

Peer Review of the  
Definitive Subdivision Plan for the  
**Retreat Amherst**  
Amherst, MA

*August 5, 2014*

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**Engineer/Surveyor**

SVE Associates  
377 Main Street  
Greenfield, MA 01301

**Applicant**

Retreat Amherst, LLC  
455 Epps Bridge Parkway, Ste. 201  
Athens, GA 30606

**Owner**

W.D. Cows, Inc.  
134 Montague Road  
N. Amherst, MA 01059

**Location**

Off Henry Street, Market Hill Road  
and Flat Hills Road

**Parcel Numbers**

6A-84, 91, 95 and 96

**Zoning Districts**

Outlying Residence R-O  
Neighborhood Residence R-N

**Content**

Eighty (80) Sheets

**Plan Dated**

May 27, 2014



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## **INTRODUCTION**

Professional Services Corporation (PSC) has been engaged by Jack Hirsch, a resident of Amherst and a direct abutter to the Retreat Amherst, to conduct a peer review of the Proposed Project.

The Retreat Amherst is a student housing project located on a 147.3 acre site off Henry Street, Market Hill Road, and Flat Hills Road. A total of 123 residential buildings is proposed containing 175 housing units including 71 single family units and 104 duplex units. The site will be subdivided into 123 buildable lots, open space parcels, and other parcels. Street "A" extends from Market Hill Road to Flat Hills Road and has a total length of 4,762 linear feet and will be constructed to "Secondary Street" standards. Streets B, C, D, and E will be constructed to "Minor Street" standards. The total length of all proposed streets will be 11,394± linear feet. The applicant proposed that all streets are to remain private; however, the Planning Board will further review this issue.

The project requires approval by the Planning Board as a definitive subdivision plan of land under the Rules & Regulations of the Amherst Planning Board. The project is being filed as a Cluster Subdivision, which is a use permitted by right subject to site plan approval by the Planning Board pursuant to Section 4.3 of the Zoning Bylaw(as Amended through November 2013). The required application for Site Plan Approval has not been filed as of this date. As discussed hereinafter, it is our opinion that a Special Permit from the Board of Appeals is required to authorize proposed duplex units.

An Order of Conditions must be obtained from the Amherst Conservation Commission or in lieu thereof a Superseding Order of Conditions from Massachusetts Department of Environmental Protection under the Massachusetts Wetlands Protection Act (MGL Ch. 131 §40). The project will alter more than 50 acres of land and will create more than 10 acres of new impervious area. Accordingly the project exceeds the review thresholds of 301 CMR 11.00: MEPA Regulations §11.03 and is categorically included and requires the preparation of an Environmental Notification Form and a Draft and Final Environmental Impact Report.

The project will be served by the municipal water distribution system and the municipal sanitary sewer system.



## BASIS OF REVIEW

Our evaluation is based upon review of the following:

- A. "Retreat at Amherst Definitive Plan Development Impact Statement" prepared by SVE Associates dated May 23, 2014.
- B. "Stormwater Management Plan" prepared by SVE Associates dated May 27, 2014 including the "Existing Hydrology Plan" and the "Developed Hydrology Plan" and the technical Appendices A through I.
- C. "Definitive Subdivision Plan for the Retreat Amherst" prepared by SVE Associates dated May 27, 2014 consisting of 80 sheets.
- D. "Letter" regarding Supplemental Test Pit Investigations Proposed Housing Development, Retreat at Amherst, North Amherst, Massachusetts dated May 27, 2014 prepared by O'Reilly Talbot & Okun Associates.
- E. "Traffic Impact Study Proposed Residential Development Retreat Amherst, Amherst, Massachusetts" dated May 2014 prepared by BETA.
- F. "Town of Amherst Zoning Map" as most recently amended June 2014.
- G. "Zoning Bylaw, Amherst, Massachusetts" as amended through November 2013.
- H. The Rules & Regulations of the Amherst Planning Board Governing the Subdivision of Land.
- I. Town Of Amherst - Planning Board Rules and Regulations October 17, 2012.

## ZONING

1. The Amherst Zoning Bylaw is enacted "...for the purpose of promoting the health, safety, convenience and general welfare of the inhabitants of the Town of Amherst, and to encourage the most appropriate use of land throughout Amherst (emphasis added) (§1). Further, "The purpose of all residential zones is to promote a suitable environment for residential life through the provision of recreational, religious and educational facilities as basic elements of a balanced



neighborhood, to stabilize and protect the essential characteristics of existing residential development, and to foster development that is compatible with the other natural and built characteristics of the area (emphasis added) (§2.01). As set forth in Comments 22 through 38, hereinafter, the submitted subdivision proposes extensive and significant violations of the Rules & Regulations in terms of the design of subdivision streets. Further, street construction will require extensive earthwork and land clearing even if the requested waivers of subdivision street design standards are granted by the Planning Board. The broad based noncompliance with the minimum design requirements of the Rules & Regulations and the extensive land clearing and earthwork necessary to build the subdivision improvements serve as prima facie evidence that the scale and density of the Retreat Amherst is incompatible with the character of the land. As submitted, the Retreat Amherst is not consistent with the purpose of the Bylaw in that it does not “encourage the most appropriate use of land.” Further, the Retreat Amherst is not consistent with the purpose of the residential districts in that it does not “...foster development that is compatible with the other natural and built characteristics of the area.”

2. A total of 104 duplex units are proposed in 52 buildings. As set forth in Section 4.3, cluster development is allowed by right subject to site plan approval in the Outlying Residence (R-O) District. However, the provisions of §4.3 do not take precedence over the provisions of §3.3211 nor are the provisions of §4.3 sufficient to authorize duplex dwelling units. Cluster development is not a “use” but rather it is one of several “Development Methods” allowed in residential districts. All uses allowed under the Amherst Zoning Bylaw are specifically enumerated in Table 3. This framework is reinforced by the introductory paragraph of Table 3 which states “For the purposes of this Bylaw, existing and future uses of land, buildings and other structures shall be allocated among the following categories.” Section 4.3 sets standards for a particular “Development Method” which utilizes reduced lot dimensional requirements to provide open space. The provisions of Section 4.320 limit permitted uses within a cluster development to “...one-family detached dwelling, a zero lot line single family dwelling, a two-family detached dwelling (duplex), or attached dwellings..” but do not authorize these uses unless in compliance with all other requirements of the Bylaw. Accordingly a Special Permit from the Board of Appeals is required to authorize the 104 duplex units.
3. For non-owner occupied duplex units, a management plan is required to be submitted as an integral part of any application (§3.3211).



