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New York State Assembly Committee on
Environmental Conservation

Comments on the Draft Regulations for the

State Superfund Program
Environmental Restoration Program
Brownfield Cleanup Program

Draft
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Environmental Remediation Program

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Introduction

Thank you for the opportunity to comment on the draft regulations governing the state's environmental remedial programs, including the State Superfund Program, the Environmental Restoration Program, and the Brownfield Cleanup Program. As Chair of the New York State Assembly Standing Committee on Environmental Conservation, I have a strong interest in protecting the health of New Yorkers who live on or near contaminated sites. As the Assembly sponsor of the statute which enacted the new Brownfield Cleanup Program in October 2003, I have an additional interest in ensuring that brownfield sites receive the resources and oversight they need to be cleaned up and developed in a safe, equitable and timely fashion.

As proposed by the Departments of Environmental Conservation (DEC) and Health (DOH), draft Part 375 of Title 6 of New York's Codes, Rules and Regulations (6 NYCRR Part 375) would result in a substantial overhaul of the existing Part 375 regulations governing the Superfund and Environmental Restoration Programs. The draft also creates an entirely new regulatory framework for implementation of the Brownfield Cleanup program, including generic soil cleanup standards for 86 chemicals. Taken together, these proposed changes and new regulatory language represent the most important regulatory action taken in regard to the state's remedial programs since the State Superfund Program was enacted more than twenty-five years ago. They are sure to influence the cleanup of contaminated sites for decades to come.

I commend both Departments for the hard work they have invested both in the development and drafting of the regulations and soil cleanup standards, and for their proactive efforts to include the public in the decision making process. In May and June of 2004, the Departments held an intensive series of workshops and invited public comment on the protocols and criteria used to develop the soil cleanup standards. Those efforts went well beyond what was required in the statute and helped to build public confidence in the Department's work. At the time, I took advantage of the opportunity to submit over 20 pages of comments on the Departments' proposed approach and the design of the survey to describe contaminant concentrations in rural New York soils.

This past fall, in part in response to my request, the Departments arranged for all the scientific information used to develop the soil cleanup standards to be made available to the public at the ten document repositories established across the state. This action was crucial to ensuring the transparency of the standard setting process and is greatly appreciated. In addition, the Departments held seven 5-hour public information meetings across the state and scheduled the public hearings late enough in the comment period to allow the public time to review and analyze the proposed regulations and standards, and yet early enough that individuals can benefit from the comments of others in drafting their own comments. All of these measures have enhanced the public's ability to comment meaningfully on the proposed regulations and standards.

The thoroughness and professionalism reflected in the draft regulation and its supporting documents, including the Technical Support Document for the Development of Soil Cleanup Objectives (TSD) is also impressive. Clearly, agency staff have worked very hard over the past two years. Their commitment to ensuring the quality of the state's cleanup programs is apparent. It is in the spirit of that openness and commitment that we offer the following comments.

Background and Overview

Chapter 1 of the Laws of 2003, which amended the State Superfund and Environmental Restoration Programs and created the new Brownfield Cleanup Program, was hailed as "historic legislation" by Governor George Pataki. The law provided long-term funding for the Superfund Program, expanded the program to include hazardous substances sites, exempted municipalities, fiduciaries and lenders from Superfund liability, and created a Technical Assistance Grants Program for all Superfund and the most contaminated Brownfield sites. It increased the state's contribution to municipal cleanups under the Environmental Restoration Program from 75 to 90 percent and allowed municipalities to leverage other funds to finance their share. Finally, it created a statutory framework for the cleanup of Brownfield sites that includes protective cleanup standards, a clear and predictable decision making process, generous financial incentives, and liability relief.

The law was the product of almost ten years of vigorous policy debate, much of which focused on the level of cleanup that would be required at Brownfield sites. The result is a statute (ECL §§27-1401 *et seq.)* that creates a delicate balance between "permanent," "use-based" and "risk-based" cleanups. "Permanent" cleanups are ones that remove all contamination from a site, allowing it to be used for any purpose without restriction and without reliance on the long-term maintenance of legal use restrictions or physical barriers to exposure.

"Use-based" cleanups allow differing levels of contamination to remain on site based on site use, which may be unrestricted, commercial, or industrial. Soil standards that must be met for each use are developed taking into consideration the categories of people and activities associated with each use. Legal instruments, such as deed restrictions or easements, must be relied upon in perpetuity to control site use.

"Risk-based" cleanups rely on the installation of engineered barriers, such as pavement, to reduce or cut off exposure. The philosophy behind such cleanups is that without exposure, there can be no risk, regardless of a chemical's toxicity or the amount of contamination left in the ground. The safety of risk-based cleanups depends entirely on the long-term effectiveness of barriers to exposure, which must be maintained and monitored in perpetuity. While exposed surface soils must meet "use-based" cleanup standards, contamination below the surface does not need to be cleaned up to a set standard.

The existing state Superfund program has a strong preference for permanent remedies in that the goal of returning a site to "pre-disposal" conditions must be met if it is technically feasible and cost effective. Parties who are responsible for the contamination at Superfund sites must always evaluate the feasibility of achieving "pre-disposal" conditions, and DEC has the authority to require the implementation of such a remedy. While the use of engineered barriers to cut off exposure has been common at Superfund sites where "pre-disposal" conditions cannot be achieved, "use-based" cleanups have not been officially authorized.

In a clear departure from the existing Superfund program, the new Brownfield statute allows the current, intended, and reasonably anticipated future use of a site and its surroundings to be considered during the remedy selection process. In other words, "use-based" cleanups are explicitly authorized.

As part of this historic compromise, two key protective provisions were also put in place. First, the statute establishes a clear preference for permanent cleanups, and includes a number of provisions, including remedy selection requirements and tax incentives, that are designed to push volunteer developers and responsible parties toward permanent cleanups. Second, the statute establishes stringent criteria for the development of "use-based" soil cleanup standards which require that all such standards be

protective of public health and the environment, including groundwater, surface water, air, indoor air, sensitive populations, children and ecological resources.

The statute establishes four soil cleanup tracks that represent the full range of "permanent", "use-based" and "risk-based" cleanups (§27-1415(4)). At the cleanest end is "Track 1," which must achieve a permanent cleanup of both soil and groundwater. At the dirtiest end is "Track 4," which can rely on engineered barriers to cutoff exposure. While the statute generally requires the removal of pure contamination (e.g. free product or drums containing waste) and grossly contaminated soil at all sites, including Track 4 sites, only exposed surface soils at Track 4 are required to meet "use-based" soil cleanup standards.

In between lie "Track 2" and "Track 3," which authorize "use-based" cleanups. Both are intended by the statute to achieve a complete cleanup of soil for its intended use, in that the levels of contamination left in soil (which must achieve generic soil standards under Track 2, and site-specific soil standards under Track 3) must be safe for a site's designated use without the need for engineered barriers or unique site use restrictions to cutoff exposure. The language governing Track 2 reads as follows:

> "The remedial program may include restrictions on the use of the site or reliance on the long-term employment of engineering and/or institutional controls, but shall achieve contaminant-specific remedial action objectives for soil which conform with those contained in one of the generic tables developed pursuant to subdivision six of this section *without the use of institutional or engineering controls to reach such objective*." (§27-1415(4); emphasis added).

Groundwater use may be restricted under Track 2 or 3 because the groundwater itself remains contaminated, but the soil cleanup levels achieved under these tracks are not supposed to pose a long-term threat to groundwater quality. The language governing the development of soil cleanup standards states that the standards included in the generic soil standard tables "shall be protective of public health and the environment pursuant to subdivision one of this section" (§27-1415(6)(b)), which includes "groundwater according to its classification . . . ; drinking water, surface water and air (including indoor air); sensitive populations, including children; and ecological resources, including fish and wildlife" (§27-1415(1)). Track 3 cleanups must achieve site specific soil cleanup standards developed in conformance with the criteria used to develop generic cleanup standards for Track 2.

Three key provisions implement the statute's clear preference for permanence. First, all proposed and alternative remedies developed by participants in the Brownfield Program must be evaluated for their ability to achieve the statute's explicit preference for permanent remedies. Additional remedy selection criteria that favor permanence include overall protectiveness, long-term effectiveness and community acceptance. (§27-1415(3))

Second, all participants in the Brownfield Program are required to develop and evaluate at least one remedy that would meet the requirements of Track 1, i.e. achieve a permanent remedy. At significant threat sites, DEC is required to select the final remedy and may require a Track 1 cleanup. At non-significant threat sites, participants generally are authorized to select their own remedy from a DEC-approved alternatives analysis, but DEC has the discretion to require the evaluation and implementation of a Track 2 cleanup. (ECL §27-1413) Third, while generous tax incentives are created for all tracks, they are highest for Track 1 cleanups (Tax Law §21) .

The draft regulations threaten the statute's preference for permanence and clear mandate for protective soil cleanup standards in six critical ways. First, they rule out the possibility of achieving a truly permanent remedy by declaring that no site can be used for farming, including sites cleaned up to a Track 1 or "unrestricted use" level. Second, they create a new "restricted-residential" category that would allow higher levels of contamination to remain at residential sites as long as vegetable gardens are not planted.

(DEC is authorized to approve vegetable gardens at such sites in specially-designated locations). This category was not contemplated in statute, which clearly assumes that at all sites intended for residential use under Tracks 2 or 3, soil will be cleaned up to unrestricted use levels. As noted above, the statute explicitly excludes reliance on institutional controls to avoid exposure to soil by restricting activities at Track 1, 2 or 3 sites that would normally fall within the land use category anticipated for the site. All soils at Track 1, 2 or 3 sites must meet soil standards developed for the site's intended use "without the use of institutional or engineering controls to reach such [standards]" (§27-1415(4); see passage quoted at length above).

Third, the statutory requirement that a complete cleanup of soil, safe for a site's designated use, must be achieved at Track 2 and Track 3 sites is seriously weakened by the draft regulations' stipulation that soil is not required to meet generic or site specific soil standards at a depth greater than 15 feet at such sites. If contaminated soil is left on site below this level, the regulations propose that it be managed as part of an ongoing operation and maintenance plan contained in an environmental easement for the site, as required for all engineered barriers. This directly contravenes the statute's requirement that Track 2 and Track 3 cleanups achieve protective generic or site specific soil standards "without the use of institutional or engineering controls to reach such [standards]" (§27-1415(4); see passage quoted at length above).

Fourth, the regulations fail to accurately characterize DEC's authority to require the implementation of cleaner remedies. The language governing alternatives assessment fails to make it clear that DEC is required to select the final remedy at significant threat sites and may require the evaluation and implementation of a Track 2 cleanup at sites which do not pose a significant threat.

Fifth, and perhaps most importantly, the regulations almost completely ignore the statute's stringent criteria for the development of "use-based" soil cleanup standards. In direct contravention of the statute, the regulations would allow the "clean" soil standards developed under Track 2 and Track 3 to be so high as to pose a long-term threat to groundwater. In contrast, numerous sections of the Brownfield statute and new Title 31 of Article 15 ("Groundwater Protection and Remediation Program"), make it clear that groundwater protection and long-term restoration are important goals of the state. In fact, ECL §15-3109 requires DEC to develop a strategy to address the long-term remediation of groundwater contamination, including "strategies to protect groundwater from future degradation from contaminated sites." Even the cleanup standards for industrial sites should not pose a long-term or permanent threat to groundwater. (A more detailed discussion of this issue is provided below.)

Also, in direct contravention of the statute, DEC and DOH fail to ensure that the "clean" soil standards for Tracks 2 and 3 are low enough to protect against the possibility of contaminated soil eroding into surface water, contaminating the indoor air of homes through vapor intrusion, or being blown onto adjacent residential sites (each of these issues is discussed in more detail below). Instead, the agencies plan to rely on the installation, maintenance and long-term monitoring of engineered barriers and systems to control the off-site migration of groundwater, restrict surface water runoff, vent indoor air pollution and eliminate wind erosion.

In addition, the regulations would only require soil to be cleaned up to levels that protect ecological resources when DEC determines that such resources are "present." Unfortunately, DEC's interpretation of "presence" is so narrow that many cleanups will fail to be protective (see more detailed discussion provided below).

Indeed, at no point in the more than 72 pages of regulations and over 1,000 pages of supporting documentation do DEC and DOH list the statutory criteria for the development of soil cleanup standards or acknowledge the statutory requirement that all soil standards developed for Tracks 1, 2 and 3 must be protective of groundwater, drinking water, surface water, air, indoor air, sensitive populations, children and ecological resources. This is a major oversight. It threatens the protectiveness of Track 1 and 2

cleanups, and fails to provide adequate guidance for the development of protective site-specific soil standards under Track 3.

It has also resulted in the development of generic soil cleanup standards for Track 2 sites that are so high they approach or may even exceed the level of cleanup that can reasonably be expected to occur at Track 4 sites. This threatens the statute's crucial preference for permanent remedies by blurring the statute's careful distinction between "use-based" (Track 2 and 3) and "risk-based" (Track 4) cleanups. The descriptions of the tracks themselves and the language governing alternatives assessment all clearly anticipate that Track 2 cleanups will be cleaner, and are to be preferred over Track 4 cleanups (§27-1415(4); §27-1413).

The level of contamination allowed to remain in soil at Track 4 sites would reasonably be expected to be higher than that allowed at Track 2 or Track 3 sites because engineered barriers can be used to cut off exposure. In other words, people are not expected to be exposed to the more contaminated soil allowed to remain at such sites, and "exposed surface soils" must meet Track 2 or 3 levels. As originally calculated by DEC and DOH staff, however, 30 out of 86 of the generic "restricted-industrial use" standards developed for Track 2 sites were so high that the agencies decided to cap them so that they would not exceed the statute's definition of "grossly contaminated soil"—i.e. a level of contamination so great that it is discernible to the eye or through strong odor. As noted above, the removal of pure contamination and grossly contaminated soil is generally required at all sites, including Track 4 sites, pursuant to the statute's source removal hierarchy (§27-1415(5)). Thus, some of the "restricted-industrial use" standards proposed by DEC for Track 2 sites approach the *minimum* levels of cleanup required for Track 4. The types of cleanups allowed under Track 4 have sometimes been referred to by citizen groups as "pave and wave." The excessively high levels of contamination that would be allowed to remain in exposed surface soils at Track 2 industrial sites under the draft regulations reduce that approach to "wave."

Another factor that contributed to the high levels contamination allowed by many of the standards is the Departments' failure to adequately protect children and workers and take exposure to multiple chemicals into account. The standards fail to protect children by systematically underestimating exposure rates, failing to consider acute toxicity for many chemicals, and failing to apply appropriate safety factors where data on children is lacking. They fail to protect workers by systematically underestimating exposure rates and failing to consider the unique susceptibility of adolescents and pregnant women. They fail to protect both children and workers because they do not take the most up-to-date information regarding toxicity into account. In addition, the additive effect of exposure to multiple chemicals is not taken into account for the majority of chemicals commonly found together at contaminated sites. (Each of these concerns is discussed in more detail below.)

