

March 29, 2021

Martha L. Taylor, Town Planner
Town of Newbury
12 Kent Way
Byfield, MA 01922

**RE: 217/221 High Road
Definitive subdivision
Peer Review services**

Dear Ms. Taylor,

On behalf of Gadsden Lane, LLC (owner/applicant), The Morin-Cameron Group, Inc. (MCG) has prepared the following responses to the peer review letter prepared by Joseph J. Serwatka, P.E. on February 24, 2021 as well as town staff comments.

Included with this submission are the following:

- "Definitive Subdivision in Newbury, Massachusetts at 217 & 221 High Road (Assessor's Map R27, Lots 51, 53, 54, & 560" for Gadsden Lane, LLC dated February 3, 2021 and revised through March 25, 2021.
- 3953 Water Quality Swale Sizing HydroCAD analysis dated March 25, 2021
- 3953 Proposed HydroCAD Analysis dated March 25, 2021
- TSS Removal Calculations dated January 12, 2021 and revised March 25, 2021
- Illicit Discharge Compliance Statement
- Figure 6 "Proposed Watershed Plan" dated January 6, 2021 and revised through March 25, 2021
- "Construction Phase Best Management Practices Operation and Maintenance Plan for 217 & 221 High Road Newbury, Massachusetts" dated March 25, 2021
- "Stormwater Management Calculations" dated January 6, 2021 and revised March 25, 2021.

The following letter restates the original comment and then follows with the response by MCG addressing the comment. Please refer to the original letter for official wording of comments:

Peer Review Letter – Joseph Serwatka, P.E.

SHEET 1 OF 8, COVER SHEET

1. *Comment: A list of four waivers is presented on the plan with regards to conformance to the subdivision regulations. The waivers list "preservation of existing trees" as one reason for the request but, the site was essentially cleared*

months ago. The remaining trees are 6-10" oak and maple, and only one tree on lot 1 is labeled "existing tree to remain (typ.)". The board may want the engineer to specify which trees will be saved, including perhaps the 30" walnut, but it would appear most trees will be removed for road and lot development.

MCG Response: The waiver request on sheet 1 was revised to indicate the intent to preserve the remaining trees. Additional notes were added on sheet 5 clarifying trees that are to remain or to be removed.

2. **Comment:** *Waiver 4 requests that the entire roadway be super-elevated to one side, rather than crowned in the center as is typical. The reason given is "preservation of existing trees, ledge outcrops, etc.", but trees are labelled to be saved in this area, and ledge outcrops appear on both sides of the road. Super-elevation is usually reserved for horizontal curves to help offset centripetal force, but that is not an issue here. Rather than subjecting drivers to an unusual super-elevated experience on a straight roadway, the board may want the engineer to crown the road in the center, and provide swales on both sides.*

MCG Response: The normal right of way width of 53 feet would allow for buried electric utilities to be situated outside the swale. The width reduction waiver that has been requested does not allow for sufficient shoulder space to fit both the swale and the electric utility. The electric provider, National Grid, will not place electric conduits within a drainage swale. The solution is to superelevate the road and have a swale on 1 side and the electric utility on the other. Relatively speaking, this project only serves as access to 4 residential dwellings which is a very low vehicular demand in which a superelevated road would not make a noticeable difference for drivers on the road compared to a crowned road. AASHTO Policy on Geometric Design of Highways and Streets states "Superelevation is advantageous...for roadways in rural areas" (4.9.2 Superelevated Sections) and that "For roads in rural areas with paved surfaces, superelevation should not be more than 12 percent, except where snow and ice conditions prevail, in which case the superelevation should not be more than 8 percent." (5.2.1.6 Cross Slope). The superelevation of the roadway in this design is 3.125%, well below the suggested maximums for this type of roadway. The cross section was adjusted to reflect actual horizontal to vertical scale whereas the prior was exaggerated vertically, as is customary.

SHEET 2 OF 8, EXISTING CONDITIONS PLAN

1. **Comment:** *The existing conditions note states that the existing conditions information is compiled from record plans and GIS data and should be considered approximate, for reference only. This note could be a carry-over from the preliminary plan and may need to be revised. Typically existing conditions are depicted based on actual field surveys.*

MCG Response: The existing conditions note was updated on sheet 2.

SHEET 3 OF 8, LOTTING PLAN

1. **Comment:** *The zoning table lists the required street setback as 20 feet, but the proposed road layout is 11.7 feet from the existing dwelling at 221 High Road. The*

board may want to verify that the reason given below the table is sufficient.

MCG Response: We differ to the building inspector on the setback determination. A letter is expected to be forthcoming.

2. **Comment:** *The plan labels 4 lots, even though 6 new lot configurations are being created, two of which will contain existing dwellings. It appears that the engineer would like to call this a 4 lot subdivision in order to avoid stormwater treatment/mitigation requirements dictated by the Policy. It is interesting to note that the same engineer/developer submitted plans in 2017 for a definitive subdivision at 255 High Road, but the lot containing an existing dwelling was, in fact, included in the lot count. Another subdivision before the board at 15 Coleman Road also counts the existing dwelling lot as a subdivision lot. The board may, therefore, prefer to recognize this as a 6 lot subdivision.*

MCG Response: The application notes 6 lots and the language in the drainage report reflects 6 lots.

3. **Comment:** *The plan labels proposed "Gadsden Lane" as private. The board may want this included in any approvals, so that all maintenance is not on the Town.*

MCG Response: No response necessary.

SHEET 4 OF 8, SITE PLAN

1. **Comment:** *As noted previously, the plan should label all trees to be preserved, as stated in the waiver requests.*

MCG Response: All trees to be removed as part of the development have been labelled on sheet 5. All trees not marked for removal are to remain. Sheet 4 has been revised to show only trees that will remain after the development is complete.

2. **Comment:** *The excavation required for the roadway will likely kill the existing 30" walnut tree at #221. The engineer should address whether it is to be removed.*

MCG Response: The portion of road at the existing walnut street is in a slight fill (approximately Station 1+15). This area also previously had a large evergreen tree growing adjacent to the walnut tree, limiting the branch growth and presumably the root growth which is typically coincident with the tree canopy. It is expected that the full pavement depth will be achievable and that only minor impact to the tree roots would result from the road construction. Site plan note 8 was added to sheet 4 stating "Preservation of existing 30" walnut tree during construction to be overseen by an arborist."

3. **Comment:** *The board may want any foundation drains to be depicted on the plan, as would be typical.*

MCG Response: Foundation drains were added to the four new homes on sheet 4. They will all daylight to stone protected outlets.

4. **Comment:** *Inverts should be provided for all of the proposed driveway culverts to verify that they work with the grading and detail on sheet 6.*

MCG Response: A driveway culvert schedule has been added to sheet 4.

5. **Comment:** *The grading appears to depict a super-elevated roadway up to about station 4+50, but then the super-elevation appears to switch from side to side for some reason. The site contractor will need adequate guidance and details on how to construct the roadway. The plan should make it clear where, and how, the super-elevation occurs, if it is approved.*

MCG Response: The roadway grading was adjusted on sheet 4.

6. **Comment:** *The proposed treeline should be depicted on the plan, as would be typical.*

MCG Response: The proposed treeline was added to sheet 4.

7. **Comment:** *The erosion control line on lots 2 and 3 is not very practical, and may just be an attempt to avoid filing with the conservation commission. The silt fence/silt sock is shown against the proposed deck and well on lot 3, and only 5 feet off the foundation, and also against the well on lot 2. The proposed tree cutting would not be able to extend beyond the silt fence, leaving no room for a rear lawn on these two lots. The board may want the engineer to address this.*

MCG Response: The work associated with the roadway development will be out of the buffer zone. It is the applicant's intent to file separate notices of intent to the conservation commission for lots 2 & 3. Site plan note 7 was added to sheet 4 to clarify that any additional clearing on the lots within the conservation jurisdiction will require filing a notice of intent for that lot.

8. **Comment:** *A label notes "prop. grassed channel along shoulder" at station 6+00, but no swale is graded in this area.*

MCG Response: The swale grading was adjusted on sheet 4.

9. **Comment:** *The board may want the engineer to address whether section 117.31 applies to this project relative to a fire storage tank.*

MCG Response: The applicant has spoken with the Newbury Fire Chief and agreed to provide 6D residential sprinkler systems in all the houses. Site Plan Note 6 was added to sheet 4 indicating this.

10. **Comment:** *As a representative for the board of health, I witnessed soil/perc testing for this project in October of 2020. The following comments are offered relative to what is depicted on the plans:*

- a. *Test pits TP-20-1 through 3 on lot 1 are used to depict two 20' by 40' septic areas, both of which extend about 30 feet beyond the test pits. This may not be appropriate in my opinion. I believe that it was clearly understood by myself, Alex Parker (soil evaluator for Morin-Cameron) and Mr. True that any septic field had to be located over the three test pits, and would likely have to consist of trenches with reserve between. This was due to limiting conditions (i.e. lack of soil, ledge refusal) outside of this area. It would be up to the engineer to determine whether there would be adequate space over these three test pits to support a design attempt for a septic system. If the engineer chooses to leave the septic area on the plans, I would recommend that additional test pits on the far end of the 20' by 40' boxes be a condition of approval. The board may also want to get Deb Rodgers*

comments relative to this.

MCG Response: The septic leaching fields have been revised to center them on the test pits on sheet 4. Final designs will be submitted to the Health Department with the building permit plans pursuant to 310 CMR 15: Title 5.

- b. *On lot 2, the 15' by 50' septic area box should be centered over test pits TP-20 4 & 5, as should be typical. As depicted, one corner of the box is about 30 feet from a test pit. If the engineer is unable to relocate the box, I would recommend that additional test pits be conducted as allowed by Title 5. The board may want to make this a condition of any approval, and also get Deb Rodgers comments on the matter, as I defer to her.*

MCG Response: The septic leaching fields have been revised to center them on the test pits on sheet 4. Final designs will be submitted to the Health Department with the building permit plans pursuant to 310 CMR 15: Title 5.

- c. *Typically two test pits and a perc test are required in the primary and reserve septic areas. The septic area depicted on lots 3 and 4 have all the test pits in one box, rather than two in each, as required. I would recommend that the engineer address this issue.*

MCG Response: The leach fields will be trench systems which require 2 test holes if the reserves are placed between the primary trenches. Final designs will be submitted to the Health Department with the building permit plans pursuant to 310 CMR 15: Title 5.

