New Jersey Department of Environmental Protection

Site Remediation Program

Fill Guidance at SRP Sites

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1 INTENDED USE OF GUIDANCE STATEMENT

This guidance is designed to help the person responsible for conducting remediation to comply with the New Jersey Department of Environmental Protection (Department) requirements established by the Technical Requirements for Site Remediation (Technical Rule), N.J.A.C. 7:26E. Because this guidance will be used by many different people that are involved in the remediation of a site, such as Licensed Site Remediation Professionals (LSRPs), Non-LSRP environmental consultants, and other environmental professionals, the generic term "investigator" will be used to refer to any person that uses this the guidance to remediate a contaminated site on behalf of a remediating party, including the remediating party itself.

The procedures for a person to vary from the technical requirements in regulations are outlined in the Technical Rules at N.J.A.C. 7:26E-1.7. Deviation from technical guidance must be documented and adequately supported with data or other information. However, this deviation does not require the Department's pre-approval.

This guidance supersedes previous Department guidance issued on this topic, pursuant to N.J.S.A. 26:10C-16, and was prepared with stakeholder input. The entire committee consists of:

Teruo Sugihara, Co-Chair (Department);
Rodger Ferguson, LSRP, Co-Chair, Sadat Associates, Inc.;
David Barskey, Department;
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Kathleen Murray, TERMS Environmental Services, Inc.; and
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2 PURPOSE

The purpose of this document is to provide guidance on the use of alternative fill and clean fill strictly at Site Remediation Program (SRP) sites, and specifically at an area of concern (AOC). Note that an AOC may be the whole site. All other applications or use of this technical guidance at non-SRP sites or properties is beyond the scope and authority of the SRP regulations.

In particular, this document:

- provides background on the need for establishing the alternative/clean fill requirements;
- provides different approaches to achieve compliance with the alternative/clean fill requirements in the Technical Rule;
- facilitates the use of alternative fill in a protective manner;
- provides the default sampling frequencies for fill characterization and options for reduced sampling frequencies; and
- aids in the evaluation, approval, and use of fill at SRP sites.

The intent of this technical guidance is to address the majority of SRP sites where fill will be used as part of the remedial action. The Department recognizes that due to the complexity and diversity of SRP sites variances from the Technical Rule and deviations from this technical guidance may be appropriate to address site-specific conditions. This technical guidance may also apply to the backfill of underground storage tank (UST) excavations, including homeowner USTs; however, there may be additional technical guidance from the Department for UST remediations that also apply and should be considered by the investigator before making a backfill decision.

3 OVERVIEW

3.1 Organization

This technical guidance covers both alternative fill and clean fill. Sections 4 and 5 address, respectively, the on-site and off-site use of alternative fill. Section 6 addresses the use of clean fill. Because the remediation of a given SRP site does not necessarily involve the use of both alternative and clean fill, the document handles each fill type in separate sections. To ensure clarity, each section is complete and independent for each fill type. Therefore, it is recognized that there is some repetition of requirements that apply to both fill types.

3.2 Limitation to Only SRP Sites

This technical guidance applies to the use of alternative fill and clean fill only at SRP sites. The SRP does not regulate or approve products at their point of origin when they are not destined to be part of the remediation at a SRP site. The use of alternative fill and clean fill at non-SRP sites is beyond the scope and authority of the SRP regulations. Because the SRP remediates sites where a discharge has occurred, this technical guidance is not designed to address or be applied to other situations.

3.3 Protectiveness Requirement

Guidance is provided for the use of alternative fill (that might otherwise be disposed as solid waste) at SRP sites in a way that is protective of human health and the environment and is consistent and supportive of the selected remedial action. The overall objective is that the alternative fill be thoroughly understood as to the types and concentrations of contaminants and its homogeneity. Alternative fill may include contaminated material that has been treated, but some contaminants still exceed the applicable remediation standards or criteria. As discussed below in Section 3.5, the use of alternative fill must not increase the contaminant concentrations present at a receiving AOC or introduce additional contaminants not already present at a receiving AOC.

3.4 Preserving Landfill Capacity/Prohibiting Excess Filling

The remediation process commonly results in the excavation of contaminated soils for off-site disposal. There is limited landfill capacity for the disposal of contaminated soils, including the use as daily cover. Thus, the treatment, recycling, or beneficial use of these impacted soils is important to conserve landfill capacity. Filling is routinely employed in the remediation of AOCs (which may encompass the entire site), including:

- leveling of the grade where insufficient material is on site and where reasonable changes in design will not eliminate the need for the material;
- raising the elevation of the site to preclude flooding that might compromise the integrity of the selected remedial alternative; and
- material needs required by a cap design.

Note that material in excess of that required by a remedial action (e.g., cap design or backfilling of excavations) is prohibited unless pre-approval is obtained from the Department pursuant to N.J.A.C. 7:26E-5.

3.5 SRP Policy Objectives (Like-on-Like and 75th Percentile)

In establishing the use of alternative fill, the intent is to achieve the following primary objectives pursuant to the Department's policy in Appendix C of this technical guidance:

- No new contaminants may be placed in an area of concern (AOC) other than those already determined to be present. This concept is referred to as the **like-on-like requirement.**
- Contaminant concentrations in the alternative fill shall be lower than those on the receiving site AOC. This objective is referred to as the **75th percentile compliance requirement**.

The Department anticipates that the use of these two requirements and this technical guidance will appropriately allow the majority of remedial actions to proceed without the use of a variance from the Technical Rule. However, there may be site-specific situations where it is in the public benefit to vary from this policy and the Technical Rule. Because Department pre-approval is not required as part of this variance process, serious consideration of the situation is warranted when employing the variance option. Removal of the alternative fill may be required if the Department subsequently determines the use is not protective of human health and the environment.

Note that consultation with the Department prior to using a variance is available to the regulated community to assist in resolving future concerns prior to implementation. The Department further recognizes that this policy and this technical guidance will be re-evaluated in the future and revised, if necessary.

3.6 Clean Fill

Clean fill is commonly used as a component of a remedial action, such as for the construction of the final cap of an engineering control (N.J.A.C. 7:26E-5) and must be used for the buffer and barrier layers for presumptive remedies (N.J.A.C. 7:26E-5). **Clean fill may include contaminated material that has been treated so it meets the definition of clean fill.**

3.7 Investigator Responsibilities

As discussed throughout this technical guidance, the investigator will be making the determination whether proposed fill may be imported to or moved around a SRP site or AOC and meets the requirements of the Technical Rule and this technical guidance. In most cases, a LSRP will be acting as the investigator for the site or AOC receiving alternative and/or clean fill without direct approval from the Department. In those cases under Department oversight, or where Department pre-approval of a Remedial Action Work Plan is required, the Department will approve the use of fill material based on the information provided by the investigator (the consultant, contractor, or LSRP hired by the Department).

3.8 Protection of Environmentally Sensitive Natural Resources and Sensitive Receptors

The use of alternative and/or clean fill in areas where there are **ESNRs** (environmentally sensitive natural resources, such as protected areas, wetlands, or open water) and/or sensitive receptors (as defined by the Technical Rule) may occur only where such use is in compliance with the Technical Rule, this technical guidance, and all other federal, state, and local laws,

regulations, and guidance. For example, the requirements of a waterfront development permit may include stipulations on the type of fill and the area where the fill may be placed.

3.9 Free Liquids Prohibition

Material containing free liquids as determined by the paint filter liquids test (SW-846 Method 9095A or 9095B), or equivalent method, may not be used unless these liquids are appropriately removed and properly treated and/or disposed prior to placement. Material containing a certain amount of free liquids may be acceptable for placement as fill where the remedial action is designed to accommodate such material and such placement is in compliance with the Technical Rule, the rest of this technical guidance, and all other federal, state, and local laws, regulations, and guidance. Use of material containing free liquids is a deviation from this technical guidance that must be documented and adequately justified in the applicable work plan or report. However, this deviation does not require the Department's preapproval, except for sediment, dredged material, and processed dredged material as discussed in later sections of this technical guidance. **Free liquids also include free and/or residual product.**

3.10 Beneficial Use and CAO/BUD

The SRP and the Division of Solid and Hazardous Waste (DSHW) concur that alternative fill that is defined to be soil in this technical guidance may be placed pursuant to N.J.A.C. 7:26-1.7(g)4v and be in compliance with the Solid Waste Rules without needing to obtain a Certificate of Authority to Operate (CAO)/Beneficial Use Determination (BUD). For those alternative fill materials that are defined to be non-soil (this includes Class B recyclables, construction and demolition material, and recycled concrete), a CAO/BUD must be obtained pursuant to DSHW regulations. Note that dredged material and processed dredged material (PDM) do not require a CAO/BUD pursuant to N.J.A.C. 7:26-1.6(a)5, but they do require a separate approval with an Acceptable Use Determination (AUD) from the Department's Office of Dredging and Sediment Technology for the donor source (i.e., dredger or processor).

3.11 Presumptive Remedies

Alternative fill may be considered for use as part of remedial action in an AOC that requires a Presumptive Remedy consisting of an engineering control, but it can only be used below the engineering control (i.e., below the demarcation layer) as described in the Department's Presumptive & Alternative Remedy Guidance.

