

Town of Warren, Vermont

Green Infrastructure/Low-Impact Development Review

November 2013

Low Impact Development (LID) is an innovative land planning and engineering design approach which seeks to maintain a site's pre-development ecological and hydrologic function through the protection, enhancement, or mimicry of natural processes." LID is considered a non-structural practice used predominantly to guide new development. At its core, LID focuses on minimizing the impacts of development. In doing so, LID mitigates problems before they start. There are generally eight principles of LID (outlined at right). When incorporated as part of the planning process, the result is wetland and riparian habitat protection, reduction of peak runoff flow and rate through the reduction of impervious surfaces, reduced risk of flooding, improved community value and aesthetics, and long-term cost savings from reduced water infrastructure maintenance.



Infiltrate

Evaporate

Recycle

When the impacts of development on a site cannot be fully mitigated through LID due to site constraints or existing infrastructure, **Green Stormwater Infrastructure (GSI)** is often used. GSI is a suite of "systems and practices that restore and maintain natural hydrologic processes in order to reduce the volume and water quality impacts of the built environment while providing multiple societal benefits." GSI relies heavily on infiltration, evapotranspiration, storage and reuse. These functions are utilized in a decentralized way throughout the landscape to manage stormwater as close to the source as possible.

Summary of Review & Findings: Town of Warren, VT

This review provides a general analysis of the extent to which the Town of Warren supports the use and implementation of LID and GSI. Warren has a relatively high-density village center adjacent to a critical body of water, the Mad River, and a large ski area with accompanying resort development in the upper watershed. These characteristics, along with risks of unpermitted incremental development below the state stormwater regulatory threshold,

LID Components:

- Conservation Development
- Minimize Soil Compaction
- Minimize Total Disturbance
- Protect Natural Flow Patterns
- Protect Riparian Buffers
- Protect Sensitive Areas
- Reduce Impervious Surfaces
- Stormwater Disconnection

Documents Reviewed and Referenced:

Warren Town Plan (2010)

Warren Land Use and Development Regulations (2008)

Stormwater Management Regulation in the Mad River Valley: Review & Recommendations (April 2013)

Disaster Recovery and Long-Term Resilience Planning in Vermont (November 2013)

erosion and sedimentation in the road drainage network, loss of riparian buffers, impacts to headwaters and climate change vulnerability (*Stormwater Management Regulation in the Mad River Valley*, 2013) provide ample reason to seek ways in which to capture, slow and infiltrate stormwater wherever possible.

Warren's Town Plan and Land Use and Development Regulations ("the Bylaws") incorporate various green infrastructure and low impact development practices through supplemental standards in the Forest Reserve District, development standards for conditional uses, general use standards (erosion control and stormwater management on steep slopes and riparian buffers/surface water protection standards), subdivision standards and PRD/PUD standards.

Notable are the requirements of an erosion prevention and sedimentation control plan in areas of steep (15-25%) and very steep (>25%) slopes providing detailed info on BMPs to be employed during all stages of development; a conservation subdivision design process that uses designation of building envelopes, use of primary conservation areas and secondary conservation areas in subdivision standards and review; standards for subdivision and/or site design and layout for stormwater management that specifically reference LID principles; and surface water standards to protect vegetated buffer strips (50 ft) and restrict structures and buildings within a 100 ft setback.

Steps the Town of Warren could take to reduce barriers to green infrastructure implementation and further address protection for the Mad River watershed include incorporation of:

- Specific standards regarding woodland protection; Standards for maximum turf grass areas;
- Reduced driveway width and parking stall length minimums to better reflect LID standards;
- Incorporation of incentives for reduced impervious cover or use of vegetation to filter and absorb stormwater in developed areas.
- Requirements for permanent easements on riparian or wetland buffer areas;
- General use regulations that apply sediment and erosion control standards and guidelines for stormwater management to all development; specifically that not on steep slopes or already requiring a state stormwater permit.
- Discussion in the Town Plan on green stormwater infrastructure/LID and further discussion of urban drainage issues, specifically regarding erosion and sedimentation from the road and driveway drainage network;