Sixth, even the protectiveness of Track 4 cleanups is weakened. While the statute requires that exposed surface soils at sites cleaned up under Track 4 must meet soil standards developed under Tracks 1, 2 or 3 (§27-1415(6)(d)), the draft regulations would allow soils that do not exceed "site background values" to remain on the surface at Track 4 sites (*draft* 375-3.8(e)(4)). In contrast, the statute only allows the background concentration of a contaminant found in "rural" New York soils to be used as an alternative to conformance with soil cleanup standards developed under Tracks 1, 2 or 3 (§27-1415(6)(b)).

Taken together, these weaknesses unacceptably undermine the law's preference for removing contamination rather than leaving it on site. That preference for permanence was adopted as a policy of the state because removing as much contamination as is technically feasible and cost effective reduces the risk should use restrictions or engineered barriers fail. The higher the level of contamination that remains on site, the greater the risk that people will be exposed to dangerous levels of toxic chemicals if controls fail. Where levels of contamination above unrestricted use levels are left on site, institutional and engineering controls will have to be maintained for decades, if not hundreds of years. These tools are

relatively new and largely untested, and the few studies that do exist indicate that they are prone to high rates of failure (GAO 2005; see more detailed discussion below).

I am proud that the new Superfund and Brownfield law establishes the most powerful mechanisms in the country for the monitoring and enforcement of institutional and engineering controls. The long-term viability of monitoring and maintenance must be considered up front (§27-1415(7)), an easement (as compared to a less effective deed restriction) must be executed (§27-1419(2)(e)), and local governments are required to review any restrictions prior to issuing a building permit (§71-3607). The effectiveness of these measures has yet to be tested, however, and it remains important to remove as much contamination as possible from contaminated sites.

Establishing soil cleanup standards that are truly protective for each category of site use is important because the levels of contamination allowed by those standards will be present in soil, including surface soil, at thousands of sites across the state for decades to come. Those levels must be truly protective of our most exposed and sensitive populations, such as children. They must be low enough to avoid posing a long-term threat to groundwater, or the State's goal of restoring groundwater will never be met. They must protect against vapor intrusion, or all sites with toxic volatile chemicals cleaned up under the state's new Brownfield program will require the extensive installation of vapor mitigation systems. They must be protective of surface water and adjacent residential uses because some degree of erosion is bound to occur, even if soil is planted with grass. As drafted, the regulations would simply allow too much toxic contamination to stay on site, putting our health, drinking water, and environment at risk.

In addition to the two major concerns discussed above, the draft regulations suffer from a number of other important weaknesses, all of which are discussed in more detail below. Some of the most important include the weakening of the cleanup goal for the Environmental Restoration Program; the failure of the regulations to include important statutory safeguards designed to ensure the long-term viability of institutional and engineering controls; the weakening of citizen participation requirements compared to the Brownfield statute or the existing Superfund regulations; and overly restrictive eligibility requirements for the Brownfield Program that appear to be resulting in the exclusion of sites that deserve financial assistance and/or require state oversight.

Overall, the draft regulations represent a major departure from the new Brownfield statute. I am concerned that long-standing agency practices within the Division of Environmental Remediation may have been given more weight than statutory language in drafting the regulations. A voluminous guidance document, 103 pages long, entitled "Draft DER-10: Technical Guidance for Site Investigation and Remediation," was released in draft form in December 2002, six months before negotiations on the new Brownfield statute were completed in June 2003. As originally drafted, the document governed all of the state's remedial programs, including Superfund, the Environmental Restoration Program, and DEC's administrative brownfield program at the time, known as the "Voluntary Cleanup Program." In recent discussions with agency staff regarding the new draft Part 375 regulations, many references were made to that document and other guidance issued before the statute was enacted, indicating that such documents had a considerable amount of influence on how these regulations were drafted.

Agency staff indicated that the Department plans to release a new version of DER 10 soon after the regulations are finalized. It is not clear whether the agency will solicit public comment on the new document or whether it will be issued in final form. The draft regulations and the DER 10 guidance document are critically important because it is they, and not the statute, which will most strongly influence how the state's remedial programs are implemented by staff on a daily basis. These documents must be redrafted to meet the letter and spirit of the new law, and where necessary, long-standing internal practices will have to change.

The failure of the draft regulations to conform to statute is also a concern because it is bound to create confusion and uncertainty and may even result in litigation. This, in turn, may have a chilling effect on developers deciding whether or not to enter the program. It was just this kind of uncertainty that the statute was originally intended to address.

DEC recently announced its decision not to extend the current public comment period, but to instead make revisions to the draft regulations based on comments received so far and re-issue a draft for additional public comment sometime later this year, hopefully in June. Reissuing the regulations in draft form is a good idea, but I remain concerned that the public has not been given enough time to fully evaluate all of the extensive and complex issues raised by the current draft. DEC and DOH themselves took a year longer than originally allowed in statute to complete this draft. In all fairness, the public deserves an equitable and adequate amount of time to perform their review and analysis.

The next public comment period should be open to any issues raised by the draft regulations and standards, not just new language revised by the Departments. At a minimum, it should be 60 days long.

Many challenges lie ahead as DEC and DOH work to finalize these regulations and ensure that the state's cleanup programs are both effective and protective in the decades to come. I look forward to continuing to work with both agencies to protect the health of New Yorkers who live on or near contaminated sites.

Brownfield Cleanup Program

Protect Public Health *and* the Environment

The statutory cleanup goal for the Brownfield Cleanup Program is that

> "All remedies shall be protective of public health *and* the environment including but not limited to groundwater according to its classification pursuant to section 17-0301 of this chapter; drinking water, surface water, and air (including indoor air); sensitive populations, including children; and ecological resources, including fish and wildlife" (§27-1415(1) emphasis added).

This language also controls the development of soil cleanup standards, which "shall be protective of public health and the environment pursuant to subdivision one of this section" §27-1415(6)(b).

The draft regulatory cleanup goal for the Brownfield Program is to

> "select and implement a remedy which shall be fully protective of public health *and/or* the environment including [the same criteria as the statute]" (*draft* 375-3.8(a) emphasis added).

The distinction between "and" and "and/or" is important. By including "or" the draft regulations limit those circumstances under which soil cleanup standards must be protective of ecological resources or other environmental resources such as groundwater, surface water or air, as discussed further below.

Recommendation:

Require all remedies and soil standards to protect public health *and* the environment.

DEC should amend the regulatory language to conform to the statute so that all remedies and soil cleanup standards must be protective of "public health *and* the environment."

Establish a Truly Permanent Cleanup Category

Track 1 is clearly described in the Brownfield statute as encompassing remedial programs that must achieve "a cleanup level that will allow the site to be used for any purpose without restriction and without reliance on the long-term employment of institutional or engineering controls" (§27-1415(4)). The same language is used by the statute to define "permanent cleanup" or "permanent remedy":

> "a cleanup or remedy that would allow a site to be used for any purpose without restriction and without reliance on the long-term employment of institutional or engineering controls" (§27-1405(28)).

"Long-term effectiveness and permanence" are included in the statute's list of remedy selection criteria, and the statute clearly establishes that:

> "A remedial program that achieves a complete and permanent cleanup of the site is to be preferred over a remedial program that does not do so" (§27-1415(3)(d)).

In addition, the statute exempts Track 1 sites from the reopening of liability due to a "change of use" at the site §27-1421(2)(b). This makes sense given that the level of cleanup achieved at Track 1 sites is meant to be safe for *any* use.

The draft regulations weaken the statute's preference for permanence and distort its designation of Track 1 as a permanent remedy by failing to create any truly permanent cleanup category. In direct contravention of the statute, the regulations establish that: "The use of a site shall be either for unrestricted or restricted use, with the exclusion of any use as a farm" (*draft* 375-1.8(g)). This effectively eliminates permanence as an option and negates Track 1's designation as a permanent remedy. The "unrestricted use" standards, as developed by DOH, are not protective of the use of a site as a farm, and so Track 1, in which the "unrestricted use" standards must be achieved, is in reality not a permanent remedy.

Moreover, the regulations fail to ensure that use restrictions will be employed to ensure that no site is used as a farm. In the draft regulations, "Unrestricted use" is defined for all programs as "without imposed restrictions, such as environmental easements or other land use controls" (*Draft* 375-1.8(g)(1)). Under the Brownfield program, Track 1 is clearly designated as "Unrestricted use," which is defined as:

> "a cleanup level that will allow the site to be used for any purpose without: (a) any restrictions on the use of the site (e.g. residential, commercial or industrial); or (b) the reliance on the long-term employment of institutional or engineering controls" (*draft* 375-3.8(e)(1)).

No requirements for the creation, monitoring and enforcement of use restrictions are established in the regulations for cleanups under Track 1. Since "unrestricted use" sites won't have warnings added to the property deed, and easements will not be created or monitored by DEC, in the future no one will know that the site isn't safe for farming.

The regulations also establish a clear preference for remedies that achieve a "complete and permanent cleanup" for all remedial programs. While a definition of "permanent cleanup" is not provided in Subpart 375-1, it is provided in Subpart 375-3, where it is defined as one which

> "would allow a site to be used for any purpose without restriction and without reliance on the long-term employment of institutional or engineering controls" (*draft* 375-1.8(f)(3) and 375-3.2(e)).

In addition, the regulations, like the statute, would exempt Track 1 cleanups from the "change of use" reopener for liability (*draft* 375-3.9(b). These provisions clearly conflict with the restriction on the use of any site as a farm.

The draft regulations also establish two separate sets of soil cleanup standards for unrestricted use sites, one that is protective of both human health and groundwater, and one that is protective of ecological resources. Out of 86 chemicals in total, the proposed standards for protection of ecological resources exceed the proposed unrestricted standards for 20 chemicals, with half of those being metals. As discussed in more detail below, the proposed standards for protection of ecological resources only apply where DEC concludes that such resources are "present." Apart from the concerns about this approach discussed below, limiting the protection of ecological resources at unrestricted use sites doesn't make sense because such sites by definition must be clean enough for any use, including the use of the site to support ecological resources. Similar to the farm restriction discussed above, allowing Track 1 "unrestricted" cleanups to achieve contaminant levels that are not protective of ecological resources amounts to a use restriction that both contravenes statute and is unenforceable due to the way both the law and regulations are structured.

Recommendations:

Create a true "unrestricted use" category, safe for any use.

DEC should remove the proposed restriction on the use of any site as a farm, and eliminate the use of two separate sets of cleanup standards for Track 1, "unrestricted use" sites. DOH should develop soil cleanup standards for the "unrestricted use" category which are safe for farming, and one set of cleanup standards, that protects both public health and ecological resources, should apply to Track 1 sites.

Apply the definition of "permanent cleanup" to all remedial programs.

The definition included in Subpart 375-3 should be included in Subpart 375-1.

Eliminate the New Category of "Restricted-Residential Use"

The draft regulations create a new "restricted-residential" category that would allow higher levels of contamination to remain at residential sites as long as vegetable gardens are not planted. (DEC is authorized to approve vegetable gardens at such sites in specially-designated locations). As drafted, this category would apply to the vast majority of residential uses – only single family homes are excluded. (*Draft* 375-1.8(g)(2)(i))

A "restricted-residential" use category was not contemplated in the Brownfield statute, which explicitly lists only three uses for a site, "unrestricted," "commercial," and "industrial." No explicit limitation on the number of categories of uses is established, but neither is expansion of the statutory number explicitly contemplated—the language reads "including," not "including but not limited to." (§27-1415(6)(a))

In addition, the statute explicitly excludes reliance on institutional controls to restrict activities at Track 1, 2 or 3 sites that would normally fall within the land use category anticipated for the site. All soils at Track 1, 2 or 3 sites must meet soil standards developed for the site's intended use "without the use of institutional or engineering controls to reach such [standards]" (ECL §27-1415(4)).

DEC's proposed approach is neither practical nor enforceable in the real world. It will be hard enough to ensure that only those activities traditionally associated with residential, commercial and industrial use are allowed on "restricted-use" sites. These categories of use at least have some connection to land-use designations commonly used in zoning and land use law, and are broadly understood by the general public. In contrast, the new "garden restriction" proposed by DEC carves just one activity out of a broad category of land use. Currently, DEC lacks the resources to monitor dams adequately. It does not have the resources necessary to track the existence and location of vegetable gardens at former Brownfield sites.

Recommendation:

Eliminate the unenforceable "restricted-residential use" category.

The proposed "restricted-residential use" category is not supported by statute and is unenforceable in practice. It should be eliminated.

Expand the "Unrestricted Use" Category

The draft regulations include passive recreational uses, such as golf courses, bike or walking paths, tennis courts, green space "or other public uses with limited potential for soil contact" under the "restricted-commercial use" category (*draft* 375-1.8(g)(2)(ii)). Most people don't make a distinction between "passive" and "active" recreational areas – they are as likely to sit down and eat lunch on the grass alongside a bike or walking path as they are at a picnic area. In addition, placing use restrictions on such sites as parks and walking areas is practicably unenforceable.

In the fact sheets on DEC and DOH's proposed approach to developing the soil cleanup standards released in May 2004, camps, camping facilities and resorts were included in the "unrestricted use" category, which makes sense (DEC and DOH, 2004). The draft regulations fail to categorize these uses.

Recommendation:

Include "passive" recreational uses and camping in the "unrestricted use" category.

DEC should require all sites that are to be used for "passive" recreational activities to be cleanup up to "unrestricted use" levels. In addition, camps, camping facilities and resorts, which are not mentioned in the draft regulations, must also be included in the "unrestricted use" category.

Base Use Determinations on More than "Ground Level" Activities

The draft regulations state that "for purposes of determining the appropriate land use category, the applicant will consider the nature of the development and the activities which are occurring, or may occur at the site: *(a) on the ground level of any structure*; (b) on the surrounding land; or (c) in the subsurface to a depth of 15 feet below the site" (*draft* 375-3.8(e)(2)(iv)). Many buildings have mixed uses, for example a commercial use on the ground floor and residential uses on the upper levels. The risk assessment performed to develop soil cleanup standards was based on exposures that occur when children play outdoors in residential areas or groundskeepers work outdoors at industrial sites. These pathways are not controlled by what activities take place on the ground level of a structure. An entire site's current and future use should be considered when determining the appropriate land use category, not just activities occurring "on the ground level of any structure."

Recommendation:

Applicants and DEC should take all activities that can reasonably be anticipated to occur at a site into account when determining the appropriate land use category, and propose or select a remedy for the site suitable for the most protective applicable category.