4 ALTERNATIVE FILL FROM OFF-SITE SOURCES

4.1 Sampling the Receiving Site Area of Concern

Soil must be fully delineated at the receiving AOC according to the Technical Rule and applicable technical guidance. The Remedial Investigation (RI) data for each AOC shall be evaluated to determine the contaminants of concern (COC) and their concentrations. To meet the like-on-like requirement, single phase and discrete discharge remediations may require sampling and analyses for additional contaminants as presented in Section 4.5.2 of this technical guidance.

4.2 Like-on-Like Requirement

No new contaminants may be placed in an area of concern (AOC) other than those already determined to be present. This concept is referred to as the like-on-like requirement. Allowing the use of alternative fill with contaminants not already present in an AOC would constitute a new discharge as defined at N.J.A.C. 7:26E-1.8. Furthermore, the use of alternative fill in this situation would be de facto landfilling (i.e., the "placement" of new wastes) without complying with the Department's solid and hazardous waste regulations. The Department does not endorse the circumvention of these regulations and intends to minimize the potential for doing so through this technical guidance and the Technical Rule. Therefore, the acceptance of alternative fill should be limited to the contaminants already present at the receiving AOC, which means the areal extent of the receiving AOC cannot be increased.

For the purposes of this guidance only, certain polycyclic aromatic hydrocarbons (PAHs) will be considered to be the same contaminant if their relevant ingestion-dermal health-based criteria are the same (see Appendix I of the Soil Remediation Standards N.J.A.C. 7:26D). For example, for a residential exposure scenario, benzo(a)pyrene and dibenz(a,h)anthracene can be considered as the same contaminant for movement of alternative fill onto a receiving site since their ingestion-dermal health-based criteria are both 0.06 mg/kg and they have the same health endpoint .Within each sample at a receiving or donor site these contaminants may be added together, but they cannot be added between separate samples. Therefore, if the observed concentrations of benzo(a)pyrene and dibenz(a,h)anthracene in a sample are 2 mg/kg and 5 mg/kg, respectively, then the combined PAH concentration for this set of contaminants would be 7 mg/kg in that sample. This 7 mg/kg concentration would then be the concentration used for the 75^{th} percentile evaluation of the receiving AOC as described in section 4.3 below. This exercise would also be performed for the donor site data to determine the maximum concentration to be used in the compliance process. The other grouping that may occur would be benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene as they all have ingestion-dermal health-based criteria of 0.6 mg/kg for a residential exposure scenario, and 2.0 mg/kg for a non-residential exposure scenario. Note that non-carcinogenic PAHs may not be grouped because each has a different health endpoint.

4.3 75^{th} Percentile Evaluation of Receiving Site Area of Concern

The Department has determined there should be confidence that the contaminant concentrations in the donor material used as alternative fill do not exceed the contaminant concentrations already known to exist in a given AOC. Using alternative fill with higher contaminant concentrations would result in making contamination worse at the receiving AOC. Of particular

concern are the higher concentrations of a contaminant distribution. There are two issues with the higher concentration data. One, delineation of contamination for an AOC at a receiving or donor SRP site is focused on sampling to meet the applicable remediation standards, so just one or a few samples characterize the upper end of a contaminant distribution, and these samples may represent a large volume of material and mass of contaminants. As a result, there will be more uncertainty concerning the characterization of receiving site and donor site material at the higher contaminant concentrations. Two, where the donor material being evaluated is at a non-SRP site; is from disturbed, possibly stockpiled material; or is from a manufactured, blended, or decontaminated soil, it will be difficult to determine with confidence that samples were biased and collected from the area of highest contaminant concentration. The net effect is limited data for the volume of material with higher contaminant concentrations and/or lower confidence that the data represent the highest contaminant concentrations.

To minimize the potential use of alternative fill with higher contaminant concentrations than in the receiving AOC, alternative fill is acceptable provided the maximum contaminant concentrations in the alternative fill are less than the 75th percentile of the contaminant concentrations already present at the receiving AOC. This concept is called the 75^{th} percentile requirement (see Appendix C). The selection of the 75^{th} percentile of the receiving AOC data as the acceptance criterion for alternative fill is further discussed in Appendix A. For most sites, particularly with smaller-sized AOCs or limited data for the higher contaminant concentrations, this compliance requirement is likely to be the most cost-effective method of screening data from potential donor material.

The procedure for determining the 75^{th} percentile at the receiving AOC consists of the following steps:

(1) Collect and/or assemble data for the receiving AOC (or site when the whole site is the AOC) where the fill is proposed to be placed (placement location at the receiving site). The sampling of the placement location will typically result from a completed RI process.
(2) Organize the data from the receiving AOC placement location so that each contaminant of concern is listed from least contaminated to most contaminated.
(3) Determine the 75th percentile for each contaminant. The investigator is referred to Appendix A for the calculation of the 75^{th} percentile.
(4) Collect and/or assemble data from the donor material for the alternative fill being proposed for placement. If data from a completed RI are not available for the donor material, use the sampling approach in this Technical Guidance (Section 4.5). It is highly recommended that data be obtained prior to excavation and shipment to the receiving AOC to avoid the possibility of having to remove alternative fill that does not meet the Technical Rule or this technical guidance.
(5) Determine the maximum concentration for each contaminant in the donor material proposed for placement. Then determine whether the maximum concentration is less than the respective 75^{th} percentile for each contaminant in the receiving AOC placement location. If the maximum concentration of each contaminant is less than the respective 75^{th} percentile for those same contaminants in the receiving AOC placement location, then the alternative fill is acceptable and placement is permissible.

4.4 Compliance Options Other than the 75th Percentile Requirement

Statistically-based compliance options other than the 75th percentile requirement in Section 4.3 may be considered where appropriate to characterize the receiving AOC. More complicated or robust statistical evaluations are generally acceptable as long as the data are from discrete samples, outliers are not excluded, and all other statistical requirements for this evaluation are met. However, additional samples may have to be collected and analyzed to better characterize the volume of material with higher contaminant concentrations and provide sufficient data for the statistical calculations. This generally requires a large sample set (i.e., greater than twenty samples per AOC) to perform the calculations and would likely only be applicable to larger AOCs. A variance pursuant to the Technical Rule is required for the use of compliance options other than the 75th percentile requirement, which may result in Department review of this component of the document.

As an example of a potential option, the 95th percent upper confidence limit (95th UCL) of the sample distribution for each contaminant in the receiving AOC can be calculated for use as the receiving AOC compliance criterion instead of the 75th percentile. This can be calculated using USEPA's ProUCL software (http://www.epa.gov/osp/hstl/tsc/software.htm), or other commercially available statistical software, to generate the 95th UCL of the sample distribution for each contaminant in the receiving AOC. The maximum concentration for each contaminant in the donor material is compared to the 95th UCL for each contaminant in the receiving AOC to determine whether the alternative fill is acceptable for placement. When the 95th UCL is greater than the maximum contaminant concentration for the receiving AOC, then the maximum contaminant concentration is used as the compliance criterion, not the 95th UCL. However, if this occurs, the investigator should evaluate the need for additional sample analyses, particularly for contaminants with a wide spread between the lower and higher contaminant concentrations, to augment the existing data to be more representative of the contamination, and the statistical analyses rerun with the new, larger dataset. The concern is that when the 95th UCL exceeds the maximum concentration for a given contaminant, the data may be insufficient to generate a truly valid 95th UCL and is likely due to the limited sampling.

4.5 Sampling at the Donor Site Area of Concern

To determine if proposed alternative fill placement is appropriate, contaminant data for the proposed fill at the donor site must be evaluated. The overall objective is that the potential alternative fill be thoroughly understood as to uniformity as well as the types and concentrations of contaminants. The sampling protocol is to be applied by collecting discrete samples from each source of donor material. **Donor source locations may include in-state and out-of-state sources of potential alternative fill.**

The sampling frequencies are determined by volume and are independent for each source of donor material. For example, if 1,000 cubic yards of contaminated soil is obtained from each of two different sources (e.g. two different AOCs), then the 1,000 cubic yard sampling frequency would be applied to each 1,000 cubic yards. The sampling frequency for 2,000 cubic yards would not be applicable, even though the total volume is 2,000 cubic yards. The sampling frequencies need to account for the depths of the donor material to be removed. If one area of donor fill will be excavated to more than one depth (e.g., three feet in one part and six feet in the

other part), then the samples must be distributed accordingly at multiple depths to be representative of the full depth of each cut.

Sampling is not required where sufficient data are available to adequately characterize the donor material being proposed for use. Typically the source of such data would be a completed RI. If the investigator has determined that the available data are not representative, not of acceptable quality, or from an insufficient number of samples, then additional sampling is warranted and should be biased towards the worst-case material where possible. In certain cases, the location of the most contaminated area may not be known, or alternatively, the contamination could be of uniform distribution. In these cases, a grid pattern of sampling should be utilized. If the contamination distribution is known, then the worst-case material should be sampled first as defined by the available data and/or information from the PA/site review as described below in Section 4.5.2. The consequence of this is that the highest rate of sampling is applied to the area of expected greatest contamination. Additional samples (dictated by the volume proposed for use) are distributed pro rata in the remaining area in order of expected decreasing contamination.

