

III-04.01 Common Excavation

It is the intent to get all the common excavation from within the right of way without impacting environmentally sensitive areas such as wetlands, easement wetlands, and cultural resource areas. When all the useable material has been utilized, provisions for additional borrow are required.

III-04.02 Borrow

Borrow is needed when there is insufficient dirt on the project from common excavation to build the roadway template. When borrow is required, it will be Department Optioned Borrow or Contractor Furnished Borrow.

There may be times when NDDOT will want to make the borrow area a mandatory borrow area. In that event, a public interest finding will be submitted to FHWA if federal funds are involved.

Try to obtain borrow close to where it is needed to keep the hauls as short as possible (desirably no more than 1 mile).

Generally, the following guide may be used for borrow:

- < 5,000 C.Y. – Contractor Furnished Borrow
- 5,000-10,000 C.Y. – If needed at multiple locations, such as a guardrail project, the contractor will furnish. If only needed at one location, consider Department Optioned Borrow.
- > 10,000 C.Y. – Department Optioned Borrow

A Borrow Site Report is provided on the Design Manual Reference and Forms web page at: <http://www.dot.nd.gov/manuals/design/designmanual/reference-forms.htm>

This spreadsheet is used to track how the requirements for borrow are being met. The order of preference is state option, contractor furnished with clue, and contractor furnished. Once the Borrow Site Report is complete, it is distributed to the Right of Way Program Manager, Designer, and Materials & Research as shown on the flow chart for the borrow process.

III-04.02.01 Department Optioned Borrow

For Department Optioned Borrow, the plans shall include bid items for topsoil, seeding, and erosion control for the borrow areas. The following procedures should be followed for Department Optioned Borrow on internal developed projects:

1. The designer determines the estimated quantity of borrow required, forwards the quantity to Right of Way Services Program Manager in ETS, and enters the milestone date for (BOR).

2. Right of Way Services will locate/negotiate borrow sites and complete SFN 10132 Borrow Option.
3. Right of Way Services will submit SFN 58466 Material Source Clearance Request Form. The Material Source Clearance Request Form can be found on the web at: <http://www.dot.nd.gov/business/contractorinfo.htm>.
4. ETS Division will send the Certificate of Approval (COA) link to the designer and the Right of Way Agent.
5. The designer shall complete SFN 9683 Borrow Area List, and attach the COA to SFN 9683. The COA needs to be converted from color to black & white.
6. The designer shall submit the electronic file (Borrow Area List and COA) to the O:\81 Special Projects\DIP PLANS in the appropriate bid opening folder.

The following procedures should be followed for Department Optioned Borrow on consultant projects:

1. The consultant determines the estimated quantity of borrow required, forwards the quantity to the Technical Support Person, and the Technical Support Person enters the milestone date for (BOR).
2. The consultant will locate/negotiate borrow sites and complete SFN 10132 Borrow Option. The consultant shall submit completed SFN 10132 to the Technical Support Person. The Technical Support Person shall submit to Right of Way Services (ETS) for review and approval.
3. The consultant will submit SFN 58466 Material Source Clearance Request Form. The Material Source Clearance Request Form can be found on the web at: <http://www.dot.nd.gov/business/contractorinfo.htm>.
4. ETS Division will send the Certificate of Approval (COA) link to the consultant and copy the Technical Support Person.
5. The consultant shall complete SFN 9683 Borrow Area List, and attach the COA to SFN 9683. The COA needs to be converted from color to black & white.
6. The consultant shall send the electronic file (Borrow Area List and COA) to the Technical Support Person. The Technical Support Person shall submit the electronic file to the O:\81 Special Projects\DIP PLANS in the appropriate bid opening folder.

III-04.02.02 Contractor Furnished Borrow

For Contractor Furnished Borrow, the contractor will be responsible for all royalty and restoration negotiations and agreements with the landowner. No department negotiated agreements will be provided. The contractor will also be responsible for all environmental/cultural surveys and clearances, permits, and erosion control for the borrow area. If Contractor Furnished Borrow is used, the only bid item required within the plans will be "Borrow-Excavation" and a plan note shall indicate that the Contractor must furnish the borrow

material. The topsoil, seeding, and erosion control for the borrow areas shall be included in the price bid for borrow.