List Statutory Criteria for the Development of Soil Cleanup Standards

The statute establishes that the generic soil standards developed for Track 1 and Track 2 cleanups "shall be protective of public health and the environment pursuant to subdivision one of this section" (§27-1415(6)(b)). Subdivision one of section §27-1415 in turn establishes that:

> "All remedies shall be protective of public health and the environment including but not limited to groundwater according to its classification . . . ; drinking water, surface water, and air (including indoor air); sensitive populations, including children; and ecological resources, including fish and wildlife."

In developing generic tables of soil standards, DEC and DOH are further directed to consider: applicable and relevant and appropriate standards, criteria and guidance; "the behaviors of children"; "the protection of adjacent residential uses"; "contaminants which act through similar toxicological mechanisms or have the potential for additive and/or synergistic effects"; "exposure to the same contaminant or group of contaminants from other sources and routes"; and the feasibility of achieving more stringent objectives, "based on experience under the existing state remedial programs, particularly where toxicological, exposure, or other pertinent data are inadequate or nonexistent for a specific contaminant" (§27-1415(6)(b)(i)-(v)).

The draft regulations do not contain any of this language and are silent on how generic soil cleanup objectives (under Track 2) and site-specific soil cleanup objectives (under Track 3) are to be developed. While the "Technical Support Document" (TSD) for the development of Brownfield Cleanup Program soil cleanup objectives describes and discusses some of the criteria listed in §27-1415(6)(b)(i)-(v), the first set of criteria (those associated with protection of public health and the environment listed in §27-1415(1) and incorporated by reference in §27-1415(6)(b)) are never explicitly listed as a group, and some, such as the protection of surface water, are never discussed at all.

Indeed, at no point in the more than 72 pages of regulations and over 1,000 pages of supporting documentation do DEC and DOH provide a clear list of the criteria established in statute for the development of soil cleanup standards. Furthermore, as discussed in more detail below, the draft regulations would allow the "clean" soil standards developed under Track 2 and Track 3 to be so high as to pose a long-term threat to groundwater, and to threaten surface water, indoor air and adjacent residential uses through water erosion, vapor intrusion, and wind erosion. This is a major oversight. It threatens the protectiveness of Track 1 and 2 cleanups, fails to provide adequate guidance for the development of protective site-specific soil standards under Track 3, and has resulted in the development of generic soil cleanup standards for Track 2 sites that are so high that they approach or may even exceed the level of cleanup that can reasonably be expected to occur at Track 4 sites (see discussion under "Background and Overview" above).

Recommendation:

Re-write the regulations to explicitly list all the criteria established in statute for the development of soil cleanup standards.

DEC should re-draft the regulations to include an explicit list of all the criteria established in statute for the development of soil cleanup standards, including those listed in §27-1415(1) and those listed in §27-1415(6)(b)(i)-(v). Furthermore, and as discussed in more detail below, the draft standards must be recalculated to ensure that all of them are protective of groundwater, surface water, air, indoor air, sensitive populations, children and ecological resources, including fish and wildlife; and take into consideration the behaviors of children, protection of adjacent residential uses, contaminants which act through similar toxicological mechanisms or have the potential for additive and/or synergistic effects, exposure to the same contaminant or group of contaminants from other sources and routes, and the feasibility of achieving more stringent objectives based on experience under existing state remedial programs.

Protect Ecological Resources

The statute establishes that the generic soil standards developed for Track 1 and Track 2 cleanups "shall be protective of public health and the environment pursuant to subdivision one of this section" (§27-1415(6)(b)), which includes the protection of "ecological resources, including fish and wildlife" (§27-1415(1)). Further, the statute specifies that:

> "The regulations shall include three generic tables of contaminant-specific remedial action objectives for soil based on a site's current, intended or reasonably anticipated future use, including (i) unrestricted, (ii) commercial and (iii) industrial" (§27-1415(6)(a)).

In contrast, the draft regulations contain six sets of generic soil cleanup standards: "Unrestricted Use-Protection of Public Health" (which includes the protection of groundwater); "Unrestricted Use-Protection of Ecological Resources"; "Restricted Use-Protection of Public Health", which includes "Restricted-Residential", "Restricted-Commercial", and "Restricted-Industrial"; "Restricted Use-Protection of Ecological Resources"; and "Restricted Use-Protection of Groundwater" (d*raft* 375-3.38 Tables (a) & (b)). A sample table is provided below for one metal and one organic chemical:

Contaminant	**Track 1 – Unrestricted Use**		**Track 2 – Restricted Use**				
	Public Health	*Ecological Resources*	*Restricted-Residential*	*Restricted-Commercial*	*Restricted-Industrial*	*Ecological Resources*	*Groundwater*
Lead	400	63	400	1,000	3,900	63	450
Trichloroethene (TCE)	0.47	2	21	200	400	2	0.47

As proposed, the regulations would only require remedial programs to achieve soil cleanup standards that are protective of ecological resources "where the Department has determined ecological resources are present" (d*raft* 375-3.8(e)(2)(ii)(b)). "Ecological resources" are defined as "all flora and fauna and the habitats that support them, excluding such species as pets, livestock, agricultural and horticultural crops" (*draft* 375-1.2(n)). In addition, the TSD states that the proposed soil cleanup standards for "protection of ecological resources" were developed considering only the protection of *terrestrial* ecological resources (p. 6). As a result, the standards do not protect livestock, crops, aquatic organisms or pets at all.

This limited approach to the protection of ecological resources is out of keeping with the statute, which requires that all remedies be protective of "public health and the environment including . . . ecological resources, including fish and wildlife" (§27-1415(1) emphasis added). First, it places arbitrary limits on what qualifies as "ecological resources," limits that are not supported by law. The statute clearly includes "fish" in its definition of "ecological resources." Moreover, the long-standing statutory definition of "environment" under the Environmental Conservation Law is comprehensive and inclusive, in the same way that the draft regulations define "environment" inclusively to mean:

> "any water including surface or groundwater, sediment, water vapor, any land including land surface or subsurface, air including soil vapor, fish, wildlife, other biota, all other natural resources and humans" (*draft* 375-1.2(q).

This definition certainly includes livestock, crops, aquatic organisms and pets.

Any Track 1 or Track 2 residential site that is not cleaned up enough to be safe for the raising of livestock, keeping of pets, or growing of crops and other plants is not truly unrestricted or safe for residential use. Ellen Harrison, Director of the Cornell Waste Management Institute at Cornell University, observes that:

> "Farming if defined to include raising domestic livestock, is a reasonable scenario for residential use. Raising chickens or animals for meat and milk poses risks not assessed in developing the [soil cleanup standards]. Particularly for organic chemicals with a tendency to bioaccumulate in fats, this is a concern. There is no effective way to preclude raising of animals by households. Thus this needs to be assessed and addressed in the proposed [soil cleanup standards]" (Harrison, 2006).

Dr. Murray McBride, a Professor of Soil Sciences in the Department of Crop and Soil Sciences, Cornell University, performed a detailed analysis of a number of important issues having to do with the soil cleanup standards developed by DEC and DOH (McBride, 2006). One issue he studied is the impact of soil contaminant levels on plants. Copper, nickel and zinc are toxic to plants. Dr. McBride determined that the levels of copper, nickel and zinc that would be allowed at restricted-residential sites (270 ppm, 130 ppm and 2,200, respectively),

> "are likely to be toxic to crop plants as well as many native plants in soils with certain properties. Specifically, coarse texture, pH below 6 and low organic matter are all soil conditions that will render these metals more toxic. Gardening could be difficult or impossible if soils contained concentrations of metals near these allowed limits" (Mcbride 2006, p. 1).

As for pets, hurricane Katrina and the flooding of New Orleans demonstrated that people care deeply about their pets and want them to be protected. The exposure of pets to contaminated soils is most likely to occur in residential settings and in parks and recreational areas, although commercial settings such as kennels could also be of concern, as well as pets exposed to contaminated surface soils by trespassing onto commercial and industrial properties that are not fenced off. It is virtually certain that many people living in single family residences will choose to keep pets, especially dogs and cats, in their backyards for extended periods of time. Even in housing complexes, pets are likely to be in intimate contact with exposed surface soils. Dogs and cats dig in the earth, lie on the ground, eat grass occasionally, roll around in the dirt and lick their fur clean, and in general can be expected to have a great deal of contact with surface soils, including soil ingestion.

The second major weakness with DEC's approach is that no criteria or guidelines are established regarding how the determination of "presence" will be made. Statements made by DEC staff at public hearings held across the state indicated that the determination of "presence" would focus entirely on an assessment of the contaminated site itself, narrowly defined as the area subject to remediation, regardless of whether or not wildlife habitat such as meadows, forests or wetlands were located on the same parcel of real property or nearby on adjacent sites. Staff did not indicate that the construction of barriers would be required to restrict the movement of wildlife onto a site.

This approach to protecting ecological resources does not appear to be based on science. It is not based on a scientific assessment of whether wildlife would have access to the area containing residual contamination. It fails to account for the movement of wildlife, which do not recognize property boundaries, and are even less likely to recognize the distinction between contaminated and uncontaminated areas of a site. Nor does it appear to be based on a scientific assessment of the potential for ecological resources to be adversely impacted by the movement of residual contamination from the site.

In addition, the Brownfield statute requires a scientific assessment of possible impacts on ecological resources. The statute's remedial investigation requirements specify that a qualitative exposure assessment "shall qualitatively determine the route, intensity, frequency, and duration of *actual or potential exposures of humans, fish and wildlife to contaminants*." (§27-1415(2)(b) emphasis added). In addition, the statute explicitly directs DEC to take natural resources into account when determining the current, intended, and reasonably anticipated future land use of a site, including "proximity of the site to

important federal, state or local natural resources, including *waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species*" (§27-1415(3)(i)(xii) emphasis added).

Not only does DEC's proposed approach fail to protect ecological resources, it creates a perverse incentive for applicants to eliminate ecological resources from a site, and a disincentive for the creation of new habitat. The BCP is a voluntary cleanup program, and in many cases the applicant will both propose and select the remedy for the site. If applicants can avoid having to achieve more stringent and expensive standards for the protection of wildlife simply by paving over a limited area, they will be tempted to do so. There is nothing in the regulations that would prohibit a developer from destroying habitat prior to applying for entry into the BCP or from choosing to modify the site design in such a way as to pave over the area to be considered by DEC in its determination of "presence."

Recommendations:

Re-calculate the soil cleanup objectives to be protective of all ecological resources.

Ecological resources should be defined to include all biota, including pets, livestock, agricultural and horticultural crops. DOH should re-calculate soil cleanup objectives that are protective of aquatic as well as terrestrial organisms, and are protective of pets, livestock and crops.

Establish protective and scientifically based criteria for determining when ecological resources may be exposed to soil at contaminated sites.

All soils with the potential to impact ecological resources should be protective of those resources. Such resources should be defined to include all biota, including aquatic organisms, fish, wildlife, pets, livestock, agricultural and horticultural crops.

Protect Groundwater

The statute establishes that the generic soil standards developed for Track 1 and Track 2 cleanups "shall be protective of public health and the environment pursuant to subdivision one of this section" (§27-1415(6)(b)), which includes the protection of "groundwater according to its classification" (§27-1415(1)). The statute's Declaration of Policy states that "All remedies shall be fully protective of public health and the environment including, but not limited to, groundwater according to its classification . . ." and that: "A remedial program that achieves a permanent cleanup of a contaminated site, including the restoration of groundwater to its classified use, is to be preferred over a remedial program that does not do so" (§27-1403).

In addition, at the same time as the Brownfield Cleanup Program statute was enacted, a new Title 31 of Article 15 of the Environmental Conservation Law was enacted establishing a "Groundwater Protection and Remediation Program." Established in recognition of the fact that groundwater contamination at superfund, brownfield and other contaminated sites "cumulatively could endanger the integrity of the water resources of New York state," the purpose of the program is for DEC to "develop a strategy to address contaminated groundwater and implement a program to remediate and manage groundwater in a manner that will ensure long-term sustainability," "including strategies to protect groundwater from future degradation from contaminated sites" (§15-3103(2); §15-3105; and §15-3109).

The new law explicitly states that "while the current use of groundwater as drinking water may be considered" by DEC in developing those strategies, "the absence of such use shall not exclude the need for remediation" (§15-3109(1)). It is clear from the language in both the Brownfield and Groundwater

Protection statutes that the intent of the Governor and the Legislature was *not* to allow groundwater to remain contaminated simply because it is not currently being used and systems are in place to control off-site migration. The clear goal, and indeed mandate to DEC, is "long-term remediation" (§15-3109) and "restoration" (§27-1403).

In contrast, the draft regulations state that when "groundwater standards are being contravened" a remedial program does not have to achieve soil cleanup standards that are protective of groundwater if

> "(1) the source has been addressed . . . ; [and] (2) a groundwater restriction is employed; [and either] (3) there is no off-site migration of contaminated groundwater; or (4) a groundwater remedy is in place to control or treat any off-site migration of contaminated groundwater" (d*raft* 375-3.8(e)(2)(ii)(a); the brackets indicate language provided by DEC that would correct a typo in the original draft).

The proposed standards for "restricted-residential," "restricted-commercial" and "restricted-industrial" use presented in Table 375-3.8(b) were developed without considering the protection of groundwater at all. They frequently exceed the standards proposed for the protection of groundwater by an order of magnitude or more. Indeed, 34 out of 86 of the standards proposed for industrial use exceed the standard proposed for the protection of groundwater by three orders of magnitude or more. In other words, they are 1,000 or more times less protective than the level needed to protect groundwater.

These standards are the ones that will apply to all sites that meet the exemption language quoted above. In other words, soil cleaned up to mandated "clean" levels will still pose a considerable threat to groundwater quality, especially at industrial use sites. DEC's adoption of this approach means that groundwater will be written off. Using the existing Superfund program as a model, it can be expected that a large number, if not the majority of sites, will meet the conditions that groundwater is not currently being used and some type of pump-and-treat system has been installed. This approach fails to meet both the letter and spirit of the Brownfield and Groundwater protection laws because it threatens the goal of groundwater restoration and would preclude DEC's ability "to protect groundwater from future degradation" regardless of whether groundwater is currently being used for drinking water or not (§15-3109(1)).

Dr. Brian K. Richards and Dr. Tammo Steenhuis, a Senior Research Associate and Professor of Water Management in the Department of Biological and Environmental Engineering at Cornell University, analyzed the approach used by DEC to develop the groundwater protection standards. Their analysis raises concerns for both the short- and long-term protection of groundwater (Richards and Steenhuis, 2006). Richards and Steenhuis explain that DEC used a simple linear soil-to-water partitioning coefficient coupled with a dilution/attenuation factor (DAF) to back-calculate allowable soil contaminant concentrations based on acceptable groundwater contaminant concentrations. The soil:water partitioning coefficient is an experimentally determined value that reflects the tendency of a contaminant to adhere to soil or soil organic matter rather than move into, and with, water. The DAF represents the reduction of contamination due to adsorption, degradation and groundwater dilution in the path between leachate production and groundwater use.

