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Section 3:

Stormwater Management and Earthwork Operations

SECTION 3 – STORMWATER MANAGEMENT AND EARTHWORK OPERATIONS

3.1 STORMWATER MANAGEMENT

The SS require the Contractor to schedule and conduct its operations to minimize erosion of soils and to prevent sediment from reaching streams, irrigation systems, lakes, reservoirs, etc. The discussion of stormwater management must be included in all pre-construction conferences. The requirements for scheduling seeding and sodding operations should be emphasized when discussing these operations with the Contractor during the pre-construction conference and at all progress meetings and as construction progresses.

The CSGP, Construction Stormwater General Permit, defines the State's regulations governing stormwater management for land-disturbing activities affecting one or more acres. These regulations are the responsibility of IDEM to enforce. Compliance with these regulations is the responsibility of the Contractor and the Department.

The PEMS should have a thorough understanding of good stormwater management and the best management practices, BMP, utilized by the Department. The PEMS should also understand the processes by which the Department obtains approval from IDEM to perform construction projects under the CSGP and the requirements placed on the Contractor for stormwater management within the contract documents.

The Department's stormwater BMPs are defined within the SS, the Standard Drawings, and the contract plans. The Department's Construction Stormwater Management Field Guide, available on the Stormwater website, is an excellent reference for BMP implementation. The PEMS should review this information to understand the purpose and scope of stormwater control establishment for the contract. The IDEM Storm Water Quality Manual also provides excellent reference information for review by the PEMS to help ensure the project is in compliance with any contract required waterway permit and, if applicable, the CSGP. It is advised that the PEMS retain a copy of any contract required waterway permits for review and reference.

3.1.1 Purpose

The purpose of stormwater management is to minimize or eliminate the potential for soil erosion and off-site sedimentation. At its core, stormwater management has two basic processes.

The first core process is erosion control. Erosion control measures are designed to maintain the soil on the ground, to keep the soil within the construction area, and to minimize its movement. Erosion control measures are more cost effective than trying to manage sediment after it has begun to move. Minimizing water or wind produced movement of soils from stockpiles, new embankments or ditch lines would fall within the erosion control category.

The second core process is sediment control. Sediment control measures are designed to slow the movement of water to allow time for sediment particles carried by the water to settle and drop out of suspension. Sediment control measures are generally more expensive, require more maintenance, and are a less effective stormwater management tool. The management of soil

particles moving with stormwater during a rain event would fall within the sediment control category.

3.1.2 INDOT's Stormwater Pollution Prevention Plan, SWP3

ES works with the Designer and IDEM to obtain approval to publish the NOI prior to letting a contract that will disturb one or more acres of land. The Designer develops an initial SWP3 to address anticipated land-disturbing activities within the construction limits during the contract. Prior to contract letting, the plan is reviewed by ES, and occasionally by IDEM. Revisions are made as necessary to provide a workable plan that ultimately becomes part of the contract documents.

Below is a chart indicating the stormwater requirements of any particular contract based on the permits necessary for that contract.

		2. Contract Requirements				
		Site Plan	SWQCP	SWQM	Weekly Inspections	Rain Event Inspections
1. Contract Permits	CSGP	N/A	Yes	Yes	Yes	Yes
	Waterway Permits	Yes	N/A	Yes	N/A	N/A
	No Permits	Yes	N/A	N/A	N/A	N/A

Contract Stormwater Requirement Matrix

3.1.3 Contractor's Stormwater Quality Control Plan, SWQCP

Plans are incorporated into the contract to address the anticipated needs for stormwater management during the different phases of the construction contract. However, since the Designer, ES, and IDEM cannot foresee the exact methods and sequence of operations the Contractor may use on a given project, the SS require the Contractor to develop and submit for acceptance a SWQCP to the PEMS describing the sequencing, prosecution, and phasing of the work for each stage of the construction contract. The SWQCP shall be prepared and stamped by a licensed engineer that holds a current certification for a Certified Professional in Erosion and Sediment Control, CPESC, or an approved equal.

The Department's design developed SWP3 and the Contractor's developed SWQCP shall work in coordination to satisfy the requirements of the CSGP.

The SWQCP, or any phase of the SWQCP, shall be submitted 14 calendar days prior to the start of any land-disturbing activities for that particular phase.

The SWQCP must address, at a minimum, the list of requirements within the Stormwater section of ITM 803.

The SWQCP is a "living" document and is required to be amended by the Contractor as new situations occur or as the plan of operation changes.

Once the SWQCP is received from the Contractor, the PEMS will perform the following:

(a) Review the SWQCP within 14 calendar days of receipt utilizing the process outlined in ITM 803, Section 15 and the SWQCP checklist within Appendix I.

(b) Contact the AE for clarification and utilize the District Stormwater Specialist as an information reference for the SWQCP review.

(c) Sign and date the SWQCP to document the review of the methodology and the content.

In addition to the work covered by the contract documents and the SWQCP, the Contractor may also need to operate offsite borrow and disposal sites. Waterway permits for these sites are solely the responsibility of the Contractor and are not covered in any part by the Department's SWP3, the plans, or the contract permits. A copy of the Contractor's offsite operations, NOI for items such as offsite stockpiles, borrow sites, waste sites, or storage areas shall be submitted to the PEMS prior to operations at those sites.

3.1.4 Installation, Inspection, and Maintenance

As defined within the SS, the Contractor is responsible for the proper installation, inspection, and maintenance of all stormwater management measures. In accordance with the CSGP, rain event inspections are required to occur at the frequency specified by the permit following each measurable storm event equal to or greater than 1/2 inch of rainfall.

Contracts operating under waterway permits and without a CSGP, do not have a requirement for formal inspections. The waterway permits require the BMPs to be maintained at all times and repairs performed as required when deficiencies are discovered. The PEMS should conduct QA inspections.

Inspection reports are to be submitted by the Contractor's designated Stormwater Quality Manager, SWQM, within 24 hours of the day of the inspection. The reports are to be documented and submitted electronically using the current version of the Department's stormwater inspection process. A paper inspection form may be used in the event that the electronic inspection process is out of service or as directed.

The PEMS is responsible to verify that the Contractor's SWQM has submitted inspection reports accurately, in a timely manner, and in accordance with the CSGP requirements. Any additional stormwater management features suggested by the Contractor's SWQM in the inspection report should be evaluated and either accepted or denied and documented by the PEMS on the inspection report. Evaluations of any proposed new stormwater management features should

include discussions with the AE, District Stormwater Specialist, the Designer, and the ES Stormwater Specialist. They can help determine and ensure that the contract continues to meet the intent of the Specifications, maintains economic value, and maintains compliance with all requirements of the CSGP.

As with any plan, it is not uncommon for changes to be made for the plan to work properly. Similarly, the stormwater management measures in the contract must be used to their best advantage to accomplish the job. Therefore, some stormwater management item quantities may overrun and some may underrun. The PEMS must use their best judgment and work with the Contractor, AE, the District Stormwater Specialist, the Designer, and the ES Stormwater Specialist to adapt the best plan to fit the actual conditions of each contract while still maintaining efficient use of BMPs. All of the initiated changes should be documented as amendments to the SWQCP.

The processes discussed within this section can be referenced within the Department's Construction Stormwater Management Field Guide.

3.1.5 Notice of Termination, NOT

An NOT must be obtained on any contract that requires a CSGP before the contract can be accepted and closed out. To successfully obtain an NOT, the CSGP requires 70% uniform density of permanent vegetation for turf areas. When using native seed, as required by waterway permits or the design of a stormwater measure, the NOT may be accepted with established vegetation levels less than 70% if the area does not pose a risk of offsite sedimentation. **Until the NOT is successfully obtained for these contracts, inspections are required to continue to be completed.** Answers to frequently asked questions are be covered in the remainder of this section:

- **What are the required procedures to obtain an NOT?**
  There are two different contract types that should be reviewed when deciding what is required to successfully obtain an NOT.

  - **INDOT Permitted Contracts** comprise the majority of Department contracts, including Design-Build but not including LPA contracts. For INDOT permitted contracts, follow the process described in **INDOT NOT Process** section below.

  - **Third-Party Permitted Contracts** include CSGPs that are submitted by the LPA's or Contractor's employee in responsible charge (ERC) who initially applied for the CSGP. For this type of contract, follow the process described in **Third-Party NOT Process** section below. The documentation of an LPA or **Contractor** NOT determination may be used for process reviews performed by the Department on those contracts as a means of QA for the process.

- **What is the NOT documentation process?**
  The documentation process is intended to provide a consistent and uniform

methodology to assess the condition of any particular contract site for NOT review. Guidance to assist with the process is available in ***Photographic Documentation Instructions*** section below.