4. For non-owner occupied duplex units, a Response Plan describing the concrete steps to be taken by the property owner or management in response to complaints about the operation of the use or the conduct of the tenants is required to be submitted (§3.3211).
5. Duplex units are allowed by Special Permit from the Board of Appeals (§3.3211). For all residential development requiring a Special Permit and resulting in additional new dwelling units, affordable housing units shall be provided (§15.10). A minimum of 12 affordable dwelling units (12 percent rounded down) must be provided and a minimum of 6 of the affordable units (49 percent rounded up) shall be eligible and countable for the purpose of the Massachusetts Department of Housing and Community Development's Subsidized Housing Inventory (DHCD's SHI).
6. Due to the unusual character of the proposed use, written documentation from DHCD should be provided to the Planning Board prior to Decision approving the form of the required "limited dividend organization" that will own the affordable units, the form of restriction in perpetuity (deed rider) for the affordable units, and the methods of calculating rent affordability limits. DHCD would also have to approve the distribution of affordable units throughout the project and approve the mechanism for determining unit count whether by bedroom or dwelling unit.
7. The Retreat Amherst is substantially different from existing abutting residential properties in terms of scale, density, traffic, and other key land use based impacts. To preserve the character of existing neighborhood, a substantial buffer should be provided along the perimeter of the project. We recommend that a 100 foot wide no cut zone be required at the subdivision boundary as a Condition of Approval.
8. With respect to the Zoning Act, the recommended 100 foot wide buffer is specifically authorized by and ensures compliance with the provisions of Section 9 of the Zoning Act (MGL Ch. 40A §9). Section 9 provides that 'Cluster development' means a residential development in which the buildings and accessory uses are clustered together into one or more groups separated from adjacent property and other groups within the development by intervening open land (emphasis added)
9. With respect to the Amherst Zoning Bylaw, the recommended 100 foot wide buffer ensures consistency with the purpose of residential districts, which is "...to stabilize and protect the essential characteristics of existing residential development" (§2.01). Further, the



recommended 100 foot wide buffer ensures consistency with the purpose of “Cluster Development’ which requires that the development be designed in a manner that ensures “Compatibility with the character of the surrounding residential areas” (§4.313). The Amherst Zoning Bylaw specifically provides that approval by Site Plan Review by the Planning Board shall be in accordance with the purposes of Cluster Development as set forth in Section 4.31 including subsection.

10. As set forth in Comment 2, provision of proposed duplex structures requires authorization by Special Permit from the Board of Appeals (§3.3211). In granting a Special Permit the Special Permit Granting Authority may impose conditions, safeguards, and limitations which shall be in writing and shall be a part of any Special Permit granted. Such conditions, safeguards, and limitations may include, among other matters and subjects setback, side and rear yards greater than the minimum required by this Bylaw. The proposed 100 foot buffer strip serves functionally as a means to provide for increased setbacks.
11. As set forth in Comment 2, provision of proposed duplex structures require authorization by Special Permit from the Board of Appeals (§3.3211). In granting a Special Permit the Special Permit Granting Authority may impose conditions, safeguards, and limitations which shall be in writing and shall be a part of any Special Permit granted. Such conditions, safeguards, and limitations may include, among other matters a reduction in residential density. The broad based noncompliance with the minimum requirements of the Rules & Regulations and the extensive land clearing and earthwork necessary to build the subdivision improvements is driven by the proposed project density. A reduction in project density is reasonable and required.
12. The maximum height limit in the R-O District is 2½ stories. The “Stafford Model” building does not comply. A revised building design is required.
13. The required “Usable Open Space” is not shown on the plans nor are the required improvements providing for both active and passive recreation (§4.570).
14. The form of ownership of the common land should be reviewed with the Board and noted on the plans (§4.350).
15. Dwelling units in which two or three rooms are separately occupied by “roomers” or “lodgers” is an accessory use allowed by right in all districts and such dwelling units are required to be



owner occupied (§5.0100). The proposed Retreat Amherst units are not owner occupied and therefore do not comply. Dwelling units in which four rooms are separately occupied by “roomers” or “lodgers” is an accessory use allowed by Special Permit from the Board of Appeals in all districts and such dwelling units are required to be owner occupied (§5.0101). A Special Permit has not been applied for and the Retreat Amherst units are not owner occupied and therefore do not comply.

16. The filling of land accessory to the development of property will be required. The area of fill placed for construction of streets and construction of other subdivision improvements should be computed and submitted in order to determine if the Special Permit threshold is exceeded with respect to filling of land which raises the existing grade of any portion of a property for 5,000 square feet or more in area by an average of two (2) feet or more or the filling of land or which raises the existing grade of any portion of a property for 2,000 square feet or more in area by an average of five (5) feet or more (§5.10).
17. Numerous building locations do not comply with the frontage (100 ft.), front setback (20 ft.), and side yard and rear yard (15 ft.) requirements for cluster development (Table 3). The Planning Board can grant relief as part of the Site Plan Review process; however, the applicant has presented no information as to why relief is in the public interest given that the standards from which relief is sought are already reduced requirements specifically applicable to cluster lots. This will be evaluated in further detail under Site Plan Review.
18. Several lots are encumbered by open space easements, which effectively deny residents beneficial use of the minimum useable lot area intended in the Bylaw. The unencumbered lot areas are commonly less than the minimum lot areas of 15,000 sq.-ft. for single family use and 25,000 sq.-ft. for two-family use. The Planning Board should determine if this is a defacto contravention of the intent of the Bylaw with respect to lot area.
19. With regard to open space easements across lots, will there be additional restrictions placed on the open space on these lots that will not be placed on other open space in the subdivision.