11. **Comment:** *Hydraulic calculations should be provided for the grassed channels and driveway culverts, based on the less frequent storms.*

MCG Response: Hydraulic calculations for the water quality swale and driveway culverts have been added as an attachment with this response letter.

12. **Comment:** *The proposed grading on lot 1 may direct roof and driveway runoff onto abutting lots. The engineer should redirect this flow or verify that it will not be an issue.*

MCG Response: The driveway for lot 1 has been revised to show spot grading and flow arrows on the driveway that will direct water towards the water quality swale. There is an existing stone wall along the majority of the property line on this edge which will stop water from flowing off the property from the yard.

SHEET 5 OF 8, ROADWAY PLAN, PROFILE & CROSS-SECTION

1. **Comment:** *Typically a vehicle landing area is provided at the intersection with the main road, at a maximum slope of 2 percent for 50 feet or more. The engineer may want to consider adding this to the roadway entrance.*

MCG Response: The slope of the roadway at the intersection with the main road is 2.96%. Per AASHTO A Policy on Geometric Design of Highways and Street 2018 7th Edition, slopes of 3% or less do not require any sight distance adjustments to the roadway for cars or trucks entering or exiting the street. Slope at the intersection is important as a steep slope can slow down the time it takes for a car

to pull out of the intersection.

2. **Comment:** *As mentioned previously, the centerline profile is provided, but the cross section from station 5+00 on appears to be non-uniform. The engineer should address this.*

MCG Response: The roadway superelevation was adjusted on sheet 4.

3. **Comment:** *The plan does not appear to depict any street lights. The board may want the engineer to address whether street lights are proposed.*

MCG Response: Currently no streetlights are proposed for this subdivision.

STORMWATER

1. **Comment:** *Page 3 of the narrative states that "the project is not required to comply with the Massachusetts Stormwater Management Handbook or the Newbury Stormwater Bylaw" since it is a small project comprised of 4 or fewer new single-family homes and under 1-acre of disturbance for the road construction. As mentioned above, the project appears to be a 6-lot subdivision based on similar projects, one of which was done by the same engineer/developer. Also, section 117-18, B, (15) of the Regulations refers to the Town of Newbury Stormwater Management, Illicit Discharge, and Erosion Control Rules and Regulations. Page 2, section 5 of the regulations appears to state that they do apply if one or more acres are altered or disturbed. The project appears to alter/disturb about 4 acres, but the narrative singles out just the road construction. The board may want to review this issue and provide direction as to whether stormwater compliance is required.*

MCG Response: The project consists of a 6 lot subdivision. Per the Massachusetts Stormwater Handbook the stormwater management standards apply only to the extent practicably, as the project is single family detached dwellings between 5 and 9 lots that do not discharge to a critical area. (Ref: Volume 1, Chapter 1, Page Three 'Applicability' states "(3) Housing development and redevelopment projects comprised of detached single family dwellings on five to nine lots, provided there is no discharge that may potentially affect a critical area"). Below is a summary of the 10 stormwater standards and how they apply to the project compliance to the maximum extent practicable or fully compliant.

1. **STANDARD:** No stormwater conveyance system discharges untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

SUMMARY OF MITIGATING MEASURES: No untreated discharge is proposed for the project. The roadway will run through a gravel filter strip to a water quality swale into a sediment forebay.

CONCLUSION: The proposed development meets this standard.

2. **STANDARD:** The stormwater management system shall be designed such that post-development peak rates of stormwater runoff do not exceed pre-development rates for the 2- and 10-year storm events. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.4

SUMMARY OF MITIGATING MEASURES: The project discharges to land subject to coastal storm flowage, which is defined as *"land subject to any inundation caused by coastal storm up to and including that caused by the 100-year storm, surge of record or storm of record, whichever is greater."*

CONCLUSION: The standard does not apply since the discharge is to a coastal flood zone AE.

3. **STANDARD:** Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook. MassDEP recognizes that it may be difficult to infiltrate the required recharge volume on certain sites because of soil conditions. For site comprised solely of C and D soils and bedrock at the land surface, proponents are required to infiltrate the required recharge only to the maximum extent practicable. (page reference

SUMMARY OF MITIGATING MEASURES: The soil on site consists of Charlton-Rock outcrop-Hollis complex between 3-15% slopes. This is a soil that is characterized by sections of ledge outcrops and surface bedrock. As can be seen in the existing conditions and was observed during the soil testing, portions of the site have visible bedrock and there is minimal area on site to add infiltration without significant earthwork, disturbance to the land and there is not a guarantee that the work will result in areas large enough for infiltration. As designed, the project uses low impact development techniques including a water quality swale, sediment forebay, and gravel filter strip to maximize and encourage recharge through overland flow.

CONCLUSION: The standard is met to the extent practicable.

4. **STANDARD:** Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

SUMMARY OF MITIGATING MEASURES: The combination of street sweeping, water quality swale, and sediment forebay provide 80% TSS removal for the roadway.

CONCLUSION: The proposed development meets this standard.

5. **STANDARD:** For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

SUMMARY OF MITIGATING MEASURES: None.

CONCLUSION: The proposed development meets this standard as it does not apply to this project.

- 6. STANDARD:** Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Management handbook.

SUMMARY OF MITIGATING MEASURES: None.

CONCLUSION: The proposed development meets this standard as it does not apply to this project.

- 7. STANDARD:** A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

SUMMARY OF MITIGATING MEASURES: None.

CONCLUSION: The proposed development meets this standard as it does not apply to this project.

- 8. STANDARD:** A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented).

SUMMARY OF MITIGATING MEASURES: Refer to the Construction Phase Operation and Maintenance Plan prepared by MCG, dated March 25, 2021.

CONCLUSION: The proposed development meets this standard.

- 9. STANDARD:** A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

SUMMARY OF MITIGATING MEASURES: Refer to the Long-Term Operation and Maintenance Plan prepared by MCG, dated January 7, 2021 and revised through March 25, 2021.

CONCLUSION: The proposed development meets this standard.

- 10. STANDARD:** There shall be no new illicit discharges created as a result of the project.

SUMMARY OF MITIGATING MEASURES: To the best of our knowledge and belief there are no illicit discharges being created as a result of the proposed project. An illicit discharge statement is included herein.

CONCLUSION: The proposed development meets this standard.

DPW Comments

1. **Comment:** "...my concern would be the waiver for the cul-de-sac. If this is going to be a town approved road these cul-de-sac are difficult to plow and when you shrink them up in becomes a lot more difficult and the become very tight with snow."

MCG Response: The road will remain private and will not require plowing by the Town of Newbury.

Conservation Comments:

1. **Comment:** It appears that the plans depict no work for the proposed roadway construction will take place within the 100' buffer to the wetland resource area (B.V.W.), however the wetland boundary has not been reviewed by the Commission, at a minimum an ANRAD or RDA may be applicable.

MCG Response: The plan includes conceptual lot designs to demonstrate constructability however it is expected that the house designs will be fine-tuned ahead of a building permit and when buyers are in place for the lots. The roadway construction is significantly outside of the buffer zone for the bordering vegetated wetland. The applicant intends to file separate notice of intent applications with the town for the houses located on lots 2 & 3. This permitting will be done subsequent to the definitive subdivision approval so as to not encumber all of the real estate titles with orders of condition for work on single lots. The wetland boundary will be submitted to the Commission prior to filing the notices for these two lots.

2. **Comment:** The project would be considered a six lot subdivision, as the two existing lots for 217 and 221 are being reconfigured, and DEP will count them as part of the overall subdivision, therefore the project exceeds the threshold for requiring SWM, so they may need to meet all ten criteria of the SWM regulations. This will also require a filing with the Conservation Commission under the local Stormwater Bylaw and MA DEP guidelines.

MCG Response: See response to Stormwater, #1 above.

3. **Comment:** Since it appears that in excess of 1 acre of soil will be disturbed as a result of the development, the applicant will need to obtain an NPDES permit and prepare a SWPPP, with construction monitoring.

MCG Response: The Town of Newbury Stormwater bylaw requires a NPDES permit if the land area disturbed is greater than one acre and drains to the Town of Newbury MS-4 (Chapter 87 Stormwater Management and Illicit Discharge and Erosion Control section 4 Applicability (a) & (c)). This project drains to land subject to coastal flowage not a Newbury MS-4 therefore, is not required to obtain a NPDES permit under the regulations. A long term operation and maintenance plan and construction phase operation and maintenance plan is included with the definitive subdivision application and erosion control measures are depicted on the plan.

4. **Comment:** It appears that they are falling short on TSS removal and possibly the recharge requirement, draw down calculations should be provided.

MCG Response: The project meets the TSS removal requirement and complies with the recharge requirement to the maximum extent practicable considering the shallow bedrock conditions of the site. See stormwater response above.

5. **Comment:** The applicant's Engineer maintains that mitigation of stormwater runoff for the various storm events, is not required, due to the fact that the receiving body of water is the tidally influenced salt march. The SWM regulations do exempt projects that discharge to a tidally influenced body of

water, however the proposed discharge is located within upland and the receiving wetland resource is noted as a B.V.W. not salt march, as such I believe they should comply with the Stormwater mitigation requirement. I will contact the Town's DEP circuit rider for an interpretation, at the State level.

MCG Response: The site drains to land subject to coastal storm flowage as defined in 310 CMR 10.04, therefore mitigation is not required.

6. **Comment:** *On Lots 2 and 3, the house construction and grading are located right at the 100 ft buffer. If the stake the erosion control in the field and do not grade or cut any vegetation beyond that, then they would not need to file with Con Comm for those lots. However, it seems a bit unlikely that the construction could take place as depicted without any encroachment into the 100 foot buffer. If they proceed as shown without filing for a permit with the Conservation Commission, I will be watching closely as I suspect encroachment would occur.*

MCG Response: The work associated with the roadway development will be out of the buffer zone. It is the applicant's intent to file separate notices for lot 2 & 3 with the conservation commission for the development of those lots. Site plan note 7 was added to sheet 4 to clarify that any additional clearing on the lots within the conservation jurisdiction will require filing a notice of intent for that lot.

