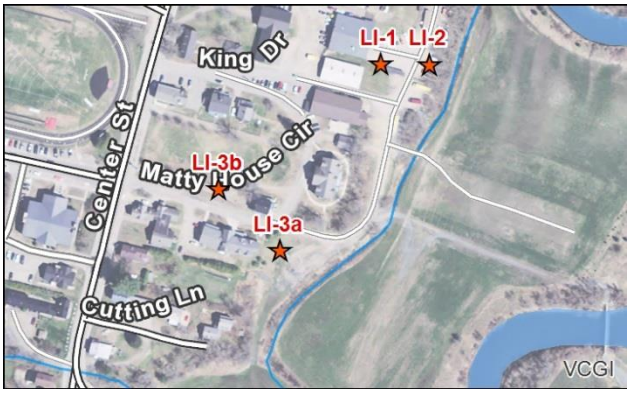
APPENDIX D:

One-Page Summary Sheets for Stormwater Problem Areas

Project: LI-1	**Problem Area Summary**

Date Observed:	5/3/2017
Location:	LI Maintenance Building
Latitude: **Longitude:**	**44.5380 N** **-72.0105 W**
Land Ownership:	Lyndon Institute
Drainage Area (acres)	0.2
Impervious (acres)	0.15



Site Description: Runoff from a large rooftop area flows on to a high traffic gravel parking area before draining to a catchbasin, significant rilling was observed along the flow path. The catchbasin is piped directly to a stream to the east.

Photo 1: Rooftops draining to catchbasin

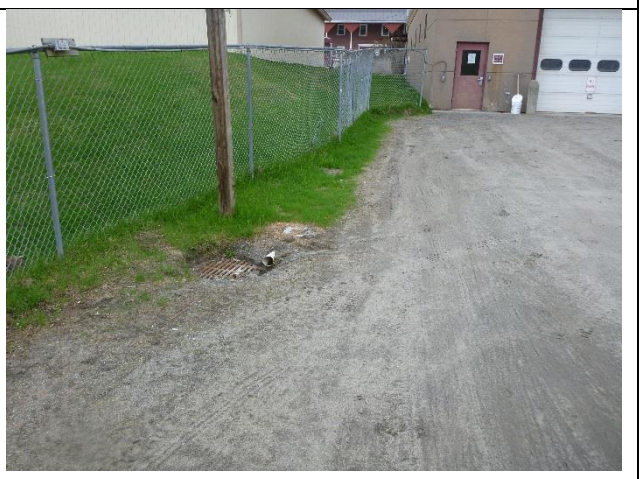


Photo 2: Erosion along edge of unpaved parking area flowing in to the catchbasin

BMP Description: Install a grassed swale along the fence to separate the "clean" rooftop runoff from the unpaved parking area, stabilize the erosion at the catchbasin inlet. **This project was completed in July 2017 by a Northwoods Stewardship Center work crew.**

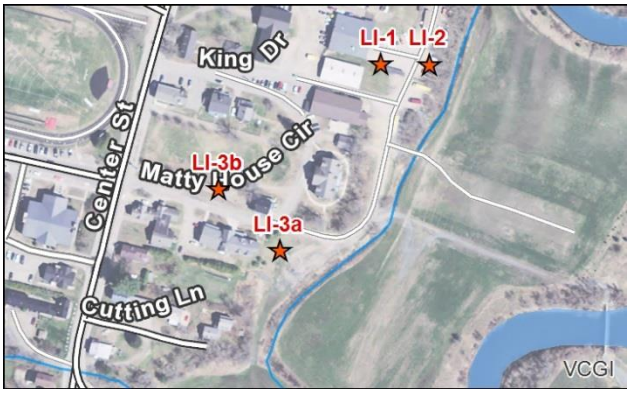
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	4	6	3	21 **(High)**

Additional Project Benefits Description: The site is a chronic problem area delivering sediment directly to the adjacent stream and the Passumpsic River. Reducing sediment loading to the catchbasin will also increase the capacity for sediment retention within the basin between cleanouts.

Project Comments: High priority project due to very low cost and ease of implementation. LI maintenance staff are supportive of the project which will reduce sediment loading to the river. **We estimate that this project will cost less than $1,000.**

Project: LI-2	**Problem Area Summary**

Date Observed:	5/3/2017
Location:	LI Maintenance Building
Latitude: **Longitude:**	**44.5380 N** **-72.0101 W**
Land Ownership:	Lyndon Institute
Drainage Area (acres)	0.7
Impervious (acres)	0.5



Site Description: Three gullies have formed along the steep bank at the edge of the parking area. Winter plowing has altered the grading so runoff does not drain to the armored swale.

Photo 1: Gully erosion through plow deposits and the steep bank down to the stream.

Photo 2: Armored swale that does not receive significant runoff due to parking lot grading.

BMP Description: Excavate the loose soil and plowing materials along the edge of the parking lot and install an armored spillway, grade the edge of the parking lot to direct all flow to armored spillways, and create a winter plowing plan to minimize future gully formation.

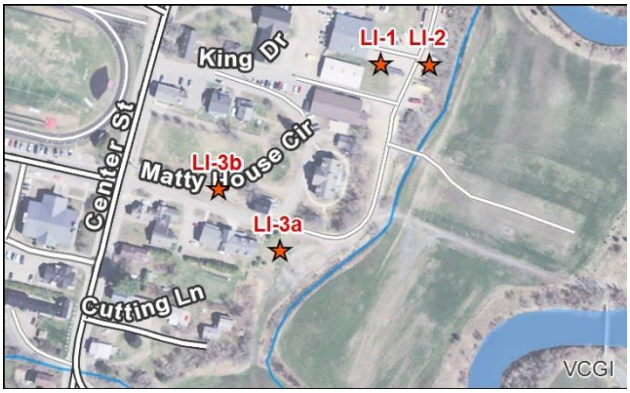
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
11	2	4	3	20 **(High)**

Additional Project Benefits Description: The gullies are an ongoing source of sediment and nutrient loading to the stream; seasonal high water could further increase erosion of the loose sediment along the bank.