## GENERAL

20. Street "A" accesses Market Hill Road through a triangular shaped parcel in Town ownership. Conveyance "in fee" of land required for the proposed street or alternatively conveyance of a permanent access and utility easement encompassing the land required for the subdivision street is required. Conveyance of an interest in real property or conveyance of a partial interest in real property with respect to a utility and access easement requires a two-thirds majority vote of Town Meeting.
21. The Typical Roadway Sections (Sheet 14.1) stipulate the pavement section will be in accordance with the geotechnical report. A geotechnical report for the project prepared by O'Reilly, Talbot and Okun Associates dated December 20, 2013 and a supplemental geotechnical report dated May 27, 2014 were submitted; however, neither report provides requirements for a street pavement section. The Board cannot reach a determination as to the adequacy of design elements which are unknown as of the date of Decision. In any instance the Rules & Regulations standard pavement section should serve as a minimum regardless of the geotechnical report findings.

## SUBDIVISION STREETS

22. Street "D" is likely to carry traffic other than traffic to or from lots on that street, and the Board could therefore determine that it should be designed to "Secondary Street" standards (§II.A.9.b).
23. Street "B" is 4,162 feet in length which substantially exceeds the maximum permitted dead end street length of 800 feet (§V.G.1.d). Municipalities throughout Massachusetts have standards for the maximum length of dead end streets. These standards vary from community to community but maximum lengths of 500 to 1,000 feet are common. In this instance the street length violates standard regulatory practice and accepted site design principals. There are 47 lots on this dead end street which would be generally regarded as excessive in terms of common regulatory practice.
24. This long dead end street creates serious concerns regarding potential blockage of emergency vehicle access and poor traffic circulation. These concerns are enhanced due to substandard horizontal and vertical roadway geometry which does not comply with the Board's Rules &



Regulations and includes a horizontal centerline radius of 150 feet and profile grades of up to 10 percent.

25. The above length of a dead end street begins at the Street "A" and Street "B" intersection which is the last point at which there are two access routes to the public street system. An emergency access road is proposed to connect the Street "C" cul-de-sac with the northerly segment of Street "B" but it is so long that maintenance would be difficult particularly during winter conditions and the net effect of its construction is merely to connect internal points on the dead end street.
26. Three proposed intersections do not comply with the requirement to provide a 100 foot long leveling area with a maximum grade of 4 percent (§V.G.4.a). At the Street "A" and Street "D" intersection the Street "A" approach grade is 8± percent. At the Street "B" and Street "B" intersection the Street "B" approach grade (Sta 11+00.48 to Sta 12+00.48 ) reaches 10 percent. At the Street "B" and Street "C" intersection the Street "B" approach grade is 10 percent. The maximum permitted grade is exceeded by up to 150 percent which adversely affects vehicular operations and safety. We recommend denial of waivers to exceed the permitted maximum leveling area grade of 4 percent.
27. In their guidance on the Preliminary Subdivision Plan, the Planning Board recommended that "Roads shall maintain a maximum 4% grade within 100 feet of any intersection."
28. The Planning Board Preliminary Plan Decision required provision of 24 foot wide pavement sections where appropriate (§V.G.2.2). All street sections on Sheet 14.1 show 22 foot wide pavements. Additionally, Street "A" must have a minimum pavement width of 24 feet as a Secondary Street. We have recommended that Street "D" be designed to Secondary Street standards which would require a 24 foot minimum pavement width.
29. The typical sections (Sheet 14.1) are mislabeled. Section A is labeled as street with parallel parking. The 22 foot wide pavement width is not sufficient to accommodate parallel parking. Section C is labeled as "road section without units" but dwelling units are shown on both sides of the right-of-way.
30. Section B "cross section at stream crossing" should be revised to provide vehicular guardrail or a parapet wall and a 42 inch high pedestrian railing. Consideration should be given to narrowing



the shoulders to reduce the wetland impact footprint. Poured in place walls are more durable and will minimize long term maintenance.

31. With respect to 'Secondary Street' standards, the design of Street "A" extensively incorporates centerline radii which do not comply with the minimum centerline radius requirement of 345 ft. (§V.G.2.3). Street "A" provides a centerline radius of 150 ft. in two locations and 190 ft. in one location. The design of Street "A" incorporates centerline radii 250 ft. in several locations along its length. The required centerline radius of less than 345 feet provides for a design speed of 30 MPH. Failure to provide a design speed of 30 MPH may comprise safety given the street length given the significant variability in the centerline radii incorporated in the design.
32. We recommend that Street "D" be designed to 'Secondary Street' standards which would require upgrading to centerline radii of 345 feet minimum (§V.G.2.3).
33. With respect to 'Minor Street' standards Street "B" and Street "D" both provide centerline radii which do not comply with the minimum required centerline radius of 245 ft. (§V.G.2.3). Street "B" provides a centerline radius of 150 ft. in one location and Street "D" provides a centerline radius of 150 ft. in one location. These substandard centerline radii provide a design speed of less than 25 MPH which may comprise a safety hazard due to the street length. Obstructions on the inside of the curve will create sight distance limitations raising additional safety concerns.
34. As a "Secondary Street," Street "A" is required to provide a minimum sight distance of 250 feet at all points (§V.G.2.5). The sag vertical curve at Sta 16+65± to Sta 18+90± and at Sta 25+01± to Sta 31+77± provide only 205± feet of sight distance. Another deficient sag vertical curve is at Sta 4+62± to Sta 6+54±. The crest vertical curve at Sta 8+91± to Sta 9+82± provides only 203± feet of sight distance. Other deficient crest vertical curves are at Sta 14.41± to Sta 14+91±, Sta 19+87± to Sta 23+27±, Sta 35+84± to Sta 36+34±, and Sta 37+23± to Sta 38+83±.
35. As a "Minor Street," Street "B" is required to provide a minimum sight distance of 150 feet at all points. On Street "B", the sag vertical curve at Sta 12+16± to Sta 12+86± provides only 131± feet of sight distance (§V.G.2.5).
36. Vertical curve data should be shown for the vertical curves on Street "D" at Sta 1+00± to Sta 3+25±, Sta 5+65± to Sta 6+40±, and Sta 8+05± to Sta 8+55±.