There may be circumstances where borrow area clues may be additionally provided to the contractor for Contractor Furnished Borrow. Borrow area clues are intended to aid the contractor in finding borrow area locations for Contractor Furnished Borrow. Examples of potential borrow area clues are information of any previously contacted or logical adjacent property owners for borrow areas, and any completed or partially completed cultural surveys, environmental surveys, or permits. A plan note shall be included to inform the contractor of any available clue information.

III-04.03 Waste

Most grading projects are designed with the intent to minimize the excess excavation, and in some cases can achieve an earthwork quantity balance for the material and eliminate any excess excavation. However, some projects may have excess material. There may be projects with a small quantity of unsuitable grading material designated for waste, or excess excavation within the projects limits. Some projects may have a large quantity of excess excavation due to unavoidable circumstances such as terrain or nature of the project such as slide repair projects.

III-04.03.01 Contractor Furnished Waste Area

For a Contractor Furnished Waste Area, similar to Contractor Furnished Borrow, the contractor will be responsible for all royalty and restoration negotiations and agreements with the landowner of the waste area. No department negotiated agreements will be provided. The contractor will also be responsible for all environmental/cultural surveys and clearances, permits, and erosion control for the waste area.

There may be circumstances where waste area clues may be additionally provided to the contractor for Contractor Furnished Waste Areas. Waste area clues are intended to aid the contractor in finding waste area locations for Contractor Furnished Waste Areas. Examples of potential waste area clues are information of any previously contacted or logical adjacent property owners for waste areas, and any completed or partially completed cultural surveys, environmental surveys, or permits. A plan note shall be included to inform the contractor of any available clue information.

III-04.03.02 Department Optioned Waste Area

It is recommended to locate a State Optioned waste area for projects with large quantities of excess excavation. For Department Optioned Waste Areas, the plans shall include bid items for topsoil, seeding, and erosion control for the borrow areas. The following procedures should be followed for Department Optioned Waste Areas on internal developed projects:

1. The designer determines the estimated quantity of borrow required, forwards the quantity to Right of Way Services Program Manager in ETS, and enters the milestone date for (BOR) and notes the quantity of waste designated within the comments area.
2. Right of Way Services will locate/negotiate waste area sites and complete agreement documents.
3. Right of Way Services will submit SFN 58466 Material Source Clearance Request Form. The Material Source Clearance Request Form can be found on the web at: <http://www.dot.nd.gov/business/contractorinfo.htm>.
4. ETS Division will send the Certificate of Approval (COA) link to the designer and the Right of Way Agent.
5. The designer shall complete the waste area list document, and attach the COA to waste area document. The COA needs to be converted from color to black & white.
6. The designer shall submit the electronic file (waste area list and COA) to the O:\81 Special Projects\DIP PLANS in the appropriate bid opening folder.

The following procedures should be followed for Department Optioned Waste Area on consultant projects:

1. The consultant determines the estimated quantity of waste required, forwards the quantity to the Technical Support Person whom enters the milestone date for (BOR) and notes the quantity of waste designated within the comments area. The Technical Support Person will also forward the waste area agreement documents from ETS Division to the consultant.
2. The consultant will locate/negotiate waste sites and complete waste area agreement documents. The consultant shall submit completed waste area agreement documents to the Technical Support Person. The Technical Support Person shall submit to Right of Way Services (ETS) for review and approval.
3. The consultant will submit SFN 58466 Material Source Clearance Request Form. The Material Source Clearance Request Form can be found on the web at: <http://www.dot.nd.gov/business/contractorinfo.htm>.
4. ETS Division will send the Certificate of Approval (COA) link to the consultant and copy the Technical Support Person.
5. The consultant shall complete waste area list document (forwarded by the Technical Support Person), and attach the COA to the waste area document. The COA needs to be converted from color to black & white.
6. The consultant shall send the electronic file (waste area list document and COA) to the Technical Support Person. The Technical Support Person shall submit the electronic file to the O:\81 Special Projects\DIP PLANS in the appropriate bid opening folder.