Richards and Steenhuis raise a number of concerns about this approach. First, it appears that DEC used a high soil pH value (6.8) for all its partitioning calculations. Given the acidic nature of many New York soils and ongoing acidification from acid rain, Richards and Steenhuis recommend a more protective level of 5.5, which would decrease the partition coefficient values used by DEC by a factor of 2 or more for contaminants that are pH-sensitive, resulting in directly proportional reductions in the groundwater protection soil cleanup standards. In other words, standards for pH-sensitive elements should be reduced by at least half (p. 2).

DEC's approach also failed to consider the potential for "facilitated transport," where contaminants that tend to adhere strongly onto soil particles are transported into water when the soil particles themselves move with water. Simple partitioning coefficient equations such as that used by DEC underestimate the transport of such contaminants because they fail to account for the portion of contaminants that move attached to soil particles. The "classic" example of this type of transport cited by Richards and Steenhuis is the movement of radionucleides on the scale of kilometers when models based on partitioning alone predicted movement on the scale of millimeters. (p. 2, 4)

Third, and perhaps most problematically, DEC uses a DAF of 100 for all its calculations. As Richards and Steenhuis observe, this factor is "based on science prior to 1990 when less was known about contaminant transport" (p. 3). It is a one-size-fits-all approach, which applies a single attenuation factor equally to both highly adsorptive vs. non-adsorbed, and rapidly degradable vs. nondegradable contaminants. They point out that more meaningful DAF factors can be calculated based on travel time, degradation rates and partitioning coefficient values. (p. 3) In other words, DEC's approach to assessing groundwater impacts is based on an overly simplistic, if not outdated, model.

In many cases, Richards and Steenhuis note, a DAF of 100 is very conservative, and actual contaminant reductions may be far greater than 100-fold (p. 3). On the other hand, there is presently no method available to predict travel time that includes the impact of "facilitated transport" as described above, or "preferential flow" through large openings in the soil that result from root penetration, animal burrowing or freezing and thawing. Soils that are coarse or sandy, or strongly-structured but with well-defined flow paths (such as clay soil with cracks), are particularly susceptible to "preferential flow". Richards and Steenhuis conclude that these phenomena can result in much more rapid movement than predicted by other DAF considerations, and support the adoption of "conservative' DAF values in vulnerable groundwater situations (pp. 3-4).

Richards and Steenhuis also point out a number of vulnerable cases where a DAF of 100 may not be protective. Currently, EPA's soil screening guidance documents use a DAF of 20 for general applications, while a DAF of 1 is used at sites with characteristics such as shallow water tables, fractured soil and rock, karst topography, or a contaminated area larger than 30 acres (p. 3). Richards and Steenhuis argue that the 30-acre threshold may be too large, especially where relatively shallow wells are tapping into a small aquifer with a small recharge area. Soils susceptible to "preferential flow" located over a shallow groundwater table can also result in actual rates of attenuation well below 100. (pp. 3-4)

Using a more sophisticated model than that used by DEC, Richards and Steenhuis calculated the travel time and attenuation factors for 13 key contaminants at Brownfield sites assuming a vulnerable-case scenario with shallow coarse soils. For four chemicals, TCE, PCE, vinyl chloride and chloroform, the predicted attenuation factors were far less than 100 at 2.1, 6.3, 3.7 and 16.2 respectively. Given these values, Richards and Steenhuis observe that it is "not surprising that these chemicals have been found in groundwater beneath contaminated sites in New York" (p. 6). Using these DAF values to calculate how contamination would affect groundwater, Richards and Steenhuis predict that soil contamination levels of TCE, PCE, vinyl chloride and chloroform equivalent to the groundwater protection cleanup standards would in reality exceed groundwater standards by a multiple of 47, 16, 27 and 6 respectively. For all 13 chemicals analyzed other than dieldrin, soils contaminated with levels at the proposed "restricted-industrial use" standards could result in "substantial exceedances" of groundwater standards at vulnerable sites, ranging from a multiple of 13 to 97. (pp. 6-7)

In terms of the threat to groundwater over time, Richards and Steenhuis demonstrate that the travel time of some contaminants, such as cadmium and zinc, may be so slow that sites currently not affecting groundwater quality may do so in the future (p. 5). This argues against the advisability of DEC's proposed policy of not requiring the clean up of soil to groundwater protective levels if groundwater standards are not currently being contravened.

Richards and Steenhuis also observe that "The proposed restricted use industrial soil cleanup objectives (SCOs) for a number of contaminants are likely to render groundwater in the area unusable into the foreseeable future" (p. 5). This certainly threatens the statutory goal of restoring groundwater quality over the long-term.

Another concern, especially for commercial and industrial use scenarios, is the potential for runoff to be concentrated as a result of impervious surfaces such as parking lots or roofs. Richards and Steenhuis illustrate that this can greatly increase the recharge rate around such structures, allowing for less degradation and leading to heightened groundwater contamination in a much shorter period of time (p. 5). Indeed, for eight of the chemicals analyzed by Richards and Steenhuis, including TCE, PCE, vinyl chloride and chloroform, soils contaminated with levels at the proposed "restricted-industrial use" standards under a concentrated runoff scenario could result in groundwater contamination levels 10,000 times higher than acceptable levels. (pp. 6-7)

Recommendations:

Utilize a more sophisticated and up-to-date model for contaminant transport.

DEC should utilize a more sophisticated and up-to-date model for the calculation of contaminant transport from soil to groundwater that is able to more accurately predict attenuation rates and travel times. Partition coefficient values should be appropriate for New York State's acidic soils, and safety factors should be applied to account for "facilitated transport" and "preferential flow".

Eliminate the exemption for sites where groundwater standards are not currently being contravened.

The proposed language exempting remedial programs from achieving soil cleanup standards that are protective of groundwater "unless groundwater standards are being contravened" (*draft* 375-3.8(e)(2)(ii) is not based on science. As the analysis performed by Richards and Steenhuis illustrates, soil contamination that has not yet impacted groundwater quality may still have the potential to do so in the future. Instead of relying on an overly simplistic contaminant transport model that may be overridden by observations in the field, a better approach would be to adopt a more sophisticated and up-to-date model able to more accurately predict attenuation rates and travel times based on contaminant and soil characteristics. Measurements of groundwater quality performed today may not accurately predict impacts on groundwater quality in the future.

Require all soil standards to be protective of groundwater, at least over the long-term.

No soil cleanup standard developed for Tracks 2 or 3 should be so high that it will pose a threat of groundwater contamination for more than 30 years.

Formalize a procedure wherein sites will be assessed for groundwater vulnerability and, if vulnerable, assigned to more protective levels.

In cases of special vulnerability, the use of "one-size-fits-all" generic soil cleanup standards may not be appropriate. DEC should develop special generic standards for cases where EPA's soil screening guidance utilizes a DAF of 1, such as shallow water tables, fractured soil and rock, karst topography, or a contaminated area larger than 30 acres. The development of site-specific cleanup standards should be required where the risk of "facilitated transport", "preferential flow"or concentrated runoff is high; or shallow wells are tapping into a small aquifer with a small, contaminated recharge area of less than thirty acres.

Redraft language on groundwater protection and control measures to better reflect statutory intent.

The draft regulations propose language in 375-1.8(d) that establishes requirements for the protection and control of groundwater. Much of this language, especially the clauses regarding source removal, plume containment and groundwater quality restoration, is important and implements key components of the Superfund, Brownfield and Groundwater Protection statutes. Some of the phrasing, however, is problematic. The phrase "All remedial programs shall *consider* the protection of groundwater" should be changed to "All remedial programs shall *protect* groundwater" (emphasis added). The hierarchy of protection and control measures, with source removal being most preferable and restoration least preferable, is awkward and fails to capture statutory intent. A better way to characterize the list would be: "The following is a list of measures which are to be used, ranked from highest priority in the short-term to highest priority in the long-term."

Protect Surface Water

The statute establishes that the generic soil standards developed for Track 1 and Track 2 cleanups "shall be protective of public health and the environment pursuant to subdivision one of this section" (§27-1415(6)(b)), which includes the protection of "surface water" (§27-1415(1)). The TSD and presentations by agency staff at the public meetings made it clear that protection of surface water was not considered in the development of the soil cleanup standards. Instead, DEC and DOH plan to rely on the installation, maintenance and long-term monitoring of engineered barriers and systems to restrict surface water runoff.

As discussed at length above, this approach is in direct contravention of the statute, which requires the soil cleanup standards to protect surface water and clearly states that Track 2 cleanups "shall achieve [soil cleanup standards] which conform with those contained in one of the generic tables developed pursuant to subdivision six of this section without the use of institutional or engineering controls to reach such objectives" (§27-1415(4) see discussion under "Background and Overview" above).

Drs. Richards and Steenhuis of the Cornell Department of Biological and Environmental Engineering observe that for some chemicals, the surface water pathway is very sensitive. Using copper as an example, they point out that the percentage of a watershed that could have soils at the level of contamination proposed for the protection of groundwater without causing a violation of DEC surface water criteria ranges from 0.3%-9% and only 0.003-0.08% could have soils at the restricted-industrial use standard without violating water quality standards (Richards and Steenhuis, 2006, pp. 7-8. (The range is due to different assumptions regarding hardness)).

Recommendation:

Require all soil standards to be protective of surface water.

DEC and DOH should re-calculate the soil cleanup standards to ensure that remediated soils will not pose a threat to surface water quality. Surface soil contaminant levels must be protective of surface water because some degree of erosion is bound to occur, even if soil is planted with grass.

Address Vapor Intrusion

The statute establishes that the generic soil standards developed for Track 1 and Track 2 cleanups "shall be protective of public health and the environment pursuant to subdivision one of this section" (§27-1415(6)(b)), which includes the protection of "air (including indoor air)" (§27-1415(1)). Vapor intrusion, the vaporization of toxic volatile chemicals from contaminated soil and groundwater up through cracks, gaps or pores in soil and foundations and into homes and other buildings, has emerged in recent years as a significant source of human exposure.

Vapor intrusion is known to have occurred at several Superfund sites in New York and has the potential to be a problem at Brownfield sites as well. DEC is currently undertaking an ambitious project to screen and evaluate the potential for vapor intrusion at hundreds of contaminated sites where remedial decisions have already been made. The New York State Assembly Committee on Environmental Conservation issued a final hearing report on vapor intrusion this January that discusses the complex and often controversial issues associated with vapor intrusion in detail (DiNapoli 2006).

The TSD explains that the possible impacts of vapor intrusion on indoor air quality were not addressed in the development of generic soil standards because too much uncertainty is associated with the scientific models used to predict vapor intrusion. Instead, vapor intrusion will be addressed at contaminated sites on a case-by-case basis pursuant to DOH's draft "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" (TSD §10.1).

The TSD states that none of the models currently available to predict vaporization from contaminated soil are protective enough. Yet, an analysis of the standards proposed by DEC and DOH recently completed by Dr. Anthony Hay, an Associate Professor of Soil Ecotoxicology at Cornell University, concludes that the draft soil standards for trichloroethene (TCE), tetrachloroethene (PCE), vinyl chloride and chloroform may be 10-100 times higher than the estimated soil concentrations of those chemicals associated with an excess cancer risk of one-in-one million when vapor intrusion is considered as a pathway (Hay, 2006).

TCE and PCE are highly volatile toxic chemicals that have been found at a large number of vapor intrusion sites. TCE is the main chemical concern at the most significant vapor intrusion sites identified in New York State to date, including the IBM Corporation Endicott Facility state Superfund site in Endicott; the Emerson Power Transmission state Superfund site in Ithaca; the Hopewell Precision Area federal Superfund site in Hopewell Junction, Dutchess County; the CAE Electronics site in Hillcrest, Broome County; and the GE Corporation site in Fort Edward, Washington County (DiNapoli 2006). Vinyl chloride and chloroform are also highly volatile chemicals that can be a concern for vapor intrusion.

Dr. Hay began by reviewing draft "target groundwater concentrations" developed by the U.S. Environmental Protection Agency (EPA) to screen chemicals that might pose a risk to human health due to vapor intrusion (EPA 2002). Using the same contaminant transport model used by DEC to calculate soil standards for the protection of groundwater (and discussed at length above under "Protect Groundwater"), he then calculated the level of contamination in soil that would cause groundwater to exceed EPA's draft "target groundwater concentrations" for TCE, PCE, vinyl chloride and chloroform.

The EPA target concentrations used by Dr. Hay correspond to an excess cancer risk of one-in-one million due to vapor intrusion and assume a soil gas to indoor air attenuation factor of 0.001.[1] As described

[1] This a fairly conservative assumption. Lenny Siegel, Director of the Center for Public Environmental Oversight in Mountain View, CA, attended EPA's national meeting on vapor intrusion this month in San Diego. He reports that scientists from NYS DOH and DEC, as well as one EPA scientist, gave presentations at that meeting showing that

above, DEC's contaminant transport model for groundwater uses a dilution attenuation factor (DAF) of 100 to account for the volatilization, sorption, and degradation of soil contamination before it reaches groundwater. In other words, the allowable concentration of a contaminant in soil that is arrived at by multiplying the soil's organic content, the chemical's partition coefficient and the allowable groundwater standard is then multiplied further by 100 to account for the breakdown of the contaminant in soil before it reaches groundwater.

Since EPA's "target groundwater concentrations" include their own attenuation factors to account for any processes that might affect the transfer of contaminants from groundwater up into a building, Dr. Hay concluded that using DEC's DAF number would be duplicative and inappropriate. Since the "target groundwater concentrations" used by Dr. Hay were roughly equivalent to the drinking water maximum concentration levels for TCE, PCE, vinyl chloride and chloroform, the contaminant levels calculated by Dr. Hay that take vapor intrusion into account were roughly 100 times more stringent than the standards proposed by DEC for the protection of groundwater.

But even if DEC's proposed DAF of 100 is applied to the calculations made by Dr. Hay, soil concentrations for TCE, PCE, vinyl chloride and chloroform that take vapor intrusion into account would be similar to the standards proposed by DEC for the protection of groundwater, and orders of magnitude lower than the proposed restricted-use standards. Specifically, the level of TCE developed taking vapor intrusion into account, 0.325 ppm, is 60 times more stringent than the draft residential standard for TCE of 21 ppm; 600 times more stringent than the draft commercial standard of 200 ppm, and over 1000 times more stringent than the draft industrial standard of 400 ppm. Similar differences exist between a standard that might protect for vapor intrusion and the draft restricted-use standards for vinyl chloride and chloroform, while a more protective standard for PCE is roughly 3, 20, and 40 times more stringent than the draft restricted-use standards, respectively, for residential, commercial, and industrial use. (See table below.)