37. The maximum centerline grade of substantial lengths of subdivision streets exceeds 8 percent. Although centerline grades of up to 10 percent may be allowed by the Board “for short distances,” the submitted subdivision plans show grades exceeding 8 percent in numerous locations and grades exceeding 8 percent extend for significant distances along the subdivision streets. For Street “A”, grades exceeding 8 percent are shown between Sta 6+50 ± and Sta 9+00± and between Sta 32+00± and Sta 34+00±. For Street “B”, grades exceeding 8 percent are shown between Sta 3+00± and Sta 5+76± and between Sta 7+25± and Sta 8+50±. For Street “D”, grades exceeding 8 percent are shown between Sta 3+00± and Sta 6+00±.
38. Slopes of the Profile Grade Line (PGL) along the subdivision streets exceed the maximum grade permitted by the Rules & Regulations by twenty five (25) percent, i.e. PGL slopes of 10 percent are proposed. This raises safety concerns in terms of vehicular operations and emergency access during winter conditions.
39. Streets should be signed for “No Parking Any Time” (MUTCD R7-1) except where parallel parking spaces are provided adjacent to the traveled way.
40. Snow storage areas should be shown and a plan for winter storm management should be submitted.

#### SANITARY SEWERS

41. The Retreat Amherst proposes 641 bedrooms which will generate 70,510 gallons of sanitary sewage per day. We recommend that the applicant be required to obtain documentation from the Amherst Department of Public Works stating that there is sufficient capacity available in the wastewater treatment plant to accept an additional 70,510 gallons of wastewater per day.
42. As mitigation, the applicant should commit to remove infiltration and inflow into the public sewer system at a ratio of 2 to 1.
43. The maximum permitted velocity in sanitary sewers is 10 feet per second (§V.I.1.d). The velocities flowing full in sanitary sewer pipe segments A2, A9, A12, A16, A17, A19, A20, A30, A32, A33, A34, B3, B4, B5, B6, B7, B8, B13, B14, B15, B19, B20, B21, and B30 exceed 10 feet per second. Design velocities flowing full of up to 14.3 feet per second are provided.



44. Based upon generation of 70,510 gallons of sanitary sewage per day and using a residential peaking factor of 5 based upon project size, the peak flow added to the sanitary sewer system will be 0.55 cubic feet per second (cfs). The capacity flowing full of an 8 inch PVC sewer line at a velocity of 2.5 feet per second is 0.87 cfs. The Retreat Amherst will utilize 62.5 percent of the capacity of such a sewer line.
45. We recommend that the applicant be required to determine the use to capacity ratio of all downgradient sewer lines where the sanitary sewage generated by the Proposed Project exceeds 10 percent of the design capacity flowing full. The use to capacity ratio of any downgradient sanitary sewer pump stations should be determined. To mitigate adverse impacts resulting from surcharging downgradient sanitary sewer lines, the applicant should commit to upgrade any sanitary sewer lines or pump station components having insufficient capacity to accommodate the additional flow.
46. Several segments of sanitary sewer lines are proposed to be installed at extra depth. Extra cost would be involved in repair or replacement of these segments of sewer line. The Board may wish to require that sanitary sewer lines having a depth of cover in excess of 15 feet remain forever private. For example, pipe segment B23 is proposed to be installed at a depth of approximately 30 feet. Extra depth sewer lines include pipe segments A36, A37, B22, B23, B24, and B28.
47. The sanitary sewer line serving a segment of Street "A," Street "B," and Street "C" is shown to connect to an existing sewer line on the municipally owned Atkins Water Treatment Plant site. The applicant should document rights to utilize this municipally owned tract of land for installation of a sanitary sewer line.
48. The sanitary sewers line serving a segment of Street "A" and Streets "D" and "E" flow by gravity to a proposed sanitary sewer pump station off Street "D" near Henry Street. A forcemain extends from the proposed sanitary sewer pump station into and along Henry Street. The applicant should document rights to install a private utility in public way through an easement for installation of a private utility in a public way that was conveyed by Town Meeting.
49. Design plans showing the extent of forcemain construction beyond the subdivision boundary must be submitted. The design plans should include a complete existing conditions right-of-way survey including right-of-way layout, roadway pavement, topography, and utilities. Plans for



maintenance of traffic should be included. Provisions for a forcemain manhole at the point of connection to the existing sanitary sewer system should be provided. An engineer's estimate of construction cost should be submitted to assist the Board in establishing the amount of surety to be posted to ensure completion of the work.

50. Due to the high operation and maintenance costs for a sanitary sewer pump station, the Board may wish to require that the sanitary sewer pump station remain forever private.

#### STORMWATER

51. The applicant should be encouraged and required to incorporate low impact design elements more extensively in the design.
52. Low impact design measures along street segments that are relatively flat should include the following:
  - a. Use of roadside swales in lieu of closed drain systems.
  - b. Provide porous pavement for sidewalks and multiuse paths.
53. Low impact design measures should be provided for lots. Although the details should be shown upon site plan submission, these measures should be integrated into the subdivision drainage system design and should include the following:
  - a. Minimize directly connected impervious area.
  - b. Use small watersheds and manage runoff from these sub-watersheds in small decentralized structures, such as swales, bioretention areas, infiltration structures, and filter strips.
  - c. Disconnect driveways from the roadway closed drain system.
  - d. Provide raingardens, lawn depressions, and drywells on individual lots.
  - e. Provide porous driveway pavements.