If a mandatory waste site is proposed, a public interest finding must be prepared.

At a minimum, a slope staking report showing the break points and tie points to the top of the topsoil shall be developed and provided to the field engineer. When ditch profile elevations are shown in the plans, the elevations shall be to the top of the topsoil.

Cross sections should show the existing topsoil so that the areas of excavation, embankment, topsoil, etc. can be verified.

III-04.06 Clearing and Grubbing

Generally, this includes the removal and disposal of trees, shrubs, stumps, roots, brush and other surface objects from the excavation and embankment areas. Include bid items within the plans whenever this type of work is needed.

III-04.07 Compaction

See Standard Specifications for details concerning embankment compaction items. The recommendations for the mainline are provided by the Materials and Research Division.

Generally, AASHTO T-180 is used for compaction; however, AASHTO T-99 is used in the Red River Valley where the engineering properties of the soil indicate that the soil would benefit from a lower maximum dry density and a higher moisture content range.

A volume adjustment percentage should be included for shrinkage in earth embankment within the plans. This is typically shown within the Earthwork Summary plan sheet and also stated within a plan note, which is available on the PPG website. The designer should consult with the District to determine an appropriate volume adjustment percentage for the project area.

III-04.08 Seeding and Erosion Control

Erosion control shall be performed for all projects as needed to enhance soil stabilization and minimize siltation and sedimentation. Typically, this is done through the use of fiber rolls, erosion control mats, silt fences, ditch checks, mulching, seeding, hydro-seeding, sod, and riprap.

Wetlands and mitigation are shown in Section 75 of the plans, temporary erosion control layouts are shown in Section 76 of the plans, and permanent erosions control layouts are in Section 77 of the plans. See the CADD manual for detailed requirements for these sections of the plans.

The designer should consult with the Hydraulic Section in the Bridge Division, ETS Division, and the Erosion and Sediment Control Handbook to develop sedimentation control for all projects. The most recent version of the Erosion and Sediment Control Handbook is on the web at: <http://www.dot.nd.gov/manuals/manuals-publications.htm>

III-04.09 Engineering Fabrics

The use of engineering fabrics such as Geosynthetic Type R1 and Geogrid should be addressed in the Materials and Research Linear Soil Survey Report or any other pertinent recommendation.

III-04.10 Widening

When the roadway is not wide enough to place the proposed improvement that meets the respective minimum roadway width from the *DESIGN GUIDELINES*, it may have to be widened. Generally this means widening on both sides, but there may be circumstances where it would be best to shift the centerline and widen on only one side.

A project is designated as widening when the overall roadway corridor within the scope of the project is to be widened with grading. Widening is typically done with either Major Rehabilitation or New/Reconstruction type projects.

Structural Improvement type projects that address isolated grading areas such as adding turn lanes, flattening approaches, or to correct geometric curvatures are not considered widening projects, as the overall corridor is not widened.

III-04.10.01 Minor Rehabilitation (Sliver Grading)

Sliver Grading is defined as minor grading required to correct foreslope, or re-establish the original traveled-way-plus-shoulders width. Where re-establishing the original traveled-way-plus-shoulders width is triggered to accommodate an overlay, Minor Rehabilitation may include: up to 2' of widening on each side of the roadway or widening to provide 12' driving lanes with 2' shoulders on each side of narrow roadways, even if the total resulting width exceeds the original roadway width. Sliver Grading is required to provide 4:1 foreslopes or flatter within the clear zone, and the installation of rumble strips. Examples of Sliver Grading are shown in the Department Shoulder/Slough Guidelines within the *DESIGN GUIDELINES*.

- Foreslopes
 - Minor Rehabilitation Sliver Grading projects require 4:1 proposed foreslopes or flatter within 20 feet of the driving lane. This only applies when sliver grading foreslopes. All other items for the project will utilize the Minor Rehabilitation clear zone within the *DESIGN GUIDELINES*.
- Signing
 - When existing signs are affected within the limits of grading:
 - The sign will be reset depending on age (less than 7 years old) and condition, otherwise it will be replaced (7 years or older).
 - The post will be reset depending on length, otherwise it will be replaced.
 - Signs outside the limits of grading would be treated per the *DESIGN GUIDELINES* for Minor Rehabilitation strategy.