7. **Comment:** *It may be prudent for the applicant and their design team to show what would likely be the anticipated limit of work to allow for some backyard and to file with Conservation Commission for the two lots.*

MCG Response: See response to comment #6, above.

8. **Comment:** *The location of the current septic systems for the two existing houses should be depicted.*

MCG Response: The septic systems for the existing homes were added to the plan.

Fire Department Comments:

1. **Comment:** *The minimum roadway width should remain 22 feet as indicated on the latest set of plans.*

MCG Response: The minimum roadway width is 22 feet.

2. **Comment:** *All homes should be sprinklered as this sub-division falls into the low water pressure district of Town. The sprinkler systems will satisfy the requirements for cisterns, with should be deleted.*

MCG Response: Site Plan Note 6 note was added to sheet 4 indicated that all new homes will have 6D residential sprinkler systems.

Board of Health Comments:

1. **Comment:** *Based on the soil/perc testing that was conducted by the Newbury Soil Evaluator Joe Serwatka there are some concerns regarding the proposed septic system areas. The soil testing revealed there was inadequate amount of soil in many areas that would not support a 4 bedroom septic system design. On the proposed lot 1, for instance, it was fully understood by the Soil Evaluator Alex Parker and Joe Serwatka that any proposed septic system requires the test pits to be in the center of the primary and reserve area of the leach field. The areas immediately adjacent to the successful test pits were mostly not adequate due to shall ledge refusal. In the proposed*

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subdivision plan, the adequate soil tests are approximately 30 feet away. The soil tests show variable areas of ledge and refusal; this is a concern that the proposed area has not been proven fully suitable. The Board of Health would need further evaluation to show the entire proposed area is suitable for a primary and reserve area throughout. Based on the information provided by the Soil Evaluator, the Board of Health would not approve any proposed septic system without additional testing.

MCG Response: The proposed septic systems were revised on the plans to show more detail on how the systems will be built as trench systems with alternating primary and reserve trenches. Final system designs will be submitted to the health department per 310 CMR 15 prior to construction of the house lots.

We trust that these plan revisions and the supplemental information provided herein addresses the Peer Review comments dated February 24, 2021 and town comments. If you have any questions or comments, please do not hesitate to contact the undersigned at (978) 777-8586.

Sincerely,
THE MORIN-CAMERON GROUP, INC.

Scott P. Cameron, P.E.
Principal

SPC/kmm

cc: Gadsden Lane LLC

**SUPPLEMENTAL STORMWATER MANAGEMENT
CALCULATIONS**

Stormwater Management Calculations

STANDARD 4: Water Quality Volume (WQV):

Water Quality Swale

1" Water Quality (1" x Tributary Impervious Area)

HCAD System ID	Tributary Impervious Area (SF)	Treatment Volume 1"	Minimum Volume (CF)	Provided Volume (CF)
SF*	35,414	1"	2,951	3,300

***Water Quality Swale drains to sediment forebay SF**

Provided Volume Calculation:

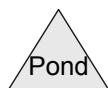
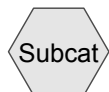
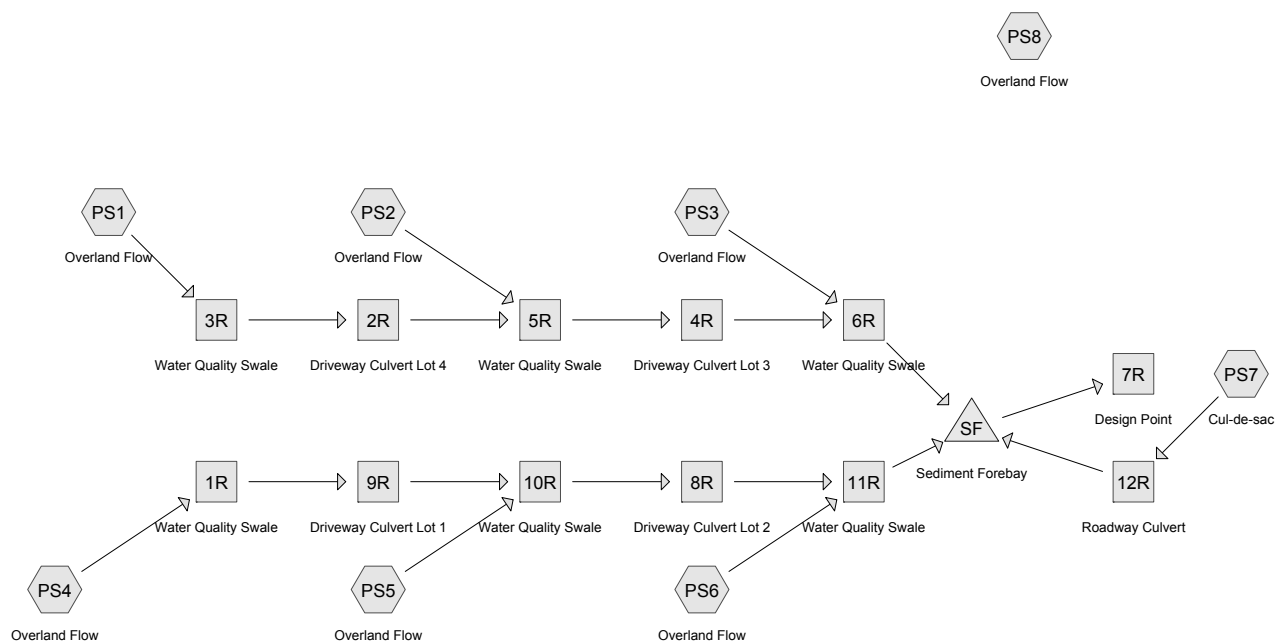
- $300 \pm$ SF between check dams * 22 dams = 6,600 SF
- 6" -- 0.5' check dam height
- Volume = $6,600 * 0.5 = 3,300$ SF > 2,951 OK

Pretreatment Forebays (0.1" x Impervious Area)

HCAD System ID	Tributary Impervious Area	Treatment Volume 0.1"	Minimum Forebay Volume (CF)	Provided Volume (CF)
SF	35,414	0.1	295	319

Verify Drawdown, Maximum 72-Hours: Static Method

HCAD System ID	Recharge Volume (CF)	Bottom Surface Area (SF)	Rawls Rate Inches/Hour	Drawdown Time Rv / (K x A) - Hours	Description
WQS	2,525	6,600	2.41	1.90	Water Quality Swale
SF	319	435	2.41	3.65	Sediment Forebay



Routing Diagram for 3953 Proposed HydroCAD Analysis
 Prepared by Microsoft, Printed 3/25/2021
 HydroCAD® 10.10-3a s/n 00401 © 2020 HydroCAD Software Solutions LLC

3953 Proposed HydroCAD Analysis

Prepared by Microsoft

Printed 3/25/2021

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	NRCC 24-hr	D	Default	24.00	1	2.63	2
2	2-Year	NRCC 24-hr	D	Default	24.00	1	3.15	2
3	5-Year	NRCC 24-hr	D	Default	24.00	1	4.02	2
4	10-Year	NRCC 24-hr	D	Default	24.00	1	4.83	2
5	25-Year	NRCC 24-hr	D	Default	24.00	1	6.16	2
6	50-Year	NRCC 24-hr	D	Default	24.00	1	7.42	2
7	100-Year	NRCC 24-hr	D	Default	24.00	1	8.94	2

3953 Proposed HydroCAD Analysis

NRCC 24-hr D 2-Year Rainfall=3.15"

Prepared by Microsoft

Printed 3/25/2021

HydroCAD® 10.10-3a s/n 00401 © 2020 HydroCAD Software Solutions LLC

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Summary for Subcatchment PS1: Overland Flow

Runoff = 0.35 cfs @ 12.12 hrs, Volume= 1,350 cf, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (ac)	CN	Description
0.664	54	1/2 acre lots, 25% imp, HSG A
0.145	98	Paved parking, HSG A
0.809	62	Weighted Average
0.498		61.56% Pervious Area
0.311		38.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.24		Sheet Flow, Grass
					Grass: Short n= 0.150 P2= 3.15"
0.2	54	0.0556	3.80		Shallow Concentrated Flow, Grass
					Unpaved Kv= 16.1 fps
3.6	104	Total			

Summary for Subcatchment PS2: Overland Flow

Runoff = 0.20 cfs @ 12.12 hrs, Volume= 648 cf, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (ac)	CN	Description
0.189	54	1/2 acre lots, 25% imp, HSG A
0.081	98	Paved parking, HSG A
0.270	67	Weighted Average
0.142		52.50% Pervious Area
0.128		47.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1220	0.30		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.15"
0.5	80	0.0250	2.55		Shallow Concentrated Flow, Grass
					Unpaved Kv= 16.1 fps
3.3	130	Total			

Summary for Subcatchment PS3: Overland Flow

Runoff = 0.11 cfs @ 12.12 hrs, Volume= 374 cf, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

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NRCC 24-hr D 2-Year Rainfall=3.15"

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Area (ac)	CN	Description
0.135	54	1/2 acre lots, 25% imp, HSG A
0.044	98	Paved parking, HSG A
0.179	65	Weighted Average
0.101		56.56% Pervious Area
0.078		43.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.26		Sheet Flow, Lawn Grass: Short n= 0.150 P2= 3.15"
0.1	25	0.1200	5.58		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
3.4	75	Total			

Summary for Subcatchment PS4: Overland Flow

Runoff = 0.13 cfs @ 12.13 hrs, Volume= 674 cf, Depth= 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (ac)	CN	Description
0.457	54	1/2 acre lots, 25% imp, HSG A
0.041	98	Paved parking, HSG A
0.024	80	1/2 acre lots, 25% imp, HSG C
0.522	59	Weighted Average
0.361		69.11% Pervious Area
0.161		30.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.15"
1.1	251	0.0537	3.73		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
4.1	301	Total			

Summary for Subcatchment PS5: Overland Flow

Runoff = 0.15 cfs @ 12.11 hrs, Volume= 466 cf, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

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Area (ac)	CN	Description
0.136	54	1/2 acre lots, 25% imp, HSG A
0.058	98	Paved parking, HSG A
0.194	67	Weighted Average
0.102		52.58% Pervious Area
0.092		47.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	44	0.0800	0.25		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.15"

