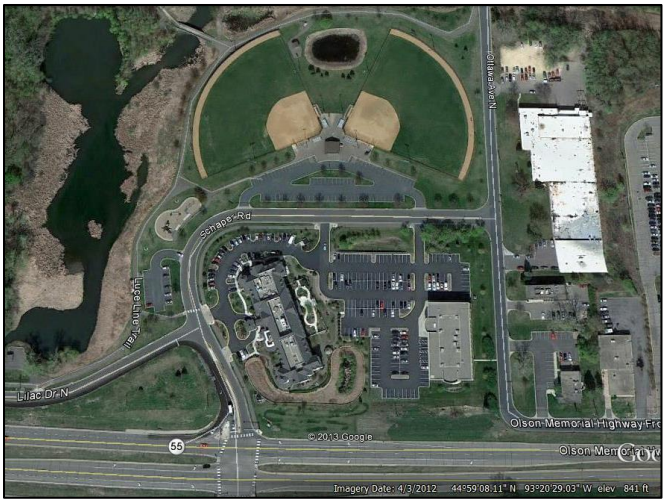
General Site Conditions:
This site has been developed as part of a mixed residential and commercial neighborhood since the 1880's. The primary source of site soil contamination is historic industrial uses, primarily machining activities that were on-site from the 1940's until approximately 2008.

The Phase 1 site had a zero lot line; the redevelopment was designed to occupy the entire property, and includes underground parking. The top six feet of fill across the entire site was contaminated with VOCs at concentrations above SLVs and SRVs, and with DRO in excess of the 100 mg/kg DRO standard in-place at the time of cleanup. The top six feet of fill (8,800 cubic yards) were removed and disposed of off-site. On-site reuse of this soil was not possible given the residential nature of the planned redevelopment. The fill beneath the top 6 feet, to a depth of 13 feet, was unregulated fill, with no contamination present. This soil was reused in the courtyard and as backfill along the new footings of the building. This comprised a total of 7,000 cubic yards.

Grants Received | Used for Off-site Disposal: $395,822| $229,929

- $245,322 | $124,428 Hennepin County ERF
- $150,500 | $105,501 DEED Cleanup Grant

Sunrise Assisted Living



Location: Golden Valley (Hennepin County)

Property Size: 2.91 acres

Redevelopment Timeframe: August 2004 - 2005

Previous Use(s):
A former dump site

Current/Planned Use(s):
A senior living complex

General Site Conditions:
At the time of redevelopment, half of this former State Superfund site featured clean fill soil, and half featured contaminated fill associated with former dumping activity. The Minnesota Department of Transportation had cleaned up the southern portion of the site as part of a Highway 55 road-widening project by disposing of excavated waste material off-site in a permitted landfill, filling the excavation with clean sand.

When Sunrise decided to construct a senior living facility on the site, the northern half of site still contained buried waste material and construction debris. Half of the new building (with a basement) was sited on top of the buried debris area; half was sited on the clean sand area. The buried waste was impacted with polynuclear aromatic hydrocarbons (PAHs), metals, and debris, and was required to go to landfill. Because the building pad extended over the sand and needed to be excavated, numerous attempts were made to find another property to take the clean sand (10,000 cubic yards). Because the MPCA unregulated fill guidance was not available at the time and the MPCA would not agree to issue a site-specific determination, no one was willing to accept even clean soil. Sunrise had no choice but to dispose of 5,893 cubic yards of clean sand in a landfill 42 miles away from the construction site, along with the buried waste and debris.

Sunrise is a great example of a project that was affected by the lack of clear guidance. Some of the issues have been addressed by the MPCA's current fill reuse policy. However, some of the issues affecting this project would still problematic even with the new regulated fill reuse guidance. Specifically, the current guidance requires that the soil be transported to a property that will be its "final destination" and requires that the soil be used almost immediately. This part of the guidance still presents a problem because it is difficult to perfectly align the schedules of two separate projects (one that has to get rid of soil and one that needs soil). The best way to resolve this would be to allow the soil to be temporarily stored at a designated property (approved/zoned for this type of storage) in an appropriate manner (this could include city or county facilities or privately owned properties).

Grants Received | Used for Off-site Disposal: $75,281| $0

- $75,281 | $0 Hennepin County ERF

The Mist

Location: Spring Lake Park (Hennepin County)

Property Size: 4 acres

Redevelopment Timeframe:
2006 - 2007

Previous Use(s):

- Commercial site
- The site of the former "Minnetonka Mist Supper Club"
- Former dump site

Current Use(s):
A multi-family residential development, including 120 units of high-end condominiums, along with over 4,000 s.f. of retail space, heated underground parking, a reflecting pool, and extensive landscaping.