Project Comments: The project is assigned a high priority due to the significant sediment and nutrient loading from ongoing erosion. The project should not require any additional permitting for limited installation of rock armor above ordinary high water. **We estimate that total project costs should be between $2,000 and $5,000.**

Project: LI-3a	**Problem Area Summary**

Date Observed:	5/3/2017
Location:	East of Campbell House
Latitude: **Longitude:**	**44.5370 N** **-72.0113W**
Land Ownership:	Lyndon Institute
Drainage Area (acres)	0.5
Impervious (acres)	0.25



Site Description: A stormwater pipe draining an area of paved roads and unpaved parking and fire lane with associated compacted soils discharges to an overflow parking area for the soccer fields along the Passumpsic River. High velocity flows from the steep stormwater pipe are causing additional erosion across the lower parking area before draining directly in to the adjacent stream.

Photo 1: Erosion at the pipe outlet

Photo 2: Erosion from the stormwater pipe across the gravel parking area.

BMP Description: Excavate the existing compacted soils and Install a grass-lined sediment trap along the edge of the parking area. Install a large rock check dam and a splash apron at the culvert outlet to diffuse the high velocity flow and protect against scour. The sediment trap should be sized to store the WQv storm. The sediment trap will overflow through a second rock check dam in to a grass-lined swale. **This project was completed in July 2017 by a Northwoods Stewardship Center work crew.**

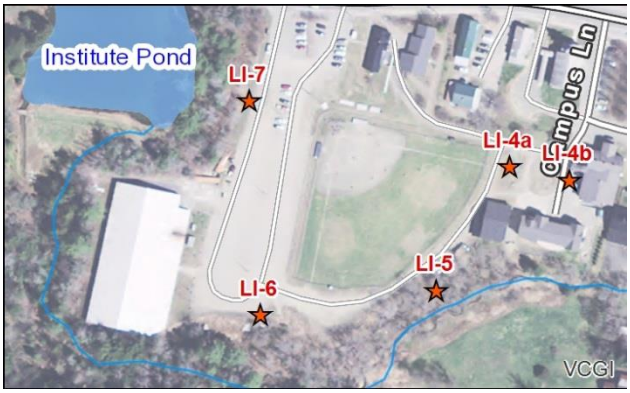
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	3	4	4	21 **(High)**

Additional Project Benefits Description: The site is a chronic problem area and delivers very high loads of sediment to the adjacent stream and the Passumpsic River. BMP installation will decrease peak runoff.

Project Comments: High priority project due to low cost, high degree of landowner support, and potential to mitigate a major sediment source to a stream draining directly into the Passumpsic River. **We estimate that this project will cost $2,000 to $5,000.**

Project: LI-6	**Problem Area Summary**

Date Observed:	5/3/2017
Location:	Fenton Chester Arena
Latitude: **Longitude:**	**44.5363 N** **-72.0157 W**
Land Ownership:	Town of Lyndon
Drainage Area (acres)	2
Impervious (acres)	1.4



Site Description: The large gravel parking lot drains south and is diverted into a water bar that empties into a narrow strip of vegetation along the top of the steep valley wall leading to the stream. Some sediment is trapped in the vegetation; however, no additional treatment or slope stabilization measures are in place. Gullies have formed along the steep slope leading to the stream.

Photo 1: Large gravel parking lot draining south.

Photo 2: Water bar directs runoff from most of parking lot to a small green area on top of the slope.

BMP Description: Install a stone lined settling basin and a stone lined spillway to the stream. The water bar should be improved and stabilized. An additional swale or water bar should be installed along the top of the slope to intercept runoff and reduce gully formation.

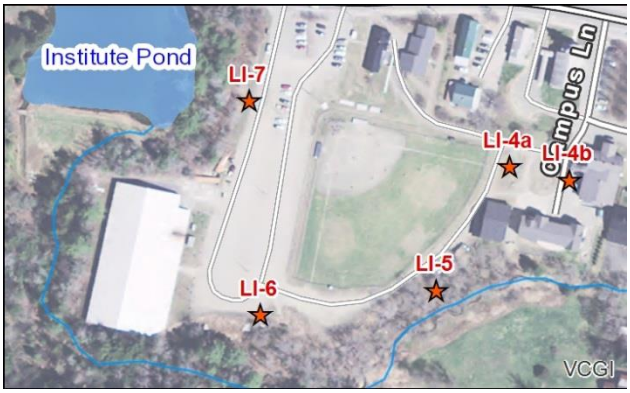
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
13	2	4	3	22 **(High)**

Additional Project Benefits Description: The site is a chronic problem area delivering very large sediment loads directly in to a small stream.

Project Comments: The project is assigned a high priority due to the very large impervious area and high sediment load draining directly in to a stream with obvious sedimentation impacts. The project will require some additional maintenance and additional design and permitting. The project would mitigate a very significant sediment source. **We estimate that total projects costs should be between $5,000 and $10,000.**

Project: LI-7 **Problem Area Summary**

Date Observed:	7/26/2017
Location:	Fenton Chester Arena
Latitude: **Longitude:**	**44.5372 N** **-72.0160 W**
Land Ownership:	Town
Drainage Area (acres)	0.7
Impervious (acres)	0.5



Site Description: Erosion is visible along the western edge of the parking lot and a large volume of sediment is delivered to a catchbasin in front of the arena, which is piped directly to the stream.

Photo 1: Flow path along the edge of the large gravel parking lot draining into a catchbasin.

Photo 2: Area draining to the catchbasin from College Road.

BMP Description: A grassed swale could be installed along the western edge of the parking lot and the existing catchbasin could be retrofitted with a small rain garden or sediment trap.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	2	5	3	19 **(Medium)**

Additional Project Benefits Description: The large volumes of runoff and sediment from this site are an ongoing issue and likely quickly fill the catchbasin, limiting effectiveness of the only existing treatment. A small treatment feature at the catchbasin and a stabilized swale would improve the existing BMP and would mitigate runoff during small storms.