Summary for Subcatchment PS6: Overland Flow

Runoff = 0.10 cfs @ 12.11 hrs, Volume= 311 cf, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (ac)	CN	Description
0.023	54	1/2 acre lots, 25% imp, HSG A
0.037	98	Paved parking, HSG A
0.060	81	Weighted Average
0.017		28.75% Pervious Area
0.043		71.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0200	0.99		Sheet Flow, Driveway Smooth surfaces n= 0.011 P2= 3.15"
3.2	30	0.0300	0.16		Sheet Flow, Lawn Grass: Short n= 0.150 P2= 3.15"
0.1	25	0.0300	2.79		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
3.6	75	Total			

Summary for Subcatchment PS7: Cul-de-sac

Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (ac)	CN	Description
0.191	39	>75% Grass cover, Good, HSG A
0.191		100.00% Pervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.15"
0.1	40	0.1500	6.24		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
3.8	90	Total			

Summary for Subcatchment PS8: Overland Flow

Runoff = 3.45 cfs @ 12.19 hrs, Volume= 15,050 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (ac)	CN	Description
1.766	54	1/2 acre lots, 25% imp, HSG A
0.365	80	1/2 acre lots, 25% imp, HSG C
2.165	70	Woods, Good, HSG C
0.892	98	Water Surface, HSG C
5.188	70	Weighted Average
3.763		72.54% Pervious Area
1.425		27.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.15"
0.2	40	0.0250	3.21		Shallow Concentrated Flow, Driveway Paved Kv= 20.3 fps
2.1	381	0.0367	3.08		Shallow Concentrated Flow, Overland Unpaved Kv= 16.1 fps
5.6	444	0.0698	1.32		Shallow Concentrated Flow, Woods Woodland Kv= 5.0 fps
10.9	915	Total			

Summary for Reach 1R: Water Quality Swale

Inflow Area = 22,738 sf, 30.89% Impervious, Inflow Depth = 0.36" for 2-Year event
Inflow = 0.13 cfs @ 12.13 hrs, Volume= 674 cf
Outflow = 0.13 cfs @ 12.16 hrs, Volume= 674 cf, Atten= 4%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.18 fps, Min. Travel Time= 1.0 min
Avg. Velocity= 0.51 fps, Avg. Travel Time= 2.3 min

Peak Storage= 8 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.05' , Surface Width= 2.30'
Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 17.60 cfs

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2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 70.0' Slope= 0.0600 '/'
Inlet Invert= 46.00', Outlet Invert= 41.80'



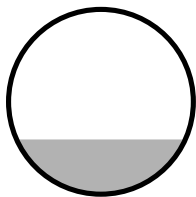
Summary for Reach 2R: Driveway Culvert Lot 4

Inflow Area = 35,240 sf, 38.44% Impervious, Inflow Depth = 0.46" for 2-Year event
Inflow = 0.29 cfs @ 12.20 hrs, Volume= 1,350 cf
Outflow = 0.28 cfs @ 12.21 hrs, Volume= 1,350 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.31 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.52 fps, Avg. Travel Time= 0.3 min

Peak Storage= 2 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 0.61'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.50 cfs

8.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 25.0' Slope= 0.0132 '/'
Inlet Invert= 48.33', Outlet Invert= 48.00'



Summary for Reach 3R: Water Quality Swale

Inflow Area = 35,240 sf, 38.44% Impervious, Inflow Depth = 0.46" for 2-Year event
Inflow = 0.35 cfs @ 12.12 hrs, Volume= 1,350 cf
Outflow = 0.29 cfs @ 12.20 hrs, Volume= 1,350 cf, Atten= 18%, Lag= 5.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.39 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 8.7 min

Peak Storage= 59 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.09' , Surface Width= 2.54'
Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 14.51 cfs

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2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 ' ' Top Width= 6.50'
Length= 286.0' Slope= 0.0408 ' '
Inlet Invert= 60.00', Outlet Invert= 48.33'



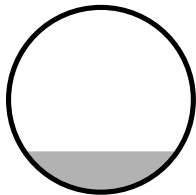
Summary for Reach 4R: Driveway Culvert Lot 3

Inflow Area = 47,001 sf, 40.71% Impervious, Inflow Depth = 0.51" for 2-Year event
Inflow = 0.36 cfs @ 12.24 hrs, Volume= 1,998 cf
Outflow = 0.36 cfs @ 12.25 hrs, Volume= 1,998 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.80 fps, Min. Travel Time= 0.2 min
Avg. Velocity= 1.30 fps, Avg. Travel Time= 0.4 min

Peak Storage= 4 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 0.83'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.38 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 30.0' Slope= 0.0077 ' '
Inlet Invert= 38.33', Outlet Invert= 38.10'



Summary for Reach 5R: Water Quality Swale

Inflow Area = 47,001 sf, 40.71% Impervious, Inflow Depth = 0.51" for 2-Year event
Inflow = 0.37 cfs @ 12.20 hrs, Volume= 1,998 cf
Outflow = 0.36 cfs @ 12.24 hrs, Volume= 1,998 cf, Atten= 3%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.73 fps, Min. Travel Time= 1.5 min
Avg. Velocity= 0.71 fps, Avg. Travel Time= 3.6 min

Peak Storage= 32 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.09' , Surface Width= 2.55'
Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 18.01 cfs

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2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 ' ' Top Width= 6.50'
Length= 154.0' Slope= 0.0628 ' '
Inlet Invert= 48.00', Outlet Invert= 38.33'



Summary for Reach 6R: Water Quality Swale

Inflow Area = 54,798 sf, 41.10% Impervious, Inflow Depth = 0.52" for 2-Year event
Inflow = 0.40 cfs @ 12.24 hrs, Volume= 2,372 cf
Outflow = 0.39 cfs @ 12.27 hrs, Volume= 2,372 cf, Atten= 1%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.64 fps, Min. Travel Time= 0.9 min
Avg. Velocity= 0.68 fps, Avg. Travel Time= 2.1 min

Peak Storage= 21 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 2.63'
Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 15.69 cfs

2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 ' ' Top Width= 6.50'
Length= 86.0' Slope= 0.0477 ' '
Inlet Invert= 38.10', Outlet Invert= 34.00'



Summary for Reach 7R: Design Point

Inflow Area = 96,921 sf, 36.54% Impervious, Inflow Depth = 0.35" for 2-Year event
Inflow = 0.59 cfs @ 12.26 hrs, Volume= 2,821 cf
Outflow = 0.59 cfs @ 12.26 hrs, Volume= 2,821 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

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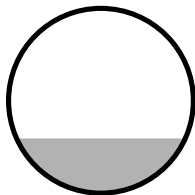
Summary for Reach 8R: Driveway Culvert Lot 2

Inflow Area = 31,189 sf, 35.37% Impervious, Inflow Depth = 0.44" for 2-Year event
Inflow = 0.21 cfs @ 12.18 hrs, Volume= 1,140 cf
Outflow = 0.21 cfs @ 12.18 hrs, Volume= 1,140 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.48 fps, Min. Travel Time= 0.2 min
Avg. Velocity= 1.20 fps, Avg. Travel Time= 0.3 min

Peak Storage= 2 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 0.61'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.13 cfs

8.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 23.0' Slope= 0.0074 '/
Inlet Invert= 37.25', Outlet Invert= 37.08'



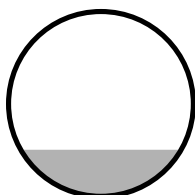
Summary for Reach 9R: Driveway Culvert Lot 1

Inflow Area = 22,738 sf, 30.89% Impervious, Inflow Depth = 0.36" for 2-Year event
Inflow = 0.13 cfs @ 12.16 hrs, Volume= 674 cf
Outflow = 0.13 cfs @ 12.16 hrs, Volume= 674 cf, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.86 fps, Min. Travel Time= 0.2 min
Avg. Velocity= 0.94 fps, Avg. Travel Time= 0.4 min

Peak Storage= 1 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.17' , Surface Width= 0.58'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.93 cfs

8.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 20.0' Slope= 0.0050 '/
Inlet Invert= 41.80', Outlet Invert= 41.70'



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Summary for Reach 10R: Water Quality Swale

Inflow Area = 31,189 sf, 35.37% Impervious, Inflow Depth = 0.44" for 2-Year event
Inflow = 0.23 cfs @ 12.12 hrs, Volume= 1,140 cf
Outflow = 0.21 cfs @ 12.18 hrs, Volume= 1,140 cf, Atten= 7%, Lag= 3.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.18 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 4.5 min

Peak Storage= 24 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.08' , Surface Width= 2.49'
Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 13.14 cfs

2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 133.0' Slope= 0.0335 '/'
Inlet Invert= 41.70', Outlet Invert= 37.25'



Summary for Reach 11R: Water Quality Swale

Inflow Area = 33,803 sf, 38.14% Impervious, Inflow Depth = 0.52" for 2-Year event
Inflow = 0.26 cfs @ 12.17 hrs, Volume= 1,451 cf
Outflow = 0.26 cfs @ 12.20 hrs, Volume= 1,451 cf, Atten= 1%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.26 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 3.2 min

Peak Storage= 19 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.09' , Surface Width= 2.54'
Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 13.15 cfs

2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 92.0' Slope= 0.0335 '/'
Inlet Invert= 37.08', Outlet Invert= 34.00'



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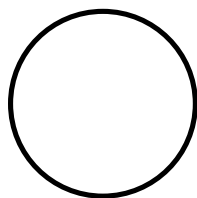
Summary for Reach 12R: Roadway Culvert

Inflow Area = 8,320 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0 cf, Atten= 5%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 24.03 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 0.03'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.79 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 65.0' Slope= 0.0154 '/
Inlet Invert= 36.00', Outlet Invert= 35.00'



Summary for Pond SF: Sediment Forebay

Inflow Area = 96,921 sf, 36.54% Impervious, Inflow Depth = 0.47" for 2-Year event
Inflow = 0.62 cfs @ 12.25 hrs, Volume= 3,823 cf
Outflow = 0.61 cfs @ 12.26 hrs, Volume= 3,823 cf, Atten= 1%, Lag= 1.0 min
Discarded = 0.02 cfs @ 12.26 hrs, Volume= 1,002 cf
Primary = 0.59 cfs @ 12.26 hrs, Volume= 2,821 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 33.69' @ 12.26 hrs Surf.Area= 365 sf Storage= 197 cf