III-04.11 Replacement of Approach and Centerline Culverts

A “stream crossing structure” is defined as a pipe, culvert, box culvert, and structural plate pipe. All new stream crossing structures must be sized to meet the requirements of Article 89-14 “Public Highway Stream Crossings” (Stream Crossings Standards) as defined in North Dakota State Administrative Code. The requirements of Article 89-14 also apply for projects that:

“...regrade, add a lane adjacent to the existing alignment, or do full depth road surface replacement on an existing highway location.”

These activities occur on NDDOT projects that are of the New/Reconstruction investment strategy in the following manner:

- *“regrade”*
 - Means to remove the existing pavement and base section and alter the subgrade profile.
- *“add a lane adjacent to the existing alignment”*
 - Means to add a continuous adjacent through lane to the entire facility. This does not mean adding incremental auxiliary lanes to the facility such as turn lanes, climbing lanes, and passing lanes.
- *“full depth road surface replacement”*
 - Means to completely remove the existing pavement and base down to the subgrade. This does not mean reclaiming the surfacing and base in place.

Therefore, all stream crossing structures will be hydraulically analyzed to ensure they conform to the requirements of the Stream Crossing Standards for all New/Reconstruction investment strategy type projects. Additionally, the replacement or rehabilitation of stream crossing structures shall only be addressed when a project falls within the New/Reconstruction investment strategy.

It is recognized that at times, under other investment strategies, it may be prudent to address a failed stream crossing structure. A failed stream crossing structure is defined as a stream crossing structure that:

- has lost capacity due to deformation
- is experiencing significant section loss due to severe corrosion
- is separated (concrete pipe) to the point that a significant amount of embankment material has been scoured out resulting in voids that are causing either holes to form in the paved surface or significant settlement of the area over the pipe.

Under this scenario, the request to perform the stream crossing structural work must be initiated at the time of Scoping, but completed no later than at the project Field Review. If extenuating

circumstances exist, this request time period may be extended. Other than lengthening of stream crossing structures (extensions) needed due to grading, the Director of Project Development, after discussion with the Office Holders, must approve any stream crossing structural work on a project that is not within the New/Reconstruction investment strategy.

If approval is granted to address a stream crossing structure in a project that is not in the New/Reconstruction Strategy, all rehabilitation options must be identified and evaluated to determine the most cost effective strategy. All rehabilitation options must be exhausted before a replacement strategy can be considered. If it determined that lining a stream crossing structure is the appropriate rehabilitation strategy, a hydraulic analysis is only required if:

1. The stream crossing structure's diameter is 48 inches or less and the thickness of the lining is greater than one half inch.
2. The stream crossing structure's diameter is greater than 48 inches and the thickness of the lining is greater than one inch.

If rehabilitation is not a feasible strategy and replacement of the failed stream crossing structure is required, a hydraulic analysis will be required to determine the structure(s) size, and to assure that the Stream Crossing Standards are being met.

III-04.11.01 New/Reconstruction Culvert Replacement

All existing culverts need to be hydraulically analyzed for compliance with stream crossing standards.

- Approach pipes
 - All approach pipes should be replaced.
- Centerline Pipes
 - Existing centerline pipes should be considered for replacement if they have been in place for 50 years or longer.
 - All existing centerline pipes and end sections should have a condition survey done.
 - Existing centerline pipes or end sections in poor condition should be replaced or rehabilitated by other means such as pipe lining.
 - If the pipes and/or end sections are in good condition and have sufficient strength for the proposed fills, the centerline pipes and end sections should be re-laid and/or extended.
 - Traversable end sections may be used if applicable.
 - Any existing centerline pipes removed within the project that are in good condition can be used for new culvert installations if they have sufficient strength for the proposed fills. If not, they may be able to be used for extensions under the foreslope where the fill height is less and within the strength limitation of the old sections.
- Structural Plate Pipe
 - The Bridge Preliminary Concept will recommend proposed improvements for existing structural plate pipes that have an associated Bridge Listing #. Structural plate pipes that do not have a Bridge Listing # will be treated as centerline pipes above.
- Box Culverts
 - The Bridge Preliminary Concept will recommend proposed improvements.
- Cattle Pass
 - The designer shall determine whether the existing cattle pass structure is being used for drainage, see centerline pipes above.
 - See Section 2.23 of the Right of Way Manual for information regarding cattle pass policies.