54. We are concerned that the 24-inch culvert at Henry Street may not be properly sized. The model has been calculated so that the peak flows from several of the large contributing areas are staggered, which results in non-concurrent peaks at Henry Street. Not only would this pipe be undersized, but the post-developed flowrate may exceed that permitted by Stormwater Management Standard #2.
55. Throughout the design of the stormwater management system, many of the conveyance networks rely upon catchbasin-to-catchbasin connections which should not be regarded as good engineering practice. Each catchbasin should connect to a standard stormwater manhole. Manholes should be designed in series ultimately discharging to a basin outfall.
56. The closed drainage system includes catchbasins on individual lots. The entirety of the closed stormwater management system should either be within the roadway layouts or within drainage parcels.
57. The conveyance calculations for the closed drain system were calculated using the 100-year storm as the design event. Several of the project pipe networks consist of pipes that are undersized for this event.
58. Much of the project is designed with significant roadway cuts that will likely dewater adjacent areas. There are no provisions shown for underdrains, or roadway subdrains that will likely be required for the project. We are concerned that the basins will not be adequately sized to accommodate additional baseflows from subdrains when they are added.
59. Several of the drain pipes are designed as excessively flat. For instance the pipe between the catchbasin and manhole on Private Street 'A' at the intersection with Flat Hills Road is designed with a slope of  $S=0.002$  which does not provide for the self-cleaning velocities required to keep the pipe free of sediment.
60. The outfall pipe to Basin #5, off Street 'A' is undersized.
61. The two drain pipes that extend from the upper Street 'D' system to the large basin behind Lots 82-86 are undersized. The 18-inch pipe in Street 'D' near Lot 86 is designed too flat and will not be able to maintain a self-cleaning velocity.



62. Four pipes at the rear of the Street 'B' loop are undersized, including the 36-inch outfall pipe into Basin #1, the 24-inch pipe in front of Lot 15, and two 12-inch pipes (one also in front of Lot 15, and the second on Lot 121).
63. The Retreat Amherst occupies an area of steep terrain that is characterized by shallow pervious surface soils over more than half the project, and mature woodland vegetation throughout the locus. The pervious soils and the forest cover combine to control runoff and enhance recharge. Surficial soils are pervious but very shallow. The shallow surface soils are underlain by impervious glacial till. The pervious surface soils play an important role in surface and groundwater hydrology by absorbing and holding excess rainfall. Because the pervious soil layer is thin in shallow pervious soils, groundwater is held near the surface.
64. Because the developmental form proposed for the project is dense and the lots are small, the hydrology of the site will be significantly impacted. Dense development on a steeply sloped site will necessitate extensive earthwork. Most of the established woodland growth and extensive areas of surface soils will be removed during construction. Because groundwater is shallow in areas, substantial lengths of the roadways and many of the houses are likely to require installation of underdrains to control groundwater.
65. The underdrains will rapidly remove groundwater, particularly during the spring high groundwater season. Excavations into water bearing strata will also be required to construct roads, buildings, detention basins, and utilities including the deep segments of sanitary sewer lines. These excavations will permanently draw down groundwater and increase runoff during periods of high groundwater.
66. The rapid drawdown of groundwater during high groundwater periods will measurably increase stream baseflow during the spring. When storm events occur during high groundwater periods when stream baseflow is already increased by higher runoff, then erosion and flooding can occur resulting in higher spring season runoff rates and erosion.
67. The loss of recharge potential due to stripping vegetation and surficial soils combined with the depletion of groundwater during seasonal high groundwater periods combine to diminish stream baseflows during the dryer summer season. These changes in the site's hydrology will adversely impact the wetland hydrology.



68. The applicant should quantify the adverse impacts of the development on the site's surface and groundwater hydrology by providing a quantitative pre-development and post-development water balance analysis.
69. The water balance analysis should quantify the volume of groundwater that will be drawn down by underdrains and excavations. This volume should be compared with the seasonal high baseflow at the wetland at Henry Street, down gradient of the project, and at the wetland adjacent to Basin 8 at the property line.
70. The design of the stormwater management system in certain locations appears to be too shallow to collect runoff from adjacent areas and may cause localized ponding.
71. By discharging the project flows into either the existing municipal system, or into a few large basins makes it difficult to replicate predevelopment recharge characteristics. Additional locations should be provided for recharge.
72. Groundwater on site is believed to be generally shallow over substantial areas of the site. Many of the detention basins require substantial excavation. It is likely in these locations, that the bottom of the basins will intercept groundwater. Due the extent of poorly drained soils, the retention basins will partially fill with water during portions of the year. This will deplete groundwater resources and decrease the available storage volume in the basins potentially leading to overtopping if major storm events are coincident with high groundwater conditions.
73. In order for detention basins to function properly, the drainpipes that convey runoff from adjacent areas must enter the basins above the water surface. For a basin that requires a 4-foot depth of storage, the bottom of the basin must be at least 8 to 9 feet below the lowest catchbasin. Several outfall pipes are located within 1 foot of the basin bottom and will surcharge under relatively minor storm events.
74. In certain locations the on-site basins are constructed with embankments to impound the required volume of stormwater. To ensure embankments stability, the on-site embankments should be designed with impervious cores and surface protection as may be required by a geotechnical engineer. To the extent that organic or other unsuitable soils underlie these basins, these soils will have to be removed and replaced with structurally suitable soils.



75. In general, downgradient side slopes for the on-site basins should be no steeper than 6 horizontal to 1 vertical. To accommodate the more gentle side slopes, the portion of the site devoted to retention and detention basins should be increased as required.
76. A design report from a geotechnical engineer establishing design guidelines for basin embankments should be submitted and should serve as the basis of embankment design.
77. Substantial portions of on-site basins are constructed within the 100-foot buffer zones along bordering vegetated wetlands. The Amherst Conservation Commission or the Massachusetts Department of Environmental Protection may not allow these locations due to their proximity to major wetland resource areas. The extent of construction within buffer zones should be minimized to the extent practicable and a minimum buffer zone should be maintained to minimize direct alteration of wetlands during construction and to facilitate maintenance.
78. The edges of wetlands are characterized by transition zones where soils and plants gradually change from upland to wetland types. As such it is likely that structurally unsuitable soils extend under areas to be altered for on-site basin construction. These unsuitable soils will have to be excavated at a 1 to 1 slope extending outward from the toe of slope.
79. Additional design information should be developed for the on-site stormwater basins including identifying locations where seasonal high groundwater may be intercepted.
80. Any intercepted groundwater should be considered in computation of loss of recharge potential.
81. The basin design should be modified to incorporate sediment forebays and related water quality measures.
82. Although some 26 Logs of test pits were taken along the proposed roadways, only one test pit was excavated in proximity to a stormwater basin. Test pits providing soils classification, permeability data, and seasonal high groundwater should be provided for all on-site basins. Per the Massachusetts Department of Environmental Protection (DEP) Stormwater Handbook, soil classification and permeability test data should be submitted comprising at least one test pit lot for each 5,000 sq. ft. of basin area with a minimum of three test pits per basin.