Plug-Flow detention time= 30.8 min calculated for 3,822 cf (100% of inflow)
Center-of-Mass det. time= 30.8 min (982.4 - 951.7)

Volume	Invert	Avail.Storage	Storage Description
#1	33.00'	322 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
33.00	207	0	0
34.00	436	322	322

Device	Routing	Invert	Outlet Devices
#1	Primary	33.50'	3.0' long x 8.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00

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			2.50	3.00	3.50	4.00	4.50	5.00	5.50				
			Coef. (English)	2.43	2.54	2.70	2.69	2.68	2.68	2.66	2.64	2.64	
				2.64	2.65	2.65	2.66	2.66	2.68	2.70	2.74		
#2	Discarded	33.00'	2.410 in/hr Exfiltration over Surface area										

Discarded OutFlow Max=0.02 cfs @ 12.26 hrs HW=33.69' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.59 cfs @ 12.26 hrs HW=33.69' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.59 cfs @ 1.05 fps)

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NRCC 24-hr D 10-Year Rainfall=4.83"

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Summary for Subcatchment PS1: Overland Flow

Runoff = 1.27 cfs @ 12.12 hrs, Volume= 3,919 cf, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (ac)	CN	Description
0.664	54	1/2 acre lots, 25% imp, HSG A
0.145	98	Paved parking, HSG A
0.809	62	Weighted Average
0.498		61.56% Pervious Area
0.311		38.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.24		Sheet Flow, Grass
					Grass: Short n= 0.150 P2= 3.15"
0.2	54	0.0556	3.80		Shallow Concentrated Flow, Grass
					Unpaved Kv= 16.1 fps
3.6	104	Total			

Summary for Subcatchment PS2: Overland Flow

Runoff = 0.56 cfs @ 12.11 hrs, Volume= 1,652 cf, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (ac)	CN	Description
0.189	54	1/2 acre lots, 25% imp, HSG A
0.081	98	Paved parking, HSG A
0.270	67	Weighted Average
0.142		52.50% Pervious Area
0.128		47.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1220	0.30		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.15"
0.5	80	0.0250	2.55		Shallow Concentrated Flow, Grass
					Unpaved Kv= 16.1 fps
3.3	130	Total			

Summary for Subcatchment PS3: Overland Flow

Runoff = 0.33 cfs @ 12.11 hrs, Volume= 1,002 cf, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

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Area (ac)	CN	Description
0.135	54	1/2 acre lots, 25% imp, HSG A
0.044	98	Paved parking, HSG A
0.179	65	Weighted Average
0.101		56.56% Pervious Area
0.078		43.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.26		Sheet Flow, Lawn Grass: Short n= 0.150 P2= 3.15"
0.1	25	0.1200	5.58		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
3.4	75	Total			

Summary for Subcatchment PS4: Overland Flow

Runoff = 0.66 cfs @ 12.12 hrs, Volume= 2,158 cf, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (ac)	CN	Description
0.457	54	1/2 acre lots, 25% imp, HSG A
0.041	98	Paved parking, HSG A
0.024	80	1/2 acre lots, 25% imp, HSG C
0.522	59	Weighted Average
0.361		69.11% Pervious Area
0.161		30.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.15"
1.1	251	0.0537	3.73		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
4.1	301	Total			

Summary for Subcatchment PS5: Overland Flow

Runoff = 0.41 cfs @ 12.11 hrs, Volume= 1,187 cf, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
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Area (ac)	CN	Description
0.136	54	1/2 acre lots, 25% imp, HSG A
0.058	98	Paved parking, HSG A
0.194	67	Weighted Average
0.102		52.58% Pervious Area
0.092		47.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	44	0.0800	0.25		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.15"

Summary for Subcatchment PS6: Overland Flow

Runoff = 0.21 cfs @ 12.11 hrs, Volume= 618 cf, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (ac)	CN	Description
0.023	54	1/2 acre lots, 25% imp, HSG A
0.037	98	Paved parking, HSG A
0.060	81	Weighted Average
0.017		28.75% Pervious Area
0.043		71.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0200	0.99		Sheet Flow, Driveway Smooth surfaces n= 0.011 P2= 3.15"
3.2	30	0.0300	0.16		Sheet Flow, Lawn Grass: Short n= 0.150 P2= 3.15"
0.1	25	0.0300	2.79		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
3.6	75	Total			

Summary for Subcatchment PS7: Cul-de-sac

Runoff = 0.00 cfs @ 14.23 hrs, Volume= 116 cf, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (ac)	CN	Description
0.191	39	>75% Grass cover, Good, HSG A
0.191		100.00% Pervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.15"
0.1	40	0.1500	6.24		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
3.8	90	Total			

Summary for Subcatchment PS8: Overland Flow

Runoff = 8.98 cfs @ 12.19 hrs, Volume= 35,992 cf, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (ac)	CN	Description
1.766	54	1/2 acre lots, 25% imp, HSG A
0.365	80	1/2 acre lots, 25% imp, HSG C
2.165	70	Woods, Good, HSG C
0.892	98	Water Surface, HSG C
5.188	70	Weighted Average
3.763		72.54% Pervious Area
1.425		27.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.15"
0.2	40	0.0250	3.21		Shallow Concentrated Flow, Driveway Paved Kv= 20.3 fps
2.1	381	0.0367	3.08		Shallow Concentrated Flow, Overland Unpaved Kv= 16.1 fps
5.6	444	0.0698	1.32		Shallow Concentrated Flow, Woods Woodland Kv= 5.0 fps
10.9	915	Total			

Summary for Reach 1R: Water Quality Swale

Inflow Area = 22,738 sf, 30.89% Impervious, Inflow Depth = 1.14" for 10-Year event
 Inflow = 0.66 cfs @ 12.12 hrs, Volume= 2,158 cf
 Outflow = 0.66 cfs @ 12.14 hrs, Volume= 2,158 cf, Atten= 1%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Max. Velocity= 2.10 fps, Min. Travel Time= 0.6 min
 Avg. Velocity = 0.73 fps, Avg. Travel Time= 1.6 min

Peak Storage= 22 cf @ 12.13 hrs
 Average Depth at Peak Storage= 0.13' , Surface Width= 2.79'
 Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 17.60 cfs

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2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 70.0' Slope= 0.0600 '/'
Inlet Invert= 46.00', Outlet Invert= 41.80'



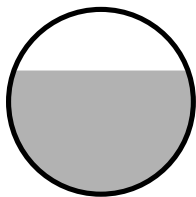
Summary for Reach 2R: Driveway Culvert Lot 4

Inflow Area = 35,240 sf, 38.44% Impervious, Inflow Depth = 1.33" for 10-Year event
Inflow = 1.18 cfs @ 12.17 hrs, Volume= 3,919 cf
Outflow = 1.18 cfs @ 12.17 hrs, Volume= 3,919 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.77 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.94 fps, Avg. Travel Time= 0.2 min

Peak Storage= 6 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.45' , Surface Width= 0.63'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.50 cfs

8.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 25.0' Slope= 0.0132 '/'
Inlet Invert= 48.33', Outlet Invert= 48.00'



Summary for Reach 3R: Water Quality Swale

Inflow Area = 35,240 sf, 38.44% Impervious, Inflow Depth = 1.33" for 10-Year event
Inflow = 1.27 cfs @ 12.12 hrs, Volume= 3,919 cf
Outflow = 1.18 cfs @ 12.17 hrs, Volume= 3,919 cf, Atten= 7%, Lag= 3.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.23 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 6.4 min

Peak Storage= 152 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 3.22'
Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 14.51 cfs

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2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 ' ' Top Width= 6.50'
Length= 286.0' Slope= 0.0408 ' '
Inlet Invert= 60.00', Outlet Invert= 48.33'



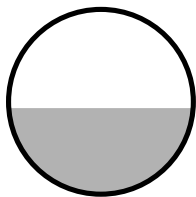
Summary for Reach 4R: Driveway Culvert Lot 3

Inflow Area = 47,001 sf, 40.71% Impervious, Inflow Depth = 1.42" for 10-Year event
Inflow = 1.49 cfs @ 12.17 hrs, Volume= 5,571 cf
Outflow = 1.49 cfs @ 12.17 hrs, Volume= 5,571 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.17 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.62 fps, Avg. Travel Time= 0.3 min

Peak Storage= 11 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.46' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.38 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 30.0' Slope= 0.0077 ' '
Inlet Invert= 38.33', Outlet Invert= 38.10'



Summary for Reach 5R: Water Quality Swale

Inflow Area = 47,001 sf, 40.71% Impervious, Inflow Depth = 1.42" for 10-Year event
Inflow = 1.51 cfs @ 12.13 hrs, Volume= 5,571 cf
Outflow = 1.49 cfs @ 12.17 hrs, Volume= 5,571 cf, Atten= 1%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.78 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.93 fps, Avg. Travel Time= 2.8 min

Peak Storage= 83 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 3.23'
Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 18.01 cfs

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2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 154.0' Slope= 0.0628 '/'
Inlet Invert= 48.00', Outlet Invert= 38.33'



Summary for Reach 6R: Water Quality Swale

Inflow Area = 54,798 sf, 41.10% Impervious, Inflow Depth = 1.44" for 10-Year event
Inflow = 1.67 cfs @ 12.15 hrs, Volume= 6,573 cf
Outflow = 1.67 cfs @ 12.17 hrs, Volume= 6,573 cf, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.61 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 1.6 min

Peak Storage= 55 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 3.41'
Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 15.69 cfs

2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 86.0' Slope= 0.0477 '/'
Inlet Invert= 38.10', Outlet Invert= 34.00'



Summary for Reach 7R: Design Point

Inflow Area = 96,921 sf, 36.54% Impervious, Inflow Depth = 1.18" for 10-Year event
Inflow = 2.72 cfs @ 12.18 hrs, Volume= 9,537 cf
Outflow = 2.72 cfs @ 12.18 hrs, Volume= 9,537 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

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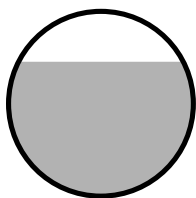
Summary for Reach 8R: Driveway Culvert Lot 2

Inflow Area = 31,189 sf, 35.37% Impervious, Inflow Depth = 1.29" for 10-Year event
Inflow = 0.99 cfs @ 12.15 hrs, Volume= 3,346 cf
Outflow = 0.99 cfs @ 12.15 hrs, Volume= 3,346 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.64 fps, Min. Travel Time= 0.1 min
Avg. Velocity= 1.50 fps, Avg. Travel Time= 0.3 min

Peak Storage= 6 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 0.59'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.13 cfs

8.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 23.0' Slope= 0.0074 '
Inlet Invert= 37.25', Outlet Invert= 37.08'



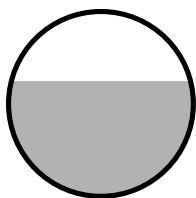
Summary for Reach 9R: Driveway Culvert Lot 1

Inflow Area = 22,738 sf, 30.89% Impervious, Inflow Depth = 1.14" for 10-Year event
Inflow = 0.66 cfs @ 12.14 hrs, Volume= 2,158 cf
Outflow = 0.66 cfs @ 12.14 hrs, Volume= 2,158 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.88 fps, Min. Travel Time= 0.1 min
Avg. Velocity= 1.25 fps, Avg. Travel Time= 0.3 min

Peak Storage= 5 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.42' , Surface Width= 0.65'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.93 cfs

8.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 20.0' Slope= 0.0050 '
Inlet Invert= 41.80', Outlet Invert= 41.70'



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Summary for Reach 10R: Water Quality Swale

Inflow Area = 31,189 sf, 35.37% Impervious, Inflow Depth = 1.29" for 10-Year event
Inflow = 1.02 cfs @ 12.12 hrs, Volume= 3,346 cf
Outflow = 0.99 cfs @ 12.15 hrs, Volume= 3,346 cf, Atten= 3%, Lag= 1.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.97 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 3.4 min

Peak Storage= 67 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 3.17'
Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 13.14 cfs

2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 133.0' Slope= 0.0335 '/'
Inlet Invert= 41.70', Outlet Invert= 37.25'



Summary for Reach 11R: Water Quality Swale

Inflow Area = 33,803 sf, 38.14% Impervious, Inflow Depth = 1.41" for 10-Year event
Inflow = 1.13 cfs @ 12.14 hrs, Volume= 3,963 cf
Outflow = 1.12 cfs @ 12.17 hrs, Volume= 3,963 cf, Atten= 1%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.05 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 2.5 min

Peak Storage= 50 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 3.25'
Bank-Full Depth= 0.75' Flow Area= 3.2 sf, Capacity= 13.15 cfs

2.00' x 0.75' deep channel, n= 0.040 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 92.0' Slope= 0.0335 '/'
Inlet Invert= 37.08', Outlet Invert= 34.00'



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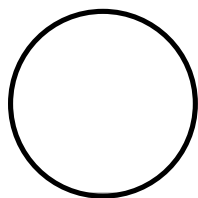
Summary for Reach 12R: Roadway Culvert

Inflow Area = 8,320 sf, 0.00% Impervious, Inflow Depth = 0.17" for 10-Year event
Inflow = 0.00 cfs @ 14.23 hrs, Volume= 116 cf
Outflow = 0.00 cfs @ 14.26 hrs, Volume= 116 cf, Atten= 0%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.87 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 1.3 min

Peak Storage= 0 cf @ 14.24 hrs
Average Depth at Peak Storage= 0.02' , Surface Width= 0.28'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.79 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 65.0' Slope= 0.0154 '/
Inlet Invert= 36.00', Outlet Invert= 35.00'



Summary for Pond SF: Sediment Forebay

Inflow Area = 96,921 sf, 36.54% Impervious, Inflow Depth = 1.32" for 10-Year event
Inflow = 2.79 cfs @ 12.17 hrs, Volume= 10,652 cf
Outflow = 2.75 cfs @ 12.18 hrs, Volume= 10,652 cf, Atten= 1%, Lag= 0.8 min
Discarded = 0.02 cfs @ 12.18 hrs, Volume= 1,115 cf
Primary = 2.72 cfs @ 12.18 hrs, Volume= 9,537 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 33.99' @ 12.18 hrs Surf.Area= 435 sf Storage= 319 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 12.8 min (920.5 - 907.6)

Volume	Invert	Avail.Storage	Storage Description
#1	33.00'	322 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
33.00	207	0	0
34.00	436	322	322
Device	Routing	Invert	Outlet Devices
#1	Primary	33.50'	3.0' long x 8.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00

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			2.50	3.00	3.50	4.00	4.50	5.00	5.50				
			Coef. (English)	2.43	2.54	2.70	2.69	2.68	2.68	2.66	2.64	2.64	
			2.64	2.65	2.65	2.66	2.66	2.68	2.70	2.74			
#2	Discarded	33.00'	2.410 in/hr Exfiltration over Surface area										

Discarded OutFlow Max=0.02 cfs @ 12.18 hrs HW=33.99' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.72 cfs @ 12.18 hrs HW=33.99' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 2.72 cfs @ 1.84 fps)

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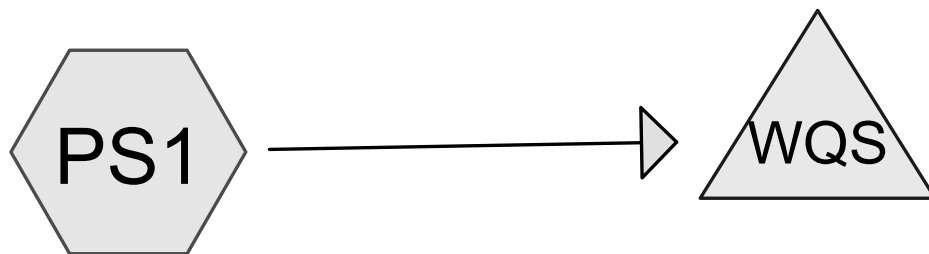
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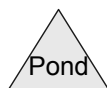
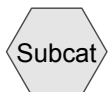
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- 23 Reach 11R: Water Quality Swale
- 23 Reach 12R: Roadway Culvert
- 24 Pond SF: Sediment Forebay



Overland Flow To Swale

Swale Storage For
Check Dams



3953 Water Quality Sizing Sizing

Prepared by Microsoft

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	NRCC 24-hr	D	Default	24.00	1	2.63	2
2	2-Year	NRCC 24-hr	D	Default	24.00	1	3.15	2
3	5-Year	NRCC 24-hr	D	Default	24.00	1	4.02	2
4	10-Year	NRCC 24-hr	D	Default	24.00	1	4.83	2
5	25-Year	NRCC 24-hr	D	Default	24.00	1	6.16	2
6	50-Year	NRCC 24-hr	D	Default	24.00	1	7.42	2
7	100-Year	NRCC 24-hr	D	Default	24.00	1	8.94	2

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NRCC 24-hr D 2-Year Rainfall=3.15"

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Summary for Subcatchment PS1: Overland Flow To Swale

Runoff = 0.70 cfs @ 12.15 hrs, Volume= 3,421 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (ac)	CN	Description
* 0.406	98	Impervious, Roadway and Driveways
* 0.191	39	>75% Grass Cover, Good, HSG A
1.603	54	1/2 acre lots, 25% imp, HSG A
0.024	80	1/2 acre lots, 25% imp, HSG C
2.224	61	Weighted Average
1.411		63.46% Pervious Area
0.813		36.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct Entry

Summary for Pond WQS: Swale Storage For Check Dams

Inflow Area = 96,877 sf, 36.54% Impervious, Inflow Depth = 0.42" for 2-Year event
 Inflow = 0.70 cfs @ 12.15 hrs, Volume= 3,421 cf
 Outflow = 0.37 cfs @ 12.12 hrs, Volume= 3,421 cf, Atten= 48%, Lag= 0.0 min
 Discarded = 0.37 cfs @ 12.12 hrs, Volume= 3,421 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 100.03' @ 12.28 hrs Surf.Area= 6,600 sf Storage= 167 cf

Plug-Flow detention time= 3.5 min calculated for 3,420 cf (100% of inflow)
 Center-of-Mass det. time= 3.5 min (965.1 - 961.7)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	8,525 cf	Storage (Prismatic) Listed below (Recalc) x 22

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	300	0	0
100.75	300	225	225
101.00	1,000	163	388

Device	Routing	Invert	Outlet Devices
#1	Primary	100.50'	0.5' long x 9.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69
#2	Discarded	100.00'	2.410 in/hr Exfiltration over Surface area

3953 Water Quailty Sizing Sizing

NRCC 24-hr D 2-Year Rainfall=3.15"

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Discarded OutFlow Max=0.37 cfs @ 12.12 hrs HW=100.01' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.37 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=100.00' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

3953 Water Quality Sizing Sizing

NRCC 24-hr D 10-Year Rainfall=4.83"

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Summary for Subcatchment PS1: Overland Flow To Swale

Runoff = 2.94 cfs @ 12.14 hrs, Volume= 10,238 cf, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (ac)	CN	Description
* 0.406	98	Impervious, Roadway and Driveways
* 0.191	39	>75% Grass Cover, Good, HSG A
1.603	54	1/2 acre lots, 25% imp, HSG A
0.024	80	1/2 acre lots, 25% imp, HSG C
2.224	61	Weighted Average
1.411		63.46% Pervious Area
0.813		36.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct Entry

Summary for Pond WQS: Swale Storage For Check Dams

Inflow Area = 96,877 sf, 36.54% Impervious, Inflow Depth = 1.27" for 10-Year event
 Inflow = 2.94 cfs @ 12.14 hrs, Volume= 10,238 cf
 Outflow = 0.37 cfs @ 11.88 hrs, Volume= 10,238 cf, Atten= 87%, Lag= 0.0 min
 Discarded = 0.37 cfs @ 11.88 hrs, Volume= 10,238 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 100.38' @ 13.19 hrs Surf.Area= 6,600 sf Storage= 2,525 cf

Plug-Flow detention time= 51.9 min calculated for 10,235 cf (100% of inflow)
 Center-of-Mass det. time= 51.9 min (962.7 - 910.8)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	8,525 cf	Storage (Prismatic) Listed below (Recalc) x 22

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	300	0	0
100.75	300	225	225
101.00	1,000	163	388

Device	Routing	Invert	Outlet Devices
#1	Primary	100.50'	0.5' long x 9.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69
#2	Discarded	100.00'	2.410 in/hr Exfiltration over Surface area

3953 Water Quailty Sizing Sizing

NRCC 24-hr D 10-Year Rainfall=4.83"

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Discarded OutFlow Max=0.37 cfs @ 11.88 hrs HW=100.01' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.37 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=100.00' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

3953 Water Quailty Sizing Sizing

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**CONSTRUCTION PHASE BEST
MANAGEMENT PRACTICES O&M PLAN**

Construction Phase Best Management Practices
Operation and Maintenance Plan

for

217 & 221 High Road
Newbury, Massachusetts

March 25, 2021

The following operation and maintenance plan has been prepared as a guidance document for the efficient implementation, operation and maintenance of the on-site stormwater management systems. The following procedures shall be implemented to ensure success of the Stormwater Management Plan:

1. The contractor shall comply with the details of construction of the site as shown on the approved plans.
2. The stormwater management system shall be maintained as indicated below.
3. Effective erosion control measures during and after construction shall be maintained until a stable turf is established on all altered areas.

Basic Information

Stormwater Management System Owner:	Gadsden Lane, LLC 6 Payson Street Newburyport, MA 01950 P: (978) 314-9865
Newbury Conservation Commission:	12 Kent Way, Suite 101 Byfield, MA 01922 P: (978) 465-0860 ext. 310
Newbury Department of Public Works:	197 High Road Newbury, MA 01951 P: (978) 465-0112
Newbury Planning Board:	12 Kent Way, Suite 101 Byfield, MA 01922 P: (978) 465-0860 ext. 312

General Conditions

1. The developer shall be responsible for scheduling regular inspections and maintenance of the stormwater BMP's until the project has been completed. The BMP maintenance shall be conducted as detailed in the following long-term pollution prevention plan and illustrated on the approved design plans:
"Definitive Subdivision in Newbury Massachusetts at 217 & 221 High Road" prepared by The Morin-Cameron Group, Inc. dated January 7, 2021 and revised through March 25, 2021.
2. All Stormwater BMP's shall be operated and maintained in accordance with the design plans and the following Long-Term Pollution Prevention Plan.
3. The owner shall:
 - a. Maintain an Operation and Maintenance Log (see Attachment A) for the last three years. The Log shall include all BMP inspections, repairs, replacement activities and disposal activities (disposal material and disposal location shall be included in the Log);
 - b. Make the log available to the Newbury Conservation Commission and Newbury Department of Public Works upon request.
 - c. Allow members and agents of the Newbury Conservation Commission and Newbury Department of Public Works to enter the premises and ensure that the Owner has complied with the Operation and Maintenance Plan requirements for each BMP.
4. A recommended inspection and maintenance schedule is outlined below based on statewide averages. This inspection and maintenance schedule shall be adhered to at a minimum for the first year of service of all BMP's referenced in this document. At the commencement of the first year of service, a more accurate inspection/maintenance schedule shall be determined based on the level of service for this site.

Construction Phase Pollution Prevention Plan

Erosion and Sedimentation Controls during Construction:

The site and drainage construction contractor shall be responsible for maintaining the stormwater system during construction. Routine maintenance of all items shall be performed to ensure adequate runoff and pollution control during construction.

The proposed sediment and erosion controls will be placed as shown on the Erosion Control & Site preparation Plan prior to the commencement of any clearing, grubbing, and earth removal or construction activity. The integrity of the erosion control barrier will be maintained by periodic inspection and replacement as necessary. The erosion control barrier will remain in place until the first course of pavement has been placed and all side slopes have been loamed and seeded and vegetation has been established. Silt sacks will be placed in the existing catch basins.

Operations and maintenance plans for the Stormwater Management construction phase and long term operation of the system have been attached to this report.

Structural Practices:

- 1) **Mulch Sock** – A mulch sock sediment barrier will be constructed around the limit of work as indicated on the Erosion Control & Site Preparation Plan to prevent the spreading of fine sediments from the site. This control will be installed prior to major soil disturbance on the site.

Mulch Sock Requirements *

- a) Locate the mulch sock upland where identified on the plans.
- b) The mulch sock should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the mulch sock should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.
- c) Stake the mulch sock in accordance with the construction details.
- d) The mulch sock should be removed when it has served its useful purpose, but not before the upslope area has been permanently stabilized through one growing season and only following approval by the Conservation Commission or their representative. Retained sediment must be removed and properly disposed of, or mulched and seeded.

Silt Fence Inspection/Maintenance *

- a) The mulch sock should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, tears, if the mulch sock is securely attached to the stakes, and to see that the stakes are firmly in the ground. Repair or replace as necessary.
- b) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the mulch sock. Sediment will be removed from behind the mulch sock when it becomes about 4" deep at the mulch sock. Take care to avoid undermining the silt fence during cleanout.
- c) If the mulch sock tears, decomposes, or in any way becomes ineffective, replace it immediately.
- d) Remove all mulch sock materials after the contributing drainage area has been properly stabilized. Any fabric or stakes should be removed. Sediment deposits

remaining after the mulch sock has been removed should be graded to conform to the existing topography and vegetation.

- 2) **Inlet Protection** – Inlet Protection will be utilized around the existing catch basins and area drains that are installed. The inlet protection will allow the storm drain inlets to be used before final stabilization. This structural practice will allow early use of the drainage system. Siltsack or equivalent will be utilized for the inlet protection. Siltsack is manufactured by ACF Environmental. The telephone number is 800-448-3636. Regular flow siltsack will be utilized, and if it does not allow enough storm water flow, hi-flow siltsack will be utilized.

Silt Sack (or equivalent) Inlet Protection Inspection/Maintenance Requirements *

- a) The silt sack trapping device and the catch basins should be inspected after every rain storm and repairs made as necessary.
- b) Sediment should be removed from the silt sack after the sediment has reached a maximum depth of one-half the depth of the trap.
- c) Sediment should be disposed of in a suitable area and protected from erosion by either structural or vegetative means. Sediment material removed shall be disposed of in accordance with all applicable local, state, and federal regulations.
- d) The silt sack must be replaced if it is ripped or torn in any way.
- e) Temporary traps should be removed and the area repaired as soon as the contributing drainage area to the inlet has been completely stabilized.

Stabilization Practices:

Stabilization measures shall be implemented as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, with the following exceptions.

- Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently cease is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.
- Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g. the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased.

- 1) **Temporary Seeding** – Temporary seeding will allow a short-term vegetative cover on disturbed site areas that may be in danger of erosion. Temporary seeding will be done at stock piles and disturbed portions of the site where construction activity will temporarily cease for at least 21 days. The temporary seedings will stabilize cleared and unvegetated areas that will not be brought into final grade for several weeks or months.

Temporary Seeding Planting Procedures *

- a) Planting should preferably be done between April 1st and June 30th, and September 1st through September 31st. If planting is done in the months of July and August, irrigation may be required. If planting is done between October 1st and March 31st, mulching

should be applied immediately after planting. If seeding is done during the summer months, irrigation of some sort will probably be necessary.

- b) Before seeding, install structural practice controls. Utilize Amoco supergro or equivalent.
- c) Select the appropriate seed species for temporary cover from the following table.

Species	Seeding Rate (lbs/1,000 sq.ft.)	Seeding Rate (lbs/acre)	Recommended Seeding Dates	Seed Cover required
Annual Ryegrass	1	40	April 1 st to June 1 st August 15 th to Sept. 15 th	¼ inch
Foxtail Millet	0.7	30	May 1 st to June 30 th	½ to ¾ inch
Oats	2	80	April 1 st to July 1 st August 15 th to Sept. 15 th	1 to 1-½ inch
Winter Rye	3	120	August 15 th to Oct. 15 th	1 to 1-½ inch

Apply the seed uniformly by hydroseeding, broadcasting, or by hand.

- d) Use effective mulch, such as clean grain straw; tacked and/or tied with netting to protect seedbed and encourage plant growth.

Temporary Seeding Inspection/Maintenance *

- a) Inspect within 6 weeks of planting to see if stands are adequate. Check for damage within 24 hours of the end to a heavy rainfall, defined as a 2-year storm event (i.e., 3.2 inches of rainfall within a twenty-four hour period). Stands should be uniform and dense. Reseed and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.
 - b) Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather. Water application rates should be controlled to prevent runoff.
- 2) **Geotextiles** - Geotextiles such as jute netting will be used in combination with other practices such as mulching to stabilize slopes. The following geotextile materials or equivalent are to be utilized for structural and nonstructural controls as shown in the following table.

Practice	Manufacturer	Product	Remarks
Sediment Fence	Amoco	Woven polypropylene 1198 or equivalent	0.425 mm opening

Construction Entrance	Amoco	Woven polypropylene 2002 or equivalent	0.300 mm opening
Outlet Protection	Amoco	Nonwoven polypropylene 4551 or equivalent	0.150 mm opening
Erosion Control (slope stability)	Amoco	Supergro or equivalent	Erosion control revegetation mix, open polypropylene fiber on degradable polypropylene net scrim

Amoco may be reached at (800) 445-7732

Geotextile Installation

- a) Netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

Geotextile Inspection/Maintenance *

- a) In the field, regular inspections should be made to check for cracks, tears, or breaches in the fabric. The appropriate repairs should be made.

- 3) **Mulching and Netting** – Mulching will provide immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. In areas, which have been seeded either for temporary or permanent cover, mulching should immediately follow seeding. On steep slopes, mulch must be supplemented with netting. The preferred mulching material is straw.

Mulch (Hay or Straw) Materials and Installation

- a) Straw has been found to be one of the most effective organic mulch materials. The specifications for straw are described below, but other material may be appropriate. The straw should be air-dried; free of undesirable seeds & coarse materials. The application rate per 1,000 sq.ft. is 90-100 lbs. (2-3 bales) and the application rate per acre is 2 tons (100-120 bales). The application should cover about 90% of the surface. The use of straw mulch is appropriate where mulch is maintained for more than three months. Straw mulch is subject to wind blowing unless anchored, is the most commonly used mulching material, and has the best microenvironment for germinating seeds.

Mulch Maintenance *

- a) Inspect after rainstorms to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, repair surface, reseed, remulch, and install new netting.
- b) Straw or grass mulches that blow or wash away should be repaired promptly.
- c) If plastic netting is used to anchor mulch, care should be taken during initial mowings to keep the mower height high. Otherwise, the netting can wrap up on the mower blade shafts. After a period of time, the netting degrades and becomes less of a problem.
- d) Continue inspections until vegetation is well established.

- 4) **Land Grading** – Grading on fill slopes, cut slopes, and stockpile areas will be done with full siltation controls in place.

Land Grading Design/Installation Requirements

- a) Areas to be graded should be cleared and grubbed of all timber, logs, brush, rubbish, and vegetated matter that will interfere with the grading operation. Topsoil should be stripped and stockpiled for use on critical disturbed areas for establishment of vegetation. Cut slopes to be topsoiled should be thoroughly scarified to a minimum depth of 3-inches prior to placement of topsoil.
- b) Fill materials should be generally free of brush, rubbish, rocks, and stumps. Frozen materials or soft and easily compressible materials should not be used in fills intended to support buildings, parking lots, roads, conduits, or other structures.
- c) Earth fill intended to support structural measures should be compacted to a minimum of 90 percent of Standard Proctor Test density with proper moisture control, or as otherwise specified by the engineer responsible for the design. Compaction of other fills should be to the density required to control sloughing, erosion or excessive moisture content. Maximum thickness of fill layers prior to compaction should not exceed 9 inches.
- d) The uppermost one foot of fill slopes should be compacted to at least 85 percent of the maximum unit weight (based on the modified AASHTO compaction test). This is usually accomplished by running heavy equipment over the fill.
- e) Fill should consist of material from borrow areas and excess cut will be stockpiled in areas shown on the Site Plans. All disturbed areas should be free draining, left with a neat and finished appearance, and should be protected from erosion.

Land Grading Stabilization Inspection/Maintenance *

- a) All slopes should be checked periodically to see that vegetation is in good condition. Any rills or damage from erosion and animal burrowing should be repaired immediately to avoid further damage.
- b) If seeps develop on the slopes, the area should be evaluated to determine if the seep will cause an unstable condition. Subsurface drains or a gravel mulch may be required to solve seep problems. However, no seeps are anticipated.
- c) Areas requiring revegetation should be repaired immediately. Control undesirable vegetation such as weeds and woody growth to avoid bank stability problems in the future.

- 5) **Topsoiling *** – Topsoiling will help establish vegetation on all disturbed areas throughout the site during the seeding process. The soil texture of the topsoil to be used will be a sandy loam to a silt loam texture with 15% to 20% organic content.

Topsoiling Placement

- a) Topsoil should not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed seeding.
- b) Do not place topsoil on slopes steeper than 2.5:1, as it will tend to erode.
- c) If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method is to actually work the topsoil into the layer below for a depth of at least 6 inches.

- 6) **Permanent Seeding** – Permanent Seeding should be done immediately after the final design grades are achieved. Native species of plants should be used to establish perennial vegetative cover on disturbed areas. The revegetation should be done early enough in the fall so that a good cover is established before cold weather comes and growth stops until the spring. A good cover is defined as vegetation covering 75 percent or more of the ground surface.

Permanent Seeding Seedbed Preparation

- a) In infertile or coarse-textured subsoil, it is best to stockpile topsoil and re-spread it over the finished slope at a minimum 2 to 6-inch depth and roll it to provide a firm seedbed. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.
- b) Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.
- c) Areas not to receive topsoil shall be treated to firm the seedbed after incorporation of the lime and fertilizer so that it is depressed no more than $\frac{1}{2}$ - 1 inch when stepped on with a shoe. Areas to receive topsoil shall not be firmed until after topsoiling and lime and fertilizer is applied and incorporated, at which time it shall be treated to firm the seedbed as described above.

Permanent Seeding Grass Selection/Application

- a) Select an appropriate cool or warm season grass based on site conditions and seeding date. Apply the seed uniformly by hydro-seeding, broadcasting, or by hand. Uniform seed distribution is essential. On steep slopes, hydroseeding may be the most effective seeding method. Surface roughening is particularly important when preparing slopes for hydroseeding.
- b) Lime and fertilize. Organic fertilizer shall be utilized in areas within the 100 foot buffer zone to a wetland resource area.
- c) Mulch the seedlings with straw applied at the rate of $\frac{1}{2}$ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas. Amoco supergro or equivalent should be utilized.

Permanent Seeding Inspection/Maintenance *

- a) Frequently inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.
- b) If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.
- c) If a stand has less than 40% cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents resowing, mulch or jute netting is an effective temporary cover.
- d) Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed. Organic fertilizer shall be utilized in areas within the 100-foot buffer zone to a wetland resource area.

Dust Control:

Dust control will be utilized throughout the entire construction process of the site. For example, keeping disturbed surfaces moist during windy periods will be an effective control measure, especially for construction access roads. The use of dust control will prevent the movement of soil to offsite areas. However, care must be taken to not create runoff from excessive use of water to control dust. The following are methods of Dust Control that may be used on-site:

- Vegetative Cover – The most practical method for disturbed areas not subject to traffic.
- Calcium Chloride – Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.
- Sprinkling – The site may be sprinkled until the surface is wet. Sprinkling will be effective for dust control on haul roads and other traffic routes.
- Stone – Stone will be used to stabilize construction roads; also effective for dust control.

The general contractor shall employ an on-site water vehicle for the control of dust as necessary.

Non-Stormwater Discharges:

The construction de-watering and all non-stormwater discharges will be directed into a sediment dirt bag (or equivalent inlet protection) or a sediment basin. Sediment material removed shall be disposed of in accordance with all applicable local, state, and federal regulations. The developer and site general contractor will comply with the E.P.A.'s Final General Permit for Construction De-watering Discharges, (N.P.D.E.S., Section 402 and 40 C.F.R. 122.26(b)(14)(x)).

Inspection/Maintenance:

Operator personnel must inspect the construction site at least once every 14 calendar days and within 24 hours of a storm event of ½-inch or greater. The applicant shall be responsible to secure the services of a design professional or similar professional (inspector) on an on-going basis throughout all phases of the project. Refer to the Inspection/Maintenance Requirements presented earlier in the "Structural and Stabilization Practices." The inspector should review the erosion and sediment controls with respect to the following:

- Whether or not the measure was installed/performed correctly.
- Whether or not there has been damage to the measure since it was installed or performed.
- What should be done to correct any problems with the measure.

The inspector should complete the Stormwater Management Construction Phase BMP Inspection Schedule and Evaluation Checklist, as attached, for documenting the findings and should request the required maintenance or repair for the pollution prevention measures when the inspector finds that it is necessary for the measure to be effective. The inspector should notify the appropriate person to make the changes and submit copies of the form to the Newbury Department of Public Works.

It is essential that the inspector document the inspection of the pollution prevention measures. These records will be used to request maintenance and repair and to prove that the inspection and maintenance were performed. The forms list each of the measures to be inspected on the site, the inspector's name, the date of the inspection, the condition of the measure/area inspected, maintenance or repair performed and any changes which should be made to the Operation and Maintenance Plan to control or eliminate unforeseen pollution of storm water.

TSS REMOVAL CALCULATIONS

THE MORIN-CAMERON GROUP, INC.

66 Elm Street,
Danvers, MA 01923
p | 978.777.8586

Standard 4: Total Suspended Solids Calculation for Roadway to Swale

Name: Definitive Subdivision Plan
Location: 217 & 221 High Road
Newbury
County: Essex
Applicant: Gadsden Lane, LLC

Proj. No.: 3953
Date: 1/12/2021
Revised: 3/25/2021
Computed by: Annie Raftery, E.I.T.
Checked by: Scott P. Cameron, P.E.

B	C	D	E	F
BMP	TSS Removal Rate	Starting TSS Load (*F)	Amount Removed (C*D)	Remaining Load (D-E)
Street Sweeping - 10%	0.10	1.00	0.10	0.9
Water Quality Swale - Dry	0.70	0.90	0.63	0.27
Sediment Forebay	0.25	0.27	0.07	0.20

Total TSS Removal =

80%

*Equals remaining load from previous BMP (E)
which enters the BMP

ILLICIT DISCHARGE COMPLIANCE STATEMENT

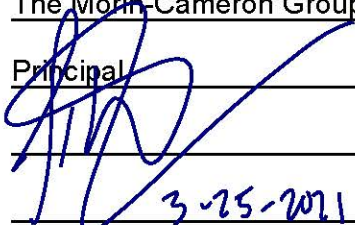
Illicit Discharge Compliance Statement

I, Scott Cameron, P.E., hereby notify the Newbury Conservation Commission that I have not witnessed, nor am aware of any existing illicit discharges at the site known as 217 & 221 High Road in Newbury, Massachusetts. I also hereby certify that the development of said property as illustrated on the final plans entitled "Definitive Subdivision in Newbury, Massachusetts at 217 & 221 High Road," prepared by The Morin-Cameron Group, Inc. dated February 3, 2021 revised March 25, 2021 and as revised and approved by the Newbury Planning Board and maintenance thereof in accordance with the "Construction Phase Pollution Prevention Plan" and "Long-Term Pollution Prevention Plan" prepared by The Morin-Cameron Group, Inc dated January 7, 2021 and as revised and approved by the Newbury Planning Board will not create any new illicit discharges. There is no warranty implied regarding future illicit discharges that may occur as a result of improper construction or maintenance of the stormwater management system or unforeseen accidents.

Name: Scott Cameron, P.E.

Company: The Morin-Cameron Group, Inc.

Title: Principal

Signature: 

Date: 3-25-2021

PROPOSED WATERSHED FIGURE



FIGURE 6
PROPOSED
WATERSHED
PLAN

The Morin-Cameron GROUP, INC.
CIVIL ENGINEERS | ENVIRONMENTAL CONSULTANTS
LAND SURVEYORS | LAND USE PLANNERS
66 ELM STREET, DANVERS, MASSACHUSETTS 01923
P: 978-777-8586, F: 978-774-3488, W: WWW.MORINCAMERON.COM

SURVEY BY:
DRAFTED BY: JMB
CHECKED BY: SPC
APPROVED BY: SPC
SCALE: 1"=30'
DATE: JANUARY 6, 2021

REVISIONS		
NO.	DESCRIPTION	DATE
1	DRIVEWAY CULVERTS	3/25/2021

217 & 221 HIGH ROAD
(ASSESSOR'S MAP R27, LOTS 51, 53, 54 & 56)
NEWMURY, MASSACHUSETTS
PREPARED FOR:
GADSDEN LANE, LLC