III-04.11.02 Major Rehabilitation Culvert Replacement

Culverts shall be extended or made traversable as recommended within the Major Rehabilitation Safety Review. Use the applicable Clear Zone for *DESIGN GUIDELINES* Major Rehabilitation.

Existing culverts will not be hydraulically analyzed on these projects. (*Only approved culvert replacements and particular pipe liners as outlined in Section III-04.11 will be hydraulically analyzed*)

- Approach pipes
 - Approach pipes affected by the grading should be extended. Need approval for any other stream crossing work as outlined in Section III-04.11.
 - Relay end sections or provide new end sections as applicable.
- Centerline pipes
 - Centerline pipes affected by the grading of the project should be extended. Need approval for any other stream crossing work as outlined in Section III-04.11.
 - Relay end sections or provide new end sections as applicable.
- Structural Plate Pipe
 - The Bridge Preliminary Concept will recommend proposed improvements for existing structural plate pipes that have an associated Bridge Listing #. Structural plate pipes that do not have a Bridge Listing # will be treated as centerline pipes above.
- Box Culverts
 - The Bridge Preliminary Concept will recommend proposed improvements. Engineering justification and the Bridge Division Engineer approval is required to extend any box culvert beyond the *DESIGN GUIDELINES* Major Rehabilitation Clear Zone.
- Cattle Pass
 - The designer shall determine whether the existing cattle pass structure is being used for drainage, see centerline pipes above.
 - See Section 2.23 of the Right of Way Manual for information regarding cattle pass policies.

III-04.11.03 Structural Improvement Culvert Replacement

Culverts shall be extended or made traversable as recommended within the Structural Improvement Safety Review. Use the applicable Clear Zone for *DESIGN GUIDELINES* Structural Improvement.

Existing culverts will not be hydraulically analyzed on these projects. (*Only approved culvert replacements and particular pipe liners as outlined in Section III-04.11 will be hydraulically analyzed*)

- Approach pipes
 - Approach pipes affected by the grading should be extended. Need approval for any other stream crossing work as outlined in Section III-04.11.
 - Relay end sections or provide new end sections as applicable.
- Centerline pipes
 - Centerline pipes affected by the grading of the project should be extended. Need approval for any other stream crossing work as outlined in Section III-04.11.
 - Relay end sections or provide new end sections as applicable.
- Structural Plate Pipe
 - The Bridge Preliminary Concept will recommend proposed improvements for existing structural plate pipes that have an associated Bridge Listing #. Structural plate pipes that do not have a Bridge Listing # will be treated as centerline pipes above.
- Box Culverts
 - The Bridge Preliminary Concept will recommend proposed improvements. Engineering justification and the Bridge Division Engineer approval is required to extend any box culvert beyond the *DESIGN GUIDELINES* Structural Improvement Clear Zone.
- Cattle Pass
 - The designer shall determine whether the existing cattle pass structure is being used for drainage, see centerline pipes above.
 - See Section 2.23 of the Right of Way Manual for information regarding cattle pass policies.

III-04.11.04 Minor Rehabilitation (Sliver Grading) Culvert Replacement

Culverts should be extended to the limits of the proposed sliver grading.