Municipal Review:

- **Part 1:** General Plan Sections and Language
Score: 9 out of 10
- **Part 2:** Vegetation and Landscaping
Score: 11 out of 16
- **Part 3:** Minimizing Land Disturbance
Score: 11 out of 12
- **Part 4:** Impervious Area Management
Score: 18 out of 26

Total Score:
49 out of 64

If you have any questions about this review, please contact Kim McKee at mckee@cvregion.com.

The recommendations in this report should be taken in context with the findings of the recent *Stormwater Management Regulation in the Mad River Valley* report which found a need for Towns in the Mad River Valley to strengthen their stormwater management regulations, in conjunction with other management measures. Though broader in scope, recommended next steps from the stormwater report included the implementation of a stand-alone stormwater ordinance which includes, but is not limited to, thresholds for project review requirements of LID project design and technical design standards that meet the latest LID design guidance. This strategy, joined with education and outreach efforts and development of a watershed-based stormwater utility, are recommended to address existing stormwater problems and protect water resources from new development activity.

Also relevant is the *Disaster Recovery and Long-Term Resilience Planning in Vermont* report based on a pilot study in the Mad River Valley conducted by the Smart Growth Implementation Assistance Program. This study focused on reviewing state and local policies in Vermont that affect Flood Resilience and provided suggestions for local communities and the state to consider as they worked to recover, rebuild and plan for a more resilient future. The approach of implementing enhanced stormwater management techniques to slow, spread and sink floodwater throughout the whole watershed is one of four main policy options presented to improve flood resilience in Vermont communities. The following findings and recommendations can serve to support this policy approach and local efforts to reduce future losses from floods.

For questions or recommended ordinance language, please contact Kim McKee at mckee@cvregion.com.

Part 1. General Plan Sections and Language

Is there background discussion on (0-5 points):

Score: 4

- Yes No Low-Impact Development and/or Green Stormwater Infrastructure concepts
- Yes No Mention of physical setting, i.e. surface waters and watersheds in the town and region and what are the quality and threats to these resources
- Yes No Steep slopes
- Yes No Protecting shorelines and wetlands
- Yes No Urban ecosystems - rainwater travel through streets, trees, rooftops, gardens etc.

Comments:

There is no background discussion on LID or Green Stormwater Infrastructure specifically; however there is apt discussion of the physical elements significant to the Town and Village. These include geology and soils and septic suitability, development capability, agricultural lands, earth resources, wetlands, floodplains, steep slopes, rivers and streams, groundwater, different types of wildlife habitat, and forest resources. The plan includes lengthy discussion of watershed planning and protection efforts, including reference to issues critical to the health of the Mad River such as river health and water quality monitoring (threat: inadequate septic or wastewater treatment systems, agricultural run-off), non-point pollution and surface run-off, riparian vegetation maintenance and protection of headwater streams.

Various implementation strategies are included to protect fragile features, open space and natural resources through the town's Land Use and Development Regulations and Act 250 proceedings as well as to prevent degradation of water resources and improve water quality, including a strategy to "control runoff and erosion during all stages of development." Surface run-off from impervious surfaces is a referenced threat to water quality. The need for erosion control provisions and down-slope protection from stormwater runoff is referenced in discussion of development on steep slopes and in close proximity to streams.

Have inventories been done? (0-5 points)

Score: 5

- Yes No Basins, watersheds, surface water resources
- Yes No Roads, bridges and culverts
- Yes No Impaired and threatened waters
- Yes No Topography, including steep slopes
- Yes No Soils - infiltration rates

Comments:

Soil classifications and acreage are included the Town Plan in relation to septic suitability. Prime farmland/farmland of statewide importance are both discussed and mapped. Roads, bridges and culverts were inventoried and prioritized by an engineering firm in 2002, which was pre-Tropical Storm Irene.