Compound **(All units in ppm) (mg/kg)**	**Standard taking Vapor Intrusion into Account, no DAF**	**Standard taking Vapor Intrusion into Account, DAF = 100**	**DEC Proposed Groundwater Protection Standard**	**DEC Proposed Restricted-Residential Standard**	**DEC Proposed Restricted-Commercial Standard**	**DEC Proposed Restricted-Industrial Standard**
TCE	0.00325	0.325	0.47	21.0	200	400
PCE	0.01325	1.325	1.30	3.5	25	51
Vinyl Chloride	0.00022	0.022	0.02	0.9	13	27
Chloroform	0.04240	4.240	0.37	49.0	350	700

Dr. Hay is careful to emphasize that his calculations are only predictions based on assumptions used by both EPA and DEC. There is no guarantee that the soil concentrations calculated by Dr. Hay would be protective of human health, nor does his analysis prove that the soil standards proposed by DEC would be harmful to human health. His analysis does, however, suggest that vapor intrusion may be a sensitive exposure pathway that should be taken into consideration when establishing soil cleanup standards for brownfield sites.

It is crucially important that the soil standards developed for Tracks 1, 2 and 3 protect against vapor intrusion. If they do not, all sites with toxic volatile chemicals cleaned up under the state's new Brownfield program will require the installation of vapor mitigation systems. Soil contaminant levels

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an attenuation factor of 0.001 (indoor air concentration divided by soil gas concentration) is often not protective in predicting indoor air levels due to "geospatial" variability (personal communication, March 2006).

designated by DEC as “clean” will be present in soils in thousands of sites across the state for decades to come. Those levels should not in themselves pose a threat of vapor intrusion.

The TSD states that in lieu of protective soil standards, DEC and DOH will address vapor intrusion at contaminated sites on a case-by-case basis pursuant to DOH’s draft vapor intrusion guidance. That guidance, however, states that:

> “The soil vapor intrusion pathway must be investigated at any site with the following: a. an existing subsurface source . . . or likely subsurface source . . . of volatile chemicals . . . and/or groundwater or subsurface soil that contains concentrations of volatile chemicals in excess of their appropriate standard, criteria, or guidance concentration; and b. existing buildings or the possibility that buildings may be constructed near a subsurface source of volatile chemicals” (NYS DOH 2005, §2.1)

This language raises concerns that the Brownfield soil cleanup standards, once promulgated, may serve as a threshold for determining the potential for vapor intrusion problems at Brownfield sites, even though the standards themselves may be high enough to cause vapor intrusion.

Recommendations:

Take vapor intrusion into account in the development of soil cleanup standards.

DEC and DOH should re-calculate the soil cleanup standards proposed for volatile organic chemicals to help ensure that they are low enough not to result in vapor intrusion. Even though much uncertainty is associated with the prediction of vapor intrusion, it is simply not acceptable to promulgate soil cleanup standards that may be 10, 100 or 1000 times higher than may be needed to protect against vapor intrusion. We must use the knowledge we have today, however imperfect, to attempt to eliminate this important source of direct human exposure.

Re-draft the vapor intrusion guidance to ensure that soil cleanup standards will not be used to rule out the possibility of vapor intrusion.

DOH should re-draft the vapor intrusion guidance to make it clear that the new Brownfield soil cleanup standards will not be used to rule out the possibility of vapor intrusion. Given the state of our scientific understanding, it is not clear that any level of volatile organic chemical contamination in soil is protective against vapor intrusion. When screening sites where volatile organic chemicals are present in soil, the sampling of sub-slab vapor levels and indoor air should be required to rule out the possibility of vapor intrusion. External soil gas sampling should only be relied on when no buildings exist on a site. It is my understanding that this is the approach already being taken by DEC and DOH when screening sites. The sampling of sub-slab and indoor air levels is strongly recommended Lenny Siegel, Executive Director of the Center for Public Environmental Oversight in Mountain View, California (Siegel 2006).

Protect Children

The statute establishes that the generic soil standards developed for Track 1 and Track 2 cleanups “shall be protective of public health and the environment pursuant to subdivision one of this section” (§27-1415(6)(b)), which includes the protection of “sensitive populations, including children” (§27-1415(1)). In addition, in developing the generic standards, DEC and DOH are directed to consider "the behaviors of children" (§27-1415(6)(b)(ii)).

The TSD makes it clear that DOH considered the protection of children and their behaviors in the development of generic soil cleanup standards for Track 1 and Track 2. The incidental and direct ingestion of soil by children was considered for unrestricted, residential and commercial use, and the exposure of an adolescent trespasser was considered for industrial use. Despite the agency's efforts, however, the draft standards do not adequately protect children because they are based on inadequate assumptions regarding levels of exposure and out-of-date scientific evidence regarding toxicity.

Dr. Nathan Graber and Dr. Nita Vangeepuram, Fellows in Pediatric Environmental Health, and Dr. Winston Kwa, Resident in Environmental and Occupational Medicine, all from the Mount Sinai Medical Center, performed a detailed analysis of the methods used to develop the soil cleanup standards. Their analysis and recommendations are presented in comments submitted to DEC and DOH on the draft regulations by the Pediatric Environmental Health Specialty Unit at Mount Sinai (Graber, *et al* 2006). The findings below and recommendations that follow are drawn from Graber, Vangeepuram, and Kwa's work. Unless otherwise noted, all citations are to their work.

- Little is known about the possible toxicity of many chemicals. Only about half of the high production volume chemicals have been tested for their potential to cause toxicity, and a mere 7% have been tested for their potential to interfere with childhood development. (p. 3)

- Children, including children in the womb and adolescents, are uniquely vulnerable to the toxic effects of chemicals due to increased susceptibility and increased risk of exposure. Yet many assumptions made by DOH in developing soil cleanup standards fail to take these unique vulnerabilities into account. For example, new research published by EPA in 2005 suggests increased susceptibility to cancer from early-life exposure and new EPA guidance finalized in 2005 requires the use of an additional safety factor for carcinogens where exposures to children are plausible. But the TSD does not differentiate adult or child exposure or apply such an additional safety factor for cancer risk. (pp. 2-5 and Burns 2006, Part I, Section 3; see also US EPA 2005)

- It is nearly universal that children will reach a level of maturity associated with wandering onto adjacent properties and placing themselves at an increased risk of exposure prior to adolescence. In the absence of a physical barrier, such as a well-maintained fence, combined with parental education and guidance regarding the risks of trespassing, children are likely to enter adjacent properties. (p. 5) This concern is shared by Dr. David Carpenter, Director of the Institute for Health and the Environment, State University of New York at Albany (Carpenter, 2006, p. 2).

- The toxicity values used by DOH are not necessarily based on the best currently available scientific evidence. Those values were selected from values published by government agencies, including EPA, ATSDR, the World Health Organization (WHO), Health Canada, DOH, DEC and the California Environmental Protection Agency. A substantial number of new studies containing evidence on the toxicity of chemicals have been published since these agencies conducted their reviews. For example, a new study on the toxicity of arsenic documents that exposure at much lower levels than previously thought results in reduced intellectual function. Based on this new study, the health-based soil cleanup levels developed by DOH for unrestricted and restricted-residential use are 13 times too high to protect children's development. (pp. 2, 6-8)

- Lead is another chemical for which a great deal of new scientific evidence exists, including growing evidence of the effects of even low levels on child intellectual function (pp. 7-8). Special concerns about lead were also raised by other scientific experts. Dr. Murray McBride of the Cornell Department of Crop and Soil Sciences states that the proposed unrestricted use standard for lead of 400 ppm "can be questioned as protective of human health." He points out that an extensive risk assessment performed to develop standards for the land application of sewage sludge arrived at a

lower limit of 150 ppm based on soil ingestion by children as the most sensitive pathway of exposure. (McBride 2006, p. 1; see also Burns, p. 17).

- In many instances, inadequate uncertainty factors were applied to account for gaps in current scientific knowledge, far below what is necessary to protect the developing child. (pp. 2, 8-9)

- Assumptions about the magnitude of exposure from particular routes do not adequately consider the risks for children. For example, the TSD invariably uses average values such as average weight, average amount of time spent outdoors, and average ingestion rates to estimate exposure. This approach fails to protect half of the children that will be exposed to contaminants at remediated Brownfield sites. (pp. 2, 10-12, 18)

- DOH analyzed only a small number of priority chemicals for acute toxicity associated with soil ingestion by children, and underestimated the amount of ingestion. The intentional ingestion of non-food items (also referred to as pica behavior) is estimated to occur in about half of children ages one to three. The ingestion estimate of 10 grams used by DOH is based on the observation of one child from one study, even though the range has been reported elsewhere as being as high as 60 grams for a single event. (pp. 2, 12-13, 18)

- Universal rules were applied for route-to-route extrapolation even though individual chemicals vary considerably. In addition, only adult parameters for inhalation rate and body weight were used to perform the extrapolation. (pp. 2, 13)

- Physiological parameters such as body weight, skin absorption and inhalation rate change with age, as do the risks of exposure due to developmentally appropriate behaviors. The physiological values used in DOH's calculations are often based on children older than those at greatest risk of exposure, or on adults. For example, it is more appropriate to estimate ingestion exposure based on the body weight of a nine-month old, rather than a two-year old child. Use of this lower value would result in soil cleanup standards almost one and one-half times lower than those proposed by DOH. (pp. 2, 14, 18)

- The soil cleanup objectives do not account for workers in direct contact with soil, placing their children at risk from take home exposures. Remediation workers may also bring home contaminants and endanger the health of their families if they do not receive proper training. (pp. 2, 15-16)

Recommendations:

Overall, DOH should use more protective assumptions and up-to-date scientific data to re-calculate the soil cleanup standards for protection of children. The recommendations below are drawn from the analysis and recommendations submitted to DEC by the Pediatric Environmental Health Specialty Unit at Mount Sinai Medical Center (Graber *et al*, 2006).

Require the construction of barriers to limit access to restricted-use sites and the posting of warning signs.

All contaminated sites in the restricted-use categories should be required to construct physical barriers and monitor those barriers over time. Clear signs labeling areas that are not safe for children should be posted.

Re-calculate the soil cleanup standards using up-to-date toxicity information, more appropriate uncertainty factors, upper range values to estimate exposure, more protective assumptions regarding intentional soil ingestion, a more valid approach to route-to-route extrapolation, and more appropriate physiological parameters.

DOH should re-calculate the soil cleanup standards using the most up-to-date information (including toxicity data for children where available). In particular, DOH should perform a detailed analysis of lead. In addition, a regular schedule of review should be established to ensure that the standards are based on the best available evidence into the future.

A minimum uncertainty factor of 900 or 1000 should be used to protect children when using toxicity values derived from animal studies. When deriving values from human epidemiological data, a minimum uncertainty factor of 10 is indicated and in the majority of cases, a factor of 100 or more is required to be protective. DOH should review the source of the toxicity values used to develop soil cleanup standards in order to determine when additional uncertainty factors need to be applied.

DOH should use upper range instead of average values to estimate exposure, including rates of ingestion, body weight, and time spent outdoors. Whenever available, the most conservative evidence-based exposure estimates should be employed as predictors of potential exposure for children. In the absence of such evidence, more realistic assumptions about the behaviors of children that can lead to exposure should be employed.

DOH should use more appropriate assumptions regarding the amount of soil ingestion associated with intentional ingestion behavior, extend their assessment of acute adverse effects to sub-acute effects, and expand their analysis to include a much broader range of priority contaminants.

DOH should reassess the validity of its approach to route-to-route extrapolation, and re-calculate its analyses using child parameters.

DOH should use the body weight, body surface area and inhalation rate of younger children who are at the highest risk of exposure and damage from that exposure.

Require Hazwoper training for all workers on former contaminated sites, as well as all remediation workers.

All workers on former contaminated sites with close contact to the soil should receive "Hazardous Waste Operations and Emergency Response" (Hazwoper) training developed pursuant to the Occupational Safety and Health Act (OSHA) in order to avoid bringing home contamination at levels that might affect the health of their families and children. All remediation workers should also receive such training.

Protect Home Gardeners

Dr. Murray McBride with the Department of Crop and Soil Sciences at Cornell University reviewed DOH's approach to assessing the home garden pathway (McBride, 2006). According to Dr. McBride, the method used by DOH to estimate exposure from the consumption of garden crops grown on contaminated soil was to multiply the incidental soil ingestion rate by a factor of 5 (TSD p. 99).

Dr. McBride characterizes this approach as "arbitrary" and expresses concern that it "is not conservative for metals readily taken up through plant roots, and could seriously underestimate additional exposure to toxins from gardening activity." Using the example of cadmium, McBride illustrates that the actual rate

of ingestion through food consumption is equal to or above 5.3 mcg/day compared to the 0.22 mcg/day value used by DOH. (McBride, 2006, pp. 7-9) This amounts to a more than ten-fold increase in exposure potential.

Recommendation:

Use a more scientifically accurate and protective method to assess the home garden pathway.

DOH should re-calculate the risks posed by the home garden pathway based on the uptake of contaminants by plants and protective assumptions regarding food consumption. Using incidental soil ingestion rates to estimate exposure through crop consumption is not scientifically defensible.

Protect Workers at Remediated Sites

As currently drafted, the soil cleanup standards do not protect workers adequately due to a failure to accurately characterize exposure and consider the most up-to-date scientific evidence regarding toxicity. Dr. Kathleen Burns, a toxicologist and Director of Sciencecorps, a not-for-profit environmental and occupational health organization, conducted a thorough analysis of DOH's assessment of risk to workers and found many instances where exposure and susceptibility were underestimated (Burns, 2006. Unless otherwise noted, all citations below are to this work). The most important weaknesses identified by Dr. Burns include:

- Failing to take adolescent and pregnant workers into account. In developing the soil cleanup standards for commercial and industrial uses, DOH identified adult groundskeepers as the most at-risk population. They did not consider pregnant workers or teens. A pregnant worker and her fetus are at particular risk of acute toxicity, an issue that was not adequately considered in the development of the standards as a whole. Teens are highly likely to engage in the relatively unskilled labor practiced by groundskeepers. Studies show that adolescents are more susceptible than adults to adverse impacts from chemical exposures, particularly neurological damage. Young workers should not be regarded as young adults. (Part I, Section 3; see also Graber *et al*, 2006, p. 1)

- Using the body weight of an adult male, rather than a female or adolescent workers (154 vs. 132 lbs.) (Part I, Section 1).

- Underestimating the daily ingestion rate for outdoor workers (100 vs. 480 mg/day) (Part I, Section 1 and Part II, Section 1).