Existing culverts will not be hydraulically analyzed on these projects. *(Only approved culvert replacements and particular pipe liners as outlined in Section III-04.11 will be hydraulically analyzed)*

- Approach pipes *(Generally, sliver grading projects will not affect the existing approach pipes and will not be addressed within the scope of the project)*
 - Approach pipes affected by the grading should be extended. Need approval for any other stream crossing work as outlined in Section III-04.11.
 - Relay end sections or provide new end sections as applicable.
- Centerline pipes
 - Centerline pipes affected by the grading of the project should be extended. Need approval for any other stream crossing work as outlined in Section III-04.11.
 - Pipe extensions will be limited to that required for the extent of sliver grading only, or to accommodate a standard pipe increment length, whichever is greater.
 - Relay the existing end sections. If the existing end section needs to be replaced, the end section may then be replaced with a traversable or flared end section.
- Structural Plate Pipe
 - Structural plate pipe should only be extended enough to accommodate sliver grading only.
- Box Culverts
 - Box culvert extensions are only needed if the proposed foreslope results in a slope that is steeper than 4:1 through the limits of the box culvert.
 - The Bridge Preliminary Concept will recommend proposed improvements. Engineering justification and the Bridge Division Engineer approval is required to extend any box culvert beyond the limits of the proposed sliver grading.
- Cattle Pass
 - Cattle passes should only be extended enough to accommodate sliver grading only.
 - The designer shall determine whether the existing cattle pass structure is being used for drainage.
 - See Section 2.23 of the Right of Way Manual for information regarding cattle pass policies.

III-04.12 Grade Raises (Closed Basin)

Grade raise projects through closed basins are generally constructed for roadways with imminent risk of inundation, or roadways that are currently inundated by the adjacent water body or basin.

The grade raise is typically measured from the existing water elevation, unless otherwise specified in the Detailed Damage Inspection Report (DDIR) or in modification agreed to later. The grade raise is measured to the roadway centerline of the proposed subgrade on a tangent section. The grade raise should be: existing water elevation + hydraulic analysis + freeboard* = centerline of proposed subgrade (see figure III-04.12).

**Freeboard will vary with the proposed typical section to accommodate riprap to be placed 2' above the forecasted water elevation and outside the clearzone with no flatter than 10:1 foreslopes. Some basins may require riprap to be placed 5' above the forecasted water elevation to accommodate larger wave attenuation such as for Devils Lake.*

Typically, 3 build alternates are proposed within the DCE for a given grade raise project:

1. Grade Raise above the natural outlet elevation
2. Grade Raise above the 3-year net storage forecasted water elevation
3. 5' Grade Raise above the existing water elevation

A hydraulic study/analysis (see Section V-04.10) should be done for the affected area to determine the natural outlet elevation of the basin, the 3-year net storage forecasted water elevation, and determine the adequate centerline drainage for equalization and stream crossing criteria. The riprap shall be placed 2' above the forecasted water elevation unless the hydraulic report recommends riprap at a higher elevation. The hydraulic study should estimate the time forecasted when the storage of the basin will reach the natural outlet and/or exceed the 5' Grade Raise elevation. Designers can use the forecasted water elevation to determine the grade at the centerline of the proposed subgrade on tangent section.

Generally, the existing centerline culverts should be extended if possible with the use of temporary earthen berms and without the use of engineered cofferdams (historically \leq 8 feet depth of water). If the existing culverts are not extended, new centerline culverts shall be installed to a higher invert.

If circumstances potentially warrant the use of engineered cofferdams for any proposed centerline culverts, a decision item should be included within the Documented Categorical Exclusion (DCE) or other decision document to address this proposed work with the project.

Grade raise projects shall follow design criteria for New/Reconstruction within the *DESIGN GUIDELINES*. Generally, the proposed typical section for rural roadway grade raise projects should incorporate:

- The existing roadway paved surface can remain in place if depth of proposed fill is $\geq 1'$.
- 2 volume adjustment percentages should be used for earth embankment:
 - A higher volume adjustment percentage should be included for shrinkage and material loss for earth embankment placed within the water.
 - A lower volume adjustment percentage should also be included for shrinkage for earth embankment not placed in water.
- A minimum foreslope rate of 10:1 within the clearzone to provide adequate drainage.
- The existing foreslope/clearzone should be transitioned to the proposed foreslope/clearzone a distance of L_r (Runout Length) in advance of the riprap. (See detail on PPG website).
- Riprap placed outside the clearzone at a 3:1 foreslope.
- Riprap placed 2' below the existing water elevation, a minimum of 2' above the design water elevation, and at a 2' thickness/depth.
- A temporary earthen berm for existing water depths 8' or greater. After the riprap has been placed, the earthen berm should be removed to a depth 1' below the existing water elevation. The earthen berm shall be entirely removed at all pipe locations to eliminate potential siltation within the pipe.
- Geosynthetic Material Type RR fabric underneath the riprap along the 3:1 foreslope to the bottom of the riprap. The Type RR fabric shall utilize a key at the top of the riprap. The Type RR fabric shall also utilize a dutch wrap at the bottom of the riprap placement if earthen berms are utilized.
- When a grade raise is on a curve, add centerline rise to the profile. The elevation of the edge of the driving lane should be maintained from the tangent section through the low side of the curve.
- The proposed roadway width shall consist of a minimum 28' paved surface and the additional roadway width required as aggregate surface to meet the minimum roadway width guidelines.
- If the existing roadway paved surface adjacent to the begin/end project limits exceeds 28', the proposed paved surface shall match the existing paved surface and the additional roadway width required as aggregate surface to meet the minimum roadway width guidelines.

*For example, if the *DESIGN GUIDELINES* for New/Reconstruction requires a 36' minimum roadway width and the existing roadway is 30' paved width, the proposed typical section should be 30' paved surface with additional 3' as aggregate surface on each side to meet the minimum 36' roadway width guidelines.

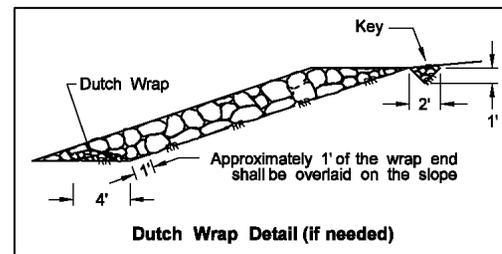
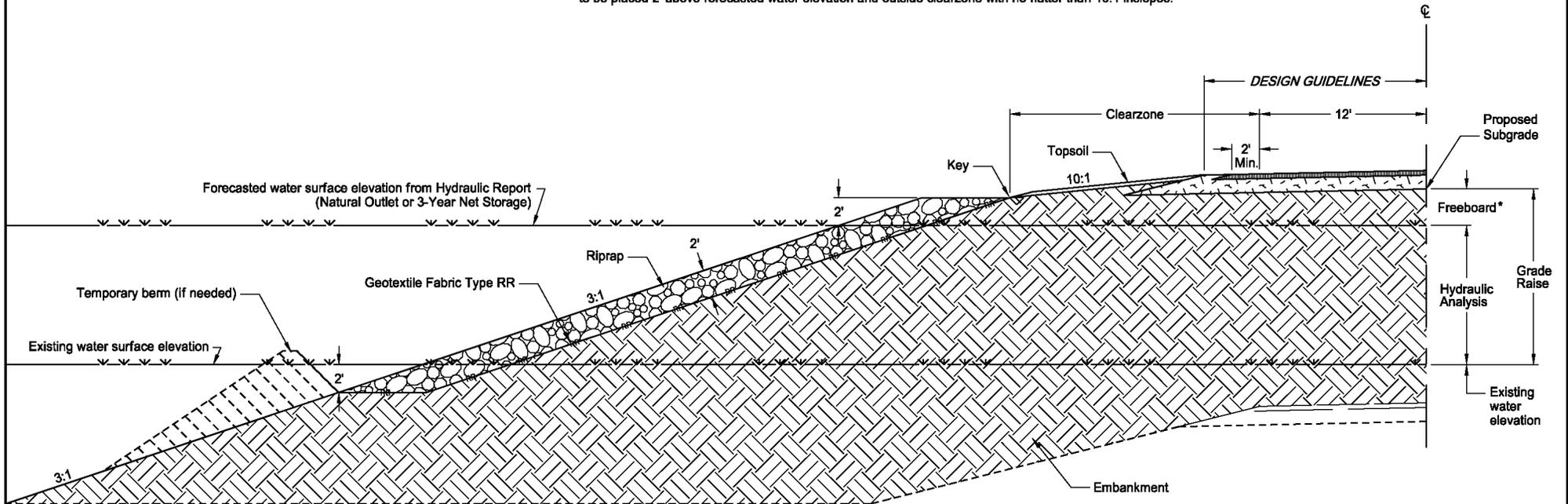
*See Figure III-04.12.01 and Figure III-04.12.02 Grade Raise on the following pages.