No particular impaired waters or waterway classifications are referenced or discussed in the Town Plan, though implementation strategies related to water quality include to “support the maintenance and upgrade of the existing water classifications on all town surface waters.” Areas of steep slopes are discussed at length including development considerations for erosion and run-off, associated costs, and adverse impacts on scenic resources.

Part 2. Vegetation and Landscaping

A. Preservation of Natural Areas (0-5 points)

Score: 3

Municipal regulations should include requirements to preserve existing vegetated areas, minimize turf grass lawn areas, and use native vegetation.

- Yes No Are applicants required to provide a layout of the existing vegetated areas, and a description of the conditions in those areas?
- Yes No Does the municipality have maximum as well as minimum yard sizing ordinances?
- Yes No Are residents restricted from enlarging existing turf lawn areas?
- Yes No Do the ordinances provide incentives for the use of vegetation as filters for stormwater runoff?
- Yes No Do the ordinances require a specific percentage of permanently preserved open space as part of the evaluation of cluster development?

Comments:

The Bylaws outline provisions for mapping existing vegetated areas explicitly in the Development Review process and indirectly in the Subdivision Review process, which more specifically requires mapping of all primary conservation resources and secondary conservation resources. “Existing vegetation” not specifically referenced in Subdivision Review, though related resources such as steep slopes, critical wildlife habitat, surface water buffer areas, scenic resources, etc. encompass vegetation that provide ecological, scenic or flood control values. The Development Review Board can also require forest management, tree removal and vegetation management plans; an erosion prevention, sediment control and stormwater management plan and other information or studies necessary to conduct a comprehensive review.

While there are no explicit regulations regarding yard size, restricting turf grass lawn areas or use of native vegetation, requirements for designating Building Envelopes (Section 7.3) can be used to limit lawn areas and Surface Water Protection (Section 3.13) standards also restrict vegetation disturbance in the buffer.

Directive language is used in development review standards indicating that development shall not have an undue adverse effect or impact on important natural resources or fragile features. DRB may restrict clearing by requiring establishment of buffer areas, conservation easements/deed restrictions or designating building envelopes to limit clearing and yard area. Development Standards are most restrictive in the Forest Reserve District which requires “careful consideration” in location of proposed

structures relative to existing vegetation and the location of fragile features.

Subdivision Standards (Section 7.4) requires that subdivisions be designed to preserve open space areas and common lands for parks, recreation, greenways, viewshed and historic site protection and/or to preserve primary and secondary conservation areas. PUD/PRD requires at least 50% of the total project area to be set aside as open space in the Forest Reserve District and incentives (density bonuses) are offered for increased percentages of open space set aside or if a percentage of the total number of dwelling units created are affordable housing.

B. Tree and Forest Protection Ordinances (0-3points) Score: 1

Municipalities should consider enhancing tree ordinances to a forest ordinance that would also maintain the benefits of forested areas (not just individual trees and their removal and replacement)

Yes No Does the municipality have a tree protection ordinance?

Yes No Can the municipality include a forest protection ordinance?

Yes No If forested areas are present at development sites, is there a required percentage of the stand to be preserved?

Comments:

Development and Subdivision review may require forest management, tree removal and vegetation management plans, though the Bylaws do not include a tree or forest protection ordinance. The Bylaws also do not require an exact percentage of a stand to be preserved on development sites.

Subdivision regulations may require landscaping and screening (Section 7.2 F) and purposes include providing for stormwater infiltration and management, establishing street trees and preserving existing trees of particular natural or aesthetic value to the site. While the ordinances are not stand-alone nor woodland-specific, Development Standards regarding tree cover are most restrictive in the Forest Reserve District (Table 2.1 F) where it is required that forest cover be maintained adjacent to proposed structures for scenic impact purposes. PRD/PUD Open Space and Common Land Guidelines (Table 8.1) outline Upland forest, especially large tracts of forest contiguous to other large, undeveloped forest land as appropriate features to designated as open space.