The sampling of the proposed donor material should be based on a systematic approach whereby the investigator will have assurance that the results accurately represent the fill. When remedial investigation data are not available, a series of field screened, discrete grab samples should be collected, biased to areas that may indicate the highest contaminant concentration. For undisturbed material, collect samples at the surface and at depth to ensure that the samples are representative of the total volume of material that may be used as alternative fill. Where biased sampling is not necessary or only a few biased samples are needed, the investigator should use grid-based, random sampling procedures using accepted USEPA guidance or other statistically appropriate references (e.g., Gilbert 1987). Where a large stockpile of proposed alternative fill has already been staged and can be maintained for use on a specific project, then the sampling should be statistically designed to collect representative samples from both the surface and interior of the stockpile. Very large stockpiles may need regrading to smaller sizes to allow for practical physical access for sampling.

4.5.1 Composite Sampling

Although existing discrete sample data are strongly preferred, in some cases existing laboratory data from composite samples may be utilized for the characterization of proposed alternative fill. The investigator should evaluate the representativeness of the composite data in characterizing the proposed alternative fill. In general, the fewer the number of samples in a composite, the more representative the composite data will be. The use of composite sample data constitutes a variance from the typically required use of discrete samples as a compliance mechanism, and requires justification by the investigator. The following are examples of when composite sample data may be considered if obtained during the site review:

- To establish a reduced sampling frequency in accordance with Section 4.5.2 below.
- For dredged material (DM) data obtained from the Department's Office of Dredging and Sediment Technology (ODST). For additional information, see Section 4.10 below.
- In lieu of some of the recommended discrete sampling data, particularly where very large quantities (i.e., greater than 10,000 cubic yards) of relatively homogeneous fill material will be used.

Because of VOC losses during homogenization, composite samples are not acceptable for VOC characterization as specified by the Department's Field Sampling Procedures Manual (FSPM, August 2005). Discrete samples for VOC analysis can be collected from one of the sub-samples used for compositing, which should be biased to the highest field screening results, odors, and/or other indicators of VOC contamination.

4.5.2 Sampling Frequency Modifications

The sampling frequencies to be used to establish the characteristics of potential donor material are summarized in Table 1. There are two sampling frequencies listed in Table 1 – (1) Default Sampling and (2) Reduced Sampling. In general, the default sampling is used for donor material with little or no prior data, and the reduced sampling frequency is utilized where there has been some prior assessment of the fill source (e.g., site review, existing data). **Further reductions beyond the reduced sampling frequency in Table 1 are permitted and would need appropriate justification in the next key document submission, but not Department pre-approval.** These further reductions would be based upon an evaluation of the source material consistent with the concepts in this guidance. Conversely, depending upon the site conditions and heterogeneity of the donor material, the investigator may elect to conduct additional sampling beyond that outlined in Table 1.

Table 1: Sampling Frequency Guide for Alternative Fill

Proposed Volume	Default Sampling Scheme without justification	Reduced Sampling Scheme with justification
(Cubic Yards)	(Samples)	(Samples)
0 to 20	1	1
20.1 to 40	2	2
40.1 to 60	3	2
60.1 to 80	4	2
80.1 to 100	5	2
100.1 to 200	6	3
200.1 to 300	7	3
300.1 to 400	8	4
400.1 to 500	9	4
500.1 to 600	10	5
600.1 to 700	11	5
700.1 to 800	12	6
800.1 to 900	13	6
900.1 to 1,000	14	7
1,000.1 to 2,000	15	8
2,000.1 to 3,000	16	9
3,000.1 to 4,000	17	10
4,000.1 to 5,000	18	11
5,000.1 to 6,000	19	12
6,000.1 to 7,000	20	13
7,000.1 to 8,000	21	14
8,000.1 to 9,000	22	15
9,000.1 to 10,000	23	16
10,000.1 to 11,000 *	24	17

*With volumes greater than 10,000 cubic yards, the sampling rate is 1 per additional 1,000 cubic yards. The sampling frequency may be reduced with appropriate justification, and does not require Department pre-approval. This includes deviation from the default or reduced sampling frequencies.

The sampling frequencies in Table 1 may be reduced based upon: (1) an understanding of the donor site's current and historical use and/or (2) reliable SI/RI data as discussed below:

- An evaluation of the historical operations and hazardous substances used at a donor site by review of a Preliminary Assessment (PA) or other "Site Review" where a PA is not required at a donor site. The PA or Site Review can be used to assess the likely types and concentrations of hazardous substances that may be present in site soils – whether from natural or anthropogenic sources. For a Site Review, the LSRP should evaluate historical site use, perform a historical aerial photograph review, and review other site historical information as typically performed for a PA. Potential sources of useful information may include (1) listings of known contaminated sites, (2) NJ-GeoWeb/-MapNJ interactive mapping on the Department's GIS, (3) SI/RI data from nearby sites available through Open Public Records Act (OPRA) reviews, and/or (4) a visual inspection of the donor site for evidence of contamination or AOCs.
- Where reliable analytical data from an SI or RI are available for the donor material, these data may be used in lieu of, or to supplement, sampling and analyses using this technical guidance. The investigator is reminded to assess whether the SI/RI data accurately reflects the donor material (e.g., was it taken from a similar location/soil type) and current site conditions (e.g., likelihood of additional releases or chemical degradation). If the fill is uniform in terms of similar contaminant concentrations and physical characteristics, some further reduction in sampling and analyses may be warranted. This reduction may include testing for a broad suite of analytes on some samples and a reduced suite of analytes on others. Conversely, linear projects such as highway and utility work are less likely to be uniform sites – particularly if they pass through heterogeneous soil types and areas with a variety of commercial/industrial uses – and may be less suitable for a reduction in sampling.
- It is expected that donor material will be analyzed for the Target Analyte List (TAL) / Target Compound List (TCL) plus 30 and Extractable Petroleum Hydrocarbons (EPH) unless a targeted suite of contaminants can be justified. Where hexavalent chromium may be a contaminant of concern or total chromium concentrations are elevated, analyze the samples for hexavalent chromium.
- The sampling and analyses may be modified for all, or just a subset of, the fill characterization samples based upon the PA/site review and/or existing sampling data. For example, if there is prior data that demonstrates consistent VOC concentrations, further VOC testing could be reduced or eliminated – especially if field screening is conducted during sampling using a properly calibrated direct reading instrument.
- To ensure geophysical compatibility of receiving AOC and donor material, other analyses may also be needed, such as pH and clay content.

If the investigator determines that existing data (this includes data from ODST) and/or other information accurately and reliably reflects the source material (e.g., it was taken from a similar location/soil) and current site conditions, the investigator may rely on this data, provided:

- The analyses were performed by a laboratory certified for those methods by the Department.
- The data meet the data quality requirements in the Technical Rule and any associated Department technical guidance for QA/QC reviews.

- A detailed description of the sample collection methodologies for the data is obtained for the donor material.
- The donor material was not moved to another property for storage.

4.6 Impact to Ground Water and Surface Water Evaluation for Off-Site Sources

Pursuant to the Technical Rule, the proposed remedial action for a given AOC must address all ground water and surface water issues whether from the existing contamination at the receiving AOC or from the proposed alternative fill.

The proposed alternative fill's potential to increase, or result in ground water contamination should be evaluated prior to placement. The finding of no ground water contamination at the donor AOC cannot be used as the basis for assuming no impact on ground water at the receiving AOC, because excavated donor material will have a different impact on ground water than in-situ donor material. If the contaminant levels in the donor material are below the greater of the default impact to ground water (IGW) screening levels or the AOC-specific IGW Soil Remediation Standard (SRS) values at the receiving site (as determined by Synthetic Precipitation and Leachate Procedure (SPLP) results), then no further IGW evaluation is needed of the donor material. However, SPLP testing of donor material is warranted to assess a potential impact to ground water when donor material is below the default IGW screening levels or SPLP testing is not the basis for a site-specific IGW SRS under the following circumstances:

- where the alternative fill will be used at receiving AOCs where no ground water remediation or monitoring will be employed; or
- where the fill will be placed near (professional judgment is required for this determination, but generally within two feet would be considered reasonable) or below the seasonally high water table.

If the contaminant concentrations in the donor material are above the default IGW screening levels, but SPLP sampling has not been done, then an evaluation of the potential for IGW of the donor fill material should include the collection and analysis of at least 3 samples per donor AOC for SPLP testing using the Department's SPLP guidance for IGW at http://www.nj.gov/dep/srp/guidance/rs/. These samples of donor material (selected from RI and/or Table 1 samples) should be of the highest contaminant concentrations and representative of the different characteristics of the donor material that would affect the mobility of any given contaminant into ground water (e.g., pH, soil texture, composition of fill). Exceedances of IGW default criteria for metals that have only secondary ground water quality standards do not need SPLP testing as described in the Department's IGW Frequently Asked Questions at http://www.nj.gov/dep/srp/guidance/rs/igw_faq.pdf, and such exceedances do not apply to the IGW evaluation of the donor material.

Evaluate the SPLP results as follows:

- If the SPLP results indicate no potential impact to ground water using the Departments SPLP guidance for IGW, then the IGW evaluation is complete and the donor material can be used as alternative fill.
- If the SPLP results indicate a potential impact to ground water, then the donor material should not be used as alternative fill unless the importation of this donor material will not

impact the type, effectiveness, or feasibility of the ground water remedy at the receiving site and will not impact adjacent surface water.