General Site Conditions:
The site was contaminated with polynuclear aromatic hydrocarbons (PAHs), metals, and petroleum. Regulated fill from six large hotspots, a total of 748 cubic yards, was disposed of at a landfill located 33 miles from the redevelopment site. A significant amount of soil was excavated to construct the multifamily residential building (two-story with underground parking garage). Approximately 62,000 cubic yards of soil was reused off-site with the approval of the MPCA (this soil was required to be below residential soil reference values and soil leaching values, and to contain no significant quantities of debris). The soil was transported to a commercial property located 15 miles from the redevelopment site, and used to help fill in an old gravel pit in order to help prepare it for future redevelopment. Another part of that same property had been a former dump.

The project was one of the first that involved a vapor barrier and venting system because of the VOC-contaminated groundwater. This is an example of a project that worked, even though the Fill Reuse guidance was not in place. Several positive factors aligned to enable the off-site reuse of unregulated fill, including the availability of another property that needed soil at the same time the soil needed to be excavated from the site, and the flexibility of the MPCA staff assigned to the project.

Grants Received | Used for Off-site Disposal: None

APPENDIX G:

SOIL REUSE SURVEY

Survey on Off-Site Use of Regulated Fill Policy

1. You are a:

Answer Options	Response Percent	Response Count
Private-Sector Developer	3.8%	2
Public-Sector Developer	5.8%	3
Non-Profit Developer	0.0%	0
Environmental Consultant	63.5%	33
Attorney	0.0%	0
Government Agency Representative	21.2%	11
Other (please specify)	5.8%	3
	answered question	52
	skipped question	0

Number	Other (please specify)
1	soil scientist
2	Architect
3	Civil Engineer

2. Have you been involved in a brownfield redevelopment project that is enrolled in the MPCA Voluntary Investigation and Cleanup or Petroleum Brownfield Programs since the March 2012 inception of the Off-Site Use of Regulated Fill Policy?

Answer Options	Response Percent	Response Count
Yes	69.2%	36
No	30.8%	16
	answered question	52
	skipped question	0

3. Have you considered applying for MPCA approval of off-site reuse of regulated fill in accordance with the new MPCA policy?

Answer Options	Response Percent	Response Count
Yes	25.0%	13
No	75.0%	39
	answered question	52
	skipped question	0

4. What motivated your decision not to apply for off-site reuse approval?

Answer Options	Response Percent	Response Count
Did not know about the application.	20.4%	10
Waiting for others to test the application process and provide feedback to the development community.	2.0%	1
No potential importing site could be identified.	24.5%	12
Potential importing site and source site did not have similar contamination types.	10.2%	5
Timing did not work with potential importing site as stockpiling would have been necessary.	18.4%	9
Insufficient liability assurance available to mitigate the risk.	20.4%	10
The Off-Site Use of Regulated Fill policy is too restrictive.	14.3%	7
Application process is too burdensome.	10.2%	5
Need for completion and signature on “Local Government Notification” is too burdensome.	12.2%	6
Hauling and disposing of marginally contaminated soil at a landfill was quicker and less complicated than applying for off-site reuse; therefore, the cost was necessary in order to expedite completion of the redevelopment project.	26.5%	13
There was no incentive to secure off-site use approval because grant funds were available to pay for removal and disposal of marginally contaminated soil.	10.2%	5
Other (please specify)	34.7%	17
answered question		49
skipped question		3

Number	Other (please specify)
1	not involved in such activities
2	Not involved with any applicable project.
3	Didn't know about this reuse program.
4	I'm not sure I understand this. It seems to me that my answer to 3 above is accurate: We considered applying, however, the MPCA has no specific approval process. Therefore, we simply did it. The client trusted that the consultant knew how to follow the guidance.
5	NA
6	never came up as a need or possibility
7	The MPCA Off-Site Use of Regulated Fill Policy does not comply with Dakota County's waste regulation ordinances.
8	The projects I'm working on either had unregulated soil for reuse off-site, or contaminated soil not meeting the regulated fill requirements
9	The projects did not require disposal of regulated fill, or there was sufficient area for re-use in the generating project area.
10	MPCA February 2012 BMP Guidance Document states that, "It is the responsibility of the property owners and other parties engaged in development and construction activities to make sure that their activities include appropriate environmental due diligence and that excess soil and other materials generated by these activities are managed in an environmentally responsible manner", so MPCA is not needed and its easier to work without them. They have nothing to offer.

11	Regulated soil is contaminated soil not marginally contaminated soil. why would anyone take on another site's responsibility with import of contaminated soil on to their site. why take the risk of adding contaminants from another site due to poor sampling or investigation. risk is not worth the cost. would not advise a client to take the risk of moving contamination from one site to another and possibly becoming an RP nor would I advise taking on another RPs risk. Do not confuse the un-regulated soil issues with regulated soil.
12	State reviewer of projects, not a sponsor
13	As a regulator, would not be in a position to do so
14	redevelopment moves at the speed of light
15	No appropriate sites.
16	Sites we're working on simply haven't encountered this particular situation yet (i.e. soils had to go to landfill). Only a matter of time though...
17	off-site reuse had already taken place with MPCA approval prior to March 2012

5. Do you have any additional comments on the likelihood that you will use this application process in the future, and/or what changes to the process would make it more likely that you would use the application process in the future? (Up to ten sentences).