Tree clearing also limited through Steep Slope regulations, riparian buffer requirements and the relationship of trees to various resources included in primary and secondary conservation areas (i.e. ridgelines and knolls, groundwater source protection areas, etc.)

C. Landscaping Island and Screening Ordinances (0-3 points) Score: 3

Landscaping islands can provide ideal opportunities for the infiltration and disconnection of runoff, or the placement of GSI systems. Hardy, low maintenance vegetation should be used for successful, low-cost systems.

- Yes** **No** Do the ordinances require landscaping islands in parking lots, or between the roadway and the sidewalk?
- Yes** **No** Can the ordinance be adjusted to require vegetation that is more beneficial for stormwater quality, groundwater recharge, or stormwater quantity, but that does not interfere with driver vision at the intersections?
- Yes** **No** Is the use of bioretention islands and other stormwater practices within landscaped areas or setbacks allowed and/or encouraged?
- Yes** **No** Do the ordinances require screening from adjoining properties? Can the screening criteria require the use of vegetation to the maximum extent practical before the use of walls or berms?

Comments:

General Regulations in the Bylaws require landscaping islands in parking lots of 8 or more spaces (Section 3.10), unless otherwise approved by DRB. Subdivision Standards provide that use of Best Management Practices shall be used to mitigate effects of stormwater runoff, including vegetated buffers and filter strips, grassed or lined swales, retention basins, recharge trenches, constructed wetlands, and bioretention and filtration facilities (Section 7.5).

Development review may require landscaping and screening as a condition of approval for parking areas (Section 3.10) and may also impose specific requirements regarding landscaping and screening designed to preserve and incorporate existing vegetation, be suited to existing site conditions and establish a consistent streetscape. Subdivision regulations may require landscaping and screening (Section 7.2 F) for a larger range of purposes, including providing vegetated buffer to protect natural resources, providing for stormwater infiltration and management, establishing street trees and preserving existing trees of particular natural or aesthetic value to the site.

D. Riparian Areas (0-5 points)

Score: 4

Municipalities may have existing buffer floodplain ordinances that require the protection of vegetation adjacent to streams. The municipality should consider conservation restrictions and allowable maintenance to ensure the preservation of these areas.

- Yes** **No** Are there measures beyond Floodplain Districts to provide streamside buffers in the community? If so, how strong is this buffer and does it apply in areas zoned for higher density residential and commercial development?
- Yes** **No** Has the municipality also adopted FEH overlay districts or equivalent on a significant portion of its streams in areas zoned for higher density residential and commercial development?
- Yes** **No** Do the ordinances require a conservation easement, or other permanent restrictions on buffer areas?
- Yes** **No** Do the ordinances identify or limit when stormwater outfall structures can cross the buffer?
- Yes** **No** Do the ordinances restrict development activities that increase impervious cover?

Comments:

General Regulations in Warren's Bylaws contain a Surface Water Protection section (3.13) with a purpose of preventing soil erosion, protecting wildlife habitat and maintaining water quality. Section 3.13 requires a 50 ft minimum vegetated buffer strip from ALL surface waters, including areas zoned for higher density development, and prohibits all development, excavation, fill or grading with the exception of clearing to accommodate roads, driveway and utility crossings, streambank stabilization and restoration projects, unpaved bicycle and pedestrian paths and trails, public rec facilities and improved river/lake accesses. The ordinance does not restrict where a stormwater outfall structure can cross the buffer.

Conditional use approval is also required for any building or structure within 100 feet of any stream or river, or lake or pond with a surface area greater than 20 acres and DRB must find no adverse effect on the ability of the stream to carry flood waters, the water quality of the stream, the natural beauty of the stream, or the area's historic settlement pattern. Increased setbacks and/or undisturbed buffers may be required depending on site conditions. Warren adopted FEH overlay districts in ____ (*complete when FEH adoption has occurred*).