Because the SPLP guidance is not appropriate for volatile organic contaminants, donor material with contaminant concentrations that are above the default IGW screening levels may not be used as alternative fill unless the volatile organic contaminant concentrations in the donor material meet the like-on-like requirement, the 75th percentile requirement, would have no vapor intrusion impact pursuant to the Department's Vapor Intrusion Guidance, and the importation of this alternative fill will not impact the type, effectiveness, or feasibility of the ground water remedy at the receiving site and will not impact adjacent surface water.

All other conditions, exclusions, and restrictions applicable to the use of alternative fill in Section 4 still apply. In all cases, the final remedial action must be protective of human health and the environment.

4.7 Resource Conservation and Recovery Act (RCRA) Waste Exclusion

Only nonhazardous material may be used at a receiving AOC; the proposed alternative fill cannot be a listed or characteristic hazardous waste as determined pursuant to N.J.A.C. 7:26G and 40 C.F.R. Part 261.

4.8 Dioxin Exclusion

Materials that contain dioxin (expressed as Toxicity Equivalent Quotients (TEQs) for 2, 3, 7, 8 TCDD) at concentrations above the Department's action level or remediation standard in effect at the time the donor material is evaluated may not be used as alternative fill at a receiving AOC.

4.9 Polychlorinated Biphenyls Restriction

Use of polychlorinated biphenyl (PCB) containing materials must comply with the Toxic Substance Control Act (TSCA) and associated regulations, 40 CFR 761 et seq., and guidance found at http://www.epa.gov/epawaste/hazard/tsd/pcbs/index.htm. In addition to TSCA compliance, use of PCB-contaminated material must also comply with this technical guidance, the Technical Rule, and the Soil Remediation Standards.

4.10 Sediment

Alternative fill proposed for use at a SRP site cannot impact sediment quality at the receiving AOC in a way that is inconsistent with the proposed remedial action. In other words, the proposed remedial action for the receiving AOC must address all sediment issues whether from the existing contamination or the placement of the alternative fill.

Sediment, inclusive of dredged material and processed dredged material (PDM), being considered for alternative fill at a receiving AOC is evaluated the same as other potential alternative fill sources. If sediments that are not impacted by known, specific contaminant discharges are relatively homogeneous and are hydraulically dredged, then such materials are candidates for reduced sampling frequency. Data for evaluation pursuant to this technical guidance may be obtained from the completion of a SI/RI and/or from the Department's Office

of Dredging and Sediment Technology (ODST). Collection and analysis of additional samples may be needed to supplement data obtained from ODST that may not meet the sampling frequencies, analyses, or discrete sampling of this technical guidance.

A concern about processed dredged materials is that the additives used may also be a source of contamination that needs to be assessed, in addition to whatever contaminants are present in the sediment. If bench-scale data for PDM is obtained from ODST, then the investigator should evaluate the data to determine if it is sufficient to meet this technical guidance. If the investigator determines the bench-scale data is either nonrepresentative or the sample frequency is inadequate, or to ensure compliance with the applicable remediation standards, then discrete samples of the actual PDM to be placed at the receiving AOC may need to be collected and analyzed.

The investigator needs to be aware that the supplier (whether an on-site or off-site person or entity) of sediment as alternative fill, must have an Acceptable Use Determination (AUD) from ODST. The receiving AOC does not require an AUD, but a final remedial action work plan for the receiving site is required by ODST.

4.11 Historic Fill

Historic fill as defined by N.J.A.C. 7:26E-1.8 may be used as alternative fill at a receiving AOC under this technical guidance. Historic fill that is non-soil as defined in this technical guidance requires a CAO/BUD. Evaluate the sampling data for all donor historic fill in accordance with section 4.5 of this technical guidance to determine if the material should be allowed to be placed at the receiving AOC. Because of the limited amount of data usually associated with historic fill, additional sampling may be needed in accordance with section 4.5.2 of this technical guidance. The donor historic fill data is then used for the like-on-like evaluation (Section 4.2) and the 75^{th} percentile evaluation (Section 4.3).

Evaluation of impact to ground water (IGW) should follow Section 4.6 of this technical guidance. If ground water in the receiving AOC is uncontaminated and ground water in the donor AOC is contaminated from the historic fill, then SPLP testing is not necessary as it is likely that the donor historic fill may impact ground water at the receiving AOC, so the donor historic fill should not be used as alternative fill at the receiving AOC. However, if the donor historic fill will still be considered for use, then conduct SPLP analyses of the material in accordance with Section 4.6. If the SPLP results indicate a potential impact to ground water, then the donor material should not be used as alternative fill unless the importation of this donor material will not impact the type, effectiveness, or feasibility of the ground water remedy at the receiving site and will not impact adjacent surface water.

A special case of historic fill relocation is applicable to Brownfield redevelopment sites. Where a Brownfield redevelopment includes multiple contiguous properties containing historic fill, see Section 5.2 of this technical guidance. Where the donor historic fill is from a non-contiguous property, then follow this section this technical guidance.

4.12 Recycled Concrete

Use of recycled concrete as alternative fill is subject to this technical guidance and the recycled concrete guidance from the Department's Solid and Hazardous Waste Management Program (SHWMP), http://www.state.nj.us/dep/dshw/resource/guidance/concrete%20demo%201210.pdf. Analytical testing conducted using Sections V or VI of the recycled concrete guidance may be substituted to fulfill some or all of the sampling and analytical requirements of this technical guidance, if those results are determined to be equivalent by the investigator overseeing the remediation of the receiving AOC. Buildings or structures should be sampled prior to demolition so samples can be biased appropriately. However, because the recycled concrete guidance does not incorporate IGW considerations, placement of this material is to minimize the potential for contamination of ground water. If there are concerns about the potential for IGW, the investigator has the discretion to require additional sampling (see Section 4.6) to address these concerns appropriately. Recycled concrete for use as alternative fill will need a CAO/BUD from the SHWMP, pursuant to N.J.A.C. 7:26-1.7(g) and as discussed in the guidance at http://www.state.nj.us/dep/dshw/rrtp/bud.htm.

4.13 Radiation Exclusion

Donor material with radiation or radionuclide contamination above natural background should not be used as alternative fill. Should a potential for radionuclide contamination be indicated in the PA or site review, then field screening with a handheld radiation/gamma meter should occur of the donor material. If radiation is found to be present above background levels, donor material should not be used as alternative fill.

The following industries are recognized by the Department's Bureau of Environmental Radiation (BER) as having the potential to have technologically enhanced naturally-occurring radioactive material (TENORM) contamination: radioactive materials licensee or a former licensee, paper and pulp facilities; ceramics manufacturing; paint and pigment manufacturing; metal foundry facilities; optical glass facilities; fertilizer plants; aircraft manufactures; munitions and armament manufactures; scrap metal recycling; zirconium manufacturing; oil and gas production, refining, and storage; electricity generation; cement and concrete product manufacture; radiopharmaceutical manufacturing; and geothermal energy production.

If the PA or site review indicates that the donor material may be from one of these industries or field screening results are above background, and the material will still be considered as a potential source of alternative fill, contact BER for sample collection and analytical requirements. If the results confirm the donor material contains radionuclides, do not use this material as alternative fill.

4.14 Asbestos-Containing Material Restriction

Because the Department does not have standards or criteria for asbestos (i.e., naturally occurring or asbestos-containing material (ACM, i.e., material containing >1% asbestos)) in soil or nonsoil material, donor material containing or potentially containing asbestos may not be used as alternative fill. The presence or potential presence of asbestos in proposed alternative fill may be determined through a PA, other site review, on-site visual observations, and/or sample collection and analysis. Properties where buildings have been demolished are of particular concern, unless

acceptable documentation exists and is reviewed to determine that ACM has been removed and properly disposed in accordance with all federal, state, and local laws, rules, regulations, and guidance. It is important to note that asbestos measured as ≤1% in samples of potential donor material (while historically used by the Department on a site-specific basis to indicate that asbestos did not require remediation) may not be a reliable indicator of the absence of asbestos or that no hazard or risk from asbestos is present from the use of such material as alternative fill. For more background on this issue, the investigator can consult the USEPA's *Framework for Investigating Asbestos-Contaminated Superfund Sites* (USEPA 2008) and 40 CFR Part M, *National Emission Standard for Asbestos*.

4.15 Engineering and Institutional Controls

Sites that import alternative fill usually include engineering and institutional controls as potential components of the remedy where these components are necessary to achieve protection of public health and the environment through mitigation of exposure. Examples of engineering controls include:

- caps;
- barrier walls;
- gas control and leachate control systems; and
- vapor intrusion barriers or mitigation systems.

Where barrier walls are employed, they should be installed prior to placement of alternative fill where practicable and consistent with good engineering practice. If the placement of alternative fill is likely to damage the barrier wall, the installation of the barrier wall may need to be conducted after the alternative fill has been emplaced.

Specific requirements for (1) establishing and maintaining engineering and institutional controls, including requirements for Deed Notices; (2) long-term operation, maintenance, and monitoring program; and (3) Remedial Action Permits are detailed the Technical Rule.