Project Comments: The project is assigned a medium priority due to the limitations for treating the large source of nutrients, sediment, and runoff from the site. The project will require survey and design but should not require any additional permitting. **We estimate that total project costs should be between $5,000 and $10,000.**

Project: LI-8	**Problem Area Summary**

Date Observed:	5/3/2017
Location:	Alumni Auditorium
Latitude: **Longitude:**	**44.5380 N** **-72.0163 W**
Land Ownership:	Lyndon Institute
Drainage Area (acres)	1.5
Impervious (acres)	1.4

Site Description: The large paved parking area and a portion of College Rd drain to a catch basin that is piped directly in to Institute Pond. Runoff from portions of the parking area flow along the edge of the pavement causing erosion along the grassed area. Some runoff continues directly down the steep slope in to the pond.

Photo 1: Catchbasin located at the Institute Circle and College Road intersection, drains to the pond.

Photo 2: Sheetflow over exposed soil along the steep bank to the pond.

BMP Description: Repair the broken curb to prevent runoff from eroding along the edge of pavement. Establish vegetation along the bank. The catchbasin should be inspected and will likely require more frequent cleanout.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	2	4	3	18 **(High)**

Additional Project Benefits Description: The site is highly visible and is likely a chronic source of sediment loading to the pond. The broken curb is increasing erosion damage to the paved parking lot.

Project Comments: The project is assigned a high priority due to the ongoing sediment loading to the pond. The project was discussed with the LI Maintenance Department and they were concerned about winter plowing damaging the curb. W**e estimate that the total costs for the project will be less than $1,000.**

Project: LI-9	**Problem Area Summary**

Date Observed:	5/3/2017
Location:	Simpson Nature Trails
Latitude: **Longitude:**	**44.5392 N** **-72.0173 W**
Land Ownership:	Lyndon Institute
Drainage Area (acres)	Variable
Impervious (acres)	Minimal

Site Description: The network of hiking trails includes several steep sections that lack proper drainage diversions and have areas of deep gullying and erosion. Runoff from these trail sections currently has some treatment before reaching Institute Pond, ongoing erosion will increase sediment and nutrient loading to the pond.

Photo 1: Minor erosion at a trail junction.

Photo 2: Major erosion along a steep and straight trail section with no stabilization structures.

BMP Description: Install water bars and other water diversion and trail stabilization measures. The steepest trail section should be closed and stabilized.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
7	4	6	3	20 **(High)**

Additional Project Benefits Description: The site is a chronic problem area that is likely to worsen with ongoing erosion.

Project Comments: The project is assigned a high priority due to the ongoing instability of the trail network will likely worsen over time, increasing nutrient and sediment loads to the pond. The trail stabilization projects are appropriate for a work crew and should be low cost and relatively easy to implement. **We estimate that the total costs for the project will be less than $2,000.**

Project: LSC-2	Problem Area Summary
Date Observed:	5/3/2017
Location:	LSC Varsity Field
Latitude: **Longitude:**	**44.5324 N** **-72.0256 W**
Land Ownership:	Lyndon State College
Drainage Area (acres)	2.5
Impervious (acres)	0.25

Site Description: A grassed swale (mowed) along the south edge of varsity field collects runoff from the field and portions of College Road. The swale drains in to a catchbasin that empties directly to Dragon Pond. Portions of the field along the swale are wet year-round and are considered a problem area. The underlying soils for the entire field are D-type and some areas are hydric. Fertilizer applications to the field likely result in excess nutrient delivery to the pond. LSC Public Safety has expressed interest in adding a footpath along this area to provide a safe walking path for students off the road.

Photo 1: Mowed swale along varsity field draining to catchbasin

BMP Description: Implement a "no-mow" buffer along the swale and plant appropriate wetland shrub species to improve nutrient retention and reduce wet areas along the field. Minor excavation to better define the swale would likely improve field conditions. Project may include additional partnership with Health and Safety to include a footpath near the guardrail to keep students off the road.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	4	3	4	21 **(High)**

Additional Project Benefits Description: The wet area along the swale is a known issue for field maintenance. The site is highly visible and could provide an opportunity for educational signage about rain gardens and swales.

Project Comments: High priority project due to relatively low cost and potentially significant reductions in nutrient loading to Dragon Pond. Additional design work would be required if a walking path is included, possible permitting requirements due to hydric soils. **We estimate that the swale improvements will cost less than $2,000.**

Project: LSC-3 **Problem Area Summary**

Date Observed:	5/3/2017
Location:	Stonehenge Complex
Latitude: **Longitude:**	**44.5328 N** **-72.0222 W**
Land Ownership:	Lyndon State College
Drainage Area (acres)	1.3
Impervious (acres)	1.0

Site Description: A footpath across the swale leading to the dry detention basin is compacted and has bare soil with active erosion. Portions of the parking lot drain directly to this path and vegetation will be hard to establish due to foot traffic. Excess sediment from this site is likely reducing the effectiveness of the existing BMP.

Photo 1: Erosion and compacted soils on footpath through swale at the BMP.

Photo 2: Installation of infiltration steps from parking lot to footbridge.

BMP Description: Install a footbridge across the swale and create a defined walking path with a stone and/or hedge border. Till compacted soil and establish vegetation. Boxed infiltration steps will reduce runoff from the parking lot. **This project was completed in July 2017 by a Northwoods Stewardship Center work crew.**

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	4	5	4	23 **(High)**

Additional Project Benefits Description: The site is a chronic problem area that is increasing the sediment load and runoff to the existing BMP. The site is highly visible.

Project Comments: The project is assigned a high priority due to the ongoing issues at the site, the high visibility, and the high degree of support from LSC. The project will likely reduce ongoing maintenance requirements and will improve BMP function. **We estimate that this project will cost $2,000 to $5,000.**

Project: LSC-4	**Problem Area Summary**

Date Observed:	5/3/2017
Location:	McGoff Hill Rd (LSC)
Latitude: **Longitude:**	**44.5335 N** **-72.0243 W**
Land Ownership:	Lyndon State College
Drainage Area (acres)	0.8
Impervious (acres)	0.5

Site Description: Runoff from McGoff Hill is causing erosion along the road edges and flows directly in to Dragon Pond near the outlet. Winter plowing along the road and parking lot is likely a significant sediment source to the pond.

Photo 1: Erosion along the edge of pavement and the steep bank leading to the pond.

Photo 2: View of watershed draining to the project site.

BMP Description: Install a grassed swale along the edge of the parking spots along McGoff Hill. Install a gravel wetland at the bottom of the slope with an armored overflow into Dragon Pond. This will require the loss of up to 4 parking spots and will require changes to winter plowing.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	3	2	5	20 **(High)**

Additional Project Benefits Description: The site is a chronic erosion area that drains directly in to Dragon Pond. The site is highly visible and could provide a useful educational opportunity.

Project Comments: The project is assigned a high priority due to the ongoing erosion issues at the site, the high visibility, and the direct drainage to the pond. The project will be moderately expensive and will require additional design work and changes to existing parking infrastructure and may require permitting given the proximity to a surface water. **We estimate that this project will cost $10,000 to $20,000.**

Project: LSC-6 **Problem Area Summary**

Date Observed:	5/3/2017
Location:	Baseball Fields (LSC)
Latitude: **Longitude:**	**44.5368 N** **-72.0260 W**
Land Ownership:	Lyndon State College
Drainage Area (acres)	1.4
Impervious (acres)	Minimal

Site Description: A grassed swale (mowed) between the two baseball fields collects runoff from a large portion of the fields and drains to an existing low point at the top of the steep bank before spilling over into an armored swale down the steep bank. Nutrient loads from this drainage area likely very high.

Photo 1: Existing low point at proposed rain garden location.

Photo 2: Swale between the two baseball fields.

BMP Description: Install a rain garden with native shrub plantings in the existing low point. Installation will likely require some additional excavation to enlarge the rain garden and increase capacity. Remove debris from west side to improve overflow conveyance into the armored swale. **This project was completed in July 2017 by a Northwoods Stewardship Center work crew.**

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
7	4	6	4	21 **(High)**

Additional Project Benefits Description: The site is visible and could provide an aesthetically pleasing treatment feature with educational signage. Stormwater currently flows down the bank and discharges to a wetland. BMP installation will increase infiltration and reduce peak flows during storm events.

Project Comments: The project is assigned a high priority due to high nutrient removal potential and the low cost of the project. The project has strong support from LSC. **We estimate that this project will cost under $2,000.**

Project: LSC-7 **Problem Area Summary**

Date Observed:	5/3/2017
Location:	Faculty Parking Lot (LSC)
Latitude: **Longitude:**	**44.5370 N** **-72.0254 W**
Land Ownership:	Lyndon State College
Drainage Area (acres)	3.5
Impervious (acres)	0.5

Site Description: Runoff from the baseball fields through the swale described in LSC-6 and from a catchbasin near the concession stand flow down an armored swale to a grassed swale along the southern end of the parking lot. Nutrient loads are very high from this drainage. The southern portion of the parking lot also drains to this area. The culvert under College Road is in poor condition.

Photo 1: Potential location of BMP at the end of the parking lot.

Photo 2: High nutrient runoff from the baseball fields flowing to the site.

BMP Description: Improve the swale along the parking lot and install a gravel treatment wetland to increase nutrient uptake. The installation will remove 2-4 parking spaces from the end of the lot. The CMP culvert under College Road should be considered for replacement during construction. Winter plowing will no longer be able to stockpile snow in this area.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
11	3	2	5	21 **(High)**

Additional Project Benefits Description: The erosion and nutrient loading at the site are an ongoing problem. The site is highly visible and an aesthetically appealing BMP would provide a valuable education opportunity. Increased water storage and infiltration will significantly reduce peak flows from the field drainage and parking lot.

Project Comments: This project will require additional design and coordination with LSC. The project has strong support from LSC and will address an ongoing source of nutrients and sediment to the adjacent wetland. **We estimate that total costs for the project will be between $15,000 and $25,000 not including the road culvert.**

Project: LY-4	**Problem Area Summary**

Date Observed:	5/11/2017
Location:	Chamberlain Bridge
Latitude: **Longitude:**	**44.5163 N** **-72.0166 W**
Land Ownership:	Town
Drainage Area (acres)	0.25
Impervious (acres)	0.25

Site Description: Runoff from the intersection at the south end of the covered bridge is bypassing the storm drain and flowing down the embankment and through a steep yard, causing a large gully. Storm drain flows directly in to the river.

Photo 1: Gully erosion through embankment and yard to Wheelock Brook.

Photo 2: Evidence of recent pavement repairs and drainage point off of the road.

BMP Description: Lower the storm drain inlet and raise pavement to better direct runoff. Reconfigure the inlet to include a small catch basin if possible. Assess opportunities for stormwater treatment upslope.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	3	4	4	19 **(Medium)**

Additional Project Benefits Description: The recent pavement repairs and the ongoing gully erosion show that this is a chronic problem area. The gully erosion is beginning to undercut the guardrail and the edge of the pavement.

Project Comments: The project is assigned a medium-high priority due to the ongoing sediment and nutrient loads from the gully erosion. Reconfiguring the inlet and the pavement will not reduce sediment loads from the road unless a catchbasin is installed, however this will prevent runoff from causing any further gully erosion. **We estimate that total costs for the project will be between $2,000 to $10,000.**

Project: LY-5	**Problem Area Summary**

Date Observed:	5/11/2017
Location:	Kingdom Hall of JW
Latitude: **Longitude:**	**44.5167 N** **-72.0100 W**
Land Ownership:	Private
Drainage Area (acres)	1.5
Impervious (acres)	1

Site Description: Runoff from the lower parking area sheetflows directly in to Wheelock Brook. Two small gullies have formed in areas of concentrated runoff. Winter plowing appears to push snow off of the east edge of the lot, directly into the stream and adjacent floodplain.

Photo 1: Parking lot draining directly to Wheelock Brook.

Photo 2: Minor gully erosion along stream bank and exposed soil from plowing.

BMP Description: Install a swale along the edge of the parking lot or consider installation of underground storage vaults to reduce sediment and peak runoff from the parking lot. Pave the overflow parking area.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	1	4	4	18 **(Medium)**

Additional Project Benefits Description: The site is a chronic source of sediment, nutrients, and thermal pollution draining directly to Wheelock Brook. Runoff from the site partially drains to the gravel parking area likely making it unusable under wet conditions, and increasing erosion. BMP implementation could significantly reduce peak runoff from the site during small storms.

Project Comments: The project is assigned a medium priority due to the private ownership and the relatively low level of sediment and nutrient loading from the site. Underground storage tanks should be considered for the site given the small area available for treatment between the stream and the parking lot. **We estimate that this project will cost between $2,000 and $15,000 depending on the selected BMP and level of required design.**

Project: LY-6	**Problem Area Summary**

Date Observed:	5/24/2017
Location:	Butlers Bus Service
Latitude: **Longitude:**	**44.5169 N** **-71.9991 W**
Land Ownership:	Town and Private (Butlers Bus Service)
Drainage Area (acres)	2
Impervious (acres)	1.6

Site Description: Two flow paths split the large gravel parking lot and rooftop drainage delivering sediment to grassed ditch that empties into a Passumpsic River side channel. Severe gullying is visible at the inlet and outlet of both driveway culverts.

Photo 1: Gully erosion and significant sediment loading at the east entrance.

Photo 2: Gully erosion and significant sediment loading at the west entrance.

BMP Description: Install water bars to direct parking lot runoff to sediment traps located along the edge of the parking lot and near the business sign. Stabilize the ditch near the inlets to stop gully erosion and add stone check dams to concentrate sediment deposition for cleanout.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
12	2	4	4	22 **(High)**

Additional Project Benefits Description: The site is a chronic problem area delivering very large sediment loads directly in to the Passumpsic River. Gully erosion could destabilize the adjacent road, driveway, or parking area. Reducing sediment loads will improve the performance of the vegetated swale.

Project Comments: The project is assigned a high priority due to the very high sediment loads generated from the site and the proximity to the Passumpsic River. **We estimate that total costs for the project will be between $2,000 to $15,000 if new BMPs are constructed.**

Project: LY-8 **Problem Area Summary**

Date Observed:	5/24/2017
Location:	Lily Pond Rd
Latitude: **Longitude:**	**44.5198 N** **-71.9931 W**
Land Ownership:	Town
Drainage Area (acres)	7.5
Impervious (acres)	2.0

Site Description: The ditch along the east side of the road is badly eroded and is sending large volumes of sediment into the adjacent intermittent stream. Several areas of gully erosion along the road edge upslope. The cross-culvert outlet is unstable and has a large gully along the road edge.

Photo 1: Gully erosion and significant sediment loads in ditch.

Photo 2: Long ditch section along a moderately steep section of Lily Pond Rd.

BMP Description: Enlarge and stabilize ditches, establish grass or line with stone based on slope as specified in MRGP guidance. Check dams may be required to facilitate sediment cleanout. Stabilize all gully erosion areas with rock and assess the size of culverts along the ditch. Stabilize the culvert outlet and install a header, add heavy rock to the eroding slope.

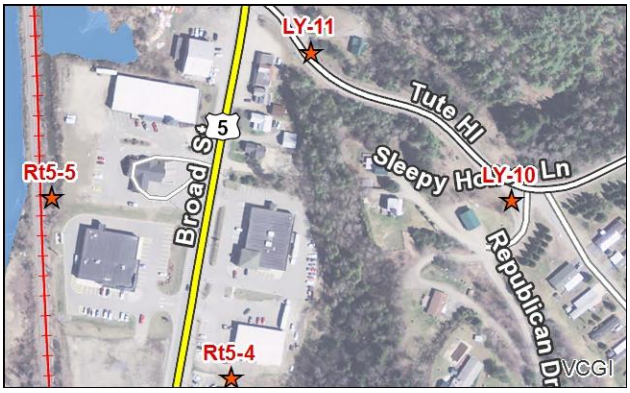
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
13	4	6	2	25 **(Highest)**

Additional Project Benefits Description: The site is a chronic problem area delivering very large sediment loads directly in to an intermittent stream. The road is vulnerable to ongoing erosion damage and excess sediment loads increase the risk of culvert failure.

Project Comments: The project is assigned a very high priority due to the very high sediment loads generated from the site and the low cost required to stabilize the ditch, reducing long-term maintenance and protecting the road. **We estimate that total costs for the project will be between $2,000 to $5,000.**

Project: LY-10	**Problem Area Summary**

Date Observed:	5/24/2017
Location:	Tute Hill
Latitude: **Longitude:**	**44.5260 N** **-71.9983 W**
Land Ownership:	Town
Drainage Area (acres)	1.2
Impervious (acres)	0.5



Site Description: Runoff from two private roads and a driveway carry large volumes of sediment to a steep swale at the top of Tute Hill Road. The swale is filled with sediment before it enters a culvert under the road and empties into an intermittent stream channel.

Photo 1: Ditch at the top of Tute Hill Road filled with sediment

Photo 2: Steep private road and gravel parking draining in to the ditch with rill and gully erosion.

BMP Description: Install a sediment trap along the edge of the road at the top of the swale. Work with the private landowners to improve drainage and reduce runoff/sediment to the swale.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	2	4	2	16 **(Moderate)**

Additional Project Benefits Description: The site is a chronic problem area delivering large sediment loads directly in to an intermittent stream.

Project Comments: The project is assigned a moderate priority due to the potential challenges of working with private landowners. The stream is not mapped and therefore the road segments are likely not "hydrologically connected". **We estimate that total costs for the project will be between $1,000 to $2,000.**

Project: LY-12	**Problem Area Summary**

Date Observed:	6/21/2017
Location:	South Prospect St
Latitude: **Longitude:**	**44.5167 N** **-72.0100 W**
Land Ownership:	Private/ Town
Drainage Area (acres)	1
Impervious (acres)	0.5

Site Description: A very large and steep gully has formed along the steep valley wall. No obvious concentrated flow paths lead to the gully, a stormwater pipe outlet 4' from the top may be increasing erosion.

Photo 1: View from the top of the gully.

Photo 2: Residential area partially draining to the gully site.

BMP Description: Conduct an alternatives analysis to identify options for stabilizing the gully and reducing overland and piped runoff to the site.

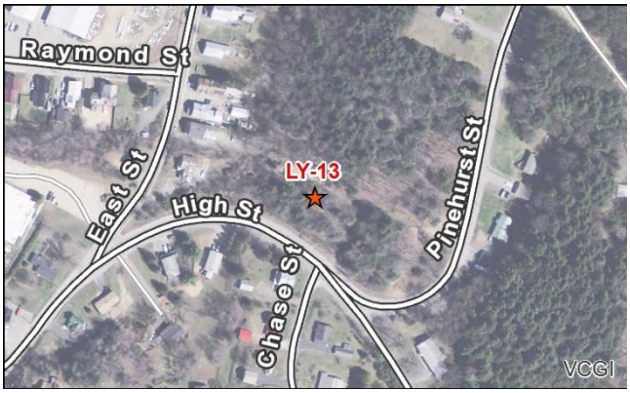
WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
11	3	2	3	19 **(High)**

Additional Project Benefits Description: The site is a major and ongoing source of sediment and nutrients into the adjacent intermittent stream channel. Gully advancement will soon threaten a shed.

Project Comments: The project is assigned a medium priority due to the private ownership and the additional survey and design required for the project. We anticipate that a wide range of recommendations will be developed for the site that will require significant funding and landowner cooperation. **We estimate that this project will cost between $15,000 and $50,000.**

Project: LY-13	**Problem Area Summary**

Date Observed:	5/24/2017
Location:	High St.
Latitude: **Longitude:**	**44.5350 N** **-71.9980 W**
Land Ownership:	Town
Drainage Area (acres)	16
Impervious (acres)	4



Site Description: Three catchbasins draining steep sections of Chase St, High St, and Pinehurst St drain to a settling pond. Significant erosion is visible along the flow path from the Pinehurst outfall and at the pond inlet. The existing pond provides some treatment; however, the pond outlet is too low and the pond is filled in with sediment.

Photo 1: Sediment buildup in the basin with active rilling and erosion.

Photo 2: Outlet structure approximately 6" above the basin bottom.

BMP Description: Stabilize the channels from the culvert outlets and repair stone step near pond inlet. Clean out the pond and install a new outlet structure with a low flow orifice and raise the elevation of the primary outlet. Site maintenance should be minimal and likely less than what is currently required.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
12	4	3	4	23 **(Very High)**

Additional Project Benefits Description: The site is a chronic problem area with ongoing channel erosion and minimal storage capacity for sediment and stormwater. Retrofitting the pond will significantly increase BMP performance and will reduce peak flows.

Project Comments: The project is assigned a very high priority due to the very high sediment and nutrient loads that could be mitigated through retrofitting the existing BMP. The project will require additional design and engineering to properly size the outlet and to ensure the stability of the soil berm. Underground sewer is likely a design constraint. **We estimate that total costs for the project will be between $10,000 to $25,000.**

Project: LY-15	**Problem Area Summary**

Date Observed:	6/21/2017
Location:	Raymond St
Latitude: **Longitude:**	**44.5360 N** **-72.0011 W**
Land Ownership:	Hopkins & Sons (Private)
Drainage Area (acres)	2.5
Impervious (acres)	2.5

Site Description: A large industrial complex with dirt parking areas partially drains to the southwest corner of the property near the train tracks. Runoff currently flows into a series of catchbasins which appear non-functioning. Stormwater infrastructure is not fully mapped, it is unclear where the runoff goes.

Photo 1: Location for potential BMP.

Photo 2: Large area of gravel road and parking and rooftops draining to the site along Raymond St.

BMP Description: Install a stormwater treatment system and grade the site to better direct flow to the BMP. High sediment loads and potential diesel contamination are design considerations.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
13	0	1	5	19 **(Medium)**

Additional Project Benefits Description: The site is a chronic problem area with very large sediment loads. The current drainage infrastructure is completely filled and not functioning as designed. Stormwater and high sediment loads are likely crossing Raymond St.

Project Comments: The project is assigned a medium priority due to the additional design requirements and the private landownership. The project site may also be within the railroad right of way. The drainage infrastructure is not mapped and additional drainage and grading will likely be required within the commercial property. The site has potential to mitigate runoff and very high sediment and nutrients loads from a large impervious area. **We estimate that total costs for the project will be between $20,000 to $40,000.**

Project: LY-18	**Problem Area Summary**

Date Observed:	5/24/2017
Location:	Finney Hill Neighborhood
Latitude: **Longitude:**	**44.5400 N** **-71.9881 W**
Land Ownership:	Town
Drainage Area (acres)	Variable
Impervious (acres)	Variable

Site Description: Many roadside ditches along Strawberry Hill, Whipple Hill, Fairview Lane, James Way are steep and eroding, Additional gully erosion was observed along the road edge. Several locations of severe gully erosion where the ditch drops sharply to a cross-culvert inlet.

Photo 1: Large sediment deposits along Clover Hollow Rd adjacent to an intermittent stream.

Photo 2: Steep section of road with unstable ditches.

BMP Description: Steep ditches should be stone lined and check dams installed where necessary, following MRGP guidance. Undersized ditches should be enlarged and deepened. Road grading should be improved in areas with excessive erosion along the road edge.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
12	2	4	3	21**(High)**

Additional Project Benefits Description: Many of the roadside ditch sections are chronic problems areas require frequent maintenance and are generating very large volumes of sediment.