Answer Options	Response Count
	28
answered question	28
skipped question	24

Number	Response Text
1	its a positive step, but is still unrealistically conservative.
2	There are multiple factors that will significantly limit the use of this policy. The policy should allow for temporary staging, including at a third location; the receiving site owner should receive a No Association Determination if the criteria are met; the local government notification requirement should be removed; and rather than requiring a case by case evaluation, the MPCA should consider a less regulatory intensive approach like is used in PA.
3	I seems that too many items need to be in alignment for this process to work: 2 sites with same contaminants, 1 needing to export and 1 needing to import, import/export quantity needs similar, project schedules in alignment, owners in alignment with regards to potential liability issues.
4	My organization does not develop brownfields areas, but rather would review an application of an outside developer wanting to redevelop.
5	Needs to be an amendment to MERLA providing liability protection + less restrictive limitation.
6	Keep the process simple and 'reasonable'. Requiring local approval may be a roadblock due to lack of understanding about the soil material, level of contaminants, etc. NIMBY thinking is not always well informed thinking in my opinion..
7	I think the guidance document is a fabulous development. I don't think it requires an application process.
8	No
9	not likely to add complications to my projects
10	Private landowners have indicated they only want clean fill (no chemical contamination), because of long-term liability questions. Public entities get pressured to accept non-clean fill for cost reasons, even when it doesn't comply with Dakota County ordinances and the land use is not appropriate according to the MPCA Policy.
11	I believe that this policy will apply to a very small sub-set of brownfield sites in MN
12	I would like to see it tested before I pursue.
13	In the right circumstance, I can see where the current policy could potentially work out. But from a practical standpoint, there are more reasons for it not to work out. Development

	projects generally require precise timing of export and import, and coordinating this timing between 2 sites well in advance is not always practical. Also, impacted soil being exported in not always homogeneous and/or suitable from a geotechnical perspective at another site. And finally, as a consultant, why would I recommend to a client developing a property (and needing fill) to bring in regulated fill when there are usually other cheap unregulated fill sources likely available. In my opinion, its worth having the Regulated Fill policy as an option, but I doubt it will be used very frequently.
14	There is little incentive for the receiving property to accept contaminated soil. Also, the movement of fill soil is often times dictated by excavating contractors who have little patience for paperwork and/or restrictions on how they can use fill soil.
15	Not sure if I would take it on to attempt to be the first, this is not an easy process
16	I think that it may be difficult to find a potential importing site that is timed with construction efforts. Maybe a centrally located storage site could be identified and managed for marginally contaminated soil, but there likely would need to be incentives to use it and soil would require covers and stormwater management.
17	Risk too high for property owners of importing sites.
18	Regulations are necessary, but please keep compliance simplified as much as possible.
19	I am hoping to take advantage of this in the future but I do not have a specific project in mind at this point.
20	I would consider it if there was a need to remove/export a significant volume of regulated fill that meets the policy criteria. I anticipate that the logistics of matching exporting and importing sites within a reasonable distance and timeframe would be a challenge. I could see the benefit of some type of exchange for exporters and importers, but not sure who would be best to "own" and manage such an exchange. I think it could be a simple site to post information so that potential users could communicate without burdensome administration.
21	If the redevelopment was a HUGE import site in need of soil (highly unlikely) and the likelihood that the import property would be sold is nil (e.g. government land), then this could work. Otherwise, there is no incentive for the importing property owner, who can almost always get excess fill from a non-MPCA regulated site.
22	I do not see the regulated soil re-use application becoming too popular, the conditions to make it work are too liability intense. We should focus more on remediating and not just moving soil from one place to another. Site investigations are not complete enough to sample for every possible contaminant and emerging contaminants are identified regularly, SRVs change, technologies and practices change. there is enough "un-regulated" soil around to use for fill on impacted sites that it does not seem to be good policy to allow the transferring of "regulated" soil for fill. The potential to make things worse or move impacts from one site to another that didn't have them before is too great. Bad policy and risky decision for a land owner.
23	no
24	Now that I know the policy change involves an application, and not just a revision of regulatory standards, I am sure I will be using the application. Although why the LGU should have a say in this or even want to know about it is beyond me.
25	will not use application process
26	Probably will use the policy in the future.
27	I have not used the off-site regulated rule, and I doubt if the University would send regulated fill to non-University property. But we may use it to transfer soil between East bank properties, but the timing will rarely work out.
28	Raising the DRO limit from 10 to 100 mg/kg removed 90% of the soil previously considered regulated fill. The same should be done for arsenic (SEV) and selenium (SLV). The arsenic cleanup criterion of 25 mg/kg applied to the S Mpls Soil Contamination superfund site should apply statewide to comply with environmental justice if for no other reason.