In the event that placement of alternative fill as part of a site remedy leads to unforeseen off-site migration of contamination, an increase in extent of contaminated area, and/or adverse impacts to human receptors or sensitive ecological receptors (i.e., environmentally sensitive natural resources), construction of appropriate remedial actions is to be initiated as soon as is practicable to address these problems.

4.16 Tracking and Record Keeping

It is important that all incoming shipments of alternative fill include fully executed bills of lading or manifests that clearly document that the incoming fill is from the approved donor site with copies of these forms provided to the Department with the Remedial Action Report. It is important that the Remedial Action Report (including the deed notice and Remedial Action Permit) and biennial certifications contain all documentation demonstrating compliance with this technical guidance, including the volume, thickness (with surveyed elevations), and area(s) where alternative fill has been placed (postgrading and consolidation) on the site or AOC.

5 ALTERNATIVE FILL FROM ON-SITE SOURCES

5.1 AOC Data Evaluation

Consolidation is encouraged as long as it enhances the final remedial action. Both AOCs, donor and receiving, must be delineated, and the physical properties of the soil must be compatible. Ideally, contaminant concentrations should be similar, but as long as the remediation requirement of Technical Rule Subchapter 5 for a remedial action are met, it will be acceptable (following proper consideration of the potential adverse impacts) to move higher contaminant concentrations to an AOC with lower contaminant concentrations. Data from a completed remedial investigation for delineation are acceptable to make this evaluation. If such data are not available, they must be obtained by sampling and delineation for each AOC (donor and receiving location) as per the Technical Rule.

Evaluation of impact to ground water (IGW) should follow Section 4.6 of this technical guidance. If ground water in the receiving AOC is uncontaminated and ground water in the donor AOC is contaminated from the historic fill, then SPLP testing is not necessary as it is likely that the donor historic fill may impact ground water at the receiving AOC, so the donor historic fill should not be used as alternative fill at the receiving AOC. However, if the donor historic fill will still be considered for use, then conduct SPLP analyses of the material in accordance with Section 4.6. If the SPLP results indicate a potential impact to ground water, then the donor material should not be used as alternative fill unless the importation of this donor material will not impact the type, effectiveness, or feasibility of the ground water remedy at the receiving site and will not impact adjacent surface water.

For on-site movement of contaminated soil, the Department will allow exceptions to the like-on-like and 75th percentile requirements in this technical guidance and **the sampling frequencies in Table 1 in this technical guidance** under the following conditions:

- A clean area or clean areas that meet both the residential and impact to ground water soil remediation standards are created or enlarged. The like-on-like and 75th percentile requirements are suspended in this case. Token creation or enlargement of a clean area does not qualify for these exceptions. A token area is suggested to be one that is less than 10% of the receiving AOC, but the size of the receiving AOC and other site-specific conditions (such as the final use of the clean area) need to be factored into this determination.
- Areas of concern with the same contaminants can be consolidated as long as the total areal extent is reduced for those contaminants. The 75th percentile requirement is suspended in this case. Placement or encroachment on clean areas will still be prohibited.
- The consolidation will not result in or increase contamination of groundwater at the receiving AOC.
- The consolidation will not result in the mixing of incompatible contaminants or creation of a vapor intrusion pathway at the receiving AOC.

A variance pursuant to the Technical Rule is required for the use of the above exceptions to the like-on-like and 75th percentile requirements, which may result in Department review of this component of the document. **All other conditions, exclusions, and restrictions applicable to**

the use of alternative fill (Section 4) still apply. In all cases, the final remedial action must be protective of human health and the environment.

5.2 Historic Fill at Brownfield Redevelopment Sites

A special case of historic fill relocation is applicable to Brownfield redevelopment sites. Where a Brownfield redevelopment includes multiple contiguous properties containing historic fill, and the historic fill has been sampled and analyzed in accordance with the Technical Rule, the Department's Historic Fill Guidance, and this technical guidance, relocation of the historic fill within the development can be allowed across property lines. On-site relocation of historic fill can be performed provided:

- It will not result in an increase in ground water contamination;
- Placement of fill is protective of human health and the environment; and
- All historic fill at the site is remediated in accordance with the Technical Rule.

If these conditions are met, then the like-on-like and 75th percentile compliance requirements do not apply, but the remainder of section 4 still applies.

5.3 Tracking and Record Keeping

It is important that the Remedial Action Report (including the deed notice and Remedial Action Permit) and biennial certifications contain all documentation demonstrating compliance with this technical guidance, including documentation of the volume, thickness (with surveyed elevations), and area where alternative fill has been moved from and placed (postgrading and consolidation) on the site or AOC.

6 CLEAN FILL

6.1 Purpose

This applies to both off-site and on-site sources of clean fill. The overall objective is that the proposed clean fill be thoroughly understood as to the types and concentrations of contaminants, and to homogeneity, so contaminated fill is not unintentionally placed as clean fill that would result in additional remediation. Clean fill is generally required for the implementation of presumptive remedies to be protective of sensitive receptors.

The guidance in this section applies strictly to the use of clean fill at SRP sites. The SRP does not regulate or approve products at their point of manufacture when they are not destined to be part of the remediation at an SRP site. The use of clean fill at non-SRP sites is beyond the scope and authority of the SRP regulations. Because the SRP remediates sites where a discharge has occurred, this technical guidance is not designed to address or be applied to other situations.

6.2 Sampling the Material Proposed for Clean Fill

Donor material proposed for use as clean fill on a SRP site should be thoroughly evaluated through a review of the source history and operations to develop a sampling and analysis strategy in accordance with the Technical Rule, this technical guidance, and the Department's *Field Sampling Procedures Manual (*FSPM). Many locations generate clean fill and topsoil for sale based on a blending process, often including mulched, composted organic materials (e.g., grass clipping or leaves). Other sources of clean fill can include a quarry to provide bank-run sand and gravel, construction projects where a net cut is needed or the topsoil is stripped and sold prior to construction, or contaminated material that has been treated so it meets the definition of clean fill. Therefore, there are different concerns that should be addressed in the evaluation, sampling, and analysis of each source type. Source locations may include in-state and out-of-state sources of potential clean fill.

Sampling of the proposed clean fill should be based on a systematic approach whereby the investigator will have assurance that the results accurately represent the clean fill characteristics. Typically, a series of field screened, discrete grab samples will be collected, biased to areas that may indicate the proposed clean fill is actually contaminated. Where biased sampling is not necessary or only a few biased samples are needed, the investigator should use grid-based, random sampling procedures using accepted USEPA guidance or other statistically appropriate references (e.g., Gilbert 1987). For undisturbed in-situ material, collect samples at the surface and at depth to ensure that the samples are representative of the total volume of material that may be used as clean fill. Where a large stockpile of proposed clean fill has already been staged and can be maintained for use on a specific project, then the sampling should be statistically designed to collect representative samples from the surface and interior of the stockpile. Very large stockpiles may need regrading to smaller sizes to allow for practical physical access for sampling.

6.2.1 Composite Sampling

Although discrete sampling is strongly preferred, in some cases laboratory data from composite sampling may be utilized for the characterization of a proposed clean fill. The investigator

should evaluate the representativeness of the composite data in characterizing the proposed fill. In general, the fewer the number of samples in a composite, the more representative the composite data will be. The use of composite sampling data constitutes a deviation from the typically required use of discrete sampling as a compliance mechanism, and requires justification by the investigator, particularly for the number of composite samples collected and the number of discrete samples included in each composite sample. The sampling frequencies need to account for the depths of the donor material to be removed. If one area of donor material will be excavated to more than one depth (e.g., three feet in one part and six feet in the other part), then the samples must be distributed accordingly at multiple depths to be representative of the full depth of each cut.

Some examples of where composite sampling may be considered for use are:

- If obtained during the site review and determined to be reliable to establish a reduced sampling frequency in accordance with Section 6.1.2, below;
- For dredged material (DM) data obtained from the Department's Office of Dredging and Sediment Technology (ODST). For additional information, see Section 4.10; and
- In lieu of some of the discrete sampling data, particularly where very large quantities (greater than 10,000 cubic yards) of relatively homogeneous fill material will be obtained.

Because of VOC losses during homogenization, composite samples are not acceptable for VOC characterization, as specified by the Department's Field Sampling Procedures Manual (FSPM, August 2005). Discrete samples for VOC analysis can be collected from one of the sub-samples used for compositing, which should be biased to the highest field screening results, odors, and/or other indicators of VOC contamination.

6.2.2 Sampling Frequency Modifications

The sampling frequencies that should be used to establish the characteristics of a potential clean fill source are summarized in Table 2. Note that there are two sampling frequencies listed in Table 2 – Default Sampling and Reduced Sampling. In general, the default sampling is used for a source site with little or no prior data, and the reduced sampling frequency is used where there has been some prior assessment of the fill source (e.g., site review, prior sampling). Further reductions in sampling frequency are permitted and would need appropriate justification in the next key document submission, but not Department pre-approval. These further reductions would be based upon an analysis of the source material consistent with the concepts in this guidance. Depending upon the site conditions and variability of the fill, the investigator may conduct additional sampling beyond that outlined in Table 2.