83. Groundwater monitoring wells should be installed in each basin and readings should be taken monthly from January through April.
84. Based upon the lack of submitted geotechnical information, insufficient data exists to establish the feasibility of the proposed stormwater basins. The supplemental geotechnical information set forth in Comments 82 and 83 should be submitted and the basin designs revised as appropriate prior to Decision on the Definitive Plan.
85. Drywells, leaching galleys, or trap rock infiltration trenches should be installed in the bottom of all basins to accommodate frozen ground conditions. Ensure that these facilities are located in pervious soils above groundwater.
86. Vehicle access should be provided around and to the bottom of all basins to facilitate maintenance.
87. A minimum 50 foot undisturbed zone should be maintained between the basin embankments and the edge of bordering vegetated wetlands.
88. For each basin, ensure that the inlet inverts of all drainlines upgradient of the basin are located are above the design water surface elevation.
89. Insufficient detail is provided at the proposed stream crossings to allow determination of the total area of wetland alternation.

#### WATER SUPPLY

90. The Retreat Amherst proposes 641 bedrooms which will draw in excess of 70,000 gallons of potable water per day from the municipal water distribution system. Water demand will include 70,510 gallons per day for domestic use. The applicant should provide documentation from the Amherst Department of Public Works that there is sufficient water to supply the domestic needs of the Retreat Amherst.
91. To mitigate water use, provide a site irrigation plan that does not utilize potable water from the public water system. In particular, the applicant should commit to extensive use of native plant materials and minimizing areas of turf.



92. A booster pump station is to be constructed on the Atkins Water Treatment Plant parcel as part of the Proposed Project. Complete construction requirements should be shown on the Definitive Subdivision Plans.
93. Given the high operation and maintenance costs for this booster pump station, the Board may wish to require that the facility remain forever private.
94. Calculations of deliverable fire flow should be provided. From the elevation of the proposed booster pump station to the high points on Streets "A" and "B", there is a  $140\pm$  difference in elevation which would reduce pressure by  $60\pm$  psi. The required fire flow should be acceptable to the Fire Department and Building Commissioner. As a minimum a deliverable fire flow of 500 gallons per minute should be provided at the high points on Streets "A" and "B" with a residual pressure of 20 psi.
95. A detail of the building water services should be provided.

#### EARTHWORK

96. Extensive earthwork will be required to construct the Retreat Amherst as submitted. Numerous segments of the proposed subdivision street deviate significantly from existing grade. Several segments of sanitary sewer line are also to be installed at excessive depth requiring deep excavations. Deep excavations for streets and are likely to encounter and intercept groundwater permanently depleting this resources. Deep excavations may also encounter ledge requiring blasting with potential impacts to neighboring residences and water supply wells. Foundations will be inspected by a firm on behalf of the blasting contractor; however, determining responsibility for structural damage is inherently problematic. Structural damage can typically be repaired; however, damage to water supply wells is typically irreversible.
97. The geotechnical reports for the project prepared by O'Reilly, Talbot and Okun Associates dated December 20, 2013 and dated May 27, 2014 are insufficient to determine the extent of bedrock required to be excavated. The report states that additional investigations are ongoing. The Planning Board should require completion of these required geotechnical studies prior to action on the definitive plan. Test pits encountering bedrock at shallow depth, i.e. above the proposed roadway grade include Test Pits 1, 10, 13, 18, 19, 20, and 22. Further due to the



extensive cuts required a number of test pits were too shallow to reach the proposed roadway grade and are thus insufficient to identify bedrock or provide information on the structural suitability of the soils. Test Pit 2 was 13 ft. too shallow, Test Pit 4 was 10 ft. too shallow, Test Pit 7 was 9 ft. too shallow, Test Pit 12 was 2.5 ft. too shallow to reach the proposed roadway grade. Generally the test pits were too shallow to identify soil conditions for subsurface utilities, which in the case of sanitary sewers extend over 25 feet below the roadway finished grade.

98. Cut slopes and embankments required for deep cuts and fills extend far beyond the street right-of-way necessitating extensive clearing and land disturbance.
99. The submitted earthwork computations show that the project will require  $290,600 \pm$  cu.-yd. of excavation and  $236,811 \pm$  cu.-yd. fill. The remaining  $53,800 \pm$  cu.-yd. of borrow will be removed from the site in trucks. The actual number of truck trips required depending on the type of truck uses to export the excess borrow and that is influenced by cost, scheduling and sequencing of earthwork and other factors. Commonly used 10 wheel dump trucks have a capacity of approximately 10 to 12 cu.-yd. Bottom dumps and other special high capacity dump trucks can be used but due to operational issues it is likely that 10 wheel dump trucks will be used extensively. Earth becomes less compact when excavated which is computed using a swell factor. Using a swell factor of 25 percent and all transport by 10 wheel dump trucks with a capacity of 12 cu.-yd., the export of excess borrow material will generate 5,600 truck trips which will significantly impacts neighboring roadways and residences.
100. Given that excavation will be done in numerous locators over the site and the three entrances to the site, truck trips hauling excess excavation are likely to be limited to one to two truck trips per hour. Based on two truck trips per hour and an 8 hour work day, the trucking of excess earth borrow will extend over 350 days.
101. The Planning Board may wish to require the applicant to modify the current design to minimize excavate and achieve a balanced site.

#### WETLANDS

102. An Order of Conditions must be issued authorizing the work by the Amherst Conservation Commission pursuant to the Massachusetts Wetlands Protection Act (MGL Ch. 131 §40) and



the DEP Regulations 310 CMR 10. Insufficient detail is provided for proposed stream crossings to allow a determination of the cumulative wetland alternation required to implement the Retreat Amherst.