- **What to do if the NOT is not obtained**?
  ES or the ERC will inform the PEMS if the project meets the requirements of 70% uniform density of permanent vegetation. If the project does not meet the requirements, the Contractor must stabilize the project and continue to perform stormwater maintenance along with inspections until the NOT is obtained. The Contractor should be paid additional costs for corrections if it is determined that all prior work was performed as required by the SS.

  - Additional costs will be reviewed for payment on a case-by-case basis. Additional costs may include, but are not **limited** to, document preparation on projects that go beyond the contract completion date due to the NOT, additional seeding or work needed for stormwater management items, etc.

  - For unhealthy vegetation **areas**, soil mitigation measures may be considered by the Department.

  - Costs and potential costs should be discussed with the AE, especially if the magnitude of the costs is estimated to be high. The Department may wish to consider additional options.

  - A time extension will not be required if obtaining the NOT causes contract time to overrun. It is the Department's intent that the time it takes to get the NOT after the original **completion** date be covered by a Final Inspection Time Waiver just as if you had added extra work to the contract at the final inspection.

- **What is the process to close-out a contract?**
  The following procedures provide information on documenting that the NOT has been obtained and completing the contract closeout process.

  - **INDOT Permitted Contracts:**
    ES will provide the PEMS a copy of the IDEM email submittal confirmation.

  - **Third-Party Permitted Contracts:**
    The ERC will provide the PEMS a copy of the IDEM sufficiency statement.

If the turf is green and looks healthy, contact ES or the ERC even if the density may not appear to be 70%.

3.1.5.1 INDOT NOT Process

Step 1:

- The Contractor and the PEMS will evaluate the project and agree that 70% uniform density of permanent vegetation has been obtained.

- All temporary stormwater Best Management Practices (BMPs) shall be removed prior to applying for the NOT.

- The PEMS will confirm and document the following:

    - All temporary stormwater BMPs have been removed

    - No further earth disturbing activities are planned for the project

    - All excess silt accumulations have been removed

    - All areas have been dressed

    - Vegetation has been re-established in all bare areas in accordance with the contract requirements

    - Both parties agree that the site meets the 70% uniform density of permanent vegetative coverage for turf areas.

- The PEMS will document actual site conditions by taking photographs as detailed in Photographic Documentation Instructions.

Step 2:

- The PEMS will notify ES of their desire to request the NOT with the following:

    - Email the request to the INDOT's Stormwater Team (csgp@indot.in.gov) and copying the appropriate persons involved with the contract (DCD, AE, INDOT PM, and District Stormwater Specialist).

    - Attach the documentation, listed in Step 1 above, to the email along with a written statement of agreement from the Contractor, and site photographs as described in ***Photographic Documentation Instructions*** section below. The Stormwater Team will determine if the site meets the requirements for NOT based on the provided documentation, site visits, and/or other sources.

- If documentation confirms that the site meets NOT requirements, ES will notify the PEMS of the determination of the NOT by providing the PEMS and all

appropriate persons involved with the contract (AE, DCD, INDOT PM, District Stormwater Specialist) with a copy of the IDEM email submittal confirmation.

- If documentation fails to confirm that the site meets NOT requirements, ES may schedule a field review with District Construction and the Contractor to discuss additional work that needs to be completed or considered. When any necessary work is completed, start back at the beginning of Step 1.

Step 3:

- The PEMS will attach a copy of the NOT submittal confirmation from IDEM into AWP.

  NOTES - At the end of the allowable time for a contract, District Construction will decide on how to proceed if documentation fails to confirm that the site meets the requirements for NOT. Normally, the Department will keep the contract open until the requirements of NOT are met. Site inspection reports and maintenance must continue until the requirements for NOT are met.

3.1.5.2 Third-Party NOT Process

Step 1:

- The ERC and PEMS will evaluate the project and agree that 70% uniform density of permanent vegetation has been obtained.

- All temporary stormwater Best Management Practices (BMPs) shall be removed prior to applying for the NOT.

- The PEMS will confirm and document the following:

  - All temporary stormwater BMPs have been removed
  - No further earth disturbing activities are planned for the project
  - All excess silt accumulations have been removed
  - All areas have been dressed
  - Vegetation has been re-established in all bare areas in accordance with the contract requirements
  - Both parties agree that the site meets the 70% uniform density of permanent vegetation coverage for turf areas.

- The PEMS will document actual site conditions by taking photographs as detailed in ***Photographic Documentation Instructions*** section below.

Step 2:

- The PEMS will notify the ERC of their desire to request the NOT with the following:
    - Email the request to the ERC, and copying the appropriate persons involved with the contract (DCD, AE, INDOT PM, District Stormwater Specialist).
    - Attach the documentation, listed in Step 1 above and site photographs as described in ***Photographic Documentation Instructions*** section below.
- If documentation confirms that the site meets the requirements for NOT, the ERC will prepare and submit the NOT form on IDEM's ePortal at the following URL https://stormwater.idem.in.gov/ncore/external/home
    - After NOT is deemed sufficient by IDEM, the ERC will notify the PEMS and all appropriate persons involved with the contract (DCD, AE, INDOT PM, District Stormwater Specialist) of the IDEM NOT sufficiency.
- If documentation fails to confirm that the site meets the requirements for NOT, the ERC may schedule a field review with District Construction and the Contractor to discuss work that needs to be completed or considered. When any necessary work is completed start back at the beginning of Step 1.

Step 3:

- The PEMS will attach a copy of the NOT sufficiency statement from IDEM into the AWP correspondence log.

  NOTES - At the end of the allowable time for a contract, District Construction will decide on how to proceed if documentation fails to confirm that the site meets the requirements for NOT. Normally, the Department will keep the contract open until the requirements of NOT are met. Site inspection reports and maintenance must continue until the requirements for NOT are met.

The documentation of an ERC's NOT determination may be used for process reviews performed by the Department on those contracts as a means of QA for the process.

3.1.5.3 Photographic Documentation Instructions

The site conditions will be documented as follows:

- Take at least one (1) panoramic photograph and four (4) perpendicular spot photographs, taken from chest height, at locations showing the most representative turf areas. These photos shall be taken in a digital format. They should provide characteristic information of the area. Additional panoramic and perpendicular photographs should be taken in areas of interest for stormwater

protection such as at bridges, pipe inlets and outlets, and areas of steep or long slopes.

- Panoramic photographs of turf areas must be in focus and show as much of the vegetated areas as possible.

- Perpendicular spot photographs should be taken in a standing position with the camera at chest height directly above areas of the least vegetated turf. Showing the tips of your boots in the photo is acceptable.

The photographs for both the panoramic and perpendicular spot locations should be taken at a time of day that best minimizes shadows. This time normally occurs between 11 a.m. and 4 p.m. When taking panoramic photographs, ensure the general focus of the photo is on the turf areas offset from the road. Do not center the road in the picture as indicated in Image 1 of this appendix. Pick a time of day when a good representation of the area can be seen as indicated in Image 2.

ES, or the ERC, will base their determination on the information obtainable from the photographs taken. They will review the overall look of the turf, its health and coverage, and the general slope conditions in the area.

The photographs at the end of this section show variations in the percentage of vegetative density. An area density showing less growth but occurring on a flat area, with low potential for erosion, may be sufficient for NOT. However, if the same density is located on a steep slope with higher erosion potential it may be determined that the density is not acceptable.

A yellow color for vegetation may be viewed as being unhealthy and may require soil enrichment as indicated in Image 3.

Image 1: Example of both poor placement of the roadway within the picture and poor lighting conditions

Image 2: Example showing a good representation of the area

Image 3: Yellow vegetation may be viewed as unhealthy and may require soil enrichment

A series of pictures are shown below to provide examples of vegetation coverage percentages.

Image 4: Vegetation Coverage: 40-50%

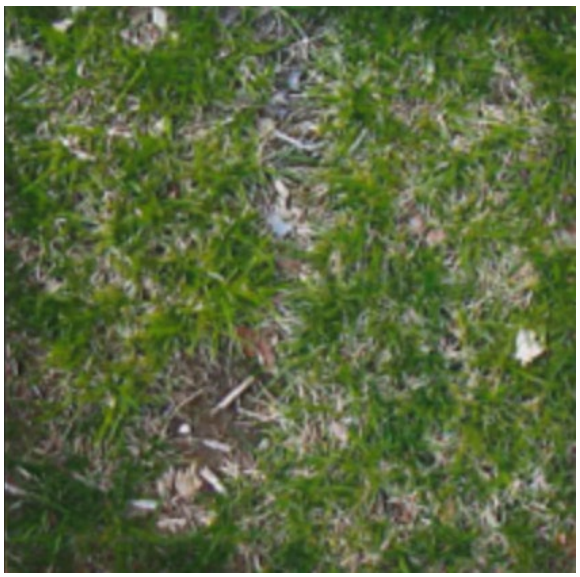

Image 5: Vegetation Coverage: 50-60%

Image 6: Vegetation Coverage: 60-70%

Image 7: Vegetation Coverage: 70-80%

3.2 POST-CONSTRUCTION STORMWATER MANAGEMENT *(add. 12-01-25)*

In accordance with an MS4 General Construction Permit and CSGP applicable to the contract, to implement permanent Post-Construction Best Management Practices, PCBMP, for the site, when required. The PCBMPs are detailed on the plans. These practices are necessary and required to comply with the above mentioned contract environmental permits and work to control erosion and sediment beyond the completion of the contract.