Table 2: Sampling Frequency Guide for Clean Fill

Proposed Volume	Default Sampling Scheme without justification	Reduced Sampling Scheme with justification
(Cubic Yards)	(Samples)	(Samples)
0 to 20	1	1
20.1 to 40	2	2
40.1 to 60	3	2
60.1 to 80	4	2
80.1 to 100	5	2
100.1 to 200	6	3
200.1 to 300	7	3
300.1 to 400	8	4
400.1 to 500	9	4
500.1 to 600	10	5
600.1 to 700	11	5
700.1 to 800	12	6
800.1 to 900	13	6
900.1 to 1,000	14	7
1,000.1 to 2,000	15	8
2,000.1 to 3,000	16	9
3,000.1 to 4,000	17	10
4,000.1 to 5,000	18	11
5,000.1 to 6,000	19	12
6,000.1 to 7,000	20	13
7,000.1 to 8,000	21	14
8,000.1 to 9,000	22	15
9,000.1 to 10,000	23	16
10,000.1 to 11,000 *	24	17

*With volumes greater than 10,000 cubic yards, the sampling rate is 1 per additional 1,000 cubic yards. The sampling frequency may be reduced with appropriate justification and does not require Department pre-approval. This includes deviation from the default or reduced sampling frequencies.

In most cases, modifications in sampling frequencies will be based upon: (1) an understanding of the donor site's current and historical use and/or (2) reliable sampling data as discussed below.

- Because a donor site is presumed to be "clean," information from a Preliminary Assessment (PA) will not usually be available. Therefore, a Site Review is conducted to evaluate the donor site's current and historical use, such as historical operations and hazardous substance use. The Site Review can be used to assess the likely types and concentrations of hazardous substances that may be present in site soils – whether from natural or anthropogenic sources. For a Site Review, the investigator should evaluate historical site use from an analysis of a historical aerial photograph review and other site historical information as typically performed for a PA. Other potential sources of useful information may include listings of known contaminated sites and Classification Exception Areas (CEA) on the Department's I-Map system, characterization data from nearby sites available through Open Public Records Act (OPRA) reviews, and a visual inspection of the donor site for evidence of chemical releases or AOCs.
- Where reliable analytical data is available for the donor site, these data may be used in lieu of, or to supplement, the sampling discussed in this section of the guidance. Unlike alternative fill, data for clean fill will typically not have been generated as part of a SI or RI. The investigator is reminded to assess whether the data accurately reflects the source material (e.g., was it taken from a similar location/soil) and current site conditions (e.g., likelihood of new releases, change in site activities or proximity to impacted properties). As with alternative fill, it is appropriate to consider the likely uniformity of the source material. If the fill is uniform in terms of similar contaminant concentrations and physical characteristics, some further reduction in frequency may be warranted. This reduction may include testing for a broad suite of analytes on some samples and a reduced suite of analytes on others. Conversely, linear projects such as highway and utility work are less likely to be uniform sites – particularly if they pass through heterogeneous geologic formations and areas with a variety of commercial/industrial uses – and may be less suitable for a reduction in sampling.
- It is expected that clean fill will be analyzed for the Target Analyte List (TAL)/Target Compound List (TCL) and Extractable Petroleum Hydrocarbons (EPH). Analysis for hexavalent chromium should not be needed unless the source of the proposed fill is from an urban area or is not from a virgin source, such as a commercial rock quarry.
- This analytical protocol may be modified for all, or just a subset of, the clean fill samples based upon the site review and/or prior sampling data as discussed below.
- The Department does not require analysis for asbestos, dioxins or for radionuclides, but the potential presence of these contaminants is discussed further later in the clean fill section of this guidance.
- To ensure geophysical compatibility of destination and donor site material, other analyses may also be needed, such as pH and clay content.

If the investigator determines that pre-existing data (this includes data from ODST) and/or other information accurately and reliably reflects the source material (e.g., it was taken from a similar location/soil material) and current site conditions, the investigator may rely on this data, provided:

- A New Jersey certified laboratory performed the analyses;

- The data meet the data quality requirements in the Technical Rule and any associated Department technical guidance for QA/QC reviews; and
- A detailed description of the sample collection methodologies is provided for the source site.
- The material was not moved to another property for storage.

For example, if there is reliable pre-existing data that demonstrates consistent VOC concentrations, further VOC testing could be reduced or eliminated – especially if field screening using a PID is conducted during sampling.

6.3 Clean Fill Testing Exceptions

Fines from rock (e.g., crushed rock, gravel, dense graded aggregate, or other such rock material) mined or excavated from undisturbed geologic formations requires one sample of the fines for analysis as long as the rock is obtained from a quarry/mine that has not been located on or impacted by other contaminant sources, based on a preliminary assessment or other site review. Existing data provided by the quarry/mine owner/operator is acceptable for use as long as there is at least one sample for each calendar year of quarry/mine operation, and the Investigator determines that these data are reliable. For other sources of rock from undisturbed geologic formations, at least one (1) sample of the fines must be collected and analyzed with additional samples collected and analyzed as needed based on a preliminary assessment or other site review and the laboratory results from the initial sample of the fines.

Sand or soil mined or excavated from undisturbed geologic formations requires one sample for analysis as long as the sand or soil is obtained from a commercial source or quarry that has not been located on or impacted by other contaminant sources based on a preliminary assessment or other site review. This exception does not apply to manufactured soil, such as the mixing of composted leaves with inorganic soil, or blended soil, which is to be sampled for analysis using the sampling frequency table (Table 2) in this guidance. These data provide appropriate documentation that the fines meet the applicable remediation standards or criteria pursuant to the definition of clean fill at N.J.A.C. 7:26E-1.8. Existing data provided by the quarry/mine owner/operator is acceptable for use as long as there is at least one sample for each calendar year of quarry/mine operation, and the Investigator determines that these data are reliable. For other sources of sand from undisturbed geologic formations, at least one (1) sample of the sand or soil must be collected and analyzed with additional samples collected and analyzed as needed based on a preliminary assessment or other site review and the laboratory results from the initial sample of the sand or soil.

If there are any potential questions or concerns that the clean fill (i.e., rock, sand, or soil) may not meet the applicable remediation standards or criteria, then sample for analysis using the sampling frequency table (Table 2) and section 6.1 in this technical guidance.

6.4 Elevated Natural Background Consideration

Certain soils or geologic formations are known to contain naturally occurring elements or compounds that can exceed the Department's remediation standards or other criteria. Examples include the glauconitic "greensand" that contains arsenic (Tedrow, 2002) and certain igneous rock formations that contain radionuclides, such as the gneisses in the New Jersey Highlands that

release radon gas (http:/www.state.nj.us/dep/rpp/rms/rmsagree-1.htm). Fill from such natural sources may not be used as clean fill at SRP sites, unless the receiving AOC and the donor material are from the same natural geologic formation (e.g., both the receiving AOC and the donor material are greensand).

Should a potential for radiation or radionuclides exist or be indicated in the site review, then field screening with a handheld radiation/gamma meter should occur at the donor site. If radiation is found to be present above natural background levels, do not use as clean fill.

6.5 Asbestos-Containing Material Exclusion

Because the Department does not have standards or criteria for asbestos (i.e., naturally occurring or asbestos containing material (ACM, i.e., material containing >1% asbestos)) in soil or other soil-like material, fill from an off-site donor source containing or potentially containing asbestos may not be used as clean fill. The presence or potential presence of asbestos in fill may be determined through a preliminary assessment, other site review, on-site visual observations, or sample collection and analysis. Naturally occurring asbestos can be found in serpentine rock found in Hudson County (Speiser 1978) or in the Highlands of Sussex County (NJGS Geologic Report 15, 1986).

Properties where buildings have been demolished are of particular concern, unless acceptable documentation exists and is reviewed to determine that ACM has been removed and properly disposed in accordance with all federal, state, and local laws, rules, regulations, and guidance. It is important to note that asbestos measured as <1% in fill samples (while historically used by the Department on a site-specific basis to indicate that asbestos did not require remediation) may not be a reliable indicator of the absence of asbestos or that no hazard or risk from asbestos is present from the use of such material as fill. For more background on this issue, the investigator can consult the USEPA's *Framework for Investigating Asbestos-Contaminated Superfund Sites* (USEPA 2008) and 40 CFR Part M, *National Emission Standard for Asbestos*.

6.6 Impact to Ground Water Evaluation

An IGW evaluation should not be needed, as clean fill is expected to meet the default IGW soil screening levels. If the default IGW soil screening levels are exceeded, then an evaluation of the potential for IGW of the donor material should include the collection and analysis of at least three samples per donor AOC for SPLP testing using the Department's SPLP guidance for IGW at http://www.nj.gov/dep/srp/guidance/rs/. These samples should be of the highest contaminant concentrations and representative of the different characteristics of the donor material that would affect the mobility of any given contaminant into ground water (e.g., pH, soil texture, composition of fill. However, exceedances of default IGW soil screening levels for metals that have only secondary ground water quality standards (GWQS) do not need this SPLP evaluation.

Evaluate the SPLP results as follows:

- If the SPLP results indicate no potential IGW using the Departments SPLP guidance for IGW, then the IGW evaluation is complete and the donor material can be used as clean fill.

- If the SPLP results indicate a potential IGW, then the donor material should not be used as clean fill.