Subdivision Standards (Section 7.3) require that building envelopes be located and configured to exclude Primary Conservation Areas (encompassing wetlands, surface waters and buffers) and that management plans, conservation easements, limitations on further subdivision or comparable site protection mechanisms may be required. No conservation easement or permanent restrictions are explicitly required on buffer areas, but the DRB may require that protected open space, which may include riparian areas and vegetated buffers, be dedicated, either in fee or through a conservation easement to the Town, a homeowners association, or a non-profit.

Impervious cover is restricted by the use of building envelopes in subdivision regulations and maximum lot coverage (MCL) provisions in the different zoning district – Forest Reserve District as most restrictive (2%), Alpine Village Residential (25%) as next most restrictive, and most others at 50-66% MCL. Neither the Rural Residential nor Warren Village Historic Residential has MCL restrictions.

Part 3. Minimizing Land Disturbance

The minimization of disturbance can be used at different phases of a development projects. The goal is to limit clearing, grading, and other disturbance associated with development to protect existing features that provide stormwater benefits. Zoning ordinances typically limit the amount of impervious surfaces on building lots, but do not limit the amount of area that can be disturbed during construction. This strategy helps preserve the site's existing hydrologic character, as well as limiting the occurrence of soil compaction.

A. Limits of Disturbance (0-7points)

Score: 6

Designing with the terrain, or site fingerprinting, requires an assessment of the characteristics of the site and the selection of areas for development that would minimize the impact. This can be incorporated into the requirements for existing site conditions and the environmental impact statement. Limits of

disturbance should be incorporated into construction plans reviewed and approved by the municipality. Setbacks should be evaluated to determine whether they can be reduced.

- Yes** **No** As part of the depiction of existing conditions, are environmentally critical and environmentally constrained areas identified? (Environmentally critical areas are areas or features with significant environmental value, such as steep slopes, stream corridors, natural heritage priority sites, and habitats of threatened and endangered species. Environmentally constrained areas are those with development restrictions, such as wetlands, floodplains, and sites of endangered species.)
- Yes** **No** Can any of the existing setbacks be reduced?
- Yes** **No** Are there maximum turf grass or impervious cover limits in any of the setbacks?
- Yes** **No** Do the ordinances inhibit or prohibit the clear-cutting of the project site as part of the construction?
- Yes** **No** Is the traffic of heavy construction vehicles limited to specific areas, such as areas of proposed roadway? Are these areas required to be identified on the plans and marked in the field?
- Yes** **No** Do the ordinances require the identification of specific areas that provide significant hydrologic functions, such as existing surface storage areas, forested areas, riparian corridors, and areas with high groundwater recharge capabilities?
- Yes** **No** Does the municipality require an as-built inspection before issuing a certificate of occupancy? If so, does the inspection include identification of compacted areas, if they exist within the site?
- Yes** **No** Does the municipality require the restoration to compacted areas in accordance with the Soil Erosion and Sediment Control Standards?

Comments:

Development and Subdivision Review both require depiction of existing conditions and identify environmentally critical and environmentally constrained areas. Subdivision Review uses two tiers of conservation areas: Primary and Secondary (Section 7.3). Primary Conservation Areas require that the location of roads, driveways and infrastructure and building envelopes shall be located and configured to avoid any adverse impacts. Setbacks (Building Envelopes) and protection measures can be reduced for Secondary Conservation Areas as the regulations note that building envelopes shall be located and configured to avoid to the extent feasible any adverse impacts to secondary conservation areas.