Figure III-04.12.01 Grade Raise

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Grade Raise: existing water elevation + hydraulic analysis + freeboard* = centerline of proposed subgrade.

*Freeboard measured to the proposed subgrade ϕ varies with proposed typical section to accommodate riprap to be placed 2' above forecasted water elevation and outside clearzone with no flatter than 10:1 inslopes.



This document is preliminary and not for construction or implementation purposes.

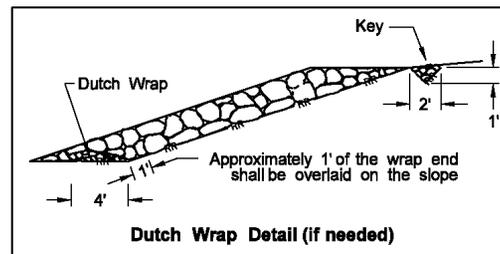
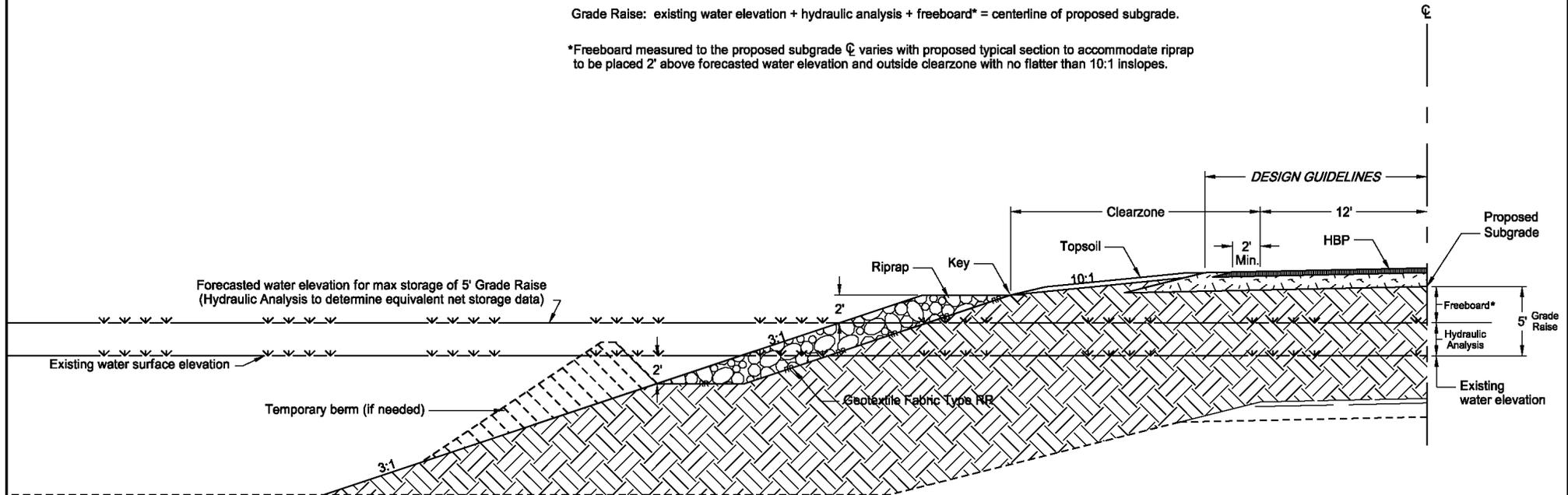
Proposed Grade Raise
Closed Basin
Based on Hydraulic Analysis

Figure III-04.12.02 Grade Raise

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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Grade Raise: existing water elevation + hydraulic analysis + freeboard* = centerline of proposed subgrade.

*Freeboard measured to the proposed subgrade ϕ varies with proposed typical section to accommodate riprap to be placed 2' above forecasted water elevation and outside clearzone with no flatter than 10:1 inslopes.



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Proposed Grade Raise
Closed Basin
5' Grade Raise Alternate