There are many devices and systems available for use as PCBMPs. These are described in greater detail within the SS.

Deviations from the planned implementation are required to be submitted for review to the PEMS and the Department's Post-Construction Stormwater Management team's email address, PCSM@indot.in.gov, at least 14 days prior to installation. A professional engineer must sign any revised design calculations made during the construction of the PCBMP.

3.3 BORROW AND DISPOSAL SITES

The Contractor must submit proposed borrow and disposal site locations to the PEMS for approval. Form IC-203, Request for Acceptance of Borrow or Disposal Site, is available on the Department's website and must be completed by the Contractor for each proposed site and submitted to the PEMS for approval. The form requires the Contractor's signature certifying that they have complied with all environmental laws and regulations required to perform the planned operations at the site. The PEMS will review and sign the form if it has been properly completed. A site must be approved before the Contractor can begin operations at the site.

Requirements for different types of sites shall be in accordance with 203.08 of the SS.

The primary need to review and approve borrow and disposal sites is to help prevent those sites from being developed in wetland areas or from disturbing archeologically sensitive sites. As the owner of the contract, the Department is responsible to take measures to prevent these occurrences.

There are many different situations that can arise when determining whether a borrow or disposal site is acceptable. However, the SS are intended to provide the PEMS the tools necessary to reasonably ensure that the Contractor has taken appropriate measures to prevent borrow or disposal operations from becoming a violation of environmental laws.

In some cases, such as existing commercial operations where the entire area has previously been developed, there can be consideration made as to whether the requirements for a wetlands delineation or archeological investigation are appropriate. There are areas on form IC-203 for the Contractor to explain why certain permit requirements may not apply to a given situation.

The PEMS must use the SS and their best judgment to reasonably determine when a given area may or may not require all environmental work to be done. However, it is the Contractor who is ultimately responsible for ensuring compliance with the laws. By contract, the Department's approval of borrow or disposal sites **does not** relieve the Contractor of any obligations or penalties under the law. The Department will hold the Contractor responsible, not the PEMS, if a borrow or disposal site turns out to be in non-compliance with any law or regulation. It is not the intent of the Department's procedures to place the PEMS in a position of responsibility for the Contractor's compliance requirements with the laws, but rather to provide a means for the PEMS and the Department to be aware of the Contractor's planned sites and to obtain the Contractor's

certification that they comply with the laws. If the PEMS has questions about a given site, they should contact the AE for further guidance.

3.4 GENERAL *(rev. 12-01-25)*

Unless advised to the contrary, no restrictions should be placed on the Contractor by the PEMS as to where the Contractor shall commence work, except that where the alignment follows an old road, the road must not be in disrepair during the winter months.

A Contractor must not be allowed to construct earth cofferdams, earth causeways or other earthen structures in a stream without a regulatory agency permit. This is a violation of environmental law. For non-earthen cofferdam and causeways, the Contractor is required to submit detailed design to the PEMS as part of the SWQCP or approved site plan, developed by the Contractor, for acceptance. If the cofferdam or causeway is not included in the permits obtained by the Department for the contract, the Contractor must submit a permit modification request to PEMS prior to starting the work. The request must include:

- The scope of the proposed changes to the permit
- The reason for the additional impacts and any avoidance or minimization that has been considered
- Contract plans marked with the locations of all proposed changes.

Accepted modification requests will be forwarded to the appropriate regulatory agency by the Department's Office of Ecology, Waterway Permits, and Stormwater.

Work on the revised causeway details is not to progress until the approved permit modification request has been received and posted at the worksite.

Construction of drainage facilities and performance of other contract work which will contribute to the control of stormwater must be carried out prior to, or in conjunction with any land-disturbing activity. The Contractor may be required to construct temporary berms, dikes, slope drains, or sedimentation basins to prevent sedimentation before the permanent stormwater features are placed.

To help prevent erosion, sodding and seeding of cut and fill slopes should be accomplished as construction progresses instead of waiting until the end of a construction season. Temporary seeding should be required when areas of disturbed earth will be open for more than 7 days or as agreed to by the Contractor and the Engineer. The Contractor should manage earth disturbing activities such that temporary and permanent seeding or sodding can occur prior to the end of the growing season to prevent winter long stormwater management problems.

As provided in the SS, the Contractor is responsible for the repair and restoration of any damaged sodded and seeded areas prior to final acceptance. This includes work necessary to comply with the requirements of stormwater management.

The procurement of soil samples, representative of the soil to be incorporated in embankments, should be one of the first activities of the PEMS. The sample submittals must be discussed with the District Testing Engineer as soon as possible in order to expedite the return of the results to the PEMS. This data obtained from the samples is necessary to perform proper density tests. The samples must be appropriately tagged and identified for correct results to be returned.

3.5 STAKING AND CONSTRUCTION ENGINEERING

Staking is performed almost exclusively by the Contractor and paid under the items and specifications for construction engineering. The following instructions apply only in cases where construction engineering by the Contractor is not included in the contract or if it is determined that additional staking is required and it will not be added to the contract by change order.

When staking is performed as part of a construction engineering pay item, the Contractor will frequently use GPS, surveying equipment to establish and control grades on the contract. This "stakeless" surveying does not lend itself to checking of grades by the PEMS. However, it should be noted that the SS require the Contractor to furnish all staking necessary for checking of the work. This is a topic that should be discussed with the Contractor at the pre-construction conference.

If the contract does not have a pay item for construction engineering, the PEMS should determine, as soon as possible, at what point the Contractor intends to begin work and start setting grade stakes. The rough grade stakes should be set for the embankment balance of the contract as rapidly as possible. This procedure will expedite the moving of utilities and fences which quite often causes delays in grading operations.

Rough grade stakes should be of appropriate length and type to serve the intended purpose and last for the duration of the work. They should be planed on two sides to facilitate marking. They should be set on each side of the road on the ROW line, at each station, at 50 ft intervals on all horizontal curves over four (4) degrees, and on all vertical curves where the algebraic difference of gradients is greater than six (6) degrees. Normally, grade stakes set on the ROW line serve to denote the limits of the ROW. Therefore, a stake should be set at any break in the ROW to facilitate the erection of fences and relocating of utilities. If Department personnel have set the grade stakes, the Contractor should not be allowed to remove rough grade stakes unless approved by the PEMS. Negligence in preserving grading stakes should not be tolerated.

Before and after setting the stakes, the plans and cross-sections should be carefully examined to make sure that sufficient ROW has been shown on the plans. Particular attention should be given to special ditches, relocation of streams and ends of structures in narrow channels. Stakes should be driven at least 1 ft into the ground and station number and offset distance marked on them. In some locations, it is advantageous to set the rough grade stakes flush with the ground and place guard laths with station and offset distance. Elevations should be taken on the top of the stake and the ground at centerline so that grade sheets can be prepared. Grade sheets indicate the vertical distance from the top of the grade stake to a specific plan grade at centerline. This specific plan grade may be the finish grade on regraded sections, the top of subgrade, or the top of a base or surface course. However, the grade used must be noted somewhere on the sheet.

Any change in grade or any correction made after issuing the grade sheet should be shown on a revised grade sheet with the corrections or revisions noted. Taking elevations of all grade stakes should START FROM A BENCHMARK AND TIE INTO A BENCHMARK EACH TIME ELEVATIONS ARE RUN. Rod readings on hard surfaces such as PCCP, HMA, concrete curbs, benchmarks, etc. are read to hundredth of a foot (.01). All notes must be recorded and kept in the contract files.

Upon assignment to a project, the setting stakes should be pursued until the entire contract is staked. If the stakes are set during the winter months, elevations should not be taken on them until the Contractor is preparing to begin grading or until the frost has left the ground. Stakes set in the winter should be driven lightly again before taking elevations. Elevations taken on stakes in the winter months must be rechecked in the spring.

Since the construction work may disturb stake alignment, horizontal control points such as a Point on Tangent, P.O.T., Point of Curvature, P.C., Point of Tangency, P.T., etc. must be referenced to stakes or objects that will not be disturbed. There are a number of methods used in referencing points. Consideration should be given to the availability of the reference objects after the grade has been completed. All references must be recorded within the permanent field notes and kept in the contract files.

