<[Date](#Date)>

TO: [0000000 00000000](#PM" \o "Insert the INDOT project manager for this des number.)

|  |
| --- |
| < Designer Stamp > |

 INDOT Project Manager

|  |
| --- |
| Designer Signature |

FROM: [0000000 00000000](#Consultant_Info" \o "Insert your name, email, firm, signiture and PE stamp)

 Consultant Engineer

 <email>

 <firm>

|  |
| --- |
| QA Signature |

THROUGH: [0000000 00000000](#INDOT_Info" \o "This is for the INDOT reviewer and his/her signiture)

 INDOT Engineer

**This memo is not to be considered final until it has been signed and stamped by the designer and signed by the QA engineer.**

SUBJECT: Hydraulic Review

 Des. #:

 Asset Name: <(Culvert or Bridge Asset ID)>

County:

 Location:  <[(Determined from BIAS or SPMS )](#location)>

 Crossing:  <[(stream crossing)](#stream)>

 DNR CIF Permit Required (Y/N): Choose an item.

 Legal Drain (Y/N): Choose an item.

|  |
| --- |
| **Site Parameters** |
| Drainage Area | [(Area)](#area) |   |
| Q100 (AEP 1%)Discharge | [(discharge)](#discharge" \o "Enter the Q100 Discharge in CFS for the listed project) | cfs |
| QChoose an item. (AEP Choose an item.)Discharge for velocity | [(discharge)](#discharge) | cfs |
| Q100 (AEP 1%) Choose an item. Depth | [(TW depth)](#WS_Elev" \o "The tailwater depth used in the backwater calculations.  The outlet depth may be used if the tailwater depth is significantly smaller.) | ft.  |
| US Edge of Travel Lane | [(road elev)](#road) | ft. |
| Design Roadway Serviceability Elevation | [(serv. elev)](#road" \o "The serviceability elevation is the elevation of the US shoulder of the road minus the freeboard requirement per IDM Fig. 203-2C.) | ft. |

|  |
| --- |
| **Culvert Properties** |
| **Parameter** | **Existing** | **Proposal 1** | **Proposal 2** | **Proposal 3** |
| Structure Size & Type |  |  | (delete column if not needed) | (delete column if not needed) |
| Q100 Headwater Elevation |  | ft. |  | ft. |  | ft. |  | ft. |
| QChoose an item.(AEP Choose an item.) Headwater Elevation  |  | ft. |  | ft. |  | ft. |  | ft. |
| Meets Roadway Serviceability @ QChoose an item. (AEP Choose an item.) | Choose an item. | Choose an item. | Choose an item. | Choose an item. |
| Backwater |  | ft. |  | ft. |  | ft. |  | ft. |
| Minimal Low Structure Elevation (DS) |  | ft. |  | ft. |  | ft. |  | ft. |
| Assumed Flowline Elevation (DS) |  | ft. |  | ft. |  | ft. |  | ft. |
| Sump Depth |  | in. |  | in. |  | in. |  | in. |

[<<<Discussion of Existing Conditions, Proposals, and Analysis>>>](#Discussion" \o "Briefly describe the methods used, location, existing conditions, proposed conditions, if it is county drain, and if a CIF permit is needed. Beveled headwalls and energy dissipaters figures are given below for reference.)

Please note that if a square edge headwall is required for a replacement structure, then a flared end section may be used at the inlet in place of constructing an actual headwall should the structure type be eligible. If a beveled headwall wall is required, then it must follow the figure below and a headwall constructed.

**Riprap Design Recommendations**

|  |
| --- |
| **Riprap Properties** |
| **Parameter** | **Proposal 1** | **Proposal 2** | **Proposal 3** |
| Structure Size & Type |  | (delete column if not needed) | (delete column if not needed) |
| Outlet Velocity @ QChoose an item.(AEP Choose an item.) | [(vel)](#Vel) | ft/s |  | ft/s |  | ft/s |
| Outlet Riprap Size | Choose an item. | Choose an item. | Choose an item. |
| [Inlet Riprap](#inlet_riprap) Needed (Y/N) | Choose an item. | Choose an item. | Choose an item. |
| Natural Channel Velocity @ QChoose an item.(AEP Choose an item.) |  | ft/s |
| Minimal Inlet Riprap Size if Warranted | Choose an item. |

Outlet riprap based on the size shown in the above table should be placed on geotextiles according to IDM Figure 203-2J.  *<If applicable please state any standard drawings as well>* ***Choose one****: Inlet riprap does not appear to be required based on the site visit. If it is determined necessary by the designer, a minimum size described in the table or larger should be placed according to the designer’s discretion.>* ***or*** *<The minimum size riprap described in the table is required at the inlet due to <give reason>>*

Alternative scour protection designs should be submitted to the INDOT Office of Hydraulics for review and approval.

**Beveled Edge Headwall Detail**





**Source:** J. D. Schall, *Hydraulic design of highway culverts*, 3rd ed. Washington, D.C.: U.S. Dept. of Transportation, Federal Highway Administration, 2012. Pg. 3.5, Fig. 3.3

**External Energy Dissipater Details – Riprap Basin**



See IDM Figure 203-2K or HEC-14 for more information.

**[Riprap Basin Properties](#energy_dissipater" \o "Provide the necessary information below of the energy dissipater proposed with the proper proposal name at the top of the column.)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Option 1** | **Option 2** | **Option 3** | **Option 4** |
| Basin Length (LB) |  | ft. |  | ft. |  | ft. |  | ft. |
| Basin Width |  | ft. |  | ft. |  | ft. |  | ft. |
| Apron Length (LA) |  | ft. |  | ft. |  | ft. |  | ft. |
| Pool Depth (hs) |  | ft. |  | ft. |  | ft. |  | ft. |
| Riprap Size | Choose an item. | Choose an item. | Choose an item. | Choose an item. |

**Inlet Depression Details**



**HDS 5 - Figure 3.5 Culvert with Inlet Depression**

Riprap should be installed along the depression slopes and at the bottom by the inlet.

**Inlet Depression Properties**

|  |  |
| --- | --- |
| **Parameter** | **Inlet Depression Properties** |
| Replacement Option  | **Option #1** | **Option #2** | **Option #3** | **Option #4** |
| T |  | ft |  | ft |  | ft |  | ft |
| D |  | ft |  | ft |  | ft |  | ft |
| B |  | ft |  | ft |  | ft |  | ft |
| D/2 (apron) |  | ft |  | ft |  | ft |  | ft |
| B + 4T (total width) |  | ft |  | ft |  | ft |  | ft |
| D/2 + 2T (total length) |  | ft |  | ft |  | ft |  | ft |
| Total Crest Width |  | ft |  | ft |  | ft |  | ft |
| Riprap Class | Choose an item. | Choose an item. | Choose an item. | Choose an item. |

If you have any questions or comments, please contact me at [(317) 23X-XXXX](#phone" \o "This phone number is of the INDOT hydraulics reviewer and will insert his or her own phone number.).

cc: file