- Failing to take indoor exposures into account (0 vs. 50 mg/day) (Part I, Section 1).

- Underestimating the amount of days per week groundskeepers work outdoors at industrial sites (2 vs. 4 days) (Part I, Section 1 and Part II, Section 1).

- Underestimating the number of weeks per year that groundskeepers would be exposed to soil (31 vs. 34 wks) (Part I, Section 1 and Part II, Section 1).

- Failing to assume groundskeepers would engage in activities, such as digging, that would generate high levels of dust (Part I, Section 1 and Part II, Section 1).

- Assuming a breathing zone of 5-6 feet above the ground, which is unrealistic for groundskeepers who often dig, plant, weed, mulch and engage in other activities close to the ground (Part I, Section 1 and Part II, Section 1).

- Overestimating the amount of vegetative ground cover (50% vs. a more realistic value) (Part I, Section 1 and Part II, Section 1).

- Using a sedentary rate of inhalation rather than a rate more appropriate to manual labor (10 vs. 20 m^3/8 hour shift) (Part I, Section 1 and Part II, Section 1).

- Mischaracterizing the clothing worn by groundskeepers, which results in an underestimation of skin area exposed (2,480 vs. 5,800-10,000 cm^2) (Part I, Section 1 and Part II, Section 1).

- Underestimating the rate of adherence and dermal absorption, which is higher for those engaged in manual labor (a factor of 0.2 vs. 0.3) (Part I, Section 1 and Part II, Section 1).

- Failing to account for the common practice of outdoor workers eating where they work.

Dr. Burns calculates that more realistic assumptions regarding body weight and ingestion rate would result in soil cleanup standards for "restricted-commercial use" that are least 13 times more protective than those proposed by DOH. For "restricted-industrial use," more realistic assumptions would result in standards that are at least 25 times more protective. (Part I, Section 1 and Part II, Section 1) She recommends applying a safety factor of 10 to all volatile chemicals or chemicals assumed to be particle-bound to soil to correct for underestimations of the inhalation rate (p. 33).

There is also an issue of whether DOH has accurately characterized the activities engaged in by workers at industrial sites that will lead to the highest levels of exposure. Ellen Harrison of the Cornell Waste Management Institute notes that there are potentially other exposures that need to be assessed, including site redevelopment and maintenance (repairs, laying pipes, new construction, and etc.) Such activities would also generate dust and mud that could result in the exposure of neighbors and other workers. Vapor intrusion into industrial buildings may also be significant. Contaminated groundwater might infiltrate into sewer lines, manholes and wastewater treatment plants and impact workers who must enter those spaces or work in such facilities. Many industries have floor drains that could be a source of vapors. (Harrison 2006, p. 2)

In developing the draft soil standards, DOH relied heavily on toxicity values published by government agencies. Dr. Burns observes that for some chemicals, these risk values were developed recently and incorporate the latest and most relevant scientific knowledge regarding toxicity. However, she notes that:

> "for many chemicals there are important studies published subsequent to the agency risk values, and it is essential that the study results be considered when establishing Brownfield standards. When values are used from risk values established in the early 1990's, the science used to establish those standards can reasonably be described as inadequate and probably also inadequately protective of the most vulnerable populations" (p. 14).

For example, Dr. Burns notes that 155 papers on the toxicity of cadmium have been published since the risk value used by DOH to develop the draft soil cleanup standard for cadmium was established in 1997, and even more studies on lead have been published since the risk value used to calculate the cleanup standard for lead was developed (Part II, Section 1). She notes that increasing bodies of evidence show "serious cardiovascular risk" is associated with exposure to arsenic and lead (Part III, Section 1).

Recommendations:

Use more protective assumptions and up-to-date scientific information to re-calculate soil standards for commercial and industrial use.

DOH should re-calculate the soil cleanup standards for commercial and industrial use sites with reliance on more accurate and protective assumptions regarding worker exposure. Specifically, the new assessment should take adolescent and pregnant workers into account; utilize the body weight of a female or adolescent worker; adopt a more accurate daily ingestion rate; take indoor exposures into account; adopt a more realistic weekly outdoor work rate; assume groundskeepers will be engaged in activities that generate high levels of dust; assume a breathing zone closer to the ground; assume a lower degree of vegetative cover; adopt an inhalation rate reflective of manual labor; better characterize the clothing worn by groundskeepers; adopt a more accurate rate of soil adherence and dermal absorption; and assume that outdoor workers will frequently eat where they work.

Require all workers with close soil contact to complete Hazwoper training.

Hazwoper training should be required for all workers who will have close contact with soil at a remediated commercial or industrial restricted-use site.

Protect Workers During Remediation

The remedial goal for the Brownfield Cleanup Program is to protect the health of future occupants and the surrounding environment of brownfield sites. The proposed regulations do not address the health and safety of remediation contractors, who are governed by Occupational Safety and Health Act (OSHA).

Numerous standards have been promulgated under OSHA that address the safety of the remediation workers. A comprehensive OSHA standard called "Hazardous Waste Operations and Emergency Response" (Hazwoper) protects workers at hazardous waste sites. It includes requirements for a written site-specific safety plan and 40 hours of training for remediation workers. Depending on what is at the site, the following may be required: air monitoring; medical surveillance; and specific control of hazards, such as the use of respirators, wetting down dusty operations or use of pressurized cabs.

Dr. Nathan Graber and colleagues at the Mt. Sinai Medical Center support the training of remediation workers in order to protect them, their families and communities (Graber *et al*, 2006, p. 16). The public can be endangered if remediation workers are not properly trained to appreciate the significance of chemical hazards. Hazwoper training provides remediation workers with the skills they need to recognize the potential health hazards posed by hazardous waste. By ensuring that remediation workers have Hazwoper training, the public will be better protected because workers will be more careful in their work practices to prevent off-site contamination (by using wet methods, for example) and they will take more care not to bring contamination off-site (by changing their clothes, for example).

Rather than making each municipality and contractor determine whether a brownfield site or specific contaminants should be covered by Hazwoper, the regulations should establish that all brownfield sites should conform with the Hazwoper Standard unless a site-specific characterization determines that full coverage is not needed.

Recommendation:

All sites should be required to comply with OSHA Hazwoper standards.

All remediation workers should receive Hazwoper training, regardless of how a site is classified. During remediation, all sites should be considered Hazardous Waste Operations covered by the requirements of the OSHA standard.

Use "Upper Range" Values to Assess Risk

The thorough analyses detailed above by both Dr. Nathan Graber and his colleagues at Mt. Sinai Medical Center and Dr. Kathleen Burns, a toxicologist in private practice, document the agencies' systematic use of "central tendency" values, otherwise known as average, or 50th percentile values, in the estimation of exposure rates and other parameters used to assess risk. This practice raises serious concerns that were discussed at length in the comments I submitted on the agencies' fact sheets regarding their conceptual approach to developing the soil cleanup standards released in May 2004.

Those comments quoted at length from a staff paper issued in 2004 by EPA's Office of the Science Advisor titled Risk Assessment Principles and Practices (US EPA 2004). Prepared in response to an initiative by the Office of Management and Budget (OMB) to gather public comments on risk assessment practices across the federal government, the document addresses the issue of conservatism head-on, and provides unequivocal support for EPA's longstanding practice of utilizing "high-end" hazard and/or exposure level values – "around 90% and above" – including the combining of such values.

EPA rightly concludes that such practices are designed "to ensure an adequate margin of safety for most of the potentially exposed, susceptible population, or ecosystem"; that they are consistent with EPA's legislative mandates; that they result in risk estimates that are "expected to be on the high end of the range of risks but within the range of plausible outcomes;" and that they are consistent with the National Research Council's landmark discussion of conservatism in 1994. (pp. 11-20)

One of the most salient points made in the EPA paper is that the level of conservatism in a final estimate of risk depends as much on the variability of the data within a given input's distribution and the sensitivity of the analysis to changes in the value chosen for a particular input as it does on the use of a 95th percentile value across all inputs. If all the input variables show the same variability, shape of distribution, number of data points, and other salient characteristics, then the compounding of three or more 95th percentile values might result in estimates above the 99.9th percentile. But, as EPA observes, "This is rarely the case in actual situations." Instead, in the more true-to-life situation "where all the input distributions are not the same," EPA concludes that "where the final estimate falls on the combined distribution depends on *which* input variable is selected as the 95th percentile" (p. 18; emphasis in original).

In other words, if all the assumptions with the exception of one in a given risk assessment represent high-end values, but the most sensitive or limiting assumption is not conservative, then the risk assessment itself will not be conservative. This reality strongly supports the need for transparency in the risk assessment process. In terms of the appropriate level of conservatism to be used in risk assessment, it suggests that abandonment of the use of high-end values in favor of means or upper mid-range values (for example the 75th percentile) is unwarranted and potentially unprotective.

The Brownfield Cleanup Program statute clearly directs DEC and DOH to err on the side of protection in developing generic tables of soil cleanup objectives, by mandating that such objectives be protective of public health and the environment (including groundwater, drinking water, surface water, air, indoor air,

sensitive populations, children and ecological resources) and directing the agencies to consider, among other factors, the behaviors of children, additive and synergistic effects, and multiple sources of exposure (see numerous citations above). These criterion are clearly health and protection based and do not consider costs or technological feasibility, except in the sense that feasibility can be considered to support the adoption of a standard that poses *less* risk than the threshold level of acceptable risk established in the statute (see discussion under "Consider Feasibility" below). This language is clearly as weighted toward protection as the language contained in the major federal environmental statutes cited by EPA as providing evidence of support for a conservative approach to risk assessment (US EPA 2004, pp. 14-16).

In developing the soil cleanup standards, DOH and DEC's goal should be to ensure that risk is not underestimated. While the "gross overestimation" of risk, as EPA phrases it, should also be avoided, the goal of protecting public health and the environment mandates that it is better to err on the side of overestimation than on the side of underestimation (p. 11). As EPA concludes:

> "[C]onsistent with its mission, EPA risk assessments tend towards protecting public and environmental health by preferring an approach that does not underestimate risk in the face of uncertainty and variability. In other words, EPA seeks to adequately protect public and environmental health by *ensuring that risk is not likely to be underestimated*" (p. 11; emphasis in original).

The Departments should adopt this philosophy in re-calculating the soil cleanup standards. The BCP statute's mandate to protect sensitive populations dictates the development of standards that are protective of the highest end of the population risk range, well into the 95th percentile and above. In other words, all plausible outcomes should be protected against. Protecting against plausible, real-life risk scenarios or adopting conservative assumptions in the face of uncertainty will not result in the gross overestimation of risk. Adopting high-end toxicity values and exposure levels is a valid way to protect more sensitive and susceptible populations, something that is mandated by the BCP statute.

Recommendation:

DOH and DEC should routinely use conservative estimates to assess risk.

DOH should adopt a policy of consistently using upper range instead of average values to estimate risk parameters. Those values should be conservative enough to protect the majority of those members of the population who are at greatest risk, including sensitive populations and children.

Re-Calculate Background Soil Levels for Some Chemicals

An analysis of the methodology used by DEC and DOH to calculate "rural" background levels was also performed by Dr. McBride of the Department of Crop and Soil Sciences at Cornell (McBride 2006). He comments that the proposed soil background values for a number of inorganic chemicals are too high, including cadmium, lead, beryllium and selenium. The levels of cadmium are "surprisingly high" in relation to data from other sources, and the values for lead are 3-5 times the normal background concentrations for lead of 10-20 mg/kg (ppm). He suspects that these anomalies might be due to analytical interference problems in the laboratory, and suggests an alternative method of analysis. (pp. 5-6)

Ellen Harrison of the Cornell Waste Management Institute concludes that DEC's "use of the 98th percentile value rather than the 95th percentile is not justified" in establishing soil background concentrations. Based on Dr. McBride's analysis, she observes that: "For many chemicals the numbers

are not very different, but for others use of the 98th percentile may result in excessively high values based on outliers." (Harrison, 2006, p. 3) Dr. Nathan Graber and his colleagues from the Mt. Sinai Medical Center note with irony that while DEC used high percentile values to estimate soil background contaminant levels, they used average values to estimate the degree of children's exposure to those contaminants (Graber *et al*, 2006, p. 18).

Recommendation:

Use more accurate laboratory methods and lower percentile values to calculate "rural" background levels.

DEC should use the more accurate methods of laboratory analysis suggested by Dr. McBride to calculate background values for cadmium, lead and other chemicals whose values are abnormally high. At a minimum, the 95th rather than the 98th percentile value should be used to estimate background values, but consideration should be given to using the 50th percentile, particularly if comparable percentile values are used to estimate exposure rates for children and adults.

Protect Adjacent Residential Uses

The statute states that in developing the generic tables of soil cleanup standards, "the department shall consider . . . "the protection of adjacent residential uses" (§27-1415(6)(b)(iii)). The TSD states that off-site exposures to contaminants emanating from Brownfield sites did not need to be addressed in the development of generic standards because DEC will include measures, such as the growing of grass, to mitigate the transport of soil contaminants from such sites to adjacent residential properties in the design of the remedial program for individual sites (TSD §10.2).

The language in the statute was drafted in direct response to the concern that vegetative covers and even buffer areas would not be adequate to protect against the movement of contaminants from more highly contaminated commercial and industrial sites onto residential areas. A number of scientific experts have raised concern about the impact of residual contamination on adjacent uses. Dr. Nathan Graber and his colleagues at Mt. Sinai Medical Center caution that:

> "Contaminated bare soil can migrate long distances in air borne dust. It is clear from studies of blood lead levels in children that air born soil represents a significant source of exposure to lead" (Graber *et al*, 2006, p. 6; see also Burns, p. 8, 24, 33).

The intent of the statute is for DOH to consider the level of contamination present in surface soils that would not result in unsafe levels of contamination blowing or being washed onto adjacent sites through water or wind erosion.

Recommendation:

Require all soil standards to be protective of adjacent residential uses.

DEC and DOH should re-calculate the soil cleanup standards to ensure that remediated soils at commercial and industrial sites will not pose a threat to adjacent residential uses. Surface soil contaminant levels must be protective of adjacent uses because some degree of water and wind erosion is bound to occur, even if soil is planted with grass.

Fully Address Exposure to Multiple Chemicals

The statute states that in developing the generic tables of CSRAO's, “the department shall consider . . . contaminants which act through similar toxicological mechanisms or have the potential for additive and/or synergistic effects" (§27-1415(6)(b)(iv)). In addition, it establishes that:

> “In all cases, the target risk of residual contamination at a site shall not exceed an excess cancer risk of one in one million for carcinogenic end points and a hazard index of one for non-cancer endpoints” (§27-1415(1).