Project Comments: The project is assigned a high priority due to the large volumes of sediment generated with the ongoing erosion issues. Most of the road segments will not be classified as "hydrologically connected" and will be lower priority for repairs under the MRGP guidance. However, several intermittent streams are visible within the neighborhood and are impacted by excess sediment loads. **Ditch improvements will not require additional permitting or design work, we estimate that total costs for the project will be between $10,000 to $20,000.**

Project: LY-22	**Problem Area Summary**

Date Observed:	5/24/2017
Location:	Finney Hill Neighborhood
Latitude: **Longitude:**	**44.5437 N** **-71.9856 W**
Land Ownership:	Town/Private
Drainage Area (acres)	2.5
Impervious (acres)	0.75

Site Description: Huge volumes of sediment are deposited on the lawn adjacent to an intermittent stream channel. Sediment is coming from two different culvert outlets and from gully erosion along the road edge. Additional erosion was observed at the inlet and outlet of the stream culvert under Strawberry Hill Rd.

Photo 1: Large sediment deposits along intermittent stream off of Strawberry Hill.

Photo 2: Large gully along road edge with sediment deposits in floodplain.

BMP Description: Install a sediment trap at each culvert outlet and grade/stabilize the road edges to reduce gully erosion. The culvert under strawberry hill needs an outlet header and stone armor along the embankment.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
11	2	3	4	20**(High)**

Additional Project Benefits Description: Many of the roadside ditch sections are chronic problems areas require frequent maintenance and are generating very large volumes of sediment.

Project Comments: The project is assigned a high priority due to the large volumes of sediment generated with the ongoing erosion issues. The site requires frequent maintenance to clean up the sediment deposits and repair gully erosion locations. The intermittent stream through the site is not mapped and therefore the road segments are likely to not be considered "hydrologically connected". Some additional design work is required for sizing sediment traps and identifying areas to stabilize and improve ditches. **We estimate that the total costs for the project will be between $10,000 to $20,000.**

Project: LY-23 **Problem Area Summary**

Date Observed:	6/21/2017
Location:	Lyndon Town School
Latitude: **Longitude:**	**44.5457 N** **-71.9844 W**
Land Ownership:	Town of Lyndon
Drainage Area (acres)	6
Impervious (acres)	0.75

Site Description: A ditch through the lawn area carries flow out of the wetland connecting to the roadside ditch. Portions of the roof and parking lots drain to the wetland. The wetland appears to be functioning well upslope of the ditch.

Photo 1: Ditch leaving the wetland and flowing towards Lily Pond Road.

Photo 2: Outlet of wetland ditch to the roadside ditch.

BMP Description: Restore sinuosity and flood benches to the ditched area and plant with native wetland vegetation. Assess if more impervious surface runoff can be directed into the wetland.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	3	3	4	20 **(High)**

Additional Project Benefits Description: This site could be a valuable educational opportunity for stormwater treatment and wetland function. The site currently drains to a stream through ditches with minimal additional treatment. Reduced runoff and sediment loads would prolong roadside ditch and culvert functionality.

Project Comments: The project is assigned a high priority due to the relatively large area of impervious surfaces that could have improved treatment before draining to a stream. The site could be an important educational opportunity. **We estimate that the project should cost $5,000 to $10,000; however, the wetland is likely Class II, requiring additional permitting to implement the project.**

Project: LY-24	**Problem Area Summary**

Date Observed:	5/24/2017
Location:	Lily Pond Road
Latitude: **Longitude:**	**44.5464 N** **-71.9834 W**
Land Ownership:	Town/Private
Drainage Area (acres)	8
Impervious (acres)	1.75

Site Description: An asphalt lined ditch carries runoff from a large portion of the Lyndon Town School property and portions of Lily Pond Road. The ditch spills down a steep bank into the stream with areas of moderate erosion and a small gully.

Photo 1: Asphalt ditch carrying runoff from the Lyndon Town School and Lily Pond Road.

Photo 2: Outlet of ditch to steep forested slope leading to the floodplain.

BMP Description: Install a linear treatment feature to infiltrate stormwater and trap sediment and stabilize the outlet channel down to the stream.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	1	3	3	19 **(Medium)**

Additional Project Benefits Description: The site is highly visible and could be an aesthetic improvement with appropriate plantings. The existing asphalt ditch likely increases stream temperatures during small storm events and has no capacity to reduce flow through retention or infiltration.

Project Comments: The project is assigned a medium priority due to private ownership and the moderate project cost and additional design requirements. The large drainage area and associated impervious surfaces will generate large volumes of runoff during storm events, limiting the BMP effectiveness to smaller storms and requiring designs that will allow for high flows. **We estimate that the project should cost $10,000 to $20,000.**

Project: LY-28	**Problem Area Summary**

Date Observed:	5/3/2017
Location:	College Road
Latitude: **Longitude:**	**44.5385 N** **-72.0200 W**
Land Ownership:	Town
Drainage Area (acres)	2.5
Impervious (acres)	0.75

Site Description: The north side of the road lacks a defined ditch and surface runoff is causing moderate to severe erosion of the road shoulder. Two turnouts are only partially accessible leading to increased flow along the edge of the pavement. Some runoff and sediment is reaching Institute Pond.

Photo 1: Poorly defined ditch with bare soil and active erosion.

Photo 2: Two eroded flow paths along the road shoulder, some runoff continues down College Rd.

BMP Description: Install a ditch along the north side of the road and improve connection to the existing turnouts. Stone checkdams may be necessary in the steeper sections of the ditch.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	3	4	4	20 **(High)**

Additional Project Benefits Description: The highly visible erosion along the road should is likely a chronic problem, and high flows during storms may damage the pavement. The turnouts along the road are poorly graded and have reduced effectiveness.

Project Comments: The project is assigned a high priority due to the low cost and ease implementation. The project should reduce overall maintenance requirements and will improve functionality of existing stormwater BMPs. Additional design should be minimal and we do not expect any permitting requirements. **We estimate that the project should cost $5,000 to $10,000.**

Project: LY-29	**Problem Area Summary**

Date Observed:	5/3/2017
Location:	College Road
Latitude: **Longitude:**	**44.5411 N** **-72.0250 W**
Land Ownership:	Town
Drainage Area (acres)	2
Impervious (acres)	1

Site Description: The ditches along a moderately steep section of Calista Ave are poorly defined, leading to erosion and rilling. The southern end of the road lacks a cross-culvert and runoff crosses the road causing rilling.