3.6 CHECKING ORIGINAL CROSS SECTIONS

When there is a pay item for construction engineering in the contract, the Contractor must take complete cross sections at 500 foot intervals and verify that the planned alignment and grades will match the existing conditions.

If an item for construction engineering does not exist, then the PEMS must make the cross section checks. The PEMS may elect to discuss the situation with the AE and establish an item for construction engineering for the contract through a change order.

While setting rough grade stakes, the elevation of the original ground at the centerline of each station must be recorded. A complete cross section must be taken every 500 foot. The centerline elevation at each station and the cross sections must be checked with those on the plans. If they do not check satisfactorily, or consistently vary more than 0.2 ft from the original sections, the reason should be found and the investigation continued to determine the correct original cross sections. It may be necessary to cross section the project again. In case of doubt, consult the AE.

3.7 SLOPE STAKES

This work is typically required to be performed by the Contractor as part of the construction engineering pay item. If a pay item is not included in the contract, the PEMS must perform the staking required. The PEMS may elect to discuss the situation with the AE and establish an item for construction engineering for the contract through a change order.

Slope stakes should be set at each station for both cuts and fills throughout the entire length of the contract including additional slope stakes for special ditches. The distances from the centerline to the slope stakes shall be shown on the grade sheets with the slope shown in the

"Cross Section" column. In preparing to set slope stakes, the cross sections should be studied to note planned variations from the typical cross section and slopes.

The slope stake field book should contain notes as to cut or fill, distance from centerline and elevation at which the slope stake was set. The elevation at which the slope stake was set is useful in tying final cross sections and in plotting the slope stakes on the original cross section sheets.

When rock is encountered in a cut with an overburden of earth above it, the cut shall be made by excavating the earth far enough back so that a shoulder or shelf will be left on top of the rock between the base of the earth cut and the top of the rock cut.

In cuts where it is not known, or cannot be determined with certainty, how far the rock is below the surface of the ground, the slope stake shall be set as if the entire cut consisted of earth. The overburden would then be excavated on the normal earth slope to the top of the rock. After the overburden has been stripped from the rock, the top of rock is slope staked for the typical rock section or to slopes designated by the PEMS. A separate or supplemental grade sheet for this slope staking work should then be completed. The distance to the top of the rock slope and designating the cross section to be constructed should be shown. Where rock cuts are very short, construct the typical earth cross section.

3.8 CLEARING ROW

Upon assignment to a contract, the PEMS should request copies of the ROW grants from the DO and compare the ROW distances on the grants with those on the plans. The DO should be notified of any discrepancies that are discovered. All buildings, gasoline pumps, etc. shall be removed from the ROW. A time limit for the removal of buildings from the ROW is usually incorporated in the ROW grant. If there is difficulty in getting them removed, the matter should be taken up with the DO. It is easier to remove all encroachments at this early stage of construction rather than just prior to final acceptance.

ROW grants must be checked for special commitments. When shown, these commitments must be fulfilled. ROW commitments may be fulfilled within the existing or future contracts, or the property owner may have been compensated during contract development. For these reasons, the PEMS should not promise or commit to perform work or other tasks for property owners that would directly profit the property owner. The exception to this policy would be when tasks are already shown on the plans. Where commitments are noted in the parcel files and not included in the contract, the PEMS should notify the PM and the AE to help with verification.

Vegetation and trees between the construction limits and the ROW line must be preserved as much as possible. The waterway permits for the contract often do not cover work outside of the construction limits. The PEMS must be aware of the limits covered by the permits before allowing any clearing outside of the construction limits. Before the Contractor starts clearing the ROW, all trees to be removed should be marked. Occasionally, ROW grants contain provisions for leaving specific trees on the ROW. These trees must not be disturbed. The Contractor should be notified of the exceptions. The PEMS should be advised of any proposed tree trimming by utilities.

Before trees, stumps, rubbish, or other material can be deposited beyond the ROW limits by the Contractor, they are required to submit a waste disposal plan as provided in the SS. After the contract has been completed, the Contractor should obtain signed property releases (Form IC-149) for the disposal areas, borrow pits, plant sites, etc. A copy of these releases must be included in the contract file.

On pre-graded projects, the paving contractor is required to mow weeds and clean up the ROW, without compensation, in the same manner as on a grading or a grading and paving project.

3.8.1 Temporary ROW for Private Drives

All ROW matters, except temporary ROW for private drive extensions, will be handled by authorized ROW agents. Where additional ROW is necessary for planned construction, constructing outlet channels, peat disposal, authorized grade changes, etc., sketches of the additional ROW with the property owner's names should be made and submitted to the DO for acquisition.

3.8.2 Temporary ROW for Building Removal

Many of the road and bridge plans indicate TEMPORARY RIGHT-OF-WAY FOR BUILDING REMOVAL. In numerous instances the property owner cannot utilize the remainder of his property until the building has been removed and the temporary ROW formally released by the Department. In some instances the courts have been critical of the delay in making the temporary ROW available to the owner. In view of the above, the Real Estate Division has requested that their office be promptly notified when the building or buildings, on any individual tract or parcel of temporary ROW that was acquired for building removal purposes, have been removed. The Division of Construction Management should be advised when such temporary ROW may be formally released to the property owner. Construction Management will in turn inform the Real Estate Division. It is suggested the removal of buildings located on temporary ROW be considered at the pre-construction conference or early in the life of the contract. Every reasonable effort should be made to expedite the removal of those that fall outside the permanent ROW. Conducting business in this manner will contribute to a more favorable public opinion of the contract and the Department.

3.8.3 Sign Encroachments

The owners of outdoor advertising signs located within the ROW should be advised, either by personal contact or by letter, to remove their sign. If the sign is of material value and the owner does not desire to salvage or relocate it, a letter should be secured from the owner so indicating. Once the letter is received, the Contractor can then proceed to remove the sign in accordance with the provisions of the SS. If the sign is of material value and the owner refuses to remove the sign, the DO must be contacted for guidance.

3.8.4 Archeological Artifacts and Historic Features

If archeological artifacts or historic features are found, work must be stopped immediately in the area of the discovery. Section 3.22 of these instructions provides guidance on how to proceed.

3.8.5 Disposal of Timber

The following procedures apply to the disposition of merchantable timber within the construction limits:

(1) Section 201.03 of the SS provides that "All merchantable timber in the clearing area, which has not been removed from the right-of-way prior to the beginning of construction, shall become the property of the Contractor, unless otherwise provided." This will be the procedure in most cases.

(2) In the event the Real Estate section has arranged with the property owner, as a part of the ROW settlement, for the property owner to retain and remove the timber, this information will be included in the contract special provisions.

3.9 CUTS

The typical sections will indicate the normal slopes based on the minimum ROW and width of roadway. A different typical section will be used for rock cuts than that used for earth slopes. The cross section sheets should be checked for exceptions to the normal slopes. Terrain or soil conditions may also necessitate deviation from the typical slopes. Flat slopes provide additional safety, can reduce erosion, are easily maintained, and greatly improve the appearance of the road by blending in with the adjacent topography. In deep cuts, interceptor ditches should be cut at the top of slopes when the width of the ROW permits.

It is standard practice to flare side ditches at the end of cuts to avoid spilling side ditch drainage onto a fill slope. The additional excavation required for flaring ditches is authorized excavation, and slope stakes should be set accordingly.

Special ditches shall be located as close to the ROW lines as possible to minimize the hazard of deep ditches located near the shoulder line. Special ditches should be constructed to provide a smooth alignment but not necessarily constructed parallel to the centerline. The flow lines of special ditches with flat gradients should be staked for final finishing.

Where dirt is left in place for shoulders, transverse trenches shall be cut through the shoulders at sufficient intervals to maintain the subgrade in a well drained condition. The center of the roadway shall also be crowned to provide drainage. Cuts should be excavated so that water will not pond at the face of the cut. Dirt for shoulders shall not be left so high as to interfere with surfacing or finishing operations. The use of slope drains and directional interceptors for moving surface water across the earth shoulders helps to minimize both erosion and potential re-work of the slopes due to run-off.

Where backslopes for cut sections are made in material which is not suitable for the growth of vegetation, the PEMS can authorize the undercutting of such slopes and the backfilling of the same with suitable material for encasement, in accordance with 203.09 of the SS.

No trees outside the slope-stake limits are to be disturbed, damaged, or trimmed unless authorized by the PEMS.

Instructions pertaining to the grading of approaches are included in Section 18 of these instructions.

3.10 EARTH CLASSIFICATION

The different classes of excavation are outlined in the SS. It is imperative that all classes of excavation be measured in their original position and an accurate set of notes kept which indicate the quantities of each class of excavation. Original cross sections for rock excavation are taken after the overburden is removed. Original sections are taken for each section within the plans plus any necessary supplementary sections. Check shots for minimum depths below pavement are made after the rock is removed and before the cut is backfilled.

It is important that the field notes be complete with title, closed bench circuit and dates. The time for this work to be performed, including any necessary explanatory notes, is when the work is being performed.

A copy of the Soil Report and Soil Profile should be retained by the PEMS for information and guidance during construction of the contract. The copy should be kept in the contract field office.

3.11 EMBANKMENTS *(rev. 07-02-26)*

The SS state that after embankment areas have been cleared of all perishable materials such as trees, stumps, sod, weeds, cornstalks, etc., the original ground shall be well compacted with approved compaction equipment. If the original ground cannot be compacted to the required strength requirements, a stabilizing material consisting of coarse aggregate encapsulated in geotextiles or the use of chemical modifiers should be used in accordance with the SS. Earth from structure excavations should be removed and if suitable, incorporated in the embankment in layers. Frozen materials, stumps, roots, all or parts of trees, brush, weeds, sod, all spongy, yielding, soft, and unsuitable materials, or other perishable materials shall not be placed in the embankment. Removed materials may only be placed in embankments if they are constructed in accordance with the soil properties described within the SS.

Earth embankments must be constructed in layers of the thickness specified, leveled, disked, and thoroughly compacted. When using a three wheeled 10 t roller or pneumatic tired roller, the layer must not exceed 8 in. before compacting. When using a sheepsfoot roller, the depth of the loose dirt must not exceed the length of the tamper feet. If the material is of a granular nature, a heavy crawler type tractor may be used, but the depth of the layer must not exceed 6 in. For areas inaccessible to the above equipment, such as structure backfills, the material must be placed in 6 in. layers and compacted with mechanical tamps or vibrators. To maintain these maximum depths of lifts, it is essential that each embankment lift be leveled, preferably by a grader. It is nearly impossible to achieve uniform compaction unless the fill lift is reasonably level and uniform.

Recycled asphalt pavement, RAP, and recycled concrete pavement may be used within embankments when they meet the requirements of the SS. RAP intended to be incorporated into embankments must meet particle size requirements, in accordance with the SS, prior to being placed into embankments. Likewise, recycled concrete pavement, defined as concrete pavements from past documented Department contracts, shall meet the SS requirements of B borrow prior to being placed into embankments.

Different sized materials shall not be mixed or mixed with other materials when used for embankments. When two or more approved materials are allowed for one embankment, those materials shall be separated with a layer of geotextile, in accordance with the SS.

RAP and recycled concrete pavement should not be used for embankment construction where piling, mechanically stabilized earth walls, soil nail walls, or other foundations are to be placed or driven. Additionally, RAP and recycled pavement should not be used for embankment construction when certain subgrade treatments are to be used, unless approved by GS. These specific subgrade treatments are described within the SS. Geotextile shall be placed completely covering the top of embankment areas containing recycled materials. In addition, a minimum soil encasement shall be constructed concurrently with the recycled material lifts.

The base of fills shall be constructed to the full width between slope stakes. On high fills the width should be checked periodically as the fill progresses. Side casting to bring the fill to the proper section should be avoided since side casting usually develops a fill slough or slide.

After clearing of the embankment area and prior to embankment placement, all pronounced depressions left in the original ground shall be filled with suitable material and compacted. Proofrolling of the natural ground surface shall be performed in accordance with the SS within all areas where new fill is to be placed with stabilizing material consisting of coarse aggregate No. 2 encapsulated in geotextile. Original ground that cannot be compacted sufficiently shall either be replaced or dried with a soil modifier.

The grading should be watched closely for unsuitable material. Roots should be removed and disposed of properly. Frozen material must not be used in the fill and a lift of dirt must not be placed upon a frozen layer. The frozen layer may be removed or bladed over the side of the fill.

As noted in the SS, rock lifts or layers are variable in height depending on the amount of rock, topography, type of rock, and mixtures of soil and rock. There should be a minimum of voids in rock fills. Bridging by slabs of rock should be avoided by judicious use of a bulldozer.

When aggregate is used for embankment construction that is less than or equal to 10 ft in height, and it is not possible to perform stiffness or strength testing, the size of the material is required to be no greater than 1 ft in any direction, in accordance with the SS. Rock embankments greater than 10 ft in height, may utilize material no greater than 2 ft in any direction. The material should be spread with several passes of crawler-tread equipment. Equipment weight is required to be at least 40 tons. The PEMS may want to consult with the AE prior to making this determination. The final 6 in. of an aggregate constructed embankment is required to be constructed with

aggregate No. 53 with a geotextile, Type 2A, placed below the aggregate. Proofrolling is required to be performed on the final lift of aggregate embankment in accordance with the SS.

For LWD testing of aggregate, if average deflection for the aggregate is greater than the maximum allowed deflection in accordance with the SS, a sample of the aggregate should be obtained and a moisture content test performed to determine if the aggregate moisture content is within acceptable limits. If the moisture content is outside acceptable limits, wait 24 hours, retest for acceptable moisture content, and test the aggregate at the same location. The aggregate test will be acceptable if the LWD tests are equal to or less than the allowable average deflection. Questions on sampling and testing procedures can be directed to the DMTE.

The critical point of any grade is the junction of the cut and the fill. If not properly constructed, a weak spot in the finished grade will result. In many cases, especially where there is a quantity of topsoil, it is advisable to undercut the beginning or ending of a fill into the cut and replace with suitable material.

Attention must be given to the construction of side ditches and the use of drainage blankets prior to building embankments on steep side hill slopes as outlined in the SS. Plowing is not a pay item, but benching may be paid for at the classification encountered. In general, benching should be considered if the slope is steeper than 4:1.

Where an existing fill will not accommodate the full width of the new pavement, the existing fill shall be excavated and the material, if suitable, used in the new embankment. This work is authorized excavation. The handling of embankments over existing pavement is explicit within the SS.

Broken concrete or brick pavement may be disposed of in fills at least 24 in. below subgrade elevation. They must be spread in such a manner to fill the voids with soil and the layers thoroughly rolled.

Embankments around the end bents of bridges must be constructed at the same time and in the same manner as the approach fills and before end bent piles are driven. Intermediate bents or piers which fall within the toe of the approach fill must be back-filled to the original ground line with B borrow. The fill above the original ground line at these bents shall be kept balanced on both sides of the bent and carefully compacted. Care should be exercised to prevent displacement of the piers or bents. Density and moisture tests must be performed and documented as required.

Compaction tests are based on dry weights. The moisture content must be controlled as per the SS or as recommended by GS. In actual practice, excessive moisture in the soil is obvious. A practical solution is to disc and aerate the lift of earth until it has dried sufficiently to compact satisfactorily. Soils that are too dry to compact to the minimum density can be disked, wetted and re-compacted. However, it is the Contractor's responsibility to determine the methods to obtain the proper moisture content of the soil.

The SS provide for aeration of embankment material if the material is too wet and the embankment is not satisfactory. This moisture provision was adopted to protect the Department from having to accept fills that passed the density specification but were obviously unsatisfactory as evidenced by excessive rutting under the construction equipment. The aeration provision is to be used when the embankment is not satisfactory but not to be used merely because the material is over optimum moisture. The Contractor must keep the grade properly drained. If necessary, payment should be withheld on grade work not properly drained.

The SS state that if embankment material is too wet or too dry, the material should be aerated to remove excess moisture or watered and disked to increase the moisture content until the moisture content is within the appropriate range. The determination of whether a fill is satisfactory involves analysis of the required density and moisture tests as well as personal judgement. Some degree of deformation of the fill under the heavily loaded equipment can be tolerated providing the fill is dense, well compacted, and not developing permanent ruts.

Allowable deflection requirements for material proofrolling are indicated within the SS and are included below. For proofrolling deflections or rutting greater than 5 in. in original ground or embankment foundation, the AE and GS should be contacted. Equipment should not be allowed to "follow the leader" in the same track. This type of "follow the leader" process can pump internal water into the surface layers or pulverize soil cohesion and ruin an otherwise acceptable fill.

Material Requiring Proofrolling	Dump Truck Weight, minimum	Allowable Deflection or Rutting
Original ground or embankment foundation	15 t	≤ 1 in.
Embankment construction, subgrade, or subbase	33 t	≤ 1/2 in.
Cement stabilized subgrade soil in accordance with 219	33 t	≤ 1/4 in.

QC/QA procedures for construction of fill and subgrade sections involve the use of the DCP. The Contractor is required to provide a QCP describing the operations. This plan is subject to review and approval by the PEMS. The Contractor will receive written notification of plan approval before soil and subgrade operations begin.

QC testing is required to be performed by the Contractor in accordance with ITM 803. The Contractor is required to provide documentation by the end of the following business day or before the next QA test, whichever comes first. Test sections are required to be constructed in accordance with the QCP. Test sections for non-chemically treated soils should utilize procedures described in ITM 513 and ITM 803. Intelligent compaction methods, described within ITM 513, may be utilized but are not required. Acceptance of the soils should be as per the SS. Deficient areas found are to be reworked by the Contractor in accordance with the QCP.

3.12 GRADING OVER PEAT MARSHES

Every attempt is made during the design phase to locate all peat marshes. Soils surveys normally make investigations regarding types of soil and sub-grade conditions. Findings and recommendations are compiled from these recommendations. The soil information is normally incorporated into the plans.

The PEMS should review the soil report to help assure that its recommendations are incorporated into the plans.

Unless otherwise instructed, peat should be excavated and treated in accordance with the methods set out in the SS. The width of the excavation should extend to the limits shown on the typical sections, as determined by the depth, and to the bottom of the peat bed or firm foundation. If the bottom of the peat slopes transversely, consideration should be given to excavating to a greater width on the deepest side to minimize subsequent lateral displacement and settlement. In cases of transverse slopes on the bottom or when questionable material is encountered, the PEMS should contact the AE.

Cross sections must be taken before the peat is excavated and again before the backfill is placed, as outlined in 203 of the SS.

3.13 MEASUREMENT OF PEAT EXCAVATION

The contract should provide for payment of peat excavation. The typical sections included in the plans for peat excavation should show the limits of excavation, backfill, and disposal. The embankment is to be built with a 2:1 slope from the shoulder point of the roadway down to the original ground line with compacted soil. From that point on the OG, a 1:1 slope should be constructed down to the lowest elevation of peat excavation. This established point determines the lower limit of peat excavation. The pay quantities for peat excavation will be limited to the volume of peat lying between the vertical neat lines for peat excavation from the lower limits to the OG. B borrow should be placed in the excavation left by the peat removal and paid for as shown in the contract.

Peat may be placed in the side slopes of the embankment outside the 2:1 slope shown on the typical section to the finished side slope. Peat may also be placed and graded to drain outside the backslope of side ditches to the construction limits. Also, temporary ROW for peat disposal will typically be shown on the plans.

When peat is removed by complete excavation, the volume will be computed from final cross sections taken after complete excavation and before placing granular backfill. Normal cross section methods and field notes should be used.

When peat removal by displacement is necessary, the volume will be computed from final cross sections derived from test holes through the completed granular treatment. A bid item for Cased Test Holes will be included in the contract for this purpose, unless otherwise specified in the CIB. An external pipe, of a diameter chosen by the Contractor, will provide the outside casing. Water pumped through a smaller diameter inner pipe will facilitate sinking of the casing and

determination of the depth. Color of the wash water and material rising to the top indicates the change in material at the bottom of the casing. Therefore, the Contractor should arrange the two pipes and water pressure such that the wash water rises between the pipes rather than outside of the larger pipe.

A record of the cased test holes must be kept. Cross sections from test holes should generally be taken at stations 50 ft apart, or more frequent if necessary, and with a minimum of five test holes per cross section. The maximum spacing of test holes for cross section purposes should be 50 ft. A line of stakes should be placed on centerline and at the right and left edges of the treatment. All stakes should be graded to the same elevation, if possible. The HT can determine the elevation of the top of the B borrow by stretching a string across the three hubs and measuring down to the B borrow. As the HT observes the borings, the depth of penetration into the B borrow and trapped peat, if any, will be recorded. If there is any trapped peat, the pay length of the boring would be the sum of the depth of B borrow and trapped peat.

3.14 SLIDES

One cause of slides is free water. When free water is introduced into a cut bank or embankment in a quantity sufficient to reduce the angle of repose to less than the angle of cut or fill slope, a flow of soil or a slide occurs. Slides also occur when the surface of an impervious stratum is tilted to such an angle that it will not offer sufficient resistance or friction to withstand the weight or pressure of the overlying material. Another type of slide or slough that occurs in fill sections is caused by not rolling to the edges of each lift or by side casting material to bring the slopes to the proper cross section. Benching of hillside fills in potential slide areas should be discussed with the AE.

The PEMS should make a review of cuts where the natural slope of a hillside has been intercepted by a steeper slope. The presence of terraces adjacent to the project indicates former slides. If this equilibrium is disturbed, further sliding can be anticipated. Usually, the first indication of a slide in a complete or incomplete cut section is a bulging of the backslope with cracks parallel to the roadway appearing in the original ground on top of the backslope. It is at this stage the sliding plane, if any, can be observed. The PEMS should note this sliding plane by elevations and distances as an aid in determining the correction plan.

When slides are observed or encountered during construction, the PEMS will contact the AE and GS. Any field information obtained or observed concerning the slide must be discussed with GS to fully disclose the slide's conditions. The Department will provide remedial measures to address the associated slope issues. There may be a delay in operations until measures can be developed to address the situation. For additional information, reference 203 of the SS.

3.15 EXCAVATION FOR SMALL STRUCTURES AND CHANNEL CHANGES

No payment is made for any class of excavation necessary to construct pipe, box, or slab top structures, or miscellaneous structures which are less than or equal to 20 ft in span length. The exception would occur when the structure is relocated from the planned location or when the flow line lowered. Notice that this refers to additional excavation and is usually determined by

cross sectioning the planned site and the relocated site. Established neat lines from the plans are to be used in this comparison.

Unsuitable material, which is authorized to be excavated below the planned elevation of the bottom of footings of the structure, is treated the same as above. When the undesirable material is removed in conjunction with adjacent excavation below grade, the entire volume shall be paid for at the contract unit price for the classification encountered and not considered as additional structure excavation. If selected material is used to backfill the excavated area, this material shall be paid for at the contract unit price for the material selected. No payment is to be made for material excavated below grade and backfilled for the convenience of the Contractor in stabilizing a normally stable foundation.

No payment is made for excavation within the ROW limits to construct a new or old channel to the grade and width shown on the plans or to the width of the new structure. Before starting channel change excavation that is a pay quantity, the cross sections should be checked for adequate coverage of the area and if necessary, additional sections taken.

3.16 SINKHOLES

Sinkholes occur in limestone areas present within the state and are the result of surface drainage through a hole or crevice in the top of the rock, a flow of water on top of the rock, or drainage through narrow horizontal seams. The surface of the ground often appears as saucer shaped depressions that vary in size from a few feet to possibly 400 ft in diameter. The actual fault in the rock may be directly, to as much as 35 ft, below the bottom of the depression. The opening may be exposed or it may not be visibly apparent. All sinkhole features are to be protected from sedimentation runoff in accordance with 205 of the SS.

Sinkholes are environmentally sensitive features and each must be addressed as a separate issue. If a sinkhole is discovered that is not shown on the plans, or if the excavation, capping, and backfilling of a sinkhole is not directly addressed by the contract documents, the PEMS must contact the AE, ES, and GS. Work within a 100 ft radius must be stopped. The PEMS should suspend work in this area per 104.02(b) of the SS. The Department will provide the treatment measures to address the feature.

When excavation, capping, and backfilling of a sinkhole identified within the plan documents, the following procedures should be utilized.

- Before starting the excavation of a sinkhole, original sections must be taken of the sinkhole site. If the hole or crevice is not exposed, it is suggested that the original sections cover an area beyond ROW to ROW and a comparable distance from the sinkhole ahead and back on centerline.

- The fault or crevice in the rock strata may be quite some distance laterally from the opening in the soil overburden. The additional area covered by the cross sections should anticipate this lateral drift or provide for a long crevice.

- When the opening in the rock is exposed, the dirt overburden adjacent to the hole should be excavated and the rock prepared for the cap. If the rock is not exposed and an opening occurs in the overburden, the opening must be followed to the rock.

- When a sinkhole with no apparent opening is encountered, the low point must first be determined by observing the area after a rain, leveling, or by observing the location of heavy vegetation. Using a scraper type of grading equipment, light parallel cuts need to be made through the area.

- This will usually disclose a small area of soil that is darker than the surrounding soils and/or an accumulation of small stones. The dark soil and stones should be followed with shovel or crane type of equipment to the top of rock. If the Contractor elects to use scraper type equipment after the initial cut, neat lines of excavation must be established, and the Contractor notified. As excavation proceeds, authorized neat lines of excavation must be documented.

- When the opening in the rock is revealed, the dirt is cleared for a distance of 2 ft to 3 ft on each side of the opening. It is often necessary to remove rock adjacent to the opening to obtain a satisfactory seal. The immediate area should be checked for secondary openings. The cap is then laid out to have a bearing of approximately 2 ft to 3 ft on the adjacent rock. It is unnecessary for the cap to be in the form of a square or rectangle, as may be indicated on the plans. The cap should conform to the figure required to cover and seal the opening. If the opening is a crevice, the cap shall extend a sufficient distance to provide adequate protection to the road, as determined in the field after consultation with the AE.

- Immediately after the cap is formed, or no later than the morning after the cap is placed, it shall be measured, drawn, and the area computed. Final cross sections are then taken of the entire excavated area, but payment is made only to neat lines previously established or authorized.

- As soon as a flexural strength of 480 psi is obtained for the concrete cap, based on beam breaks, consideration is given to the method of backfilling. When the cap is below the top of rock or a drainage cap is designed, B borrow should be limited and its use discussed with the AE, DCD, and the DMTE. When the excavated area is within the roadway area, ramps should be excavated parallel to centerline to eliminate abrupt changes in fill depth. A 3:1 slope is recommended for the ramping. Since ramping is paid for at the contract unit price for the class of excavation encountered and sinkhole excavation at 3 times the contract unit price for the classification encountered, the cross sections must clearly indicate this separation. No payment is made for backfill except for authorized B borrow. The backfill must be placed in accordance with the specifications and thoroughly compacted.

3.17 BORROW

Borrow is acceptable fill material obtained by the Contractor from locations outside of the ROW and used to complete the planned grading section. Coal ash as well as granular tire shed (GTS) mixtures may be utilized as borrow if they meet the requirements of the SS.

When coal ash is used as borrow, the Contractor is required to place the material in the embankment, compact, and encase the material as incorporated into the contract. If the material is stockpiled, it must be stockpiled at an approved location and in an approved manner. All control measures used should be included in the Contractor's submitted SWQCP, in accordance with 205. If there is no SWQCP required for the contract, control measures should be documented by the Contractor in the site plan and in accordance with 108.04.

Coal ash should not be mixed with other embankment materials within a given lift and should not be considered for placement in the following locations:

1. below existing ground,
2. within a 100 ft horizontal distance of a stream, river, lake, reservoir, wetland, karst feature, or any protected environmental area,
3. within a 150 ft horizontal distance of a well, spring, pond, or other ground source of water,
4. within MSE wall backfill,
5. as encasement material,
6. within the limits of subgrade treatment, and
7. directly in contact with any permanent metallic construction materials.

Compaction procedures and moisture content will be in accordance with 203.23.1.

Material such as muck, cinders, or a soil mixture with a high organic content shall not be used as borrow. Should the material be questionable, the AE must be consulted.

When borrow is necessary, the Contractor must make the arrangements for obtaining the material. The PEMS must be notified of the location of the proposed borrow pit and an IC 203 must be submitted for approval of the location prior to beginning land-disturbing activities.

If the location, planned excavation, and material comply with the SS, the Contractor may proceed with clearing the borrow pit site. Soil samples of the pit are then taken and forwarded to DMT. Before any pay material is removed from the borrow pit, the PEMS must establish a base line and take original cross sections for the pit. The base line should be established through or near the

proposed borrow pit with the extremities of the line staked and referenced outside of the area that will be excavated.

Precautions are to be taken to ensure that the stakes or references are not disturbed. In establishing a base line, consideration should be given to the topography, the line of the cross sections, and the possibility of extending sections, if necessary. If the borrow pit involves a large area, it is suggested that an auxiliary line be run parallel to the base line to properly align the cross sections.

Borrow pits that are adjacent to the ROW often involve excavation within the ROW. No material excavated within the ROW is considered as borrow. If the borrow pit is in close proximity to the project ROW, a benchmark should be established near the borrow pit and the elevation of it tied into the project level circuit.

A rod reading and distance from the base line at the point each cross section intercepts the ROW line must be taken and noted. This will aid in computing the separation of the borrow quantity from the Common Excavation item quantity. A drawing must be made of the borrow pit layout in the permanent field notes immediately preceding the original cross section notes. A description of the location of the borrow pit must also be included with the drawing, including the offset, right or left, of a roadway station. The name of the property owner is also included with the drawing.

The SS must be read carefully relative to the location of borrow pits. Proximity to the ROW, elevation, drainage, erosion control, etc. must be evaluated.

Since the Contractor selects the source of borrow material, they are responsible for compliance with all environmental regulations that may govern the borrow site. The PEMS must evaluate the submitted IC 203 to determine if the Contractor has complied with the requirements of the SS.

3.18 B BORROW

B borrow consists of suitable crushed stone, sand, gravel, or other materials meeting the requirements of 904 of the SS. This material is used for constructing fills over peat marshes, as backfill for certain structures, or for other situations where settlement might seriously affect the finished work. B borrow should not be used for locations other than indicated on the plans, unless approved by the AE. Hydraulic methods of embankments construction, or for other instances, B borrow consisting of ACBF or GBF shall not be used within 2 ft of an embankment free water level.

The preferred method of placing B borrow is in specified lifts and then compacting that lift after placement. At locations that are inaccessible to heavy compacting equipment such as tractors, rollers, etc., vibrators or mechanical tamps are to be used. B borrow should not be used indiscriminately. Factors to be considered in choosing locations where B borrow is to be used should include the feasibility of compaction and the type of pavement surface being constructed.

If material within the contract limits substantially meets the SS requirements for B borrow and is readily available, this material must be used for the contract before any B borrow sourced outside the contract is used. In that event, the B borrow material should be paid as Common Excavation.

For certain locations such as Catch Basins, Inlets, and Manholes, as defined in the SS, no payment is made for structure backfill for these structures.

When the CIB contains a pay item of "B Borrow", payment for the item will be made on the basis of the limits indicated on the plans or as adjusted through authorized changes, provided the material comes from outside the permanent ROW. The provision for adjustment by authorized changes is included to allow for substantial quantity adjustments due to plan error or omissions and changes to structures in the field. In those cases where an adjustment in the plan quantity is required, the theoretical amount should be computed for the individual structure in the normal manner and these computations kept in the contract file. A Change Order containing the adjustments required for B borrow should be submitted as soon as practicable for approval.

The method of and payment for B borrow should be discussed with the Contractor at pre-construction conferences and progress meetings.

3.19 PLAN QUANTITY PAYMENT FOR COMMON EXCAVATION

In accordance with 203.27 of the SS, quantities of excavation to be paid for will be those shown in the contract, unless extra work has been performed or either party disagrees.

The following procedure will apply to all contracts or portions of contracts that involve payment for Common Excavation on the basis of plan quantity:

- New original cross sections are to be taken at 500 ft intervals and plotted to check the accuracy of the original sections. (See section on Staking and Construction Engineering).

- Final cross sections are to be taken at 500 ft intervals at the same locations as the original sections. Cross sections should be complete sections in cuts and from the shoulder break out in fills. These final sections should indicate substantial conformance with the planned cut slopes and ditches. The sections will be used to determine if earthwork deductions are required.

- Spot checks must be made of the cross-section areas shown in the plans. The number of spot checks should average one for each 2,000 ft with the locations concentrated in areas of major excavation. Additional area checks should be made to determine whether the plan quantity should be adjusted if any of the areas checked varies more than 10% from the area shown on the plans. If the average deviation of all the areas checked varies from the total planned areas at the same location by more than 2%, a more detailed check will be required on those areas or balances showing the highest deviation.

Record the area checks as indicated above and included the information in the contract files. The documentation should have the heading "Comparison of Planned and Final Cut Areas for Check of Plan Quantity." The documentation sheet could then be divided into five columns with headings of: Station, Planned Area, Checked Area, Percent Deviation, and Remarks. The Percent Deviation column would be totaled algebraically and the average Percent Deviation would be listed.

The computation of the volume from the planned areas of one balance should be checked. In general, this should be the largest balance in the contract. Any other questionable balances should also be checked for volume computations.

Any other pertinent facts that would justify using plan quantity or indicating the need for adjustments should be considered. In addition to the above steps, the contract documentation should include the use of form IC 675 found within the AWP Reports page.

3.20 DEDUCTIONS

It is important that the PEMS and Contractor be familiar with deductions in excavation and Borrow quantities. It is essential that all notes and computations be accurate and complete to support any deductions made in accordance with established policy. Should circumstances justify waiving deductions, a full explanation should be written to fully describe the situation and signed by the PEMS.

When payment is made on the basis of plan quantity or computer facilities used for computation of pay quantities, sufficient documentation must be included in the contract files to indicate whether deductions are required. Sections plotted at 500 ft intervals should be used to verify whether deductions, in accordance with standard procedures are necessary. The completed contract should be visually inspected to determine whether there are other locations which warrant cross sections to check for deductions such as areas bounded by interchange ramps, areas between variable median sections, etc. When deductions are indicated, additional sections must be taken at the necessary stations to compute the deductible materials. A statement should be included in the contract files that the above check has been made.

3.21 SETTLEMENT STAKES AND GEOTECHNICAL INSTRUMENTATION

When the geotechnical investigation indicates a large or uneven settlement of the foundation soil under a proposed embankment is expected, fill movements during and after grading must be reviewed. This review is specified mainly for three reasons:

1. To detect foundation soil failures in early stages to prevent costly reconstruction.

2. To verify predicted settlement.

3. To determine when embankment settlement has slowed to the point that paving can be done without being excessively distorted by continued uneven settlement.

The checking of fill movement can be accomplished through installation of settlement plates, settlement stakes, lateral stakes, vibrating wire settlement systems, and standpipe piezometers. When any of these are required, details of their construction and use are set out in the CIB. These details should be carefully followed so that desired results will be obtained.

Vibrating wire settlement systems monitor settlement or heave at a particular point in soil. Two weeks prior to beginning operations, the Contractor shall submit a Type D certification and the manufacturer's calibration report to the PEMS and to GS for the system selected.

The installation and operation shall be in accordance with the manufacturer's instructions and the SS. Only hand tools shall be used to place and compact fill material for a height of 1 1/2 ft above the signal cable, tubing, and settlement plate.

All monitoring of the device will be performed by GS. They will keep a weekly record of the device readings. A copy of the weekly report will be provided to the PEMS.

Settlement plates are for observation of vertical movement of the original ground beneath a fill during and following embankment construction.

The PEMS will determine the plate elevation and the elevation of the top of the first section of pipe at the time the plate is set. As additional sections of pipe are added, their effective length must be carefully measured. Observations are to be made every 7 days to determine movement of the plates. These observations should start about 7 days after fill construction has started.

Results of settlement observations on the plates are to be reported weekly. This weekly report series should start with the first observations after fill construction has started. During winter months and periods of job suspension, the frequency of observations and reports may be decreased with proper approval. Observations and reports should continue until a written release from observation responsibility has been secured from GS.

3.22 SUBGRADE TREATMENT *(rev. 09-01-26)*

Section 207 of the SS contains the requirements for subgrade treatment. In most cases, the Contractor may choose options for subgrade treatment. The plans and Standard Drawings should be reviewed for information on the treatment specified for the contract.

Recycled concrete pavement processed into coarse aggregate-sized material, No. 53, and ACBF shall not be used as coarse aggregate in subgrade treatment when an underdrain is specified.

3.22.1 Chemically Modified and Cement Stabilized Subgrade Soil

There are two sections within the SS that should be referenced when working with soils and subgrade soils. The two sections include 215 Chemical Modification of Soils and 219 Cement Stabilized Subgrade Soil. Reference can be made to the Design Procedures for Soil Modifications or Stabilization manual for more detailed information. The manual is also available on the Geotechnical Engineering Division website.

Section 215 of the SS contains information on modifying soils by uniformly mixing cement or lime with soil to aid in strength gain to achieve workability. The purpose of chemical modification is to create a working platform for construction equipment. A small credit is accounted for this modification in the pavement. Chemical modification is considered for all reconstruction and new alignment projects.

Section 219 of the SS contains information on stabilizing 12 in. of subgrades soils utilizing cementitious materials. Subgrades may benefit by utilizing cement for the stabilization of the subgrade soil. The purpose of subgrade stabilization is to enhance the strength of the subgrade. This increase is accounted for in the pavement design. Subgrade stabilization requires a more thorough design methodology during construction compared to subgrade modification. When specified on the plans, the process consists of stabilizing 12 inches of subgrade by uniformly mixing Type I or blended Type IL portland cement to achieve an unconfined compressive strength that is in accordance with the SS.

The process of determining the optimum content of either chemical modifiers or stabilizers is the responsibility of the Contractor. Mix design and test results, performed by a Department approved geotechnical consultant, are required to be submitted to the PEMS and the Department's Geotechnical Engineering Division five business days prior to use and are subject to approval. If the type of cement is changed, a new mix design is required to be submitted by the Contractor. The Contractor must also submit a quality control plan addressing all testing requirements for the mixture.

Preparation of the existing soils, mixing, spreading, and compaction of the soil with either chemically modifying or cement stabilizing mixtures must follow the requirements of the SS. Requirements for QC/QA testing of the mixture are also outlined within the SS.

The stabilized surface is required to be maintained in a moist condition for the first seven days after mixing. Liquid membrane forming compound is required to be applied to the surface, and reapplied as applicable, to aid in the curing and to prevent moisture loss. Proofrolling is required over the entire stabilized area. Deflections or ruts greater than specified must be corrected.

3.23 ARCHEOLOGICAL ARTIFACTS

An archeological artifact may be a fragment of historic or prehistoric pottery, chipped stone tools or flakes, ground stone tools, prehistoric or historic housing material, burial objects such as headstones, or even human remains. Other types of historic features may include a prehistoric garbage pit or cooking pit, the remains of a prehistoric house, a privy, well, canal features, building foundations, etc. Burial objects are of particular concern, they suggest the presence of human remains.

If any archaeological artifact or historic feature, including human remains, is found during construction, work must immediately stop within a 100 feet radius of the discovery site and the site must be left undisturbed.

For artifacts other than human remains, the PEMS must coordinate with IDNR to mitigate impacts to the discovery. Work at the site cannot resume until written consent is received.

If human remains are encountered, the local law enforcement agency must be contacted first by the Contractor or the Department, and then ES must be notified. The law enforcement agency will contact the County Coroner. Although human remains may appear archaeological or historic, they may actually represent a modern or historically recent crime scene. This is why the County Coroner always documents the remains. It is very important to leave the area of the discovery as undisturbed as possible.

3.24 REGULATED MATERIALS

Hazardous materials are considered to be regulated materials and must be handled in accordance with applicable environmental laws, regulations, and rules. The SS clearly address all the requirements that the Contractor must deal with when working with regulated materials within 104.06 and 202. However, disposal of bridge coating debris shall be in accordance with 619. The PEMS must see that the Contractor follows the SS pertaining to regulated materials.

When materials suspected of being regulated are encountered on the project site or are identified in the contract documents, the Contractor must cease all operations in the immediate vicinity and the PEMS must notify the AE. If the situation warrants an immediate emergency response, the procedures as outlined in 104.06 of the SS must be followed.

The DCD will work with District Environmental concerning any necessary handling, cleanup, testing, transportation, and disposal of such materials. District Environmental may contact ES for further guidance and coordination with IDEM.

A private consulting company may be necessary for testing of suspected regulated materials. This consultant may be acquired and paid by the Contractor or the Department. ES and IDEM, if required, would review the results of any such tests. The PEMS should be advised, through the DCD, of procedures for the Contractor to follow. The Contractor may be advised of any required handling, storage, cleanup, additional testing, transportation, or disposal of hazardous materials.

The Contractor should not resume work in any affected area until notified that conditions and the area have been rendered safe for resumption of work.

Payment for the Contractor's work related to storage, cleanup, testing, transportation, or disposal of any such materials should be in accordance with 104.06 and 202 of the SS.

Removal of UST shall follow 202 of the SS. The Contractor and PEMS must maintain accurate records of all operations. The Contractor shall submit two additional copies of the compulsory completed report distributed to IDEM UST Branch (Notification for UST & UST System Closure Site Assessment Report) to the PEMS within 30 days after closure. One copy shall be forwarded to ES. The second copy is retained in the contract file. In addition, a copy of all detailed pay item costs, with justification and calculations relating to the UST removal, will be submitted to ES. This documentation is needed so the Department may submit cost reimbursement from the Excess

Liability Fund (ELF) for the removal of the UST's to IDEM.

3.25 ASBESTOS CONTAINING MATERIALS

The Contractor is required to comply with all applicable laws and regulations concerning the inspection, testing, and removal of asbestos material. Asbestos containing materials are considered to be regulated materials and must be handled as such. The SS explain in detail what procedures the Contractor must follow when handling this type of material in 104.06 and 202.07. Such regulations require an inspection for the presence of asbestos in buildings, bridges, and pipes to be demolished or renovated. The inspection must be performed before the start of demolition or renovation operations. In this regulation, renovation is defined as the disturbance of any load-carrying member. In bridges, this term has been defined as work involving any substructure element.

Persons who inspect for asbestos containing materials must have a current certificate of accreditation, issued by IDEM. Also, only accredited asbestos removal contractors, supervisors, and workers can be employed on asbestos removal operations. Listings of accredited inspectors, and asbestos removal contractors and persons, can be obtained from IDEM's Office of Air Quality website.

IDEM requires written notification 10 working days prior to the start of renovation or demolition operations, even if no asbestos is found during the inspection. IDEM's notification form must be filled out completely and accurately. The start of work date must be as accurate as possible. If work will not start on the date shown on the form for some reason, a new notification must be made. Copies of the same form may be used to satisfy the notification requirements of the US EPA, and the Indianapolis Bureau of Environmental Services for such operations in Marion County. There are specified waiting periods between notification and asbestos stripping or removal that must be followed.