At the public meetings on the draft regulations and cleanup objectives, DEC and DOH stated that the additive effects of only five mixtures, technical chlordane; technical endosulfan; technical endrin; xylenes; and polycyclic aromatic hydrocarbons (PAHs) were considered, and that synergistic effects were not considered at all due to the scientific uncertainty associated with the issue (also see TSD §5.1.5).

The majority of sites will be contaminated by more than one chemical which causes the same type of adverse health effect, including cancer and non-cancer effects such as liver, neurological or cardiovascular damage. The statute requires that these effects be considered as a group in order to ensure that the overall target risk level for a site is not exceeded. Ignoring the cumulative impact of exposure to multiple chemicals could result in the promulgation of cleanup standards that are not protective of public health.

Dr. Kathy Burns performed an analysis of DOH’s approach to addressing mixtures and concludes that it is inadequate (Burns, 2006, Part I, Section 2 and Part II). Only the structurally similar PAHs and PCBs, and a very small number of combinations found in commercial products were considered by DEC. The TSD makes the argument that since cleanup levels are usually below the target value for overall site risk, most mixtures should not be cause for concern. Dr. Burns rightly points out that this statement is not substantiated with evidence. Nor does it mitigate the requirement to establish soil cleanup standards that protect against exposures to multiple chemicals. DOH must establish soil standards that will protect public health when they are achieved, rather than assuming that even lower levels will actually be achieved at sites.

Burns discusses two methods for calculating the cumulative cancer or non-cancer risks posed by multiple chemicals present at a site (Part II). She presents compelling evidence that solvents commonly found together at sites, such as TCE, PCE and their structural relatives, should be addressed as a mixture, both as carcinogens and as central nervous system toxins. She describes in detail the issue of mixtures of acute developmental toxins and the derivation of a protective approach to developing soil cleanup standards for one important group of these toxins. She also cites the availability of the “Interaction Profiles” developed for a small number of chemicals by the Agency for Toxic Substances and Disease Registry (ATSDR) to calculate safe levels of exposure to multiple toxins. These “Profiles” have been developed for certain combinations of arsenic, cadmium, chromium and lead, and have already gone through a formal review process, including public comment.

Dr. Burn’s findings and recommendations are supported by Dr. Nathan Graber and colleagues from the Mt. Sinai Medical Center (Graber *et al*, 2006). They, too, conducted a review of DOH’s approach to multiple chemical exposure, and conclude that “the evaluation of chemical mixtures was not appropriately addressed” (p. 15). They state that mixtures of TCE, PCE, 1,1,1,-trichloroethane, and 1,1,-dichloroethane are found in soil samples at 23% of federal Superfund sites. Other common mixtures include benzene, toluene, ethylbenzene and xylene; and arsenic, cadmium, chromium and lead. According to Graber and colleagues, these are all mixtures that have similar health affects and the potential to act synergistically. They emphasize that ATSDR recommends combining the toxicity values for these substances in order to compute an overall toxicity value. As discussed above, ATSDR has

evaluated a number of important mixtures and proposed methods for dealing with them. Other chemicals noted by Graber and colleagues that may interact with more commonly found priority chemicals include the pesticides glyphosate and chlorpyrifos, asbestos, radionuclides, and phthalates.

Dr. David Carpenter of the SUNY Albany Institute for Health and the Environment published an article in 2002 documenting the increasing evidence that some chemicals have more than additive interactions (Carpenter 2006, 2002). He believes that "allowing for this possibility is essential when considering protection of people, and especially children, following remediation of brownfield sites" (2006, p. 2). He points out that many quite different chemicals can act on the same organ systems. For example, lead, mercury, some pesticides, PCBs and dioxins, all cause neurobehavioral abnormalities. Carpenter concludes that "the question of what happens to a child exposed to two or more of these compounds requires attention, and standards must be set to provide protection against harm" (2006, p. 2).

The approach contemplated in statute was for DOH to consider the additive or synergistic toxicity of common combinations of chemicals in the development of the generic tables of soil cleanup standards. Special values that apply for each chemical when found in a particular mixture should be provided so that a site specific analysis is not necessary.

Recommendations:

Revise the soil cleanup standards to protect against exposure to common mixtures of chemicals, including mixtures with lead.

DEC and DOH should identify the most common mixtures of chemicals that occur at contaminated sites, including TCE, PCE and their structural relatives; benzene, toluene, ethylbenzene and xylene; and the metals arsenic, cadmium, chromium and lead. Because it is such a ubiquitous chemical at contaminated sites and commonly found in combination with a number of other contaminants, special consideration should be given to developing generic standards for mixtures containing lead.

Generic soil cleanup standards should be developed and promulgated in the regulations that list acceptable levels for each chemical found in common mixtures that would apply whenever they are present at a site in that mixture.

Retain Approach to Addressing Exposure from Multiple Sources and Routes

The statute states that in developing the generic tables of soil cleanup standards, "the department shall consider . . . exposure to the same contaminant or group of contaminants from other sources and routes" (§27-1415(6)(b)(iv)). The approach adopted by DOH to address this issue was to adjust reference doses in such a way that when estimating noncancer effects, 80% of overall exposure to a substance was assumed to come from sources other than the contaminated site. Generally speaking, this is a protective approach, and I commend DOH for addressing exposures from multiple sources and routes.

Dr. Nathan Graber and colleagues from the Mt. Sinai Medical Center and Dr. Burns both express concern, however, that this generally protective assumption may be an underestimate for certain high-risk groups, including children who are exposed to very high levels of pesticides in their diet or environment, or subsistence fishermen and their families who are exposed to PCBs in amounts well over 100% of the reference dose. (Graber *et al*, 2006, p. 13-14; Burns 2006, p. 17) Populations in defined geographic regions can be identified at higher risk, such as the Akwesasne community in north-west New York, and both experts recommend the development of site-specific cleanup standards to address these exposures.

Recommendation:

Calculate site-specific soil standards for areas at high risk of multiple source exposure.

Where higher than average background exposures to contaminants found on a site exist in a community, DEC and DOH should require applicants to develop lower site-specific soil cleanup standards taking such exposure levels into account.

Consider the Feasibility of Achieving More Stringent Standards

The statute states that in developing the generic tables of CSRAO's,

> "the department shall consider . . . the feasibility of achieving more stringent remedial action objectives, based on experience under the existing state remedial programs, particularly where toxicological, exposure, or other pertinent data are inadequate or nonexistent for a specific contaminant." §27-1415(6)(b).

In describing DEC's decision not to establish more stringent generic CSRAOs based on feasibility, the TSD notes that "where the toxicological, exposure, or other pertinent data were inadequate or nonexistent for a particular contaminant, the Department elected not to develop an SCO for such contaminant." It concludes that

> "while it may be possible to achieve cleanup values which are more stringent than those set forth in the [soil cleanup objective] tables, since both public health and the environment will be protected through the use of the [soil cleanup objectives] and more stringent levels will not significantly increase this level of protection," the generic soil cleanup objectives set forth in the draft regulations "achieve the objective of Article 27-1415 of the Environmental Conservation law." TSD §10.4.

On its face, this rationale fails to satisfy the requirements of the statute. The clear intent of the law is for DEC and DOH to consider feasibility in those situations where information on risk may be lacking and soil cleanup standards developed based on current knowledge may not be protective enough.

Recommendation:

Re-calculate the soil cleanup standards taking feasibility into account.

DOH should re-calculate the soil cleanup standards for all use categories taking the feasibility of achieving more stringent standards, based on experience under the existing state Superfund and Oil Spill programs, into account. The development of soil cleanup standards based on feasibility should be given highest priority for those chemicals where DOH has determined that toxicological, exposure or other data are inadequate to develop a standard based on risk.

Require All Soils at Track 2 Sites to Meet Standards

The regulations weaken the statute's preference for permanence by allowing the use of engineering controls to cut off exposure to contaminated soil at Track 2 sites. The statute states that Track 2 cleanups "shall achieve [soil cleanup standards] which conform with those contained in one of the generic tables

developed pursuant to subdivision six of this section without the use of institutional or engineering controls to reach such objectives" §27-1415(4). In other words, engineered barriers cannot be used to cut off exposure and avoid meeting protective cleanup standards at such sites. No limit is established on the depth of soil that must meet such standards, and the fact that no controls can be used to reach such standards implies that all soil must reach such standards without limitation.

The draft regulations state that under Track 2, soil is not required to meet generic soil cleanup standards

> "at depths greater than 15 feet below the surface of the site, provided that: (a) the soils do not meet the definition of a source; (b) the environmental easement for the site requires that any contaminated soils remaining at greater than 15 feet below the surface of the site will be managed along with other site soils . . . ; (c) off-site groundwater is not impacted, where soil concentrations exceed the protection of groundwater [standards]; and (d) on-site groundwater use is restricted." *Draft* 375-3.8(e)(2)(iii).

As discussed in more detail under "Background and Overview" above, Tracks 2 and 3 are intended by statute to achieve a complete cleanup of soil for its intended use. The soil cleanup levels achieved under these tracks are not supposed to pose a long-term threat to groundwater quality. The proposed exemption from the requirement to meet soil cleanup standards at Track 2 sites blurs the statute's careful distinction between "use-based" (Track 2 and 3) and "risk-based" (Track 4) cleanups. The descriptions of the tracks themselves and the language governing alternatives assessment all clearly anticipate that Track 2 cleanups will be cleaner, and are to be preferred over Track 4 cleanups (§27-1415(4); §27-1413).

Recommendation:

Eliminate the 15-foot exemption for Track 2 sites.

DEC should not allow applicants to use engineering controls to cut-off exposure to contaminated soil at Track 2 sites.

Require Surface Soil to Meet Standards at Track 4 Sites

The statute states that:

> "For Track 4, exposed surface soils shall not exceed the generic [soil cleanup standards] for soil developed for unrestricted, commercial, or industrial use pursuant to this subdivision which conforms with the site's current, intended or reasonably anticipated future use. For purposes of this section "exposed surface soils" shall mean two feet for sites used for residential use and one foot for sites used for commercial or industrial use" (§27-1415(6)(d)).

The draft regulations state that only those exposed surface soils (the top two feet for residential and top one foot for commercial and industrial) "which exceed the site background values for contaminants of concern and are not otherwise covered by the components of the development of the site (e.g. buildings, pavements), shall not exceed the applicable [standards]." *Draft* 375-3.8(e)(4)(iv).

Historically, DEC and DOH have determined "site background" at state Superfund sites based on the neighborhood surrounding a site. Such an approach is problematic because it allows high levels of pollution that may already exist in a community, such as that caused by industrial emissions, to dictate the level of cleanup at a contaminated site. The statute explicitly rejects this approach. The single reference to "background levels" in the statute only allows conformance with "rural" background concentrations to

be used as an alternative to conformance with soil cleanup standards developed under Tracks 1, 2 or 3 (§27-1415(6)(b)).

Recommendations:

Do not allow unsafe levels of contamination to remain in surface soils at Track 4 sites.

DEC should amend the regulations to require that all exposed surface soils cleaned up under Track 4 must meet protective standards developed for Tracks 1, 2 or 3. Polluted site background levels should not be used as the basis for determining surface soil cleanup at Track 4 sites.

Clarify that "exposed surface soils" includes lawns and landscaping.

The draft regulations require only "exposed surface soils which…are not otherwise covered by the components of the site (e.g. buildings, pavements)" to be remediated under Track 4 (*draft* Part 375-3.8(e)(4)(iv)(a-c)). The regulations should be amended to explicitly state that soils merely covered by grass or other vegetation shall be treated as "exposed surface soils" and must comply with soil cleanup standards developed for Tracks 1, 2 or 3.

Clearly State DEC's Authority to Require Cleaner Remedies

The Brownfield statute clearly states that all participants in the BCP Program are required to develop and evaluate at least one remedy that would meet the requirements of Track 1, i.e. achieve a permanent remedy. At significant threat sites, DEC is required to select the final remedy and may require a Track 1 cleanup. At non-significant threat sites, participants generally are authorized to select their own remedy from a DEC-approved alternatives analysis, but DEC has the discretion to require the evaluation and implementation of a Track 2 cleanup. (ECL §27-1413)

While the draft regulations clearly state the obligation of all participants to evaluate at least one alternative that meets the requirements of Track 1, they fail to state that DEC must select the final remedy at significant threat sites and may require the implementation of a Track 1 remedy at such sites. In addition, while the regulations do state that DEC may require the evaluation of a Track 2 remedy at sites which do not pose a significant threat, they fail to state that DEC has the authority to require the implementation of such a remedy.

Recommendation:

Revise the regulations to clearly state that DEC has the authority to require cleaner remedies.

The regulations should be revised to make it clear that DEC is required to select the final remedy at all significant threat sites, may require the implementation of a Track 1 remedy at significant threat sites, and may require the implementation of a Track 2 remedy at sites which do not pose a significant threat.

Amend Definition of "Grossly Contaminated Soil"

The brownfield law defines "grossly contaminated soil" as "soil which contains free product or residual contamination which is identifiable visually, through the perception of odor, by elevated contaminant

vapor level, by field instrumentation, or is otherwise readily detectable" (§27-1405(15)). The draft regulations (for all remedial programs) define "grossly contaminated media" as:

> "soil sediment, surface water or groundwater which contains free product or mobile contamination that is identifiable either visually, through strong odor, by elevated contaminant vapor levels or is otherwise readily detectable without laboratory analysis." Draft 375-1.2(w)

This definition, while extending to additional media (surface and ground water) includes a weaker detection threshold for what is already a highly subjective determination.

Recommendation:

DEC should amend the definition of "grossly contaminated media" to replace "strong odor" with "perceptible odor" and "without laboratory analysis" with "by field instrumentation or other means," as established in law.

Improve Off-Site Testing and Cleanup Requirements

Even though the law requires comprehensive off-site investigations and cleanups to protect adjacent residents, the regulations are weak or unclear on the scope and content of investigations, and are totally silent on the state's critical role in facilitating off-site cleanups in a timely manner.

Under the law participants (responsible party) are required to "… fully investigate and characterize the nature and extent of contamination emanating from such site." (§27-1411(1)) Volunteers "must perform a qualitative exposure assessment pursuant to subdivision two of section 27-1415 of this title regarding contamination emanating from such site." (§27-1411(1)). Subdivision 2 of Section 27-1415 states,

> "A qualitative exposure assessment shall qualitatively determine the route, intensity, frequency, and duration of actual or potential exposures of humans, fish and wildlife to contaminants. Such assessment must analyze the nature and size of the population currently exposed or which may reasonably be expected to be exposed to the contaminants that are present at or emanating from a site, and shall include a determination of the reasonably anticipated future land use of the site and affected off-site areas and the reasonably anticipated future groundwater use. A qualitative exposure assessment consists of characterizing the exposure setting, identifying current and reasonably foreseeable exposure pathways, and evaluating contaminant fate and transport. Some off-site field investigation to identify and sample any potential areas of contamination may be required to support the exposure assessment."