Photo 1: Poorly defined ditch spills across road causing rilling.

Photo 2: Erosion along road shoulder and poorly defined ditch.

BMP Description: Improve or install ditches on both sides of road, include check dams where appropriate. Install a cross-culvert at southern end of road.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
11	2	4	2	19 **(Medium)**

Additional Project Benefits Description: The ditch and road erosion are likely a chronic problem requiring frequent maintenance.

Project Comments: The project is assigned a medium priority due to the low cost and ease implementation required to address a significant ongoing sediment source. The road segments are not likely to be classified as "hydrologically connected" for the MRGP standards. The project should reduce overall maintenance requirements for the Town. Additional design should be minimal and we do not expect any permitting requirements. **We estimate that the project should cost $5,000 to $10,000.**

Project: LY-34 **Problem Area Summary**

Date Observed:	5/24/2017
Location:	Shores Hill
Latitude: **Longitude:**	**44.5436 N** **-72.0103 W**
Land Ownership:	Town
Drainage Area (acres)	0.5
Impervious (acres)	0.1

Site Description: Steep road segment with erosion and no ditches. Steep drop to cross-culvert inlet has gully erosion. Storm drain directly connected to intermittent stream draining to wetland.

Photo 1: No ditch along steep section of road draining to a drop inlet.

Photo 2: Stormwater cross under road to intermittent stream flowing into a wetland.

BMP Description: Install a stone lined ditch to trap sediment upslope of the storm drain.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	2	4	3	19 **(Medium)**

Additional Project Benefits Description: Erosion along the steep road is a likely an ongoing issue requiring regular road maintenance.

Project Comments: The project is assigned a medium priority due to the low cost and ease of implementation required to address a significant ongoing sediment source. The road segment may be classified as "hydrologically connected" for the MRGP standards. The project should reduce overall maintenance requirements for the Town. Additional design should be minimal and we do not expect any permitting requirements. **We estimate that the project should cost $5,000 to $10,000.**

Project: LY-35	**Problem Area Summary**

Date Observed:	5/24/2017
Location:	Shores Hill
Latitude: **Longitude:**	**44.5433 N** **-72.0089 W**
Land Ownership:	Town
Drainage Area (acres)	0.5
Impervious (acres)	0.1

Site Description: Steep road segment with erosion and no ditches. Stormwater flows across road and empties in to wetland to the southwest. Town appears to have made a temporary sediment trap in the wetland.

Photo 1: Steep road segment with no ditches, grader berm on south side.

Photo 2: Sediment trap at base of hill in wetland.

BMP Description: Establish a stone lined ditch along the north side of road and construct a stone lined sediment trap at culvert outlet

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
10	2	4	3	19 **(Medium)**

Additional Project Benefits Description: Erosion along the steep road is a likely an ongoing issue requiring regular road maintenance.

Project Comments: The project is assigned a medium priority due to the low cost and ease of implementation required to address a significant ongoing sediment source. The road segment may be classified as "hydrologically connected" for the MRGP standards. The project should reduce overall maintenance requirements for the Town. Project implementation may require additional permitting to construct a sediment trap within the wetland. **We estimate that the project should cost $5,000 to $10,000.**

Project: Rt5-2	**Problem Area Summary**

Date Observed:	6/21/2017
Location:	The White Market
Latitude: **Longitude:**	**44.5196 N** **-72.0036 W**
Land Ownership:	Private
Drainage Area (acres)	1.25
Impervious (acres)	1.25

Site Description: Runoff from the parking lot drains to the west and into a poorly defined swale. Several low points collect water and discharge to the river. Soils along the edge of the pavement are extremely compacted.

Photo 1: Compacted soil along flow path from parking lot to swale.

Photo 2: Existing low point with flow path down the steep bank to the river.

BMP Description: Identify priority runoff treatment areas and install BMPs to improve sediment and nutrient retention and mitigate peak runoff during smaller storm events. Parking and plowing changes will be required.

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
8	1	4	4	17 **(Medium)**

Additional Project Benefits Description: Runoff from the large parking area causes erosion along the edge of pavement and is creating small gullies down the steep bank to the river. The existing swale is highly compacted, limiting infiltration and increasing erosion.

Project Comments: The project is assigned a medium priority due to the large impervious area and close proximity to the Passumpsic River. The existing swale is poorly functioning. Project implementation will require some additional survey, BMP design, and mapping, but we do not expect additional permitting requirements. We estimate that total project costs should be between $5,000 and $20,000.

Project: Rt5-11	**Problem Area Summary**

Date Observed:	6/21/2017
Location:	Bandstand Park
Latitude: **Longitude:**	**44.5360 N** **-72.0061 W**
Land Ownership:	Town
Drainage Area (acres)	1.5
Impervious (acres)	0.8

Site Description: Unpaved parking area for the park is eroding. Low point along the edge of the road receives runoff from park and road, draining to a catchbasin on Maple St.

Photo 1: Low point between road and gravel parking area conveys runoff to the south.

Photo 2: Possible location for BMP near existing flower plantings.

BMP Description: Grade the site to encourage flow into a gravel swale and install a small BMP at the corner of the park. An overflow outlet can tie in to the existing catch basin. **Highway Department installed catchbasins tied in to Maple St in August/September 2017 to improve site drainage – BMP implementation is unlikely following this work.**

WQ Benefits	Landowner Support and O&M	Cost and Constructability	Additional Benefits	Total Score (Priority)
9	2	4	4	19 **(Medium)**

Additional Project Benefits Description: BMP installation in this highly visible site would provide an educational opportunity on the role of rain gardens or gravel wetlands while reducing peak runoff.

Project Comments: The project is assigned a medium priority and will address a moderate ongoing nutrient and sediment source that currently has no treatment. A rain garden or gravel wetland would be highly visible and could be educational. Some additional design will be required, we do not anticipate any additional permitting. **We estimate that total project costs will be between $5,000 and $10,000.**