103. An Order of Conditions must be issued authorizing the work by the Amherst Conservation Commission pursuant to the Amherst General Bylaws, Section II, Public Works, Wetlands Protection and the Town of Amherst Wetland Protection Bylaw Regulations.
104. The Conservation Commission cannot issue an Order of Conditions for a project cumulatively altering more than 5,000 sq.-ft. of vegetated wetland. Given the number and construction limits of the wetland crossings required for the Proposed Project, it is unlikely that the Conservation Commission will be able to issue the required Order of Conditions. In order to avoid future amendment of the Definitive Subdivision Plan, the Board may wish to consider encouraging the applicant to pursue concurrent approval by the Conservation Commission. Given that the feasibility of the Proposed Project is dependent upon resolution of this issue, in their recommendation on the Preliminary Subdivision Plan, the Planning Board strongly recommend that the applicant go through the wetlands delineation process with the Conservation Commission prior to submitting the Definitive Subdivision Plan.

#### TRAFFIC

105. The Traffic Study Area (TSA) should include the intersection of Market Hill Road and Henry Street. This intersection is separated from the Bridge Street and Market Hill Road intersection by approximately 100 feet giving rise to safety concerns. Separation of intersections by at least the minimum stopping sight distance for the design speed is desirable in order to isolate driver decisions. Traffic controls should be evaluated to specifically address hazards caused by the close spacing between these intersections. Crash rate work sheet should be submitted to identify the effects of this substandard geometry on vehicle crashes. Mitigation should be provided by the applicant as appropriate including traffic controls and geometric upgrades.
106. The Traffic Study Area (TSA) should include the intersection of Flat Hills Road and Shutesbury Road as well as the immediately proximate intersection of North East Street and Flat Hills Road. These intersections will be directly impacted by project traffic given that one of the access points to the Retreat Amherst is on Flat Hills Road and these intersection are located between Retreat Amherst and the colleges. These two intersections are situated approximately 75 feet



apart. Separation of intersection by at least the minimum stopping sight distance for the design speed is desirable in order to isolate driver decisions. Traffic controls should be evaluated to specifically address hazards caused by the close spacing between these intersections. Crash rate work sheet should be submitted to identify the effects of this substandard geometry on vehicle crashes. Mitigation should be provided by the applicant as appropriate including traffic controls and geometric upgrades.

107. Traffic assignment to the Strong and East Pleasant Streets Intersection should be revised. A portion of the trips generated by Retreat Amherst particularly those trips assigned to the Flat Hills Road and Street "A" Intersection will impact the Strong and East Pleasant Streets Intersection. Evaluation of estimated travel times indicates that the Flat Hills Road, North East Street, and Strong Street minimizes travel time for destinations along Massachusetts Avenue and proximate sections of the Campus.
108. Vehicle crash rate worksheets should be provided for the East Pleasant and Pine Streets Intersection, the East Pleasant Street, Eastman Lane, and Tilson Farm Road Intersection, the East Pleasant Street and Strong Street Intersection, and the North Pleasant, Pine, and Meadow Streets Intersection. Computed crash rates should be compared to state wide crash rates for signalized or unsignalized intersection as applicable.
109. Traffic impacts should be evaluated in the context of the community in which these changes occur. Traffic volumes generated by the Retreat Amherst will significantly impact the rural character of the streets in Cushman. In comparison to the No-Build traffic volumes, trips generated by the Retreat Amherst will increase traffic volumes by 12.1 to 68.1 percent.

Street Segment	Morning Peak Hour			Evening Peak Hour		
	No-Build Volume (Vehicles /hour)	Generated Trips (Vehicles /hour)	Change	No-Build Volume (Vehicles /hour)	Generated Trips (Vehicles /hour)	Change
Market Hill Rd. west of Subdivision Street "A"	156	64	41.0%	135	92	68.1%



Bridge St. south of Market Hill Rd.	371	64	17.3%	383	92	24.0%
Henry St. north of Subdivision Street "D"	313	38	12.1%	310	53	17.1%
Pine St. west of Henry St.	228	58	25.4%	236	53	22.5%
Pine St. east of East Pleasant St.	603	102	16.9%	667	145	21.7%

110. Trip generation varies by land use. The Traffic Impact Study for the Retreat Amherst includes an evaluation of trip generation for apartments and residential condominium/townhouse uses from published data and also includes an evaluation of empirical data obtained for the "Puffton Village Apartments" on North Pleasant Street in Amherst. The Institute of Transportation Engineers (ITE) has compiled trip generation data for various land uses in the ITE Trip Generation Manual.<sup>1</sup> The Traffic Impact Study provides alternative trip generation values for 175 dwelling units based upon ITE Land Use Code 220 Apartment and ITE Land USE Code 230 Residential Condominium/Townhouse developments. The empirical trip generation data from the "Puffton Village Apartments" was used to forecast trip generation for the Retreat Amherst. However, none of the above land uses are comparable to the land use proposed for the Retreat Amherst.

111. The Retreat Amherst includes a mix of 2, 3, and 4 bedroom units, primarily 3 and 4 bedroom units. The leasing arrangements for the Retreat Amherst differ from conventional leasing practice in that the management leases each bedroom to a separate individual. With conventional apartment and condominium leases, units are occupied on the basis of each unit

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<sup>1</sup> Institute of Transportation Engineers, Trip Generation, an ITE Informational Report, Ninth Edition, Volumes 1 through 3, © 2012 Institute of Transportation Engineers.



containing a single household, as the term “household” is used in the vernacular. This affects trip generation because a traditional household commonly shares trip making among its members and may contain individuals who do not operate motor vehicles. The Retreat Amherst differs significantly from these conventional residential uses in that each bedroom in each unit is separately leased to individuals having no family or personal relationship. Each individual would make their own arrangements for transportation so the trip generation is likely to be more comparable to a lodging or hotel use with trip generation correlating more strongly with the number of occupied rooms rather than the number of occupied dwelling units.