6.7 Resource Conservation and Recovery Act (RCRA) Waste Exclusion

Only nonhazardous clean fill may be used at a receiving AOC. Clean fill can be assumed to be nonhazardous because of its definition, so waste classification testing should not be needed. If there is any question whether a clean fill source may be hazardous, then this shall be determined pursuant to N.J.A.C. 7:26G and 40 C.F.R. 261.

6.8 Recycled Concrete

Use of concrete is subject to this technical guidance and the recycled concrete guidance established by the Department's Solid and Hazardous Waste Management Program found at http://www.state.nj.us/dep/dshw/resource/guidance/concrete%20demo%201210.pdf. Analytical testing conducted using Sections V or VI of the recycled concrete guidance may be substituted to fulfill some or all of the sampling and analytical requirements of this technical guidance, if those results are determined to be equivalent by the investigator overseeing the remediation of the receiving AOC. Buildings or structures should be sampled prior to demolition so samples can be biased appropriately. However, because the recycled concrete guidance does not incorporate IGW considerations, IGW must be evaluated using Section 6.5 of this technical guidance. Clean concrete that meets this technical guidance and the recycled concrete guidance requires a CAO/BUD from the SHWMP, pursuant to N.J.A.C. 7:26-1.7(g) and as discussed in guidance at http://www.state.nj.us/dep/dshw/rrtp/bud.htm.unless justification is provided otherwise.

6.9 Dioxin Exclusion

Materials that contain dioxin expressed as Toxicity Equivalent Quotients (TEQs) for 2, 3, 7, 8-TCDD at concentrations above the Department's action level or remediation standard in effect at the time the donor site material is evaluated shall not be used as clean fill at a receiving AOC.

6.10 Sediment

Sediment, inclusive of dredged material and process dredged material (PDM), being considered for placement at a SRP site as clean fill is subject to the same requirements as other clean fill sources. Based on the PA or site review, if sediments are from a source not known or suspected to be contaminated, and are relatively homogeneous, then such materials are candidates for reduced sampling frequency as described in Section 6.1.2 of this technical guidance. Data for evaluation pursuant to this technical guidance may be obtained from the completion of a site investigation/remedial investigation or from the Department's Office of Dredging and Sediment Technology (ODST). Collection and analysis of additional samples may be needed to supplement any data obtained from ODST that may not meet the sampling frequencies, analyses, or discrete sampling of this technical guidance.

A concern about processed dredged materials is that the additives used may also be a source of contamination that needs to be assessed. If bench-scale data for PDM is obtained from ODST, then the investigator should evaluate the data to determine if it is sufficient to meet the concepts of this technical guidance. If the investigator determines the bench scale data is either non-

representative, the sample frequency is inadequate, or the need to ensure compliance with the applicable remediation standards, then discrete samples of the actual PDM may need to be collected and analyzed.

The investigator needs to be aware that the supplier (whether an on-site or off-site person or entity) of sediment as clean fill, must have an Acceptable Use Determination (AUD) from the Department's Office of Dredging and Sediment Technology (ODST). The receiving SRP site does not require an AUD, but an approved remedial action work plan for the receiving site is required by ODST.

Clean fill proposed for use at a SRP site cannot impact sediment quality at the receiving AOC in a way that is inconsistent with the proposed remedial action. In other words, the proposed remedial action for the receiving AOC must address all sediment issues whether from the existing contamination or the placement of the clean fill.

6.11 Engineering Concerns

Sites that import soils or soil-like material (e.g., sediment) clean fill may include engineering and institutional controls, such as containment systems, as potential components of the remedy where these components are necessary to achieve protection of public health and the environment through mitigation of exposure. Examples of containment systems/engineering controls include:

- caps;
- barrier walls;
- gas control and leachate control systems; and
- vapor intrusion barriers or mitigation systems.

Where barrier walls are employed, they should be installed prior to placement of clean fill where practicable and consistent with good engineering practice. If the placement of clean fill is likely to damage the vertical barrier, the installation of the barrier wall may be conducted after the clean fill has been emplaced.

Specific requirements for establishing and maintaining engineering and institutional controls, including requirements for Deed Notices; long-term operation, maintenance, and monitoring program; and Remedial Action Permits are detailed at N.J.A.C. 7:26E-6.7 and -8.5. The Department has also established guidance for the preparation of Remedial Action Permits.

In the event that placement of clean fill as part of a site remedy leads to unforeseen off-site migration of fill and/or adverse impacts to human receptors or sensitive ecological receptors (i.e., environmentally sensitive natural resources), construction of appropriate engineering controls is to be initiated as soon as is practicable to correct these problems.

6.12 Tracking and Record Keeping

All incoming shipments of clean fill for use at a SRP site should include bills of lading to document clearly that the incoming fill is from the approved donor site with copies of these forms provided to the Department with the Remedial Action Report (RAR). It is important that

the RAR (including the deed notice) or biennial certifications contain all documentation demonstrating compliance with this guidance, including documentation of the volume, thickness (with surveyed elevations of final subgrade and top of clean fill), and area where clean fill has been placed (postgrading and consolidation) on the site or AOC.

7 REFERENCES

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APPENDICES

APPENDIX A

DETERMINING THE 75TH PERCENTILE

Determining the 75th percentile

The determination of the 75th percentile of a population can be done in various ways; however, the SRP would prefer to avoid confusion and make the process as easy and efficient as possible. Consequently, the SRP has elected to use the methodology found in the Excel software program because Excel is so widely available and is already in use by the regulated community.

The steps to use Excel to calculate the 75th percentile of a data set follow:

(1) Input or import the data points into a column within a blank Excel spreadsheet.
(2) Type "=PERCENTILE(" into an empty cell.
(3) Continuing in this same cell, enter the address of the data using the array format (e.g. A1:A26 for data in column A occupying rows 1 through 26).
(4) Still continuing in the same cell, type in a "," followed by "0.75)" and then hit "Enter."
(5) The 75th percentile of the data will appear in the formerly empty cell.

The following example is provided for illustrative purposes.

75th percentile example calculation for a given contaminant

Sample No.	Concentration in mg/kg
1	2
2	5
3	10
4	19
5	21
6	25
7	51
8	612
The 75th percentile is	32

If you do not have access to Excel, the following is the calculation that Excel employs.

1. $(V_{.75})$ is the 75th percentile of an ascending ordered dataset containing N values which are $(V_1$ through $V_N)$
2. If $(n) = (((0.75) (N-1)) + 1)$ and
3. Assuming $(n) = (k + d)$ where k is the integer component and d is the decimal component
4. Then $(V_{.75}) = (V_k) + ((d) (V_{k+1} - V_k))$ for $1 < n < N$

Discussion of the Selection of the 75th Percentile

The selection of the 75th percentile is based on two considerations. First, the 75th percentile is a robust boundary beyond which extreme values or outliers in a population occur irrespective of population distribution type. As such, the 75th percentile is a conservative upper bound of the central distribution of a sample population. Second, the Department does not want to institute new or additional sampling requirements, but rather opted to rely mainly on the existing data provided by the remedial investigation of an AOC, where possible. There is a recognition that the remedial investigation sampling would typically be limited relative to statistical requirements for sample size and sampling design. Therefore, the Department chose to be conservative in selecting the upper limit of the concentration of contaminants that are allowed to be brought in as fill, rather than expand the sampling requirements for an AOC where placement is proposed.

SRP has found that the maximum concentrations observed (100th percentile) in the RI of areas of concern (AOCs) can be atypical, much higher than those measured in the remaining AOC. Allowing these atypical concentrations to be imported would exaggerate the already increased mass of contaminants that will occur with the placement of these materials. This is why a comparison of maximum concentrations in the imported fill and the placement location was deemed to be inappropriate, and the 75th percentile was chosen instead.

SRP also considered using a comparison of mean values (which, depending on the distribution, can be equivalent to the 50th percentile) as a basis for establishing a critical value. However, the potential issues of unlike distributions, unequal sample sizes, sampling bias, etc. caused SRP regard this option as less credible. The SRP has concluded that, based on current knowledge, the 75th percentile of the concentrations in the placement locations shall be the maximum concentration allowable for a given contaminant in any fill allowed to be placed under this guidance.

The use of the 75th percentile offers certain advantages:

- For many uni-modal distribution types, observations in the distribution do exhibit a central tendency. It has been further observed that outliers and potential outliers for a given population of observations are generally above the 75th percentile or below the 25th percentile. The selection of the 75th percentile as a critical value would allow the importation of the largest volume of contaminated fill, while minimizing the inclusion of extreme concentrations.

- Use of the75th percentile as a critical value would provide a margin of safety to prevent bringing on-site concentrations above those already present. SRP recognizes the limitations of small sample sizes and, rather than increase the characterization effort, opted to employ a more conservative limit.

SRP recognizes that the selection of any basis for a critical value has drawbacks or weaknesses. Consequently, the use of the 75th percentile will be subject to periodic scrutiny and SRP is committed to revising this guidance document as needed.