While there are no maximum turf grass provisions, Building Envelope requirements serve to limit turf grass in the subdivision standards and impervious cover limits are imposed in most zoning districts. The Bylaw inhibits the clearcutting of project sites through requirements to minimize disturbance in development on steep slopes (Section 3.4) and protection of vegetated buffers adjacent to surface waters. Subdivision Standards also require that subdivision, site design and layout maintain natural vegetative cover for effective stormwater management (Section 7.5). Conditional Use standards in Development review (Section 5.3) may require establishment of buffer areas, designation of building envelopes to ensure that development, including clearing and yard area, do not adversely impact important natural resources and fragile features.

Bylaws do require identification resources that provide significant hydrologic functions, including existing vegetation, floodplains and wetlands in Subdivision Standards (Section 7.3) and Development Review for Conditional Use Standards (Table 5.1); the Bylaws also require no adverse impact on wetlands, rivers and streams and adjacent buffer areas, groundwater source protection areas and/or flood plains.

As-built inspections are required for a Certificate of Zoning Compliance or Certificate of Subdivision Compliance (Section 9.4), though inspection as described does not necessarily include identification of compacted areas. Bylaws do require the restoration of compacted areas within Steep Slope regulations (15% and up) (Section 3.4).

B. Open Space and Cluster Development (0-5 points)

Score: 5

Open space areas are restricted land that may be set aside for conservation, recreation, or agricultural use, and are often associated with cluster development requirements. Since open space can have a variety of uses, the municipality should evaluate its open space ordinances to determine whether amendments are necessary to provide improved stormwater benefits.

- Yes** **No** Are open space or cluster development designs allowed in the municipality?
- Yes** **No** Are flexible site design incentives available for developers that utilize open space or cluster design options?
- Yes** **No** Are there limitations on the allowable disturbance of existing vegetated areas in open space?
- Yes** **No** Are the requirements to re-establish vegetation in disturbed areas dedicated for open space?
- Yes** **No** Is there a maximum allowable impervious cover in open space areas?

Comments:

Warren uses Open Space Subdivision design principles and requires the design sequence to occur in the following order: 1) Identify conservation areas, 2) Identify potential development areas, 3) Identify building sites & envelopes, 4) Layout roads, driveways & utilities, and 5) Identify proposed lot boundaries. Flexible site design incentives are available for developers that utilize PRD/PUD in the form of density bonuses for either increased open space set aside or incorporation of affordable housing units.

Conservation easements, limitations on further subdivision or comparable site protections may be required for the open space. Vegetation disturbance is limited to the extent said vegetation is connected to natural values, scenic values or flood/erosion hazard (riparian buffers, steep slopes, etc.) and/or is outside the designated building envelope, where all areas of principle and accessory structures, parking areas, and associated site development are located, with the exception of road and utility rights-of-way.

Re-establishment of vegetation in disturbed areas may be required by Stormwater Management and Erosion Control measures in Subdivision Standards (Section 7.5). It is required that all areas exposed during construction be protected in accordance with state and federal standards. DRB may require phasing and that permanent vegetation and erosion control measures according to a schedule.

Part 4. Impervious Area Management

The amount of impervious area, and its relationship to adjacent vegetated areas, can significantly change the amount of runoff that needs to be addressed by BMPs. Most of a site's impervious surfaces are typically located in the streets, sidewalks, driveway, and parking areas. These areas are further hampered by requirements for continuous curbing that prevent discharge from impervious surfaces into adjacent vegetated areas.

A. Streets and Driveways (0-8 points)

Score: 7

Street widths of 18 to 22 feet are recommended for low impact development designs in low density residential developments. Minimum driveway widths of 9 and 18 feet for one lane and two lanes, respectively, are also recommended. The minimum widths of all streets and driveways should be evaluated to demonstrate that the proposed width is the narrowest possible consistent with safety and traffic concerns and requirements. Municipalities should evaluate which traffic calming features, such as circles, rotaries, medians, and islands, can be vegetated or landscaped. Cul-de-sacs can also be evaluated to reduce the radius area, or to provide a landscape island in the center.

- Yes** **No** Are the street widths the minimum necessary for traffic density, emergency vehicle movement, and roadside parking?
- Yes** **No** Are street features, such as circles, rotaries, or landscaped islands allowed to or required to receive runoff?
- Yes** **No** Are curb cuts or flush curbs with curb stops an allowable alternative to raised curbs?
- Yes** **No** Can the minimum cul-de-sac radius be reduced or is a landscaped island required in the center of the cul-de-sac?
- Yes** **No** Are alternative turn-arounds such as "hammerheads" allowed on short streets in low density residential developments?
- Yes** **No** Can the minimum driveway width be reduced?
- Yes** **No** Are shared driveways permitted in residential developments?
- Yes** **No** Can you reduce total length by considering alternative street layouts?

Comments:

Warren's Bylaws includes road standards within Subdivision Standards (Section 7.7) and specifications for street widths are at appropriate minimums for LID. Stormwater Management and Erosion Control provisions in Subdivision Standards (Section 7.5) require avoidance or minimal use of curbing and gutters and require that subdivision and/or site design minimize the length, width and paved area of roads and driveways. These standards also note that subdivision and/or site design and layout shall incorporate landscaped areas to absorb stormwater runoff from adjoining impervious surfaces (e.g. yard areas, filter strips, parking and cul-de-sac islands).

Residential driveways shall be constructed to town driveway standards (VTrans B-71) unless otherwise required and these standards dictate a 12 ft minimum, which do not reflect LID guidelines. Shared driveways are permitted (Article 5) and encouraged in residential development (Section 7.5). Steep Slope

provisions in General Use Standards (Section 3.4) also require that driveways and roads follow the natural contours of the land, and not exceed an avg finished grade of 12% over any 50 ft section.

The Subdivision Standards (Section 7.7 E) require that roadbeds, shoulders, ditches and culverts are designed and maintained in conformance with the VT Better Backroads Manual, whose principals include avoid having water run lengthwise down roads, stabilizing and revegetating disturbed areas near road infrastructure, and diverting runoff from surface waters and into vegetated areas.

B. Parking Areas and Sidewalks (0-13 points)

Score: 7

A mix of uses at a development site can allow for shared parking areas, reducing the total parking area. Municipalities require minimum parking areas, but seldom limit the total number of parking spaces.

- Yes No Can the parking ratios be reduced?
- Yes No Are the parking requirements set as maximum or median rather than minimum requirements?
- Yes No Is the use of shared parking arrangements allowed to reduce the parking area?
- Yes No Are model shared parking agreements provided?
- Yes No Does the presence of mass transit allow for reduced parking ratios?
- Yes No Is a minimum stall width of 9 feet allowed?
- Yes No Is a minimum stall length of 18 feet allowed?
- Yes No Can the stall lengths be reduced to allow vehicle overhang into a vegetated area?
- Yes No Do ordinances allow for permeable material to be used in overflow parking areas?
- Yes No Do ordinances allow for multi-level parking?
- Yes No Are there incentives to provide parking that reduces impervious cover, rather than providing only surface parking lots?

Sidewalks can be made of pervious material or disconnected from the drainage system to allow runoff to re-infiltrate into the adjacent pervious areas.

- Yes No Do ordinances allow for sidewalks constructed with pervious material?
- Yes No Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)?

Comments:

Parking requirements are set as minimums though shared parking arrangements are allowed to reduce the parking area in both Development Review for Conditional Uses (Section 5.3) and in General Use Standards. As outlined in General Use Standards (Section 3.10), parking ratios can be reduced or waived by the DRB if green areas are set aside for future conversion, adequate shared parking is available under common ownership or a long-term lease, adequate off-site public parking exists within reasonable walking distance (or applicant pays fee, proposal is for development of affordable or elderly housing or parking structures are designed to avoid land intensive, single-level parking.

Though this reference to multi-level parking is present in Section 3.10, multi-level parking or parking structures are not explicitly listed in the district use tables (Article 2). No mention is made to reduced parking requirements due to the availability of mass transit. DRB may require the preparation and implementation of a parking management plan to ensure efficient use of available parking and Subdivision Standards (Section 5.3) require driveway connections to parking areas on adjacent properties, or provision for future connection to adjacent properties where feasible.

Parking ratios for professional, government and business offices could be reduced – recommended is no more than 3 off-street spaces per 1,000 sq ft and Warren’s Bylaw dictates 3.33 spaces). Minimum stall width is appropriate, though minimum stall length could be decreased up to 4 ft. Subdivision Standards require that the use of pervious materials in spillover parking.

C. Unconnected Impervious Areas (0-3 points)

Score: 3

Disconnection of impervious areas can occur in both low density development and high density commercial development, provided sufficient vegetated area is available to accept dispersed stormwater flows. Areas for disconnection include parking lot or cul-de-sac islands, lawn areas, and other vegetated areas.

- Yes** **No** Are developers required to disconnect impervious surfaces to promote pollutant removal and groundwater recharge?
- Yes** **No** Do ordinances allow the reduction of the runoff volume when runoff from impervious areas is infiltrated into vegetated areas?
- Yes** **No** Do ordinances allow flush curb and/or curb cuts to allow for runoff to discharge into adjacent vegetated areas as sheet flow?

Comments:

Subdivision Standards (Section 7.5) note that subdivision and/or site design and layout shall minimize the impervious area connected directly to stormwater conveyance systems (e.g. by draining such areas over stable, vegetated pervious areas) and incorporate landscaped areas to absorb stormwater runoff from from adjoining impervious surfaces (e.g. yard areas, filter strips, parking and cul-de-sac islands).

Flush curbs and curb cuts are not specifically mentioned in relation to stormwater runoff, though Subdivision Standards (Section 7.5) state that site design and layout shall be designed to avoid or minimize the use of curbing and gutters.

D. Vegetated Open Channels (0-2 points)

Score: 1

The use of vegetated channels, rather than the standard concrete curb and gutter configuration, can decrease flow velocity, and allow for stormwater filtration and re-infiltration. One design option is for vegetated channels that convey smaller storm events, such as the water quality design storm, and provide an overflow into a storm sewer system for larger storm events.

Yes **No** Do ordinances allow or require vegetated open channel conveyance instead of the standard curb and gutter designs?

Yes **No** Are there established design criteria for vegetated channels?

Comments:

Subdivision Standards (Section 7.5) requires that subdivision and/or site design and layout shall use vegetated, open channels within road rights-of-way to convey and treat stormwater, where density, topography, soils and slopes permit. The ordinance does not contain established design criteria for vegetated channels.

SUMMARY OF QUANTITATIVE ANALYSIS

GI / LID Municipal Plan and Bylaw Review:	
Name of Municipality	Town of Warren, VT
County	Washington
Month and Year of Review	Nov. 2013
Name of RPC performing review	Central Vermont RPC
Part 1. General Plan Sections and Language	
Is there background discussion (0-5 points)	4
Have inventories been done (0-5 points)	5
Part 2: Vegetation and Landscaping	
A. Preservation of Natural Areas (0-5 points)	3
B. Tree and Forest Protection Ordinances (0-3 points)	1
C. Landscaping Island and Screening Ordinances (0-3 points)	3
D. Riparian Areas (0-5 points)	4
Part 3: Minimizing Land Disturbance	
A. Limits of Disturbance (0-7 points)	6
B. Open Space and Cluster Development (0-5 points)	5
Part 4: Impervious Area Management	
A. Streets and Driveways (0-8 points)	7
B. Parking Areas and Sidewalks (0-13 points)	7
C. Unconnected Impervious Areas (0-3 points)	3
D. Vegetated Open Channels (0-2 points)	1
TOTAL SCORE	49
MAXIMUM SCORE	64