112. Trip generation for Retreat Amherst will not be comparable to the trip generation for the “Puffton Village Apartments.” The mix of bedrooms is different with more two bedroom units and no four bedroom units. Most importantly the each apartment “Puffton Village Apartments” are managed using conventional leasing arrangements where entire units are leased to one party. While subleases are allowed, all individuals residing in a unit do so at the discretion of the primary lessee. The trip generation characteristics for such a development are more likely to be comparable to a “household” based residential use such an apartment or residential condominium/townhouse and thus lower than the trip generation that will occur with the Retreat Amherst. Additionally comparatively lower trip generation will occur at the “Puffton Village Apartments” as the site provides better mode choice. From the central portion of the “Puffton Village Apartments” site to the central portion of the UMass Campus is approximately 1¼ miles so many trips will be pedestrian and bicycle trips. Additionally, the “Puffton Village Apartments” site is on core bus routes with convenient access to the UMass and other college destinations. Conversely, the central portion of the Retreat Amherst site is located approximately 3 miles from the central portion of the UMass Campus and the Retreat Amherst is on the periphery of the bus service area making trips by pedestrian and bicycle mode less convenient.
113. Given the proposed leasing arrangements for the Retreat Amherst with each bedroom leased to a separate individual, the trip generation is likely to be more comparable to that for a lodging facility such as a boarding house, hotel, or motel with occupied rooms serving as the independent variable used to forecast future trip generation. The ITE Trip Generation Manual lists several lodging uses and provides equations for trip generation based on occupied rooms as the independent variable. When fully leased, the Retreat Amherst will contain 641 occupied



rooms. Using occupied rooms as the independent variable, the trip generation forecast in the Traffic Impact Study significantly understates future trip generation.

**Comparative Trip Generation  
Vehicle Trips for 641 Occupied Rooms**

	Traffic Impact Study Retreat Amherst BETA, May 2014	Hotel ITE Land Use 310	Motel ITE Land Use 320
Weekday Morning Peak Hour <sup>1</sup>	122	470	333
Comparison	N/A	385%	273%
Weekday Evening Peak Hour <sup>2</sup>	173	449	346
Comparison	N/A	260%	200%
Weekday 24-Hour	N/A	5,718	5,267

1. Peak hour of adjacent street traffic, one hour between 7:00 AM and 9:00 AM.
2. Peak hour of adjacent street traffic, one hour between 4:00 PM and 6:00 PM.

Using lodging based trip generation data for occupied rooms results in trip generation rates that range from 200 percent to 385 percent of the Traffic Impact Study Retreat Amherst



forecast based on empirical data. Due to these significant differences, additional analysis is required to more precisely quantify future trip generation.

114. We recommend that empirical data be gathered at another facility operated by with similar individual room lease policies that is not located within convenient walking distance of the college campus. In lieu thereof, we recommend that lodging based data be used as we believe that it more precisely quantifies future trip generation.
115. Calculations used to distribute and assign trips to the roadway network should be provided. The distribution and assignment of trips should be based on the recognition that college and university based trips have origins and destinations that have significant geographic separation affecting traffic assignment. Vehicle trips should be separately distributed and assigned based upon projected enrollment at University of Massachusetts, Amherst College, and Hampshire College.
116. Further in computing distribution and traffic assignment, the analysis should consider that parking at the UMass campus in particular is polycentric with separate lots located by department and college within the university. Lots are further distinguished by parking and pricing policies. The separation of these parking facilities is sufficient that it will affect traffic assignment.
117. At the unsignalized East Pleasant and Pine Streets Intersection during the morning peak hour, level-of-service (LOS) decreases from LOS C to LOS D with an increase in delay of 6.9 seconds. At this intersection during the evening peak hour, level-of-service decreases from LOS C to LOS D with an increase in delay of 64.2 seconds. This significant adverse impact is caused by trips generated by the Retreat Amherst.
118. The applicant should formalize a commitment to traffic impact mitigation. Significant adverse traffic impacts should be mitigated. The report states that the Town should implement improvements at this intersection but provides no contingent mitigation plan should this not happen. We recommend that the applicant be required to mitigate the significant adverse impacts by providing an engineering study of traffic control options at this location including without limitation provision of two approach lanes on the northbound approach and provision of a roundabout. If required by the Board of Selectmen as street commissioners or other



agencies having jurisdiction, the applicant should commit to constructing the intersection improvements that evolve from the traffic study.

119. The applicant should formalize a commitment to traffic impact mitigation. Operational and safety problems will arise based upon the close proximity of the Market Hill Road and Henry Street intersection and the Bridge Street and Market Hill Road intersection which are separated by approximately 100 feet. Existing safety and operational issues will be impacted by the traffic generated by the project which will use this intersection. The applicant should be required to provide an engineering study of traffic control and geometric upgrades at this location. If required by the Board of Selectmen as street commissioners or other agencies having jurisdiction, the applicant should commit to constructing the intersection improvements that evolve from the engineer study.
120. The applicant should formalize a commitment to traffic impact mitigation. Operational and safety problems will arise based upon the close proximity of the Flat Hills Road and Shutesbury Road intersection and the North East Street and Flat Hills Road intersection which are separated by approximately 75 feet. Existing safety and operational issues will be impacted by the traffic generated by the project which will use this intersection. The applicant should be required to provide an engineering study of traffic control and geometric upgrades at this location. If required by the Board of Selectmen as street commissioners or other agencies having jurisdiction, the applicant should commit to constructing the intersection improvements that evolve from the engineer study.
121. The applicant should formalize a commitment to construction phase traffic impact mitigation by decreasing the volume of off-site construction truck traffic. The number of truck trips required to dispose of excess borrow material should be minimized by redesigning the required subdivision improvements to achieve a balanced site.
122. The applicant should formalize a commitment to traffic impact mitigation by committing to a transportation demand management program.
  - a. On-site automobile use should be discouraged by incentives such as reduced rents for residents who do not have automobiles at the site or by disincentives such as charging for parking.



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- b. Car pools and van pools for students should be encouraged by financial incentives or other viable means.
- c. Zip cars or other vehicle sharing programs should be encouraged by financial incentives or other viable means.
- d. Bicycle use should be encouraged by providing bicycle racks and prioritizing assignment of units closest to the campus to residents using bicycles.
- e. A free or nominal cost shuttle service should be provided for all residents that operates beginning 90 minutes prior to the start of classes or opening of the library, athletic facilities or other facilities and continuing until 90 minutes after the end of classes or the closing of libraries, athletic facilities, and other facilities.