Subdivision 5 of Section 27-1411 states that DEC is responsible for addressing off-site pollution at a significant threat site being remediated by a volunteer. DEC must first try to have polluters fund the off-site cleanup within six months of the decision that a volunteer's brownfield site poses a significant threat. If the department is unsuccessful, it must clean up the off-site contamination within one year of the completion of the enforcement or volunteer cleanup, whichever is later. The proposed regulations omit these critical details provided in the statute.

Where groundwater at the site boundary contravenes drinking water standards at non-significant threat sites, the statute requires that the annual certification regarding institutional and engineering controls must also certify that no new information has come to the owner's attention, including groundwater monitoring data from wells located at the site boundary (if any) to indicate that the assumptions made in the qualitative exposure assessment of offsite contamination are no longer valid. Every five years, the owner

at such sites shall certify that the assumptions made in the qualitative exposure assessment remain valid. (see §27-1415(7)(c) of the ECL) The intent of these statutory provisions is to ensure that where off-site cleanup is not pursued, public health and the environment will not be impacted adversely. Therefore it is important that this provision be restated in the regulations so that owners and future owners of these sites are aware of the five year recertification requirement.

Recommendation:

Explicitly include all statutory off-site investigation and cleanup requirements.

DEC should revise the regulations to explicitly include all the statutory language discussed above.

Ensure the Reliability of Engineering and Institutional Controls

The regulations do not specify how site owners will ensure reliable and viable engineering controls (fences, pavement covers, etc.) and institutional controls (drinking water prohibitions, etc.) are used as required by law. The law requires that any cleanup plan using controls must include a detailed description of the controls, evaluation of their reliability and viability, and sufficient analysis that they will be effectively implemented (see ECL § 27-1415.7). This is a critical requirement since failure of a site control could result in human exposure and contamination of the environment. A study by the U.S. Congress General Accountability Office identified failures in maintaining such controls (GAO report GAO-05-163, January 2005). Therefore, it is important that brownfield site controls are reliable and well-maintained, and that environmental easement notices are recorded and strictly followed. The draft regulations do not repeat these critically important statutory requirements, but instead incorporate them by reference.

Recommendation:

Include all statutory requirements regarding engineering and institutional controls in the regulations, including the requirement for notice by local governments.

DEC should revise the regulations to include all statutory requirements regarding engineering and institutional controls, and provide detailed guidance on demonstrating reliability and viability, monitoring and reporting, including reporting by local government. Specifically, applicants should be required to conduct a "Risk Failure Analysis" of the engineering or institutional control to investigate its reliability and viability. As part of this analysis, applicants should be required to:

- Identify all possible activities associated with the new use of the site and evaluate the impact of each such activity on the controls.

- Assess the capacity of local government to enforce the control. Does the local government have enforcement authority? If so, does the local government have the technical ability to oversee engineering or institutional controls?

- Ensure that a system has been established by the local government to notify DEC when a building permit has been requested for the site, in order to ensure that such activities are not in conflict with site controls as required by ECL § 71-3607.

- Conduct a financial analysis of the long term costs, and an assessment on whether the site owner is financially able to maintain the site control.

In addition, the regulations should establish strict and enforceable requirements regarding the maintenance of controls, including the frequency of monitoring, the type of data required, and a regular reporting process to DEC and local government on the status of any controls.

The regulations should also include a provision restating the requirements of ECL §71-3607(2) that a local government shall notify the department of any proposed project that may impact an environmental easement designed to protect the long-term viability of institutional and engineering controls, and that the local government shall not approve the project until it receives approval from the department.

Strengthen Citizen Participation

People living near contaminated sites have the right to participate in cleanup and land use decisions that affect their health, their property and their community. DEC, volunteers and responsible parties are all required to inform and involve the public before making final decisions on the scope of a site investigation, on the soil and water standards and remediation technology, and on the future land use and redevelopment of a site. The following regulatory amendments and actions are needed to ensure that the Brownfield law's directive to provide meaningful public participation is followed, and that the tradition of meaningful participation at Superfund sites is upheld.

Recommendations:

Reinstate citizen participation goals.

Public participation goals were explicitly included in the Brownfield law as follows:

> ". . . citizen participation plans shall embody the following principles of meaningful citizen participation: (1) opportunities for citizen involvement should be provided as early as possible in the decision making process prior to the selection of a preferred course of action by the department and/or the applicant. (2) activities proposed in such plan should be as reflective of the diversity of interests and perspective found within the community as possible, allowing the public the opportunity to have their views heard and considered, which may include opportunities for two-way dialogue. (3) full, timely and accessible disclosure and sharing of information by the department shall be provided, including the provision of technical data and the assumptions upon which the analyses are based." (§27-1417(2))

In addition, the current Superfund Part 375 regulations provide the following goals and guidance to government agencies and responsible parties.

> "To facilitate the remedial process and enable citizens to participate more fully in decisions that affect their health, the Department will require the provision of opportunities for citizen involvement and will encourage consultation with the public early in that process before the Department forms or adopts final positions. The primary goals of the citizen participation program at sites are to facilitate two-way communication between the Department and individuals, groups, and organizations that have expressed interest in or are affected by the site or the site's program, in the decisionmaking process associated with the remediation of sites. The Department will require that opportunities for public involvement be included in the development and implementation of a remedy." (375-1.5 (a))

In drafting the proposed regulations, DEC failed to include both the current Superfund public participation goal language and the goals from the Brownfield law. These goals and principles are an

important component of the remediation program and should be explicitly included in the draft regulations.

The following language captures important elements from both goal statements, and should be included in the regulations at 375-1.10, with reference to the goals provisions in 375-2.10, 375-3.10 and 375-4.10:

> "To facilitate the remedial process and enable citizens to participate more fully in decisions that affect their health, the Department will require the provision of opportunities for meaningful citizen involvement. The primary goals of citizen participation programs at sites are to: (1) provide opportunities for citizen involvement as early as possible in the decision making process prior to the selection of a preferred course of action by the department and/or the applicant or responsible party; (2) provide citizen participation site plans that are reflective of the diversity of interests and perspective found within the community and allow the public the opportunity to have their views heard and considered with opportunities for two-way dialogue; and (3) provide full, timely and accessible disclosure and sharing of information by the department, volunteers, participants and responsible parties, including the provision of technical data and the assumptions upon which the analyses are based."

Require the establishment of an inclusive site contact list.

The Brownfield Law states that all citizen participation plans shall include the "identification of the interested public and preparation of a brownfield site contact list." (§27-1417(2)(b)(1)). It also states that the plan shall "be as reflective of the diversity of interests and perspective found within the community as possible." (§27-1417(2)). DEC is directed to provide notice of a completed site application to:

> "the chief executive officer and zoning board of each county, city, town and village in which such brownfield site is located, residents on and/or adjacent to the site, the public water supplier which services the area in which such brownfield site is located, any person who has requested to be placed on the brownfield site contact list and the administrator of any school or day care facility located on and/or adjacent to the site . . ." (§27-1407(5)).

The current Superfund regulations state that a site contact list should include "government representatives, civic organizations, environmental groups, residents, media representatives, business interests, and other individuals and groups that have expressed an interest in, or are affected by, the site or the site's program" (375-1.5 (b)(2))

Developing an inclusive list of site contacts is an important step in informing and involving the interested public. The regulations do not include some key constituencies in the Superfund and Brownfield Site Contact Lists. Detailed regulatory requirements are needed to ensure that the site contact list is reflective of the diversity of interests found within a community, and includes all those who may be affected by or are interested in the site.

The regulations should be amended to require the inclusion of the following persons in a site contact list (375-1.10 (b)):

> "owners and occupants of adjacent properties, local government officials including the chief executive officer and zoning board of the county and the city, town or village where the site is located, county clerk, local public water supplier, administrator of any school or day care facility near the site, local community groups, local or regional environmental groups, and local media representatives."

Expand the Citizen Participation Handbook and require public involvement on interim remedial measures.

The Brownfield statute states that DEC "shall prepare a citizen participation handbook for the purpose of providing guidance to applicants in the design and implementation of meaningful citizen participation plans..." (§27-1417(1))

The regulations make no mention of this Handbook. DEC has a Superfund Citizen Participation Handbook—a valuable document detailing how site owners and DEC can best involve people that was developed with input from community and environmental leaders. DEC should expand the existing Superfund Handbook to include brownfield and environmental restoration sites, and include relevant additions on technical assistance grants, site redevelopment and other issues.

A citizen handbook would provide essential guidance to volunteers and participants in developing their public participation plans. For instance, the proposed regulations state that for interim remedial measures (IRMs), the agency "will require such citizen participation activities, if any, as are appropriate *upon consideration of applicable guidance.*" (375-1.10 (f) emphasis added). The expanded Superfund handbook would provide that guidance.

Moreover, to ensure the agency meets the statute's citizen participation goals, the regulations should be changed to state that DEC "will require citizen participation activities for all non-emergency interim remedial measures, and will ensure the public is notified of any emergency interim remedial measures. (insert in 375-1.10 (f)).

We recommend the department expand the existing Superfund Handbook to include brownfield and environmental restoration sites, and include relevant additions on technical assistance grants, site redevelopment and other issues, and amend the regulations to ensure adequate public participation is provided on site IRMs.

Post signs at active and restricted-use sites to help stop exposures.

DEC used to place bright yellow "Hazardous Waste Site" signs with the DEC toll-free number at sites. These signs helped stop dangerous exposures by warning children, teenagers and adults to stay away from the site. Signs are still needed but they are no longer posted at many Superfund sites. DEC should require Brownfield site owners to post prominent signs at all sites advising the public of any known or suspected contamination, informing them that the site is in the Brownfield Cleanup Program, and telling them how they can be included on the Site Contact List.

At brownfield sites remediated to restricted-use cleanup levels, DEC should require site owners to post prominent signs advising the public of the presence of residual contamination and listing specific activities (such as picnicking or playing) that may be unsafe, particularly for children. This recommendation is strongly supported by Dr. Nathan Graber and colleagues at the Mt. Sinai Medical Center and Dr. David Carpenter of the SUNY Albany Institute for Health and the Environment (Graber *et al*, 2006, p. 5; Carpenter, 2006, p. 2).

Make Eligibility More Inclusive for Contaminated Sites

The proposed regulations state that in considering BCP eligibility, the DEC may "consider only that contamination from a source or sources located on the brownfield." (See proposed Part 375-3.3(2)). This language appears nowhere in the statute and would exclude many sites including urban sites contaminated

by historic fill. Specifically, the statute broadly defines "brownfield site" to include "any real property, the redevelopment or reuse of which may be complicated *by the presence or potential presence of a contaminant*." ECL § 27-1405.2 (emphasis added). Nothing in that definition suggests that DEC exclude a site from the program on the basis that the contamination originated from an off-site source. Regardless of where the contamination came from, if it is presently on a site, then it is "complicat[ing] ... the redevelopment or reuse of" the site. While the statute does provide for certain exceptions from the definition of "brownfield site," (see ECL § 27-1405.2), none of these exceptions apply to circumstances where contamination originates offsite. Further the statute directs DEC to reject a site under certain circumstances even if it meets the definition of "brownfield site," (see ECL § 27-1407.8, .9). However, there is no reference to sites contaminated by off-site sources in those provisions.

Recommendation:

DEC should revise the regulations to eliminate consideration of whether contamination on a site resulted from sources located on the site in determining whether a site is eligible for the program.

Environmental Restoration Program

Restore the Statutory Cleanup Goal

The remedial goal of the Environmental Restoration Program (ERP) mirrors that of the Superfund. Specifically, the law states that "the remediation objective of an environmental restoration project shall meet the same standards for protection of public health and the environment that applies to remedial actions undertaken pursuant to section 27-1313 of this chapter" (ECL §56-0505(3)). But the draft regulations state that "The goal of the program for a specific site is to select a remedy that is protective of public health and/or the environment" (*draft* 375-4.8(b)). No criteria are specified for such protection as in the Brownfield statute, making this goal language weaker than that established for both the Superfund and Brownfield programs.

Recommendation:

Use the same remedial goal for the ERP as for the Superfund program.

Superfund Program

Retain Proposed Remedial Goal

The Superfund law states that "The goal of any such remedial program shall be a complete cleanup of the site through the elimination of the significant threat to the environment posed by the disposal of hazardous wastes at the site and of the imminent danger of irreversible or irreparable damage to the environment caused by such disposal" (ECL §27-1313(d)). The draft regulations retain the language of the old Part 375 regulations, which stated that the remedial goal is to restore the site "to pre-disposal conditions, to the extent feasible."(old 375-1.10 and *draft* 375-2.8(a)).

Recommendation:

DEC should retain this important and well-established goal language.

Retain Proposed Source Removal Requirements

The draft regulations make the hierarchy of source removal and control measures established in the Brownfield law applicable to all three environmental remediation programs (*draft* 375-1.8(c)). Source removal is crucial to the elimination of the significant threat posed by the disposal of hazardous waste at Superfund sites and has always been an important part of the program. Establishing clear source removal requirements in regulation is sound public policy.

Recommendations:

DEC should be commended for applying the source removal hierarchy to all three cleanup programs.

Retain Existing Definition of "Significant Threat"

The current Superfund regulations include the following public health criterion for determining whether a contaminated sites poses a significant threat to public health or the environment:

> "where the site is near private residences, recreational facilities, public buildings or property, school facilities, places of work or worship, or other areas where individuals or water supplies may be present, the New York State Department of Health or the Agency for Toxic Substances and Disease Registry has determined that the presence of hazardous waste on a site poses a significantly increased risk to the public health" (375-1.4 (a) (1) (vi)).

The proposed regulations would substantially change this criterion, even though there has been no change in the law to justify such a change. The new regulations state that the site would need to have

> "*a significant adverse impact to public health* where the site is near residences, recreational facilities...*or* the NYS Department of Health has determined that the presence of hazardous waste on a site poses a significantly increased risk to the public health" (375-2.7 (b) (3) (vi) italics indicate new language).

This could be interpreted as requiring DOH to make a finding of significant adverse public health impact—an extremely difficult determination to make when a new site, which has usually not been tested nor had a health study done, is being considered for the Superfund or Brownfields program. The criteria used by DEC and DOH to determine whether a site poses a significant threat to public health or the environment has always been a crucially important component of the state Superfund program. The new Brownfield statute makes that determination an equally important part of the Brownfield Cleanup Program, with important ramifications for remedy selection, the cleanup of offsite contamination and the availability of technical assistance grants. The existing, long-standing, and time-honored regulatory language which guides the determination of significant threat must be retained.

Recommendations:

DEC should redraft the regulations to reinstate the language of the existing public health criterion by removing the phrase "significant adverse impact to public health" from (b) (3) (vi).

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