APPENDIX B

FILL USE PLAN

APPENDIX B Fill Use Plan

The Fill Use Plan required in the Remedial Action Workplan (RAW) pursuant to N.J.A.C. 7:26E- 6.2(c) and 6.4(d) should include all of the following (parts can be provided in the Remedial Action Report (RAR) when not known at the time of RAW preparation, such as the information for the donor site):

1 For alternative and clean fill:

1.1 The location of the site of use and donor site(s) including state, county, municipality, address, block, and lot numbers.

1.2 The names, contact information, and relationship of all persons involved with the source, preparation, and transport of the fill from the donor site to the receiving site.

1.3 A description of the originating or donor site or AOC including use history from a PA or site review.

1.4 The volume of alternative fill or clean fill to be used or imported.

1.5 Identification of the specific location(s) on the site where the use will occur on a properly scaled map.

1.6 The depth to ground water on the receiving site, including the method of determination.

1.7 The description of the geotechnical properties of the fill appropriate for the intended use.

1.8 The use of the area(s) of the receiving and donor site (e.g., residential or nonresidential) being as specific as possible (e.g., light industrial, commercial strip mall, soccer field, condominium complex, etc.).

1.9 A discussion of the performance, effectiveness, and reliability of the proposed fill use and any potential negative impacts to human health, safety or the environment as a result of the use pursuant to the requirements at N.J.A.C. 7:26E-6.4(d).

1.10 The tracking and QC requirements to ensure all shipments received are of the fill from the approved donor site(s).

1.11 The field sampling and quality assurance project plan where new data must be generated for application of this guidance.

1.12 Documentation of the reliability of all data used in the application of this guidance.

1.13 The applicable laboratory data deliverables for all new data used in the application of this guidance.

1.14 All other documentation demonstrating compliance with this guidance.

2 For alternative fill only:

2.1 Data used to demonstrate that the same contaminants are present at the receiving and donor AOCs (i.e., contaminants not present at the receiving AOC may not be introduced as new contaminants in the donor fill).

2.2 Documentation to demonstrate compliance with the 75^{th} percentile or mean criterion.

2.3 Documentation of the waste classification of the fill, including all supporting data.

2.4 Cut and fill calculations to support the volume of alternative fill is not in excess of what is required for the remedial action.

2.5 Documentation that the intended use of the alternative fill will not contaminate or increase contamination of ground water, surface water, or sediment, or result in or increase ecological risks.

2.6 All other documentation demonstrating compliance with this guidance.

3 For clean fill only:

3.1 The documentation (e.g., data deliverables) that the clean fill meets all applicable remediation standards and criteria and is free of extraneous debris or solid waste.

3.2 All other documentation demonstrating compliance with this guidance.

APPENDIX C

SRP POLICY STATEMENT
APRIL 26, 2011

Policy on the Use of Alternative Fill 4-26-11

Alternative fill (as defined in the Technical Requirements for Site Remediation (N.J.A.C. 7:26E-1.8) to be proposed in 2011) can be an economical substitute for the use of clean fill in remedial actions, provided its use is protective of human health and the environment. Furthermore, by not sending contaminated soil to be landfilled the use of alternative fill helps preserve landfill capacity. However, the Department will not allow the use of alternative fill if the end result constitutes a new discharge or if contamination is made worse from a concentration perspective. These two concepts, as discussed below, were first embodied in the June 2008 Department guidance titled, "Guidance for Beneficial Use of Soil and Non-Soil Material in the Remediation of Contaminated Sites and Closure of Solid Waste Landfills." Because of the importance of these two concepts, the Department is including them in the Technical Requirements for Site Remediation (N.J.A.C. 7:26E) to be proposed in 2011.

The first concept is that no new contaminants may be placed in an area of concern (AOC) other than those already determined to be present. This concept is referred to as the **like-on-like requirement**. Allowing the use of alternative fill with contaminants not already present in an AOC would constitute a new discharge as defined at N.J.A.C. 7:26E-1.8. Furthermore, the use of alternative fill in this situation would be de facto landfilling (i.e., the "placement" of new wastes) without complying with the Department's solid and hazardous waste regulations. The Department does not endorse the circumvention of these regulations and intends to minimize the potential for doing so through this policy and the "Fill Guidance for SRP Sites."

The second concept is to prevent the use of alternative fill with higher contaminant concentrations than are known to exist in the AOC where placement is proposed. This concept is referred to as the **75th percentile requirement**. To meet this concept, the alternative fill is acceptable provided the maximum contaminant concentration in the alternative fill is less than the 75th percentile of the contaminant concentration already present in the AOC at the destination site.

The selection of the 75th percentile is based on two considerations. First, the 75th percentile is a robust boundary beyond which extreme values or outliers in a population occur irrespective of population distribution type. As such, the 75th percentile is a conservative upper bound of the central distribution of a sample population. Second, the Department does not want to institute new or additional sampling requirements, but rather opted to rely mainly on the existing data provided by the remedial investigation of an AOC, where possible. There is a recognition that the remedial investigation sampling would typically be limited relative to statistical requirements for sample size and sampling design. Therefore, the Department chose to be conservative in selecting the upper limit of the concentration of contaminants that are allowed to be brought in as fill, rather than expand the sampling requirements for an AOC where placement is proposed.

For on-site movement of contaminated soil, the Department will allow exceptions to the like-on-like and 75th percentile Technical Rule requirements under the following conditions:

(1) A clean area or clean areas that meet the unrestricted use standard are created or enlarged. The like-on-like and 75th percentile requirements are suspended in this case. Token creation or enlargement of a clean area does not qualify for these suspensions.

(2) Areas of concern with the same contaminants can be consolidated as long as the total areal extent is reduced for that contaminant. The 75th percentile requirement is suspended in this case. Placement or encroachment on areas meeting the unrestricted use standards will still be prohibited.

In all cases, the final remedial action must be protective of human health and the environment.

The Department anticipates that the use of this policy and the "Fill Guidance at SRP Sites" will appropriately allow the majority of remedial actions to proceed without the use of a variance from the Technical Requirements for Site Remediation (N.J.A.C. 7:26E). However, there may be site-specific situations where it is in the public benefit to vary from this policy and the Technical Requirements for Site Remediation (N.J.A.C. 7:26E). Because Department preapproval is not required as part of this variance process, serious consideration of the situation is warranted when employing the variance option. Removal of the alternative fill may be required if the Department subsequently determines the use not to be protective of human health and the environment.

Note that consultation with the Department prior to using a variance is available to the regulated community to assist in resolving future concerns prior to implementation. The Department further recognizes that this policy and the "Fill Guidance at SRP Sites" will be reevaluated in the future and revised, if necessary.

APPENDIX D

GLOSSARY

GLOSSARY

Alternative Fill: Material to be used in a remedial action that contains contaminants in excess of the most stringent soil remediation standards, site-specific alternative standards, or site-specific interim standards and does not contain free liquids. This also includes any material that contains contaminants in excess of criteria or action levels for contaminants without standards, such as asbestos, radiation, hexavalent chromium, and dioxins. This material can be “soil” or “non-soil.”

Clean Fill: Material to be used in a remedial action that meets all soil remediation standards, site-specific alternative standards, or site-specific interim standards, does not contain extraneous debris or solid waste, and does not contain free liquids. This also includes any material that meets all criteria or action levels for contaminants without standards, such as asbestos, radiation, hexavalent chromium, and dioxins. This material can be “soil” or “non-soil.”

Concrete: Concrete includes concrete, concrete block, and brick from all sources including buildings or other structures (such as roadways, sidewalks, and curbing). Concrete from buildings or other structures must have all caulk, glass, doors, windows, and other construction debris removed from the concrete prior to use as fill.

Donor Site: Property (in-state or out-of-state) from which fill is obtained for use at a Site Remediation Program (SRP) site for remediation.

Non-Soil: Material that does not meet the definition of a "soil." Examples of non-soil material include, but are not limited to, Class B recyclables, asphalt millings, and construction and demolition screenings.

Receiving Site: A Site Remediation Program (SRP) site that is being remediated and for which fill will be imported for use in the remediation.

Soil: Unconsolidated mineral or organic matter on the surface of the earth that has been subjected to and influenced by geologic and other environmental factors. Materials or mixtures that are predominantly soil-like in nature will be considered as soil, which include sediment, dredged material, and processed dredged material.

Technical Rule: Technical Requirements for Site Remediation (N.J.A.C. 7:26E)

APPENDIX E

ACRONYMS

ACRONYMS

ACM	Asbestos containing material
AOC	Area of concern
AUD	Acceptable use determination
BUD	Beneficial use determination
CAO	Certificate of authority to operate
CEA	Classification exception area
COC	Contaminants of concern
DSHW	Division of Solid and Hazardous Waste
EPH	Extractable petroleum hydrocarbons
ESNR	Environmentally Sensitive Natural Resource
IGW	Impact to ground water
LSRP	Licensed Site Remediation Professional
N.J.A.C.	New Jersey Administrative Code
NJGS	New Jersey Geological Survey
OPRA	Open Public Records Act
PA	Preliminary Assessment
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PDM	Processed Dredge Material
RAW or RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SI	Site Investigation
SPLP	Synthetic Precipitation Leaching Procedure
SRP	Site Remediation Program
SRS	Soil Remediation Standards
TCL/TAL	Target Compound List/Target Analyte List
TEQ	Toxicity equivalent quotients
TSCA	Toxic Substance Control Act
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound