LAND SUBDIVISION CONTROL REGULATIONS

By

The Planning Board
of
The Town of New London
New Hampshire
2009

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Thomas A. Cottrill, Chair
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Town of New London
New Hampshire

LAND SUBDIVISION CONTROL REGULATIONS

SECTION I - ADOPTION AND PURPOSES

A. AUTHORITY AND ADOPTION

Under the authority vested in the New London Planning Board by the voters of the Town of New London on March 14, 1950 in accordance with Chapter 674, Section 35 to 42 inclusive, N.H. Revised Statutes Annotated, 1983, as amended, and every other authority thereto enabling, the New London Planning Board adopts the following regulations governing the subdivision of real property in the Town of New London.

B. TITLE

These regulations shall be known as the Town of New London Land Subdivision Control Regulations, and hereinafter referred to as "these regulations" or "subdivision regulations".

C. PURPOSE

The purpose of these regulations is to provide for orderly and planned growth of undeveloped areas of New London, to foster the development of an economically and environmentally sound and stable community and to safeguard and protect the interests of the public and the taxpayer from the consequences of improper subdivision and unmanaged growth by:

1. Providing against such scattered or premature subdivision of land as would involve danger or injury to health, safety, or prosperity by reason of the lack of water supply, drainage, transportation, schools, fire protection, or other public services, or necessitate the excessive expenditure of public funds for the supply of such services;

2. Providing for the harmonious development of the municipality and its environs;

3. Requiring the proper arrangement and coordination of streets within subdivisions in relation to other existing or planned streets or with features of the official map of the municipality;

4. Providing for open spaces of adequate proportions;

5. Requiring suitably located streets of sufficient width to accommodate existing and prospective traffic and to afford adequate light, air, and access for fire fighting apparatus and equipment to buildings, and be coordinated so as to compose a convenient system;

6. Requiring in proper cases, that plats showing new streets or narrowing or widening of such streets submitted to the Planning Board for approval shall show a park or parks suitably located for playground or other recreational purposes;

7. Requiring that proposed parks shall be of reasonable size for neighborhood playgrounds or other recreational uses;

8. Requiring that the land indicated on plats submitted to the Planning Board shall be of such character that it can be used for building purposes without danger to health or safety;

9. Prescribing minimum areas of lots so as to assure conformance with local zoning ordinances and to assure such additional areas as may be needed for each lot for on-site sanitary facilities;

10. Providing for the preservation of wildlife habitat by minimizing the impacts of development on deer wintering yards, wildlife corridors and vernal pools; and

11. Including provisions which will tend to create conditions favorable to health, safety, convenience, or prosperity.

D. WHEN SUBDIVISION APPROVAL IS REQUIRED

Subdivision approval by the Planning Board is required for the following development:

1. The division of a lot, tract, or parcel of land into two or more lots which are to be conveyed as separate lots to be owned individually.

2. The division of a lot, tract, or parcel of land into two or more sites for buildings for sale, lease or for condominiums.

3. Annexations, Minor Lot Line Adjustments and Boundary Agreements.

   For subdivision purposes the land on each side of a highway shall be a separate and existing lot providing each lot so created conforms to the Zoning Ordinance.

SECTION II - ADMINISTRATION AND ENFORCEMENT

A. FAMILIARIZATION

The subdivider shall familiarize himself with all State and Town regulations relative to zoning, health, buildings, roads and other pertinent data, so that he is aware of the obligations and standards with which the proposed subdivision must comply.

B. WAIVER OF REQUIREMENTS

Upon written request of the subdivider, the Planning Board may waive compliance with any part of the Regulations if it determines:

1. That the request for the waiver arises out of unique physical conditions which exist in the proposed subdivision; and

2. That literal compliance with the Regulations shall cause the subdivider an unnecessary hardship. An unnecessary hardship is one where there is no public benefit which offsets the private detriment.

3. That granting the waiver shall not be contrary to the purpose and objective of these Regulations; and

4. That the public good shall not be adversely affected.

C. COMPLIANCE WITH THESE RULES AND REGULATIONS

All plans and all procedures relating thereto shall in all respects comply with the provisions of these rules and regulations, unless the Planning Board authorizes a waiver therefrom in specified instances.

D. APPLICATION OF MOST RESTRICTIVE REGULATIONS

Whenever the regulations made under the authority hereof differ from those prescribed by any statute, ordinance or other regulations, that provision which imposes the greater restriction or the higher standard shall govern, to the extent not contrary to state law.

E. COMPLIANCE WITH ZONING ORDINANCE AND SITE PLAN REVIEW REGULATIONS

The Planning Board will not approve or modify and approve any plan of a subdivision of land unless all buildings, structures and lots shown on said plan comply with the zoning ordinance of the Town or unless a variance from the terms thereof has been properly granted.

The subdivider is advised to consult the Site Plan Review Regulations which may be applicable to the development project. Concurrent public hearings for subdivision and site plan review may be permitted at the Planning Board's discretion.

F. ENFORCEMENT, FINES & PENALTIES AND INJUNCTIVE RELIEF

These regulations shall be enforced by the provisions of the New London Zoning Ordinance and the provisions of the following state statutes:

1.	RSA 676:15, as Amended	Injunctive Relief;
2.	RSA 676:16, as Amended	Penalties for Transferring Lots in Unapproved Subdivisions;
3.	RSA 676:17, as Amended	Fines and Penalties;
4.	RSA 676:17-a, as Amended	Cease and Desist Orders;
5.	RSA 676:17-b, as Amended	Local Land Use Citations; Pleas by Mail; and
6.	Any Amended or Additional Statutory Provisions for Enforcement.	

G. ADHERENCE OF SUBDIVISION TO APPROVED PLANS

1. After the Planning Board's approval of a plat, it will be the subdivider's responsibility to see that construction does not deviate from the approved plat. Any changes to utilities, roads, or structures or other subdivision improvements as approved shall be presented to the Town Inspector for approval of the proposed changes. The Planning Board designated Town Inspector shall determine if the change is minor or major and shall report such changes in writing to the Planning Board.

2. Minor changes, by way of illustration, may include, but are not limited to, minor changes to the location of roads, utilities, and building foundations due to subsurface conditions encountered during construction or improvement in design such as a lower street grade or additional minor drainage facilities.

3. Major changes, by way of illustration, may include, but are not limited to, significant changes in the location of roads, utilities and building foundations, downsizing utility lines, eliminating drainage facilities, increasing road grades, and decreasing curve radii. Major changes shall require the resubmission of the final subdivision and approval by the Planning Board before construction can proceed on the basis of the major changes.

4. Failure of the subdivider to obtain the Planning Board's review of other than minor changes in the approved plat shall cause the Board of Selectman to use enforcement measures deemed appropriate and necessary to ensure compliance with these regulations as provided in Section F. above.

H. INSPECTION SERVICES

The Planning Board shall require inspection services for all major subdivisions which include street and/or utility line construction or for other subdivisions at the Planning Board's discretion. The cost of the inspection services shall be borne by the subdivider. Some subdivision projects may require full time inspection services depending on the size of the subdivision, sensitive areas in or near the subdivision. The Planning Board may require the inspection services to be provided by either Town employees or agents or by an outside consulting, civil engineering firm of the Planning Board's choice. If the Planning Board determines the need for inspection services and requires such as a condition of final plat approval, then prior to the start of construction the subdivider shall establish an escrow account for the inspection services with the Town. The subdivider shall maintain a positive balance in the account at all times during construction to cover the expenses for inspection services or be subject enforcement measures as provided in Section F. above. Any remaining balance in the account after issuance of a Certificate of Performance of Improvements pursuant to Section VII-G. of these regulations shall be refunded to the subdivider.

The initial deposit in the account shall be determined as follows:

A. # of Proposed Lots: ____ X $100/Lot = $ _____

B. Length of Proposed Road: _____ feet X $5/Linear Foot = $ _____

C. Initial Account Deposit = A. + B. $ _____

The Planning Board may increase the amount of the initial deposit if information indicates more difficult development conditions may be encountered during construction such as ledge or intercepting the water table.

I. APPEALS

Any person aggrieved by a decision of the Planning Board concerning a plat, or subdivision may appeal therefrom to the Superior Court as provided by RSA 677:15.

J. SEPARABILITY

If any section, clause, provision, portion, or phrase of these regulations shall be held to be invalid or unconstitutional by any court of competent authority, such holding shall not affect, impair, or invalidate any other section, clause, provision, portion or phrase of these regulations.

K. INTERPRETATION

In the matters of interpretation of these regulations, the opinion of the Planning Board shall prevail.

L. AMENDMENTS

These regulations may be amended, changed, altered, added to, or rescinded from time to time whenever this action is deemed necessary or advisable by the Planning Board, but not until the Planning Board conducts a public hearing to consider the proposed amendment as per RSA 675:6. The Planning Board shall record any changes so authorized at the Registry of Deeds of Merrimack County. Certified copies signed by a majority of the Planning Board members shall be filed with the Town Clerk and the Board of Selectmen.

M. NUMBERING

After amendments are adopted, the Planning Board shall have the authority to renumber the sections consecutively and correct typographical errors without an additional vote at Town Meeting.

N. FOUR-YEAR EXEMPTION

1. Pursuant to RSA 674:39, every subdivision plat approved by the Planning Board and properly recorded in the Registry of Deeds shall be exempt from all subsequent changes in Subdivision Regulations, Site Plan Review Regulations, impact fee ordinances, and Zoning Ordinances adopted by the Town, except those regulations and ordinances which expressly protect public health standards, such as water quality and sewage treatment requirements, for a period of 4 years after the date of approval; provided that:

   (a) Active and substantial development or building has begun on the site by the owner or the owner's successor in interest in accordance with the approved subdivision plat within 12 months after the date of approval, or in accordance with the terms of the approval, and, if a bond or other security to cover the costs of roads, drains, or sewers is required in connection with such approval, such bond or other security is posted with the town at the time of commencement of such development;

   (b) Development remains in full compliance with the public health regulations and ordinances specified in this section; and

   (c) At the time of approval and recording, the subdivision plat conforms to the subdivision regulations, site plan review regulations, and zoning ordinances then in effect at the location of such subdivision plat.

2. Once substantial completion of the improvements as shown on the subdivision plat has occurred in compliance with the approved subdivision plat or the terms of said approval or unless otherwise stipulated by the Planning Board, the rights of the owner or the owner's successor in interest shall vest and no subsequent changes in subdivision regulations, site plan regulations, or zoning ordinances, except impact fees adopted pursuant to RSA 674:21 and 675:2-4, shall operate to affect such improvements.

3. The Planning Board may, as part of its subdivision regulations or as a condition of subdivision plat approval, specify the threshold levels of work that shall constitute the following terms, with due regard to the scope and details of a particular project:

   (a) 'Substantial completion of the improvements as shown on the subdivision plat' for purposes of fulfilling paragraph 2; and

   (b) 'Active and substantial development or building,' for the purposes of fulfilling paragraph 1.

4. Failure of the Planning Board to specify by regulation or as a condition of subdivision plat approval what shall constitute 'active and substantial development or building' shall entitle the subdivision plat approved by the Planning Board to the 4-year exemption described in paragraph 1. The Planning Board may, for good cause, extend the 12-month period set forth in paragraph 1(a).

O. <u>REVOCATION OF RECORDED APPROVAL</u>

1. A subdivision plat, street plat, site plan or other approval which has been filed with the appropriate recording official under RSA 674:37 may not be revoked, in whole or in part, by the Planning Board, except pursuant to this section, and only under the following circumstances:

   (a) At the request of, or by agreement with, the applicant or the applicant's successor in interest.

   (b) When the applicant or successor in interest to the applicant has performed work, erected a structure or structures, or established a use of land, which fails to conform to the statements, plans or specifications upon which the approval was based, or has materially violated any requirement or condition of such approval.

   (c) When the applicant or successor in interest to the applicant has failed to perform any condition of the approval within a reasonable time specified in the approval, or, if no such time is specified, within the time periods specified in RSA 674:39.

   (d) When the time periods specified in RSA 674:39 have elapsed without any vesting of rights as set forth therein, and the plat, plan or other approval no longer conforms to applicable ordinances or regulations.

   (e) When the applicant or successor in interest to the applicant has failed to

provide for the continuation of adequate security as provided by RSA 674:36, III (b) and 674:44, III (d) until such time as the work secured thereby has been completed.

2. Prior to recording any revocation under this section, the Planning Board shall give notice, as provided by RSA 676:4, I(d), to the public, the applicant or the applicant's successor in interest, and all abutters and holders of conservation, preservation, or agricultural preservation restrictions. The notice shall include the Planning Board's reasons for the revocation. A hearing with notice as provided in RSA 676:4, I (d) shall be held at the request of any party receiving such notice, submitted within 30 days of receiving such notice, or if the Planning Board determines to hold a hearing.

3. A declaration of revocation, dated and endorsed in writing by the Planning Board, and containing reference to the recording information for the plat, plan or other approval being revoked, shall be filed for recording with the Registry of Deeds, no sooner than 30 days after written notification of the revocation is served on the applicant or the applicant's successor in interest, in person or by certified mail, or 30 days after any public hearing, whichever is later. If only part of an approval is revoked, that portion of land subject to revocation shall be clearly identified in the declaration. The declaration shall be recorded under the same name or names as was the original approval, as well as the names of subsequent owners, if any, of the land or part thereof subject to revocation, as identified by the municipality.

4. A revocation under this section may be appealed pursuant to RSA 677:15. Nothing in this section shall affect the municipality's ability, either before or after such a revocation, to pursue other remedies or penalties as set forth in RSA 676:15-17.

P. PROFESSIONAL REVIEW

The Planning Board may require the subdivider to pay the cost of a professional review of various parts or of the whole of the proposed subdivision upon such terms and conditions as the Planning Board deems to be appropriate as provided by RSA 676:4-I (g). By way of example, the Planning Board may request professional reviews by a civil engineer, attorney, environmental consultant, soil scientist, wetland scientist, wildlife biologist, etc. The Planning Board shall select the professional(s). For each professional review required by the Planning Board on a particular subdivision application, the Planning Board shall determine an amount to be placed in an escrow account with the Town for the estimated cost of the scope of services to be provided by the consultant chosen by the Planning Board. The subdivider must deposit this amount with the Town to establish this escrow account before the consultant will begin his/her review for the Planning Board and before the application will proceed in the review process.

Q. TREE CUTTING FOR SUBDIVISION LAYOUT

Tree cutting for the purpose of laying out a subdivision including roads, utility lines, drainage facilities, views for lots, and/or building sites is prohibited prior to final subdivision approval by the Planning Board and subsequent issuance of an Intent to Cut Permit by the Board of Selectmen. Minor tree cutting for the purpose of conducting soil test pits for proposed on-site septic systems is permitted.

If a landowner makes application to the Planning Board for a subdivision and it appears to the Planning Board that the landowner has already cut trees for the layout of a subdivision including roads, utility lines, drainage facilities, views for lots, and/or building sites, then the Planning Board shall request the Board of Selectmen to pursue this as a violation of the Land Subdivision Control Regulations and the Planning Board shall suspend further consideration of the subdivision application pending resolution of the enforcement action.

A Notice of this regulation shall be attached to the Intent to Cut Permit signed by the Board of Selectmen.

SECTION III – DEFINITIONS

If a term is used in these Subdivision Regulations, but is not defined herein, then refer to ARTICLE II Definitions in the Zoning Ordinance.

For the purposes of these Regulations, certain terms or words used herein shall be interpreted as follows:

The word person includes a firm, association, organization, partnership, trust, company or corporation as well as an individual. The word person is used interchangeably with the terms subdivider, applicant, owner, or landowner.

The present tense includes the future tense, the singular number includes the plural, and the plural number includes the singular.

The word shall is mandatory; the word may is permissive.

1. Abutter means any person whose property adjoins or is directly across the street or stream or within 200 feet of the land under consideration by the Planning Board. For purposes of receiving testimony only, and not for purposes of notification, the term abutter shall include any person who is able to demonstrate that his land will be directly affected by the proposal under consideration. For the purposes of receipt of notification by a municipality of a local land Use board hearing, in the case of an abutting property being under a condominium or other collective form of ownership, the term Abutter means the officers of the collective or association, as defined in

RSA 356-B:3, XXIII. The names of all abutters shall be obtained from the Town Tax List as it exists, not more than five days before the date of filing the application.

2. Annexation shall mean the sale, transfer, or other conveyance of land to the owner of adjoining land which does not increase the number of parcels, lots, or owners and does not result in additional lots of substandard areas under the Zoning Ordinance. Annexations include minor lot line adjustments and boundary agreements.

3. Berm shall mean a linear earthen mound designed to hold or direct runoff, or block views, noise or other potentially objectionable circumstances.

4. Board shall mean the Planning Board of the Town of New London.

5. Clear Days for the purpose of public notice, clear days shall not include the day of publication or posting of the notice and shall not include the day of the public hearing.

6. Condominium means the division of a lot, tract, or parcel of land into two or more lots or building sites, whether immediate or future, which lots shall be submitted to the condominium form of ownership and for which there shall be condominium conveyances, whether immediate or future, in conformity with RSA 356-B. A condominium consisting of a single building on a lot shall not be subject to subdivision review, but subject to Site Plan Review.

7. Dead-End Street shall mean a street configuration where one must exit from the same place where one entered.

8. Deciduous shall mean a plant with foliage that is shed annually.

9. Detention Basin shall mean a stormwater storage facility which acts as a temporary reservoir, allowing rainfall runoff to be released at slow, pre-determined rates.

10. Development means any construction or grading activities on real estate for other than agricultural and silvacultural practices.

11. Disturbed Area means an area where the natural vegetation has been removed exposing the underlying soil.

12. Engineer as used herein shall mean a person duly licensed as such under the laws of the State of New Hampshire.

13. Erosion means the wearing away of the land surface by natural or artificial forces such as wind, water, ice, gravity, or vehicle traffic and the subsequent detachment and transportation of soil particles.

14. Evergreen shall mean a plant with foliage that is retained and remains green throughout the year.

15. Flood Limit shall mean the land-water boundary of a body of water or a watercourse flowing at its highest 100 year frequency as defined by a responsible public agency such as the U.S. Army Corps of Engineers or the U.S. Department of Agriculture Soil Conservation Service.

16. Flood Prone Area shall mean the area of land lower in elevation than the land-water boundary of a body of water or along a watercourse flowing at its highest 100 year frequency or those soils classified by the National Cooperative Soil Survey as "soils subject to flooding."

17. Major Subdivision shall mean the subdivision of land into four or more lots, plats or sites as defined by RSA 674:4, III.

18. Minor Subdivision shall mean the subdivision of land into a total of three or fewer lots, plats or sites within a five year period requiring no new roads, utilities, or other public improvements as defined by RSA 676:4, III.

19. Mulch shall mean nonliving organic or synthetic matter spread over cultivated ground to retain moisture, limit weed growth and control erosion.

20. Multi-Family Dwelling shall mean a residential building designed for or occupied by three or more families with the number of families in residence not exceeding the number of dwelling units provided.

21. Off-Site Improvements means those improvements that are necessitated by a development but which are located outside the boundaries of the property that is subject to a subdivision plat or site plan approval of the Planning Board. Such Off-Site Improvements shall be limited to any necessary highway, drainage, and water and sewer upgrades pertinent to the development.

22. Ornamental Tree shall mean a deciduous tree, generally smaller than a shade tree, that is planted primarily for its aesthetic or ornamental value.

23. Planned Unit Development shall mean the use of land in conformity with Article XIX of the Town Zoning Ordinance which has either individual or multi-unit building sites with common ownership of property and facilities.

24. Plat shall mean the final plan, with all required data, maps and narrative materials, on which the subdivider's plan of subdivision is presented to the Planning Board for approval and includes the Site Survey Plat which if signed by a majority of the Planning Board will be recorded in the Registry of Deeds of Merrimack County.

25. Project Area means the area within the subdivision boundaries.

26. Redevelopment is defined as any construction, alteration, or improvement that disturbs greater than or equal to 2,500 square feet of existing impervious cover performed on sites where the existing land use is commercial, industrial, institutional, or multi-family residential.

27 Retention Basin shall mean a stormwater storage facility which acts as a temporary reservoir which does not allow any surface release of runoff until after a storm, if at all. Most often the retained stormwater is discharged into the ground by infiltration or into the atmosphere by evaporation and transpiration by plants (collectively called evapotranspiration).

28. Sediment means solid material, either mineral or organic, that is in suspension, is transported, or has been moved from its site of origin by erosion.

29. Shade tree shall mean a large deciduous tree with a high crown of foliage or overhead canopy.

30. Shrub shall mean any multi-stemmed woody plant which normally grows to a mature height of less than twenty (20) feet.

31. Soil Carrying Capacity means the dwelling unit density is calculated by dividing the given area of any soil type to be used by the required area for that soil type found in Exhibit C.

32. Soil Scientist means a person qualified in soil identification, classification and mapping, and who is licensed as a soil scientist by the New Hampshire Joint Board of Licensure and Certification.

33. Stream means a stream that flows for sufficient times of the year to develop and maintain defined channels, but may not flow during dry portions of the year. It includes, but is not limited to all perennial and intermittent streams located on U.S. Geological Survey Maps.

34. Street shall mean a Class V highway or better, or a road or a right-of-way (public or private) shown on a subdivision plat approved by the Planning Board.

35. Subdivider means the owner of record of land to be subdivided or the agent of the owner. Agents shall present their authority from the owner in writing.

36. Subdivision means the division of the lot, tract, or parcel of land into 2 or more lots, plats, sites, or other divisions of land for the purpose, whether immediate or future, of sale, rent, lease, condominium conveyance or building development. It includes resubdivision and, when appropriate to the context, relates to the process of subdividing or to the land or territory subdivided. The division of a parcel of land held in common and subsequently divided into parts among the several owners shall be deemed a subdivision under these regulations.

37. Surveyor as used herein shall mean a person duly licensed as such under the laws of the State of New Hampshire.

38. Town means the Town of New London, New Hampshire.

39. Town Inspector means all inspections to be done on behalf of the Planning Board to ensure conformance with the standards and requirements of these Subdivision Regulations and the subdivision plans approved by the Planning Board including any conditions of approval. The Town Inspector, as designated by the Planning Board, may be Town employees or agents or may be an outside consulting civil engineer of the Planning Board's choice. The Planning Board may choose to have multiple Town Inspectors for specific aspects for the construction of the subdivision.

40. Voluntary Merger shall mean when an owner of two or more contiguous preexisting approved or subdivided lots or parcels merges them for municipal taxation and regulation purposes per RSA 674:39-a.

41. Wetland Scientist means a person qualified in wetland identification, classification and mapping, and who is certified as a wetland scientist by the New Hampshire Joint Board of Licensure and Certification.

SECTION IV - APPLICATION PROCEDURES

A. MAJOR SUBDIVISIONS

1. Conceptual Consultation Phase

A Subdivider may present a subdivision proposal to the Planning Board in conceptual form. The Planning Board may discuss the proposal in general terms only focusing on the basic concept of the proposal and general items such as the desirability of types of development and proposals under the master plan, and applicability and conformity with the Zoning Ordinance, Subdivision Regulations and other pertinent

local regulations. Such discussion may occur only at formal meetings of the Planning Board, but will not require formal public notice to abutters and the general public. There will be no decision or action of the Planning Board with regard to any conceptual consultation. Such consultation shall not bind either the applicant or the Planning Board. There is no application fee or time limit for this review. This phase in the review process is optional for the applicant and is made available by the Planning Board in order to save expense and unnecessary changes later on. The Planning Board encourages the subdivider to meet with the Town Planner, or other designee of the Planning Board, to review the project at this phase and to meet with the Planning Board only if the applicant so desires. If the subdivider desires to discuss the subdivision proposal in more detail than the basic concept, then he/she must make an application for the Preliminary Plan or Design Review Phase which involves a public hearing with notice to abutters.

2. Preliminary Plan or Design Review Phase

If a subdivider desires the Planning Board to review the subdivision proposal beyond discussion in only conceptual form as provided in the Conceptual Consultation Phase, then the subdivider MUST apply to the Planning Board for review of a Preliminary Plan.

For the review of a Preliminary Plan, the subdivided must comply with the same procedures required for the Final Subdivision Plat Phase as specified in Section IV-A:3, a. through f. There is no time limit on Preliminary Subdivision Review.

3. Final Subdivision Plat Phase

a. Application Required: Any subdivider desiring final plat approval for a subdivision as defined in these regulations MUST apply to the Planning Board in writing on the designated application form and pay the required fees. The applicant is encouraged to meet with the Town Planner, or other designee of the Planning Board, in advance for guidance on the process, application materials, guidance on which departments and outside agencies need plans for review, and to schedule the public hearing with the Planning Board to review the final plat application.

b. Filing of Final Application: The applicant shall file the application and related materials as required by these regulations by delivering the complete application to the Town Offices at least fifteen (15) days prior to the Planning Board public hearing date to consider whether the application is complete.

c. Notice of Application and Public Hearing: The Secretary of the Planning Board shall notify the abutters located within 200 feet of the subject

property; any professionals assisting with preparing the application such as engineers, architects, land surveyors, wetland scientists or soil scientists; holders of any conservation, preservation, or agricultural preservation restrictions; the subdivider; and the applicant by certified mail of the date, time and place upon which the application will be formally submitted to the Planning Board and the Planning Board will hold a public hearing to consider the application. Such notice shall give at least ten (10) "clear days" of notice prior to such formal submission. Such notice shall also be given to the general public by posting a copy of the notice in two public places in the Town at the same time that notice is mailed to the applicant and the abutters. The notice shall include a general description of the proposal which is the subject of the application and shall identify the applicant and the location of the property which is the subject of the application. Additional notice of an adjourned session of a public hearing is not required if the date, time and place of the adjourned session is made known at the prior hearing. Separate notice is required for preliminary and final hearings. At the hearing, the applicant, any abutter or any person with a demonstrable interest in the matter may testify in person or in writing. Other persons may testify as permitted by the Planning Board at each hearing.

d. Payment of Fees and Notification Costs: All costs of such notice, including secretarial time and disbursements, and application fees established by the Planning Board shall be paid by the applicant at the time of filing the application in advance of the hearing to consider whether the application is complete. Failure to pay such costs shall constitute valid grounds for the Planning Board to terminate further consideration and to disapprove the plat without a public hearing. The application will not be accepted for review until the fees set forth in the Planning Board's current fee schedule are paid. Additional fees may be imposed by the Planning Board during the review process to cover fees and costs of professional reviewers of the Planning Board including engineers, surveyors, lawyers, and community planners. Please refer to SECTION II - ADMINISTRATION AND ENFORCEMENT, Paragraph P. PROFESSIONAL REVIEW.

e. Town Departments & Agencies Review & Meeting:

1. Distribution of Plans for Review: The applicant shall deliver a copy of the application and related materials to each of the departments outlined below applicable for their subdivision application at least fifteen (15) days prior to the scheduled Planning Board meeting when the project will be reviewed. Failure by the applicant to distribute the application and related materials to the applicable departments at least fifteen (15) days prior to the scheduled Planning Board meeting when

the project will be reviewed will result in the Planning Board determining the application is **not** complete for both preliminary and final applications and no further review will take place until this requirement has been satisfied. Additionally, any material changes to the plans submitted for review by the Town departments and agencies and the Planning Board will require a new application and starting the process over again. The applicant should contact the Town Planner, or other designee of the Planning Board, for guidance on which departments and agencies need to be provided a copy of the application and related materials.

The departments the application may be referred to include:

a. Fire Department;
b. Police Department;
c. Public Works Department;
d. N.H. Department of Transportation, if providing access to the subdivision;
e. Conservation Commission;
f. New London/Springfield Water System Precinct, if serving the subdivision;
g. Kearsarge Regional School District;
h. Health Officer;
i. Zoning Administrator;
j. Town Administrator; and
k. Town Planner, or other designee of the Planning Board,.

2. Meeting to Review Subdivision: During the afternoon of the scheduled Planning Board meeting when the subdivision will be reviewed, the subdivider may be required to meet with the Town departments and agencies to discuss their subdivision proposal as directed by the Town Planner, or other designee of the Planning Board. The Town departments and agencies may provide the subdivider and the Planning Board with their review comments. Only the subdivision application and related materials distributed to the Town departments as provided in the paragraph above will be reviewed and discussed at the meeting; any material changes to the plans submitted for review by the Town departments and agencies and the Planning Board will require a new application and starting the process over again.

f. Acceptance of Complete Application: At the public meeting of the Planning Board specified in the notice, the Planning Board shall first review the application for completeness as required by these regulations. SECTION V of

these regulations identifies what constitutes a complete application. If determined to be complete, and all required fees and costs of notice have been paid, then the Planning Board shall by motion accept the application as complete which is sufficient to invoke jurisdiction of the Planning Board per RSA 676:4,I(b).

g. Public Hearing on Application; Time Limits: The Planning Board shall hold a public hearing on the application only after the Planning Board has accepted the application as complete. The Planning Board shall act to approve, conditionally approve or disapprove the application within sixty-five (65) days after acceptance of the application as complete provided, however, that the Planning Board may apply to the Board of Selectmen of the Town for an extension not to exceed an additional ninety (90) days before acting to approve or disapprove the application and, provided further, that the applicant may waive the requirement for Planning Board action within the foregoing time periods and consent to such extension as may be mutually agreeable. Upon failure of the Planning Board to approve, conditionally approve, or disapprove the application, the Board of Selectmen shall, upon request of the applicant, immediately issue an order directing the Planning Board to act on the application within 30 days. If the Planning Board does not act on the application within that 30-day time period, then within 40 days of the issuance of the order, the Board of Selectmen shall certify on the applicant's application that the plat is approved pursuant to this paragraph, unless within those 40 days the Board of Selectmen has identified in writing some specific subdivision regulation or zoning or other ordinance provision with which the application does not comply. Such a certification, citing this paragraph, shall constitute final approval for all purposes including filing and recording under RSA 674:37 and 676:18, and court review under RSA 677:15.

h. Disapproval: In case of disapproval of any application, the grounds for such disapproval shall be adequately stated upon the records of the Planning Board and a copy thereof shall be mailed to the applicant certified mail, return receipt requested.

i. Planning Board Approval & Distribution of Final Subdivision Plans: Before the subdivision plat will be signed by the Planning Board and transmitted to the Merrimack County Registry of Deeds to be recorded, the subdivider shall provide the Planning Board a complete full-scale set of subdivision plans as approved by the Planning Board, including any revisions required as conditions of approval, to each applicable Town department as directed by the Town Planner, or other designee of the Planning Board, and to the Town Inspector required by the Planning Board in Section II-H Inspection Services.

Following Planning Board approval, the subdivider shall provide the Town Planner, or other designee of the Planning Board, with a complete full-scale set of approved subdivision plans, including any revisions required as conditions of approval, for the Planning Board to stamp & sign. The subdivider shall then provide the Town Planner, or other designee of the Planning Board, with a complete full-scale set of approved subdivision plans signed by the Planning Board for distribution to each applicable Town department as directed by the Town Planner, or other designee of the Planning Board, and to the Town Inspector required by the Planning Board in Section II-H Inspection Services.

This step needs to be completed before the Planning Board will sign the subdivision plat and transmit it to the Merrimack County Registry of Deeds for recording.

j. Signing of the Subdivision Plat for Recording: Following final approval of the Final Subdivision Plat, including satisfaction of any conditions of approval, three alternative methods are available to the subdivider before the Planning Board will sign and record the Final Subdivision Plat in the Merrimack County Registry of Deeds as outlined in 1), 2) or 3) to follow:

1) Construction of Required Improvements and the Signing of the Plat: The subdivider shall construct and install all improvements required by the Planning Board within 36 months from the receipt of the notice of decision by the subdivider from the Planning Board. The subdivider shall provide the Planning Board with security in a form and amount sufficient to cover the expense of restoring the site to a stable condition and prevent soil erosion. Upon completion of the improvements, the subdivider shall make application to the Planning Board for a Temporary Certificate of Performance of Improvements as outlined in SECTION VII DEVELOPER'S RESPONSIBILITIES, Paragraph H. CERTIFICATE OF PERFORMANCE OF IMPROVEMENTS. This application shall include all the applicable inspections of the improvements by the various departments and agencies. Within that same time period, the subdivider shall present the plat to be signed after the improvements have been installed, inspected and a Temporary Certificate of Performance has been approved by the Planning Board. The Temporary Certificate of Performance includes a requirement for the subdivider to submitted security for a period of one year which is acceptable to the Planning Board to cover corrections of defects, omissions or failure of installation of the subdivision improvements to comply with the approved plans and the cost of inflation. The plat will be recorded in

the Merrimack County Registry of Deeds and the subdivider may then sell and convey lots in the subdivision.

2) Security and the Signing of the Plat: Before the subdivider starts installation or construction of improvements such as streets or roads, water or sewer service facilities, drainage structures or other utilities, the subdivider shall furnish security in an amount and form acceptable to the Planning Board. The purpose of this security will be to provide the funds necessary to install the improvements in the subdivision required by the Planning Board in the event the subdivider fails to do so for any reason, including but not limited to insolvency or bankruptcy.

Where security has been furnished as required by the Planning Board, the subdivider shall then present the plat for signature and recording. Upon the recording of the signed plat, the subdivider may then sell lots even though the improvements have not yet been constructed.

Where security is furnished, the subdivider must construct and install the improvements within 36 months from the receipt of the notice of decision by the subdivider. The subdivider may request a time extension beyond the 36 months for completion of the improvements and the Planning Board may for good cause shown approve such a request. Alternatively the subdivider could apply for an annexation to combine the subdivided lots and void the subdivision providing for release of the security for the improvements. If the improvements have not been completed within 36 months and no time extension has been approved by the Planning Board, then the Board of Selectmen shall use the security to complete the improvements.

Within the 36 months from the receipt of the notice of decision by the subdivider and upon completion of the improvements, the subdivider shall make application and the Planning Board must approve a Temporary Certificate of Performance of Improvements as outlined in SECTION VII DEVELOPER'S RESPONSIBILITIES, Paragraph H. CERTIFICATE OF PERFORMANCE OF IMPROVEMENTS. This application shall include all the applicable inspections of the improvements by the various departments and agencies. The Temporary Certificate of Performance includes a requirement for the subdivider to submit security for a period of one year which is acceptable to the Planning Board to cover corrections of defects, omissions or failure of installation of the subdivision improvements to comply with the approved plans, and the cost of inflation.

3) Covenant restricting lot sales and Signing of the Plat: The subdivider shall file with the Planning Board for recording in the Merrimack County Registry of Deeds a covenant restricting the sale of interior lots which use a proposed road for access until either a Certificate of Performance of Improvements has been approved by the Planning Board or security in an amount and form acceptable to the Planning Board has been furnished. The subdivider shall provide the Planning Board with security in a form and amount sufficient to cover the expense of restoring the site to a stable condition and prevent soil erosion if the subdivider chooses to construct the subdivision improvements in lieu of providing security for all the improvements and the Planning Board signing and recording the plat thus allowing sale of lots. The covenant shall include a statement that a breach of the covenant may result in the refusal of a building permit for construction by the Board of Selectmen. The covenant shall reference the Four Year Exemption clause outlined in Section II-N. of the New London Land Subdivision Control Regulations. The covenant shall indicate that in order to nullify the covenant, the Planning Board must approve and record an instrument that indicates that either:

a) Security in the amount and form acceptable to the Planning Board for the then required subdivision improvements has been furnished to and accepted by the Planning Board; or

b) The required subdivision improvements have been constructed and a Certificate of Performance required by Section VII-H. has been approved by the Planning Board.

c) Nothing herein shall obligate the Planning Board to approve either the Certificate of Performance of Improvements or the proposed security. Not withstanding the four year exemption clause in Section II-N, in the event that at the time said certificate is requested or security is proposed the Planning Board determines and finds that circumstances in the Town have so changed so that the continued sale of lots in the subdivision results in the need for either Off-Site Improvements, the assessment of impact fees, restrictions on the issuance of building, sewer or water permits or other material and substantial changes have occurred in the Town of New London since the subdivision was approved in which event the Planning Board shall consider the request for said certificate or approval of security as a new subdivision

application. A suggested form for a 'Covenant Restricting Lot Sales' is attached as Exhibit E.

4) Nothing herein shall obligate the Town to build or complete improvements when in the opinion of the Planning Board after consultation with the Board of Selectmen and a public hearing the Planning Board determines that such improvements are not in the public interest.

k. Recording the Plat: Within thirty days after the plat is signed, the Planning Board shall transmit to the Registry of Deeds of Merrimack County the original plat for recording, charging the subdivider for the recording fee and expenses. The plat must contain signatures of a majority of the Planning Board and indicate the date of signing. If there are any associated documents to record for the subdivision such as, but not limited to, restrictive covenants or homeowner association bylaws, the applicant shall deliver signed copies of those documents ready to be recorded to the Planning Board before the plat is recorded. After the recorded plat is returned from the Registry, the Town shall fill in the subdivision plat recording information in the document(s) and transmit the original signed document(s) to the Registry for recording charging the subdivider for the recording fees. For good cause shown, the time limit for recording may be extended by the Planning Board. The subdivider shall submit a check payable to LCHIP to be transmitted to the Registry of Deeds of Merrimack County along with the signed plat to be recorded unless the fee is no longer required by state statutes.

l. Distribution of Recorded Copies: Recorded copies of the final plat returned from the Merrimack County Registry of Deeds shall be furnished to the Planning Board at the subdivider's expense with one copy to be retained in the Planning Board file one copy provided to the subdivider, and one copy provided for each new property file created as a result of the subdivision approval.

m. Conditional Approval of the Plat: Conditional approval of the plat is not the same as signing the Plat. If conditional approval is given by the Planning Board, all required conditions of approval must be accepted by the Planning Board before the plat will be signed and recorded. Additionally, the subdivider must meet the requirements of SECTION IV -A:3., j Signing the Plat before the plat will be signed and recorded by the Planning Board. All of these conditions of approval and security requirements must be met by the applicant within 12 months of the date of conditional approval of the subdivision or the subdivision approval by the Planning Board is null and

void.

n. Street Acceptance: Final approval by the Planning Board does not constitute acceptance of the street or streets by the Town of New London. Refer to SECTION VII- I. STREET ACCEPTANCE PLANS.

B. MINOR SUBDIVISIONS

The application procedure for a Minor Subdivision shall be the same as for a Major Subdivision as outlined in Section IV-A. above except:

1. Minor Subdivisions are not required to file an application for a Preliminary Plan; and

2. Minor Subdivisions need not be referred for comment as required for Major Subdivisions in Section IV-A:3,e.

3. Consultation with the Town Planner, or other designee of the Planning Board, in most instances should provide the applicant with the direction needed to proceed directly with filing an application for a Final Subdivision Plat as per Section IV-A.3. above. Only three copies of the application and related materials need be submitted for the Planning Board's review fifteen (15) days prior to the regularly scheduled public meeting of the Planning Board at which the applicant will formally submit the application to the Planning Board.

C. ANNEXATIONS, MINOR LOT LINE ADJUSTMENTS, OR BOUNDARY AGREEMENTS

The application procedure for an annexation, minor lot line adjustment or boundary agreement shall be as follows:

1. Application Required: Any person desiring an annexation, minor lot line adjustment or boundary agreement as defined in these regulations MUST apply to the Planning Board in writing on the designated application form and pay the required fees. The applicant shall contact the Town Planner, or other designee of the Planning Board, to schedule the public hearing with the Planning Board to review the application.

2. Filing of Application:

The applicant shall file the application and related materials as required by these regulations by delivering the complete application to the Town Offices at least fifteen (15) days prior to the Planning Board public hearing date to consider whether the

application is complete.

3. Notice to Abutters, Professionals, Holders of Preservation Restrictions and Public
The Secretary of the Planning Board shall notify abutters located within 200 feet of the subject property; any professionals assisting with preparing the application such as engineers, architects, land surveyors, wetland scientists or soil scientists; holders of any conservation, preservation, or agricultural preservation restrictions; and the applicant by certified mail of the date, time and place upon which the application will be formally submitted to the Planning Board and the Planning Board will hold a public hearing to consider the application. Such notice shall provide at least ten (10) "clear days" of notice before the Planning Board meeting. Such notice shall also be given to the general public by posting a copy of the notice in two public places in the Town at the same time that notice is sent certified mailed to those identified above.

4. Payment of Fees and Notification Costs:

All application fees established by the Planning Board, including the costs of such notice, secretarial time and disbursements, shall be paid by the applicant at the time of filing the application. Failure to pay such costs shall constitute valid grounds for the Planning Board to terminate further consideration and to disapprove the plat without a public hearing. The application will not be accepted for review until the fees set forth in the Planning Board's current fee schedule are paid. Additional fees may be imposed by the Planning Board during the review process to cover fees and costs of professional reviewers for the Planning Board, including engineers, surveyors, lawyers, and community planners. Please refer to SECTION II - Administration and Enforcement, Paragraph P. PROFESSIONAL REVIEW.

5. Public Hearing and Time Frame:

The Planning Board shall review the application at the scheduled public hearing after determining the application is complete and all fees have been paid. The Planning Board shall act to approve or disapprove the application within sixty-five (65) days after submission and acceptance by the Planning Board subject to the extensions outlined in Section IV-A:3, g. In case of disapproval of any application, the grounds for such disapproval shall be adequately stated upon the records of the Planning Board and a copy thereof shall be mailed to the applicant certified mail, return receipt requested.

6. Signing and Recording the Annexation Plat:

A majority of the Planning Board shall sign the annexation plat following approval. Within thirty (30) days after the plat is signed, the applicant shall deliver copies of signed deeds to the Planning Board ready to be recorded. After receiving

the signed deeds, the Planning Board shall transmit to the Registry of Deeds of Merrimack County a mylar for recording, charging the developer for the recording fees. The Town shall fill in the subdivision plat recording information in the signed deeds after the recorded plat is returned from the Registry and transmit the original signed deeds to the Registry for recording, charging the developer for the recording fees. For good cause shown, the time limit for recording may be extended by the Planning Board. The applicant shall submit a check payable to LCHIP to be transmitted to the Registry of Deeds of Merrimack County along with the signed plat to be recorded unless the fee is no longer required by state statute.

7. Distribution of Recorded Copies:

Recorded copies of the annexation plat and recorded deeds returned from the Registry of Deeds shall be furnished to the Planning Board with one copy to be retained in the Planning Board files, one copy given to the subdivider and one copy provided for property file for each lot in the approved annexation.

D. VOLUNTARY MERGERS

The application procedure for a voluntary merger of lots of record shall be as follows:

1. Filing of Application:

The applicant shall complete and sign a Voluntary Merger of Lots of Record Form and submit the completed and signed form along with a copy of the deed(s) of the properties to be merged. When existing lots as described in recorded deeds are to be merged, then the Voluntary Merger Lots of Record Form found in Exhibit G1 should be used. When existing lots in an approved and recorded subdivision are to be merged, then the Voluntary Merger Lots of Record Form found in Exhibit G2 should be used.

2. Approval and Signing by the Planning Board:

Except where such voluntary merger would create a violation of the current ordinances or regulations, all such requests shall be approved, and no public notice or hearing shall be required. The Planning Board shall approve and a majority of the Boar shall sign the Voluntary Merger of Lots of Record Form.

3. Recording of the Voluntary Merger of Lots of Record Form:

After the Voluntary Merger of Lots of Record Form is signed by the Planning Board, the Recording Secretary of the Planning Board shall transmit the original signed form and signed deeds to the Merrimack County Registry of Deeds for recording. The

applicant is responsible for reimbursing the Town for the cost of the recording fees.

4. Distribution of Recorded Copies:

Recorded copies of the Voluntary Merger of Lots of Record form and recorded deeds returned from the Registry of Deeds shall be furnished to the Planning Board with one copy to be retained in the Planning Board files, one copy given to the subdivider and one copy provided for the property file for each lot in the approved lot merger.

SECTION V - APPLICATION SUBMITTAL REQUIREMENTS

A. MAJOR SUBDIVISIONS - PRELIMINARY APPLICATION

The applicant shall submit up to twenty-four (24) sets of the Preliminary Subdivision application and related materials to the Town Offices at least 15 days before the date of the scheduled Planning Board meeting to review the Preliminary Subdivision Plan. Three (3) sets of the full-scale plans (24" x 36") and ten (10) sets of the reduced-scale plans (11" x 17") are for review by the Planning Board, and up to eleven (11) sets of the full-scale plans (24" x 36") are for review by the departments and any outside agencies. At least 15 days before the date of the scheduled Planning Board meeting to review the Preliminary Subdivision Plan, the applicant shall deliver three sets of the application for the Planning Board and the sets of the application for all the Town Departments to the Town Offices, and deliver sets of the application to any applicable outside agencies, such as the NH Department of Transportation for access approval or to the New London/Springfield Water System Precinct for public water service, as guided by the Town Planner, or other designee of the Planning Board.

The intent is to have preliminary plans and preliminary information provided at this stage of the review process. More detailed plans or information may be needed to resolve issues encountered on certain applications before proceeding to a Final Subdivision Plat application.

A complete application for a Preliminary Subdivision Plan shall include all of the information and maps required for the Final Subdivision Application as outlined in SECTION V- B. **except** as follows:

1. The Preliminary Subdivision Plat does not require the Planning Board title block;

2. The only legal documents required with the Preliminary Subdivision Application are the covenants and restrictions proposed for any homeowner's association; and

3. Agency and permit approvals are not required with the Preliminary Subdivision Application.

B. MAJOR SUBDIVISION - FINAL APPLICATION:

The applicant shall submit up to twenty-four (24) sets of the final subdivision application and related materials to the Town Offices at least 15 days before the date of the scheduled Planning Board meeting to review the Final Subdivision Plan. Three (3) sets of the full-scale plans (24" x 36") and ten (10) sets of the reduced-scale plans (11" x 17") are for review by the Planning Board, and up to eleven (11) sets of the full-scale plans (24" x 36") are for review by the departments and any outside agencies. At least 15 days before the date of the scheduled Planning Board meeting to review the Final Subdivision Plan, the applicant shall deliver the application with plans sets noted above for the Planning Board and the sets of the application for all the Town Departments to the Town Offices. In addition, the applicant shall also deliver sets of the application, at least 15 days before meeting with the Planning Board, to any applicable outside agencies, such as the NH Department of Transportation for access approval or to the New London/Springfield Water System Precinct for public water service, as guided by the Town Planner, or other designee of the Planning Board.

A complete application for a Final Subdivision Application shall include the following information and maps:

1. An application form completed and signed by the landowner or the landowner's authorized agent (refer to Exhibit A1) and a Major Subdivision Checklist of Application Requirements (refer to Exhibit A2);

2. Written authorization from the landowner of record for any agent(s) to represent and sign for the owner;

3. Impact Assessment

   Statement as to Impact of Subdivision and Determination of Whether or Not Premature or Scattered

   A. Purpose: The purpose of this section is to require the subdivide to provide information to the Planning Board with regard to the impact of the subdivision and such other information as to allow the Planning Board to make a determination as to whether or not the proposed subdivision will be premature or scattered.

   B. Areas of Study and Information: The following areas shall be considered in such studies and such information provided to the Planning Board to determine the effect of the proposed subdivision. The Town Planner, or other designee of the Planning Board, may provide guidance to assist the subdivider in providing appropriate

information.

1. Statement of impact of the proposed development on natural resources and environmental quality including, but not limited to, water quality, air quality, visual impact of land clearing and construction, impact on conservation owned land and conservation easements, impact on wildlife habitats, wetlands, soil erosion and agricultural soils, and a statement of pollution control and environmental impact mitigation measures.

2. Capacity of the school system; effect on school bus transportation and distance of the proposed subdivision from the nearest elementary school.

3. Adequacy of streets and/or sidewalks in the general area of the subdivision including major intersections providing access, and such other areas as requested by the Board.

4. Sufficiency, availability and capacity of utility services to provide water, fire protection, and sewer, and further, the impact of the subdivision on the municipal solid waste disposal facility.

5. (If applicable) The impact of on-site subsurface sewage disposal systems as to adjacent wells, water supply systems, and any know aquifers so designated by the United States Geological Survey.

6. Any special fire, police, and public safety problems due to location and/or special conditions relative to the type of use.

7. Impact of drainage from the subdivision on abutting properties and potential drainage problems both on the site of the subdivision and downstream from the subdivision.

8. Fiscal impact statement analyzing the impact of the subdivision on municipal, school, and county revenues and expenditures, including estimated potential tax revenue and estimated number of school children.

The Impact Assessment shall demonstrate to the Planning Board that the proposed subdivision is not scattered and premature such that it would involve danger or injury to health, safety, or general welfare by reason of lack of water supply, drainage,

transportation, school, fire protection, or other public services, or necessitate an excessive expenditure of public funds for the supply of such services. The impact assessment shall also include an assessment of the impacts of the proposed or potential development of all contiguous land owned by the applicant which might constitute future phases of development.

The Planning Board may require the subdivider to pay the cost of professional review of the subdivider's impact study as provided by these regulations and RSA 676:4,I.(g).

4. A list of Abutters within two hundred (200) feet; any professionals assisting with preparing the application such as engineers, architects, land surveyors, or soil scientists; holders of conservation, preservation or agricultural preservation restrictions; and the applicant.

5. Payment of the application fee based on the current Planning Board fee schedule;

6. Any requests for waivers presented in writing shall include the rationale for the waiver(s) as provided in SECTION II. B. Waiver of Requirements and shall cite the specific section of the regulations requested to be waived;

7. Maps

For the number and distribution of required maps, refer to SECTION V-B. above. All the required full scale maps shall be drawn at a scale of not more than 100 feet per inch; be prepared, signed and sealed by a NH Registered surveyor or engineer; show any dates of revisions; and include the name of the town and subdivision, name and address of subdivider and registered surveyor or engineer. The maps to follow shall be presented on separate plans rather than combining them onto one plan in order that they are legible and clear. For greater detail, the Planning Board at its discretion may require maps to be drawn at a scale of 50 feet per inch. Required maps shall include the following:

a. Final Survey Plat (Plat to be recorded if approved): The site survey shall show the following information and conform to the following specifications:

1) Be drawn in permanent black ink on permanent, reproducible material on the size and type of material specified by the Merrimack County Registry of Deeds.
2) Show complete boundaries of the entire parcel owned by the subdivider, whether or not all land therein is to be subdivided, referenced to a public street intersection or USGS bench mark; north point (identify whether true north or magnetic north was used),

graphic scale, and tax map(s) and lot number(s) of property included in subdivision application.

3) Show existing and proposed street right-of-way lines or center lines for private roads, dimensions arc lengths and radii; have points of curvature and tangency of curved streets; bearings of lot lines; have names of existing and proposed streets; and width of adjacent streets, pavement and right-of-way.

4) Show existing and proposed lot lines, bearings and dimensions, lot sizes in square feet or acres, consecutive numbering of lots, monuments at lot corners. Show or note building setback lines as required by the Zoning Ordinance. Show the minimum contiguous area required by the Zoning Ordinance for each lot excluding Wetlands and areas with slopes in excess of 25%.

5) Show location of existing and proposed easements and areas affected by existing and proposed covenants, reservations and restrictions, benefiting or burdening the property.

6) Show location of existing or proposed parks and other open space, and significant natural and manmade features. Show all Wetlands as defined by the Zoning Ordinance and Wetland Buffers regulated by the Zoning Ordinance. Show all Streams as defined by the Zoning Ordinance and Stream Buffers regulated by the Zoning Ordinance. Show all areas with slopes in excess of 15% through and including 25% and areas with slopes in excess of 25%.

7) Show location and type of all proposed and existing survey monuments.

8) Show all Zoning district boundary lines.

9) Show location of driveway access to each lot. (See Section VI-I)

10) Show names and tax map and lot numbers of all abutters as they appear in the town records not more than five (5) days before the date of filing the application.

11) Show a general site location map locating the subdivision boundary and proposed streets in relation to major roads or other features shown on the town map.

12) Show subdivisions, lot lines existing buildings, and intersecting streets and driveways within 200 feet of the parcel to be subdivided.

13) The survey map shall include the following title blocks:

NAME OF SUBDIVISION

Name of Surveyor or Engineer	Name of Owner of record
Address of Surveyor or Engineer	Address
Signature and Seal of Surveyor or Engineer	Date

TOWN OF NEW LONDON, NH PLANNING BOARD

NH DES Subdivision Approval Number for Wastewater Treatment _____

NH Wetlands Board - Wetlands Permit: Dredge and Fill Permit Number _____

NH DES Land Disturbance (RSA 485-A:17) Permit Number ____

NH DES Community Water Supply Permit Number ____

N.H. Department of Transportation Access Permit Number _____

Date Application Filed _____

Hearing Date _____

Approval Date _____

Signatures of Planning Board:

_____
Chair

_____
Vice-Chair

_____
Secretary

_____ _____

_____ _____

_____ _____

b. Topographic Map: The topographic map shall show existing topography and proposed changes in topography. Contours of existing grade shall be shown at intervals of not more than five (5) feet unless otherwise approved by the Planning Board. Intervals less than five (5) feet may be required depending on the character of the topography. All low points, high points and other areas needing spot elevations shall be shown. Two (2) foot contour intervals shall be provided in areas where soils are mapped to conform to the soil classification and standards prepared by the Society of Soil Scientists of Northern New England in their publication "High Intensity Soil Maps for New Hampshire". Contour lines shall extend a minimum of one hundred (100) feet beyond the subdivision boundary if requested by the Planning Board.

Contour lines are to be actual and not interpolations of USGS maps unless otherwise approved by the Planning Board. The Planning Board may accept interpolations of USGS maps for large lots to be served by Town sewer. Existing contours shall be shown as dashed lines and proposed contours shall be shown as solid lines.

c. Soils Map: The soils map shall show the location of all percolation test sites, soil test pits and borings, and soil mapping units and boundaries. The soils map shall be prepared by a Soils Scientist to conform with the soil classifications and standards prepared by the Society of Soil Scientists of Northern New England in their publication "High Intensity Soil Maps for New Hampshire". A legend on the soils map shall identify soil mapping unit symbols and soil names. Also to be shown on the soils map are the results of all soil tests including dates, locations by reference to soil map, percolation rates, soil profile with depth to ledge, clay, hard pan and existing and seasonal high water table.

d. Utilities and Fire Protection Plan Map: This map shall show the location and details of all existing and proposed utilities including lines and associated facilities for water, sewer, telephone, electric, gas, and cable as well as the location of existing or proposed wells and on-site sewage disposal systems, including the 4,000 square foot area required by the NH Department of Environmental Services for on-site waste disposal. This map shall show the fire protection measures to be provided to include fire hydrants (active or dry), fire ponds or on-site water supply tanks. In addition to this map, the applicant shall submit the covenant relating to the release of the Town of New London from furnishing any public fire protection facilities in the proposed subdivision of land as outlined in Exhibit B3.

e. Drainage Plan Map: This map shall show all surface water on and within two hundred (200) feet of the subdivision including rivers, streams, intermittent streams, lakes, ponds, marshes, and wetlands. This map shall show all flood prone areas. This map shall detail all existing and proposed drainage facilities on and within two hundred (200) feet of the subdivision to include all drainage ditches, drainage swales, storm drainage lines, and all drainage structures. This plan shall show the final identification, location, elevation, grades, profiles and contours at two (2) foot intervals for the existing and proposed drainage ways and structures.

8. Erosion and Sedimentation Control Plan

The Erosion and Sedimentation Control Plan shall contain sufficient information to describe the nature and purpose of the proposed development, pertinent conditions of the site and the adjacent areas, and proposed erosion and sedimentation controls. The applicant shall submit such material as is necessary to show that the proposed development will comply with the design standards and contain the information listed below.

a. Standards: The Erosion and Sedimentation Control Plan shall be designed to meet the Town of New London Stormwater & Erosion Control Design Standards and Landscape Design Standards for Stormwater Treatment and designed to comply with the requirements of the NH Department of Environmental Services under RSA 485-A;17. In addition to the Low Impact Development best management practices (BMPs) for managing stormwater and controlling erosion, the Stormwater Management and Erosion Control Handbook for Developing Areas in New Hampshire shall also be used in selecting the design and the BMPs to manage stormwater and control erosion.

b. Contents: The Erosion and Sedimentation Control Plan shall contain the following information:

1) Names, addresses, and telephone numbers of the owner, applicant, and person(s) or firm(s) preparing the plan;
2) Title, date, north arrow, names of abutters, scale (1"=20' or 1"=40'); legend, and locus map (1"=800');

3) Location and description of natural features including:
   a. Watercourses and water bodies, wetland resource areas, riparian zones and all floodplain information, including the 100-year flood elevation based upon the most recent Flood Insurance Rate Map, or as calculated by a professional engineer for areas not assessed on these maps;
   b. Existing vegetation of various kinds including tree lines, shrub layer, ground cover and herbaceous vegetation, and trees with a caliper twelve (12) inches or larger, noting specimen trees and forest communities; and
   c. Habitats mapped by the New Hampshire Natural Heritage Program as Rare Plant Species and Natural Communities within five hundred (500) feet of any construction activity.
4) Lines of existing abutting streets showing drainage and driveway locations and curb cuts;
5) Existing soils (type, hydrologic group, erodibility) and the volume and nature of imported soil materials;
6) Topographical features including existing and proposed contours at intervals no greater than two (2) feet with spot elevations provided when needed;
7) Steep slopes for pre-development and post-development conditions, delineated by 0%-15%, 15%-25%, and over 25%;
8) Surveyed property lines showing distances and monument locations, all existing and proposed easements, rights-of-way, and other encumbrances, the size of the entire parcel, and the delineation and number of square feet of the land area to be disturbed;
9) Drainage patterns, watersheds and subwatersheds, with calculations of proposed land disturbance within each subwatershed and areas of soil to be disturbed in each watershed throughout the duration of the proposed land disturbance activity;
10) Location and details of erosion and sediment control measures with a narrative of the construction sequence/phasing of the project, including both operation and maintenance for structural and non-structural measures, interim grading, and material stockpiling areas;
11) Path and mechanism to divert uncontaminated water around disturbed areas, to the maximum extent practicable;

12) Location and description of and implementation schedule for temporary and permanent seeding, vegetative controls, and other temporary and final stabilization measures;
13) A description of construction and waste materials expected to be stored on-site. The Plan shall include a description of controls to reduce pollutants from these materials, including storage practices to minimize exposure of the materials to stormwater, and spill prevention and response.
14) A description of provisions for phasing the project where 40,000 square feet of contiguous area or greater is to be altered or disturbed;
15) Plans, reports, and calculations must be stamped and certified by a qualified professional civil engineer; and
16) Such other information as is required by the Planning Board.

9. Stormwater Management Plan

The Stormwater Management Plan shall contain sufficient information to describe the nature and purpose of the proposed development, pertinent conditions of the site and the adjacent areas, and proposed best management practices for the permanent management and treatment of stormwater. The Stormwater Management Plan shall contain sufficient information for the Planning Board to evaluate the environmental impact, effectiveness, and acceptability of the measures proposed by the applicant for reducing adverse impacts from stormwater. The Plan shall be designed to meet the Town of New London Stormwater & Erosion Control Design Standards and Landscape Design Standards for Stormwater Treatment and designed to comply with the requirements of the NH Department of Environmental Services under RSA 485-A;17. In addition to the Low Impact Development best management practices (BMPs) for managing stormwater and controlling erosion, the Stormwater Management and Erosion Control Handbook for Developing Areas in New Hampshire shall also be used in selecting the design and the BMPs to manage stormwater and control erosion. The Stormwater Management Plan shall fully describe the project in drawings, and narrative. The applicant shall submit such material as is required below.

a. Standards: The Stormwater Management Plan shall be prepared in accordance with the Town of New London Stormwater & Erosion Control Design Standards and Landscape Design Standards for Stormwater Treatment.
b. Stormwater Management Plan Requirements: The Stormwater Management Plan shall contain the following information:
    1) A locus map, at a scale of 1"=800';
    2) The existing zoning, and land use at the site;
    3) The proposed land use;

4) The location(s) of existing and proposed easements
5) The location of existing and proposed utilities;
6) The site's existing & proposed topography with contours at 2 foot intervals;
7) The existing site hydrology;
8) A description & delineation of existing stormwater conveyances, impoundments, and wetlands on or adjacent to the site or into which stormwater flows;
9) A delineation of 100-year flood plains, if applicable;
10) An estimate made by a Soil Scientist of seasonal high groundwater elevation in each area to be used for stormwater retention, detention, or infiltration;
11) The existing and proposed vegetation and ground surfaces with runoff coefficient for each;
12) A drainage area map showing pre and post construction watershed boundaries, drainage area and stormwater flow paths;
13) A description and drawings of all components of the proposed drainage system including:
    a) locations, cross sections, and profiles of all brooks, streams, drainage swales and their method of stabilization;
    b) all measures for the detention, retention or infiltration of water;
    c) all measures for the protection of water quality;
    d) the structural details for all components of the proposed drainage systems and stormwater management facilities;
    e) notes on drawings specifying materials to be used, construction specifications, and typicals; and
    f) expected hydrology with supporting calculations.
14) The proposed improvements including location of buildings or other structures, impervious surfaces, and drainage facilities, if applicable;
15) The Timing, schedules, and sequence of development including clearing, stripping, rough grading, construction, final grading, and vegetative stabilization;
16) A maintenance schedule for the period of construction; and
17) Any other information requested by the Planning Board.

c. Operation and Maintenance Plan: An Operation and Maintenance Plan (O&M Plan) for the permanent storm water management system is required at the time of application for all projects. The maintenance

plan shall be designed to ensure compliance with these regulations in all seasons and throughout the life of the system. The Planning Board shall make the final decision of what maintenance option is appropriate in a given situation. The Planning Board will consider natural features, proximity of site to water bodies and wetlands, extent of impervious surfaces, size of the site, the types of stormwater management structures, and potential need for ongoing maintenance activities when making this decision. Once approved by the Planning Board, the Operation and Maintenance Plan shall be recorded at the Merrimack County Registry of Deeds by the permittee, shall remain on file with the Planning Board and shall be an ongoing requirement. The Operation and Maintenance Plan shall conform to the requirements listed below. Stormwater management easements shall be provided by the property owner(s) and shall be sufficient in location and extent to carry out the required maintenance.

1) Operation and Maintenance Plan Requirements: An Operation and Maintenance Plan shall include:
    a) The name(s) of the owner(s) for all components of the system;
    b) Maintenance agreements that specify:
        (1) The names and addresses of the person(s) responsible for operation and maintenance;
        (2) The person(s) responsible for financing maintenance and emergency repairs;
        (3) A Maintenance Schedule for all drainage structures, including swales and ponds;
        (4) A list of easements with the purpose and location of each; and
        (5) The signature(s) of the owner(s).
2) Stormwater Management Easement(s):
    a) Stormwater management easements shall be provided by the property owner(s) as areas are necessary for:
        (1) access for facility inspections and maintenance;
        (2) preservation of stormwater runoff conveyance, infiltration, and detention areas and facilities, including flood routes for the 100-year storm event; and
        (3) direct maintenance access by heavy equipment to structures requiring regular cleanout maintenance.
    b) The purpose of each easement shall be specified in the maintenance agreement signed by the property owner;
    c) Stormwater management easements are required for

all areas used for off-site stormwater control, unless a waiver is granted by the Planning Board; and

d) Easements shall be recorded with the Merrimack County Registry of Deeds prior to issuance of a Certificate of Completion by the Town Administrator.

3) Changes to Operation and Maintenance Plans:

a) The owner(s) of the stormwater management system must notify the Town Inspector of changes in ownership or assignment of financial responsibility.

b) The maintenance schedule in the Maintenance Agreement may be amended to achieve the purposes of this Stormwater Management and Erosion Control Bylaw and Regulations by mutual agreement of the Planning Board and the Responsible Parties. Amendments must be in writing and signed by all Responsible Parties. Responsible Parties shall include owner(s), persons with financial responsibility, and persons with operational responsibility. Once the amended Plan is signed the Planning Board shall file it at the Registry of Deeds at the expense of the current owner(s).

4) Annual Report Submittal:

The Responsible Parties must submit annual reports regarding the inspection and maintenance of the BMPs for which they are responsible. A copy of the annual report shall be sent by the Responsible Parties to the Town Inspector, the Town Public Works Director, the Planning Board, and the Board of Selectmen. The reports must include:

a) Descriptions of the condition of the BMPs;

b) Descriptions of maintenance performed; and

c) Receipts for maintenance performed.

The Town Land Use and Assessing Coordinator shall maintain a file with all the required Annual Reports and the dates they are due annually. If an Annual Report is not received on time the Town Land Use and Assessing Coordinator shall notify the board of Selectmen for enforcement action.

10. Drainage construction plans and details:

a. Pipe profiles for all culverts and closed drain system pipes. These may be shown on roadway cross sections, roadway profile or on a completely separate profile, including existing and proposed finished grades, as required.

Plans shall specify pipe type, size, length, slope and invert elevations.

b. All catch basins, drop inlets and man-holes shall be shown in profile, the type of grate with rim elevations shall be specified.

c. Any ditch section proposed, which is different from the typical roadside ditch, shall be shown in detail giving the bottom width, side slopes and minimum depth of ditch.

d. Permanent erosion control measures shall be specified and detailed on the plans for all roadside ditches (where required) and the drainage pipe outlets. Sufficient detail shall be provided to properly construct the intended item (i.e., stone size, thickness of stone layer, subgrade preparation or protection, depth of stone lining in ditch, etc).

e. Sufficient plans and construction details for Detention and Retention Ponds shall be provided.

11. Soils Report

In addition to the Soils Map, the subdivider shall submit a Soils Report prepared by a Soils Scientist or an engineer which provides an analysis of the suitability of the soils for the proposed development. The Soils Report shall also include a report by the Town Health Officer on his/her review of the suitability of the soils for the proposed development given the percolation test pit results, the soils mapping and the soils report prepared by a soils scientist or engineer.

12. Wildlife Habitat Impact Report

The subdivider shall have a wildlife biologist assess the significant wildlife habitat located on the property proposed for development including, but not limited to, deer wintering yards, wildlife corridors, significant wildlife feeding areas, vernal pools, etc. The Wildlife Habitat Impact Report shall include recommendations on how to mitigate or eliminate the impacts on the significant wildlife habitat resources.

13. Road Profiles, Cross Sections and Details

a. Profiles shall be provided of all proposed streets showing existing and proposed elevations along the centerlines and proposed grades. Profiles shall be drawn at a scale of one (1) inch equals fifty (50) feet horizontal scale and one (1) inch equals five (5) feet vertical scale.

b. Cross-sections shall be provided of all proposed streets at fifty (50) foot stations and at all catch basins, bridges, or culverts. Cross-sections shall be

drawn to a convenient scale of not more than one (1) inch equals ten (10) feet with both horizontal and vertical scales being the same.

c. Construction details of all roadway, curbing and sidewalk improvements shall be shown.

14. Subdivisions located within "Special Flood Hazard Areas"

The subdivider of any proposed subdivision which includes land which has been designated as a "Special Flood Hazard Area" by the National Flood Insurance Program shall provide the following:

a. The subdivider shall submit all necessary permits from those governmental agencies from which approval is required by Federal or State law, including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334.

b. The subdivider of any subdivision proposal greater than 50 lots or 5 acres, whichever is the lesser, shall submit base flood elevation data.

c. The subdivider shall submit sufficient evidence such as construction drawings, grading and land treatment plans in order for the Planning Board to determine that:
   1) All such proposals are consistent with the need to minimize flood damage;
   2) All public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage; and
   3) Adequate drainage is provided so as to reduce exposure to flood hazards.

15. Legal Documents Required

Where applicable to a specific subdivision, the following legal documents shall be submitted with the final subdivision application and approved by Town Counsel prior to signing the final plat:

a. <u>Agreement to convey to the Town</u> land to be used for streets, open space and other public purposes, with transfer of title to such interests to be effective on such date as the Town accepts such land;

b. <u>Easements and rights-of-way</u> over property to remain in private ownership;

c. Easements or other rights to drain onto or across other property, whether public or private, including a street. If the storm water drainage system may create additional flow or change water flow over any adjacent property, which in the Planning Board's opinion would substantially interfere with the reasonable use of that property, then the subdivider shall obtain an agreement to provide an easement therefore from the adjacent and/or nearby owner. The subdivider shall submit a written undertaking to hold the town harmless from any claims for damage resulting therefrom.

d. Covenants (if applicable) - Relating to release of Town of New London, New London-Springfield Water System Precinct, New London Public Works Department from furnishing certain facilities (Exhibits B1, B2 and B3).

e. Security and/or performance bond

1) Amount: The amount of security shall be determined by the Planning Board and shall be sufficient to cover the costs of the improvements and the estimated cost of inflation over the projected term of the security not to exceed 10% per year.

The subdivider must file with the Planning Board a registered engineer's detailed estimate of the costs of the improvements together with maps, plans and supporting data. The Planning Board may require additional estimates of the costs of the improvements from such sources as a second engineer or contractor chosen by the Planning Board in determining the amount of security required. The cost of the additional estimates shall be borne by the subdivider.

2) Form: An irrevocable letter of credit is the preferred form of security. A suggested form for an irrevocable letter of credit is attached as Exhibit D. Irrevocable letters of credit with language differing from the suggested form or alternative forms of security must be approved by the Planning Board and may require consultation with Town Counsel at the Planning Board's discretion. The Planning Board will not accept mortgages or escrow accounts from each lot sale as security.

Where a surety bond is required, it shall be issued by a Surety Company authorized to do business in the State of New Hampshire and shall be approved as to form and sureties by the legal counsel of the Town of New London.

3) Release of Security: Release of any security after completion of all

improvements shall be with the approval of the Board of Selectmen, the Public Works Director and/or the Water Commissioner of the New London-Springfield Water System Precinct and any other appropriate agency and only after a Final Certificate of Performance has been issued by the Planning Board as provided in Section VII-H.

f. Covenant Restricting Lot Sales - Required if the subdivider chooses this method for the Planning Board to sign the plat as outlined in Section IV-A:3,i,3). A suggested form for a 'Covenant Restricting Lot Sales' is attached as Exhibit E.

g. Indemnification - In event of damage to Town property or facilities, incurred by or from work performed by or for the developer, the developer shall indemnify, defend and hold harmless the New London Highway Department for subsequent maintenance of pavement, shoulders, catch basins, culverts, storm sewers and any additional costs.

h. Maintenance Until Acceptance - The subdivider shall provide the Planning Board a written acknowledgment of the subdivider's responsibility for maintenance of easement areas and the assumption by them of liability for injuries and damages that may occur on any land to be dedicated for public use, until such land has been legally accepted by the Town of New London as outlined in Section VII-I.

i. Easements for Water Supplies for Firefighting Purposes - The subdivider shall provide the Planning Board with a written easement for any water supplies for firefighting purposes the town agrees to maintain and an easement for the fire department access to those water supplies. The location of these easements shall be shown on the subdivision plat.

16. Agency or Permit Approvals

The following applicable permits shall be obtained and submitted prior to final approval, signing and recording the subdivision plat:

a. An Access Permit from the N.H. Department of Transportation if a state road or from the Public Works Director if a Town or private road.
b. Approval of Community Water Supply Systems and/or Subdivision Approval for On-Site Sewage Disposal from the N.H Department of Environmental Services.
c. A 485-A:17 permit from the N.H. Department of Environmental Services for land disturbance in excess of 100,000 square feet in area

or for land disturbance in excess of 50,000 square feet in area when project borders a body of water; and

d. A Dredge and Fill Permit from the N.H. Wetlands Board.

e. Approval from the New London/Springfield Water System Precinct if the Precinct is to provide water service to the subdivision; and

f. Approval from the Public Works Director if sewer service is to be provided by the Town of New London.

17. Additional Information

The Planning Board may require such additional information to be provided at the subdivider's expense as it deems necessary in order to evaluate the subdivision in relation to the purposes and scope of these regulations.

C. MINOR SUBDIVISION

A complete application for a Minor Subdivision shall include of the following items:

1. An application form completed and signed by the landowner or the landowner's authorized agent (refer to Exhibit A1) and a Minor Subdivision Checklist of Application Requirements (refer to Exhibit A3);

2. Written authorization from the landowner of record for any agent(s) to represent and sign for the owner;

3. A list of Abutters within two hundred (200) feet of the subject property; any professionals assisting with preparing the application such as engineers, architects, land surveyors, or soil scientists; holders of conservation, preservation or agricultural preservation restrictions; and the applicant.

4. Payment of the application fee based on the current Planning Board fee schedule;

5. Any requests for waivers presented in writing including the rationale for the waiver(s);

6. Copies of a Site Survey Map as required by Section V-B:7.a.: three (3) copies of the full-scale plan (36" x 48") and ten (10) copies of the reduced-scale plan (11" x 17").

7. Copies of a Topographic Map as required by Section V-B:7.b.: three (3) copies of the full-scale plan (36" x 48") and ten (10) copies of the reduced-scale plan (11" x 17").

8. Copies of a Soils Map as required by Section V-B:7.c.: three (3) copies of the full-scale plan (36" x 48") and ten (10) copies of the reduced-scale plan (11" x 17").

9. Information on subdivisions located within "Special Flood Hazard Areas" as required by Section V-B:14 if applicable."

10. Applicable Agency or Permit Approvals as provided in Section V-B:16.

11. The Planning Board may require such additional information to be provided at the subdivider's expense as it deems necessary in order to evaluate the subdivision in relation to the purposes and scope of these regulations.

D. ANNEXATIONS, MINOR LOT LINE ADJUSTMENTS AND BOUNDARY AGREEMENTS

A complete application for an Annexation, Minor Lot Line Adjustment or Boundary-Agreement shall include the following items:

1. An application form completed and signed by the landowner or the landowner's authorized agent (refer to Exhibit F1) and an Annexation Checklist of Application Requirements (refer to Exhibit F2);

2. Written authorization from the landowner of record for any agent(s) to represent and sign for the owner;

3. A list of Abutters within two hundred (200) feet of the subject properties; any professionals assisting with preparing the application such as engineers, architects, land surveyors, or soil scientists; holders of conservation, preservation or agricultural preservation restrictions; the landowner; and the applicant.

4. Payment of the application fee based on the current Planning Board fee schedule;

5. Any requests for waivers presented in writing including the rationale for the waiver(s);

6. Three (3) copies of the full-scale annexation plat drawn to a scale of one (1) inch equals one hundred (100) feet (36" x 4 8") and ten (10) copies of the reduced-scale plan (11" x 17") in permanent black ink on permanent reproducible material on the size and type of material specified by the Merrimack County Registry of Deeds to include:

    a. Signature and seal by a NH Registered Surveyor or Engineer;

    b. Name of the Town and Annexation;

c. Names and addresses of property owners;

d. Names and tax map & lot numbers of all abutters as they appear in the Town records not more than five (5) days before the date of filing the application;

e. Complete boundary survey of each of the properties involved in the annexation showing the boundary line to be moved as a dashed line and the new boundary line as a solid line;

f. Include a notation which explains the parcels and sizes as they exist and the parcels and sizes which would result with approval of the annexation;

g. North point, bar scale, date of preparation, and dates of any revision, and tax map(s) and lot number(s) of property included in annexation application.

h. Show location of existing or proposed easements and areas affected by existing and proposed covenants, reservations and restrictions benefiting or bordering the property;

i. Include a notation on the annexation plat stating: "The property conveyed as a result of this annexation shall not be deemed or considered a separate lot of record, but shall be regarded as merged into and made an integral part of the contiguous lot of land previously owned by the grantee(s) so that the same shall hereafter be one confirmed single lot of record."

j. The annexation map shall include the following title block:

NAME OF ANNEXATION:

Name of Surveyor or Engineer:	Name of Owner(s) of Record:
Address of Surveyor or Engineer:	Address(es) of Owner(s) of Record:
Signature and Seal of Surveyor or Engineer:	Date:
Hearing Date:	Approval Date:

TOWN OF NEW LONDON, N.H. PLANNING BOARD

Signatures of Planning Board:

_____ _____
Chair

_____ _____
Vice-Chair

_____ _____
Secretary

_____ _____

7. The applicant shall deliver copies of signed deeds ready to be recorded to the Planning Board. These signed deeds must be submitted within 30 days following approval and signing of the plat by the Planning Board.

E. VOLUNTARY MERGERS

A complete application for a Voluntary Merger of Lots of Record includes:

1. A **Voluntary Merger of Lots of Record Form** completed and signed by the owner(s) of record. When **existing lots as described in recorded deeds are to be merged**, then the Voluntary Merger Lots of Record Form found in Exhibit G1 should be used. When **existing lots in an approved and recorded subdivision are to be merged**, then the Voluntary Merger Lots of Record Form found in Exhibit G2 should be used; and

2. A copy of the signed **deed(s)** for the lots to be merged ready to be recorded with the Voluntary Merger of Lots of Record form.

SECTION VI - STANDARDS FOR SUBDIVISION DESIGN

Subdivisions shall conform to the following Standards for Subdivision Design unless waived by the Planning Board:

A. CRITERIA FOR PLANNING BOARD ACTION

1. Best Use of Land

The Planning Board, in considering any proposed subdivision plan, will be concerned with the requirements of the community and the best use of the land being subdivided.

The Planning Board will give particular attention to the following items within the proposed subdivision as well as how they may affect existing and potential adjoining land use: width, arrangement and location of streets, sanitation, drainage systems; steep slopes, shorelands, streams, wetlands, buffers, soil erosion, wildlife habitat, sizes and arrangement of lots, open space, parks and retention of major site features. Adequate street connections will be required whenever feasible to ensure access to adjoining subdivisions and lands.

2. Special Features

The Planning Board may require that the plat show a park or parks suitably located for playground or recreation area. Due regard shall be shown for all natural features, such as large trees, water courses, scenic points, historic spots, and other community assets, which if preserved will enhance the value of the subdivision and enrich the neighborhood.

B. CHARACTER OF LAND FOR SUBDIVISION

1. General

Land of such character that it cannot, in the judgment of the Planning Board, be safely used for building development purposes because of danger to health or peril from fire, flood, poor drainage, excessive slope, or other hazardous conditions, shall not be platted for residential or commercial subdivision, nor for such other uses as may increase danger to life or property, or aggravate the flood hazard. Land with inadequate characteristics or capacity for sanitary sewage disposal shall not be subdivided for residential or commercial subdivision purposes unless connected to the town sewage system

2. Minimum Lot Size by Soil Type

a. Minimum Lot Sizes: In the absence of municipal sewerage facilities minimum lot sizes in all subdivisions shall, in addition to meeting the requirements for the use district of the zoning ordinance, also meet the minimum lot size requirements specified in Exhibit C "Minimum Lot Size By Soil Type Using HIS Maps." Each lot shall have a soil carrying capacity of one or greater.

1) Lots With Multiple Soils Types: Where more than one soil type is found on a lot, a soil carrying capacity of the sum of all soil types occurring on the lot shall be used to determine the minimum lot size.

2) Wetlands: Wetlands may be used as part of the minimum lot size as specified by the provisions of the Zoning Ordinance.

3) Public Water: Where municipal or community water systems are available, the minimum lot size required by Exhibit C may be reduced by 33 1/3 percent (but not to a smaller size than required by the use districts of the zoning ordinance).

4) Large Residential Developments: Minimum lot sizes for residential developments with greater than four (4) bedrooms per unit shall be determined as follows:

a) For residential use with 5 or more bedrooms per unit, the minimum lot size shall be proportionately larger than the lot size indicated in Exhibit C determined by the formula:

$$\text{Lot Size (Sq. Ft.)} = \frac{\text{No. of Bedrooms}}{4} \times \text{(Lot size from Exhibit C)}$$

b) For two-family dwellings, the lot size shall be increased by 50% of the minimum size as determined from Exhibit C.

5) Commercial and Industrial Developments: Commercial and industrial developments must be served by municipal sewerage facilities. Lot sizes for commercial and industrial uses are determined based on compliance with setback requirements of the Zoning Ordinance and conformance with the development standards of the Site Plan Review Regulations

b. Determination of Soil Type: Soils data used for making the determinations required by Section VI-B:2.a. above shall be presented on plans which shall be mapped to High Intensity Soils Mapping Standards (HIS) as set forth in the publication High Intensity Soils Mapping for New Hampshire, Society of Soils Scientists of Northern New England, January, 1987.

C. SCATTERED & PREMATURE SUBDIVISION DEVELOPMENT, IMPACT FEES & OFF-SITE IMPROVEMENTS

1. Scattered & Premature Subdivision Development: The Planning Board shall

determine based on the information presented and other information available and made part of the record, whether or not the amount of development contained in the proposed subdivision in relation to the quantum of services available will pose a danger to the public through insufficiency of services.

The Planning Board shall not approve a subdivision if such subdivision constitutes scattered or premature subdivision of land as would involve danger or injury to health, safety, or general welfare by reason of lack of water supply, drainage, transportation, school, fire department, or other public services, or necessitate an excessive expenditure of public funds for the supply of such services.

If a subdivision is determined by the Planning Board to be scattered and premature, the subdivider may show through both on and Off-Site Improvements made at the expense of the subdivider, that the subdivision is not scattered and premature or, if so, is overcome by remedial action of the subdivider.

2. Impact Fees: The Planning Board may, in accordance with ARTICLE XXIV of the Zoning Ordinance, require the subdivider to contribute an impact fee for types of capital improvements in addition to those listed under paragraph 3. to follow for Off-Site Improvements in an amount reasonably and proportionally related (a) to the capital needs created by the subdivision, and (b) to the benefits accruing to the subdivision from the capital improvements financed by the fee.

3. Off-Site Improvements: If the Planning Board determines that the proposed subdivision will adversely affect existing public facilities (including streets, sidewalks, drainage, sewer, and water supply) causing them to be inadequate to meet the additional needs created by the subdivision, then the subdivider shall pay a reasonable share for such upgrading of the public facilities to an extent necessary to protect the public interest. If other properties benefit from the upgrading of such Off-Site Improvements, the Planning Board shall determine the portion of the cost to be paid by the subdivider, taking into consideration the following elements:

   A. The character of the area;
   B. The extent that other public and private property will be benefited by the upgrading; and
   C. Any other factors that the Planning Board deems appropriate to establish a rational connection between the needs created by the subdivision and the amount to be paid by the subdivider.

D. PARK AND OPEN SPACE LAND

The subdivider shall at the option of the Planning Board either:

1. Provide an easement or deed land to the Town for public park use or to the Conservation Commission or Land Trust for public conservation or open space land or provide privately maintained recreational facilities and/or open space land within the residential project at a standard of one (1) acre per each 50 persons, or

2. Pay the Town an equivalent sum of money in cases where the Planning Board determines that due to the size, topography or location of the subdivision, land for park, playground, other recreational purposes, or open space cannot be properly located therein. This cash payment shall be used by the Town for either land acquisition or development of public land for recreational purposes for the benefit of the residents of the subdivision.

The Planning Board may approve a combination of the two previous methods in making provision for open space and recreation.

E. WILDLIFE HABITAT

The subdivider shall demonstrate through a Wildlife Habitat Impact Report, conducted by a wildlife biologist, that with the development of the proposed subdivision: 1) there are no impacts on significant wildlife habitat; or 2) the impacts can be eliminated or mitigated. The significant wildlife habitat includes, but is not limited to, deer wintering yards, wildlife corridors, significant wildlife food sources and feeding areas, vernal pools, etc. The Wildlife Habitat Impact Report shall include recommendations on how to mitigate or eliminate the impacts on any significant wildlife habitat resources. The developer shall incorporate those recommendations into the subdivision proposal. In order to ensure wildlife habitats are protected, the Planning Board may require the use of building envelopes on individual lots or the use of the Cluster Development approach on larger scale projects.

F. PROHIBITION AGAINST RESERVE STRIPS

No privately owned reserve strip, except an open space area, shall be permitted which controls access to any part of the subdivision or to any parcel of land from any street, or from any land dedicated to public use, or which may be so dedicated.

G. WATER SYSTEM IMPROVEMENTS AND EASEMENTS

1. The water system within a subdivision proposed to be served by the New London-Springfield Water System Precinct shall meet the standards and specifications required by the Precinct.

2. When the New London-Springfield Water System Precinct Commission certifies a need, a water main easement shall be established to provide for a future "loop" connection between the adjacent land and a water main proposed within the

subdivision.

H. SEWER SYSTEM IMPROVEMENTS

The sewer system within a subdivision proposed to be served by the Town of New London shall meet the standards and specifications required by the Public Works Department.

I. FIRE PROTECTION

An adequate water supply for fire protection shall be available within the subdivision or within a reasonable distance from the subdivision as determined by the Planning Board after recommendation from the Fire Chief or the Board of Firewards.

J. DRIVEWAYS

Each lot shall be served by a driveway which conforms with the standards specified in the New London Driveway Regulations.

Location of driveways is intended to prove that there is at least one location for each lot that can meet the standards and requirements of the Driveway Regulations of the Town of New London before all opportunity for lot line change is foreclosed by the Planning Board's approval of the Plat. These Driveway Regulations apply to both private and public streets.

K. BOUNDS

1. Locations

Permanent survey monuments shall be set in the boundary of all property corners and of rights-of-way at intersection of streets, points of curvature and points of tangency of curves; the point of intersection of short curves may be used instead, where such is practical, at the discretion of the Planning Board. Adjacent monuments shall be in sight of one another by a standing person. Monuments shall be placed on both sides of the street.

2. Monuments

Monuments shall be stone, concrete, or other material acceptable to the Planning Board, and not less than 4 inches in diameter or square, and not less than 42 inches long. Concrete monuments shall be reinforced with steel rods. A plug, brass plate, or pin shall serve as a point of reference and a magnetic rod or other suitable metal device shall be placed adjacent to the monument to allow for recovery. The monuments shall protrude 4 inches above the natural ground surface if land is to be mowed, otherwise 6 inches. Other proposed monuments may be considered and accepted by the Planning

Board when conditions warrant.

3. Pipes

Iron pipes shall not be considered permanent monuments for the purpose of these regulations.

4. Timing of Monument Installation

Monuments shall be installed before the final plat is signed by the Planning Board and recorded in the Merrimack County Registry of Deeds.

L. STORMWATER & EROSION CONTROL DESIGN STANDARDS

Subdivision plans shall be designed to comply with the following standards. The construction of the subdivision improvements shall comply with the following standards. The Town Inspector to inspect the construction of the subdivision improvements to ensure these standards are being met shall have the authority to enter on the property to conduct those inspections.

1. Hydrologic and Hydraulic Criteria for All Designs

a. All drainage design shall be done by a registered civil engineer.

b. Impervious cover is measured from the site plan and includes any material or structure on or above the ground that prevents water from infiltrating through the underlying soil. Impervious surface is defined to include, without limitation: paved parking lots; sidewalks; roof tops; driveways; patios; and all roads, including gravel. Alternative surfaces (e.g., porous pavement, grass pavers, etc.) are encouraged for low-traffic driveways, sidewalks and parking lots, and these areas may be removed from the total impervious area calculations when designing the stormwater system for recharge and water quality criteria only. General design guidance is included in Appendix A.2 (Infiltration Practices), but there is not one set of required design criteria since alternative paving technology is still evolving and improving. Thus, the applicant shall submit specifications for any proposed alternative surfaces, which shall be reviewed by the Planning Board on a case-by-case basis.

c. Determination of flooding and channel erosion impacts to receiving streams due to land development projects shall be measured at each point of discharge from the development project and such determination shall include any runoff from the balance of the watershed which also contributes to that point of discharge.

d. The specified design storms shall be defined as a 24-hour storm using the

rainfall distribution recommended by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS).

e. Proposed residential, commercial, or industrial subdivisions shall apply these stormwater management criteria to the land development as a whole. Individual lots in new subdivisions shall not be considered separate land development projects, but rather the entire subdivision shall be considered a single land development project. Hydrologic parameters shall reflect the ultimate land development and shall be used in all engineering calculations.

f. Soil test pits shall be performed by a qualified soil scientist at all proposed stormwater management locations to determine feasibility and appropriate design infiltration rates.

g. Inspections and maintenance of stormwater BMPs shall be required. The applicant shall submit an Operation and Maintenance Plan for the proposed stormwater management system as part of the application package. Responsibility for maintenance by subsequent property owners, including any homeowners association, on which permanent measures have been installed shall be included in the deed and shall run with the land. If the owner fails to adequately maintain such measures, the Town shall have the authority to perform required maintenance. The cost of such work shall be borne by the owner. If the owner fails to reimburse the town for this expense, then the Town shall have the right to place a lien on the property.

2. Stormwater Recharge (Re_v):

a. The purpose of this criterion is to maintain existing recharge rates to preserve existing groundwater levels and stream base flows.

b. All storms up to one half inch must be retained on site for post-development conditions. The volume of water to be retained can be calculated using the following equation:

Infiltration required per storm (ft^3) = impervious surfaces (ft^2) X 0.5 (inch) / 12 (inches per foot)

c. The Planning Board may alter or eliminate the recharge requirement if the site is situated on unsuitable soils. In this situation, the water quality volume must still be treated through other BMPs designed to remove pollutants. Bioretention areas are the preferred alternative in these cases, as they most clearly mimic the benefits of infiltration. Design criteria for acceptable BMPs are included in Appendix A.

d. Redevelopment projects may not be able to achieve the one half inch recharge criteria due to site layout and limited space. These projects must recharge or treat a minimum of one quarter inch precipitation over the impervious surfaces.

e. The following criteria also apply:
   1) Recharge shall not be concentrated in one area. It shall be distributed to multiple areas throughout the site, as feasible.
   2) The recharge volume does not apply to any portion of a site that discharges to areas designated as a stormwater hotspot. Hotspots are defined as sites with high potential pollutant loads, including:
      a) Auto salvage yards;
      b) Auto fueling stations;
      c) Fleet storage areas;
      d) Vehicle service and maintenance areas;
      e) Vehicle and equipment cleaning facilities;
      f) Commercial parking lots with average trip generation rates of 1,000 or greater per day, such as fast-food restaurants, convenience stores, high-turnover (chain) restaurants, and shopping centers;
      g) Road salt storage and loading areas if exposed to rainfall;
      h) Commercial nurseries;
      i) Flat metal (galvanized metal or copper) rooftops of industrial facilities;
      j) Outdoor storage and loading/unloading areas of hazardous substances;
      k) SARA 312 generators, if materials or containers are exposed to rainfall; and
      l) Marinas (service, repainting and hull maintenance areas).

Stormwater recharge may be prohibited or otherwise restricted within groundwater recharge areas, wellhead protection areas, or where certain unusual geological features may exist such as clays, shallow bedrock, or areas of documented slope failure.

3. Pretreatment

a. To prevent premature failure, the design of stormwater treatment devices shall include a pre-treatment device or method that will trap sand and sediments to avoid clogging the treatment mechanism. Infiltration of stormwater from the treatment device into underlying soils and eventually groundwater aquifers is an important beneficial component of the device.

b. The design criteria for pretreatment BMPs are included in Appendix A. The

following standards shall be followed to ensure that the device will permit sufficient treatment of stormwater and allow for a reasonable required maintenance frequency for the BMP, but not less than annually:

1) Pre-treatment devices shall be provided for each BMP; ***and***

2) Pre-treatment devices for BMPs treating roadways, parking lots, and access drives shall be designed in accordance with the criteria in Appendix A.

3) Pre-treatment devices shall be designed to capture anticipated pollutants, such as oil and grease; ***and***

4) Pre-treatment devices shall be designed and located to be easily accessible to facilitate inspection and maintenance; ***and***

6) The developer shall maintain any BMPs used to trap sediment during construction to prevent sediment from leaving the site, and shall remove all sediment from all BMPs when construction is finished and the site is stabilized.

4. Flooding Protection (Q_p)

a. Impervious and disturbed surfaces from development cause an increase in the volume, velocity and flow rates of stormwater leaving sites and entering surface waters. This in turn causes increased flooding of the receiving waters during storms, which damages the stream banks and can threaten both property and life.

b. The following standards should be followed to control peak discharge rates and improve the overall effectiveness of the BMPs. These are minimum design standards.

1) The post-development peak discharge rate shall be equal to or less than the pre-development peak discharge rate (based on the 1-year, 2-year, 10-year, 25-year, & 100 year 24-hour storms). Exemptions may be granted for matching the 10-, 25-, and 100-year storms if a Downstream Analysis (Appendix B) is performed and the results indicate that detaining flood waters would exacerbate flooding problems downstream. A Downstream Analysis is required for all projects that are over 50 acres and have greater than 25% impervious cover, or when deemed appropriate by the Planning Board when existing conditions are already causing a problem; ***and***

2) The site shall be designed to ensure that all runoff from the site up to the maximum design storm (i.e., 100-year storm) enters the control structure. For example, the drainage system may only be sized to handle a ten-year storm, with larger storms flooding the distribution system and traveling overland. This overland flow, or overflow, must be directed into the peak flow control structure; ***and***

3) The applicant shall account for all run-on and run-off (including off-site impacts) in both pre- and post-development conditions; ***and***

4) The applicant shall prepare hydrographs for pre- and post-development conditions; ***and***

5) The pre-developed condition shall be considered forested land cover in good condition for all runoff calculations, regardless of clearing or cutting activities that may have occurred on the site during the pre-application period. Post development should assume the proposed condition for disturbed areas; ***and***

6) Use TR-55 to develop hydrographs and peak flow rates for the proposed development site. Make sure all areas are accounted for in the pre/post runoff calculations. The total tributary area that contributes flow from the proposed site, including runoff entering the site through piped drainage or surface runoff from off-site sources, must be included even if a portion does not contribute flow to the BMP. The objective is for the development's storm drain design to account for total runoff leaving the site; ***and***

7) Off-site areas should be modeled as "present land use condition" in good hydrologic condition for all storm events for both pre and post development calculations; ***and***

8) The length of the overland sheet flow used in t_c calculations shall be limited to no more than 100 feet for pre-development conditions and 50 feet for post-development conditions.

5. Channel Protection (Cp_v)

a. The purpose of this criterion is to limit the total amount of time that a receiving stream exceeds an erosion-causing threshold based on pre-development conditions.

b. Method: 24 hours extended detention of the post-development 1-year, 24-hour return frequency storm event shall be provided. Water bodies that support trout are exempted from the 24-hour extended detention requirement, with only 12 hours of extended detention required to meet this criterion.

c. Exemptions to Channel Protection Requirement: Since there are practical limitations on minimum orifice or weir sizes needed to control Cp_v as well as flow and receiving water considerations, the requirement shall be waived for:

- Small sites (i.e., sites requiring <1" orifice);
- Post-development discharges from the site are less than 2 cfs; and
- Direct discharges to 4th order or greater streams, lakes, and reservoirs where the development area is less than 5% of the watershed area upstream of the development site.

6. Water Quality Volume (WQ_v)

a. It is important that BMPs are used to handle water quantity as well as treat water quality. The water quality volume should include the first flush of storms, as this is where the majority of pollutants are collected and discharged. Appendix A lists the BMPs appropriate for water quality treatment and provides design criteria for each.

b. Method: The water quality volume required to be treated shall be calculated as:

Water Quality Volume (ft^3) $= [(P)(R_v)(A)(43{,}560)]/12$, *where*
P = *rainfall depth in inches - use 1"*
$R_v = 0.05 + 0.009(I)$ *where I is the percent impervious cover*
A = *site area in acres*

At a minimum use 0.2 inches per acre at sites with less than 15% impervious cover.

c. Redevelopment projects may not be able to treat the full water quality volume as estimated due to site layout and limited space. These projects must treat a minimum of one half inch of precipitation over the impervious surfaces.

7. Erosion Control

a. Land clearing and grading for construction purposes leaves soils susceptible to erosion. If not controlled, eroded soils may reach streams and lakes, filling them in and adding pollutants attached to the soil particles. It is important to

have controls in place to prevent and control the erosion of disturbed lands.

b. The Erosion and Sedimentation Control Plan shall be designed to meet the Town of New London Stormwater & Erosion Control Design Standards and Landscape Design Standards for Stormwater Treatment and designed to comply with the requirements of the NH Department of Environmental Services under RSA 485-A;17. In addition to the Low Impact Development best management practices (BMPs) for managing stormwater and controlling erosion, the Stormwater Management and Erosion Control Handbook for Developing Areas in New Hampshire shall also be used in selecting the design and the BMPs to use.

c. The following standards shall be met for erosion control:

1) Prior to any land disturbance activities commencing on the site, the developer shall physically mark limits of no land disturbance on the site with tape, signs, or orange construction fence, so that workers can see the areas to be protected. The physical markers shall be inspected daily by the Town Inspector.

2) Appropriate erosion and sediment control measures shall be installed and inspected by the Town Inspector prior to soil disturbance in accordance with the plans approved by the Planning Board. Measures shall be taken to control erosion within the project area. Sediment in runoff water shall be trapped and retained within the project area. Wetland areas and surface waters shall be protected from sediment. If any straw or hay bales must be used, each row shall be limited to intercepting no more than one half (½) acre of runoff area. Temporary seedings shall be used to stabilize exposed critical areas during development within 14 days of disturbance.

3) Sediment shall be removed once the volume reaches 1/8 the height of the silt fence or hay bale.

4) Divert offsite runoff from highly erodible soils and steep slopes to stable areas.

5) Land disturbance activities exceeding two acres in size (including lot development) should not be initiated without a sequencing plan that requires stormwater controls to be installed and the soil stabilized, as disturbance beyond the two acres continues. A construction phasing plan shall be submitted and approved by the Planning Board as part of the subdivision review process. Mass clearings and grading of the entire

site shall not be permitted.

6) An area of exposed soil is not considered stabilized until there is permanent growing vegetation, such as grass, if that is the means to stabilize the exposed soil.

7) All stockpiles shall be surrounded by appropriate sediment controls. Soil stockpiles shall not be left exposed more then than seven (7) days or they must be stabilized. Stockpile side slopes shall not be greater than 2:1.

8) The area of disturbance shall be kept to a minimum. Disturbed areas remaining idle for more than 14 days shall be stabilized with hydroseeding or other appropriate stabilization measure(s).

9) For active construction areas such as borrow or stockpile areas, roadway improvements and areas within 50 feet of a building under construction, a perimeter sediment control system shall be installed and maintained to contain soil and inspected by the Town Inspector prior to initial disturbance.

10) A tracking pad shall be constructed at all entrance/exist points of the site to reduce the amount of soil carried onto roadways and off the site.

11) Dust shall be controlled at the site by minimizing soil disturbance, applying mulch and establishing vegetation, water spraying, surface roughening, applying polymers, spray-on tackifiers, chlorides, and barriers.

12) On the cut side of roads, ditches shall be stabilized immediately with rock rip-rap or other non-erodible erosion control liners, or where appropriate, vegetative measures such as sod.

13) Permanent seeding shall be undertaken in the spring from April through June, and in the late summer and early fall from August to October 15. During the peak summer months and in the fall after October 15, when seeding is found to be impractical, an appropriate temporary mulch shall be applied. Permanent seeding may be undertaken during the summer if plans provide for adequate mulching and irrigation.

14) All slopes steeper than 3:1 (h:v, 33.3%), as well as perimeter dikes, sediment basins or traps, and embankments must, upon completion, be immediately stabilized with sod, seed and anchored straw mulch, or

other approved stabilization measures. Areas outside of the perimeter sediment control system must not be disturbed.

15) Monitoring and maintenance of erosion and sediment control measures throughout the course of construction shall be required. The applicant shall submit an Operation and Maintenance Plan for temporary and permanent erosion control measures as part of the application package.

16) Temporary sediment trapping devices must not be removed until permanent stabilization is established in all contributory drainage areas. Similarly, stabilization must be established prior to converting sediment traps/basins into permanent (post-construction) stormwater management facilities. All facilities used as temporary measurers shall be cleaned prior to being put into final operation and inspected by the Town Inspector. Areas to be used as post-construction infiltration practices should be protected during construction to prevent compaction.

17) All temporary erosion and sediment control measures shall be removed after final site stabilization. Disturbed soil areas resulting from the removal of temporary measures shall be permanently stabilized within 30 days of removal and inspected by the Town Inspector.

18) Naturally occurring streams, channels and wetlands shall be used for conveyance of treated runoff leaving the project area.

19) Site development shall not begin before the erosion and sediment control plan is approved by the Planning Board, installed and inspected by the Town Inspector.

20) Erosion and sediment control measures shall be installed as scheduled in the plan as approved by the Planning Board.

21) The subdivider shall maintain all soil and erosion control measures, including devices and plantings as specified in the plan approved by the Planning Board, in effective working condition. Responsibility for maintenance by subsequent property owners, including any homeowners association, on which permanent measures have been installed shall be included in the deed and shall run with the land. If the owner fails to adequately maintain such measures, the Town shall have the authority to perform required maintenance. The cost of such work shall be borne by the owner. If the owner fails to reimburse the town for this expense, then the Town shall place a lien on the property.

8. Storm Frequency Design Requirements

a. Cross culvert pipes – 50-year storm frequency; check impacts for 100–year storm;

b. Closed drain system – 25-year storm frequency; check impacts at sag points for a 50-year storm;

c. Box culverts and bridges – 100-year storm frequency; check impacts for 500-year storm.

Note: The Planning Board reserves the right to require that storm drain systems be designed for less frequent, more intense rainfalls where conditions warrant.

9. Culvert Design

a. All computations for culvert pipes shall be documented and included in the drainage report. These shall be performed under the supervision of an engineer. The engineer shall stamp and sign the drainage report.

b. All available records concerning rainfall and floods shall be used in the design of culverts and storm sewers.

c. Pipe culverts will be designed as open flow channels. They will either be under inlet or outlet control. The exact control can be found by following the procedure outlined in "Hydraulic Charts for the Selection of Highway Culverts", published by Bureau of Public Roads as H.E.C. No. 5. This material can also be found in the NH DOT, DRAINAGE MANUAL.

d. Minimum pipe culvert sizes are as follows:

* Roadways - 15"
* Drives - 12"

e. Pipe culverts with a span of 10 feet or more will be considered as bridges.

f. It is preferred that culverts be located to fit natural channels in lines and grade.

g. The minimum grade of culverts shall be 0.4% or able to maintain a velocity of 2 fps while flowing one-third full.

h. Collars will be designed for culverts whose grade exceeds 20%; erosion control should be considered on all culverts.

i. When the computed outlet velocity is in the range beyond normal design of 10 fps additional outlet protection shall be considered.

j. The maximum headwater depth from the top of the culvert immediately upstream from a pipe culvert shall be determined by the following:

* Damage to adjacent property;
* Damage to culvert and the roadway;
* Traffic interruption;
* Hazard to human life; and,
* Damage to stream & floodplain environment.

As a guide, the following table may be used under "normal conditions":

PIPE SIZE	MAXIMUM ALLOWABLE HEADWATER
12" - 30"	2 times pipe diameter
36" - 48"	1 ½ times pipe diameter
54" - up	1 times pipe diameter

k. Minimum cover for culverts, measured between the pipe crown and finished grade, shall be as follows:

* Paved and Unpaved Roads - minimum of 3' for all type of pipe material
* Under Drives - minimum of 1' for all type of pipe material; 2' preferred
* Under Grassed - minimum of 2' for all type of pipe material; 3' preferred

Acceptable pipe materials for culverts include: reinforced concrete; corrugated, galvanized steel; corrugated aluminum; and smooth lined, corrugated PVC pipe or other material acceptable to the Planning Board or its designated agent.

l. All culverts shall be constructed with end sections, headers, or stone slope paving as specified below. End sections shall be permitted on all pipes less than 48" diameter, except 24" diameter where there is an active stream. Stone slope paving or riprap shall be permitted at culvert ends for pipes up to 24" in diameter.

10. Closed Drainage System Design

a. A closed drainage system design may be required at the Planning Board's discretion in commercial or densely developed residential areas. However, low impact practices such as open channel systems are encouraged when feasible to improve treatment, reduce peaks, and promote regular maintenance.

b. All computations for closed drainage system designs, shall be documented and included in the drainage report. These shall be performed under the supervision of an engineer.

c. Storm drains shall be designed on the assumption that each inlet intercepts all runoff that contributes to it, providing the inlet capacity is equal to or greater than the design runoff.

d. The compatibility of grate capacity, pipe capacity and design flow must be considered in closed system design.

e. The minimum grade of closed system pipes will be 0.4% or able to maintain a velocity of 2 fps while flowing one-third full.

f. Manholes shall be placed wherever a change in grade or alignment of a storm drain occurs but, in any case, a storm drain shall normally not have a manhole, catch basin or drop inlet more than 200 feet apart.

g. In general use catch basins rather than drop inlets. Call for drop inlets only where no pipe inlet occurs and where soils and other debris are not liable to wash in, on slope drainage, in embankments, and in culverts. Refer to the Section showing the Typical Catch Basin and Drop Inlet Design.

h. The minimum pipe size for closed systems under roadways is 15" diameter.

i. Minimum cover for closed drainage systems, measured between the pipe crown and finished grade, shall be as follows:
   * Paved and Unpaved Roads - minimum of 3' for all type of pipe material
   * Under Drives - minimum of 1' for all type of pipe material; 2' preferred
   * Under Grassed - minimum of 2' for all type of pipe material; 3' preferred

Acceptable pipe materials for closed drainage systems include: reinforced concrete; corrugated, galvanized steel; corrugated aluminum; and smooth lined, corrugated PVC pipe.

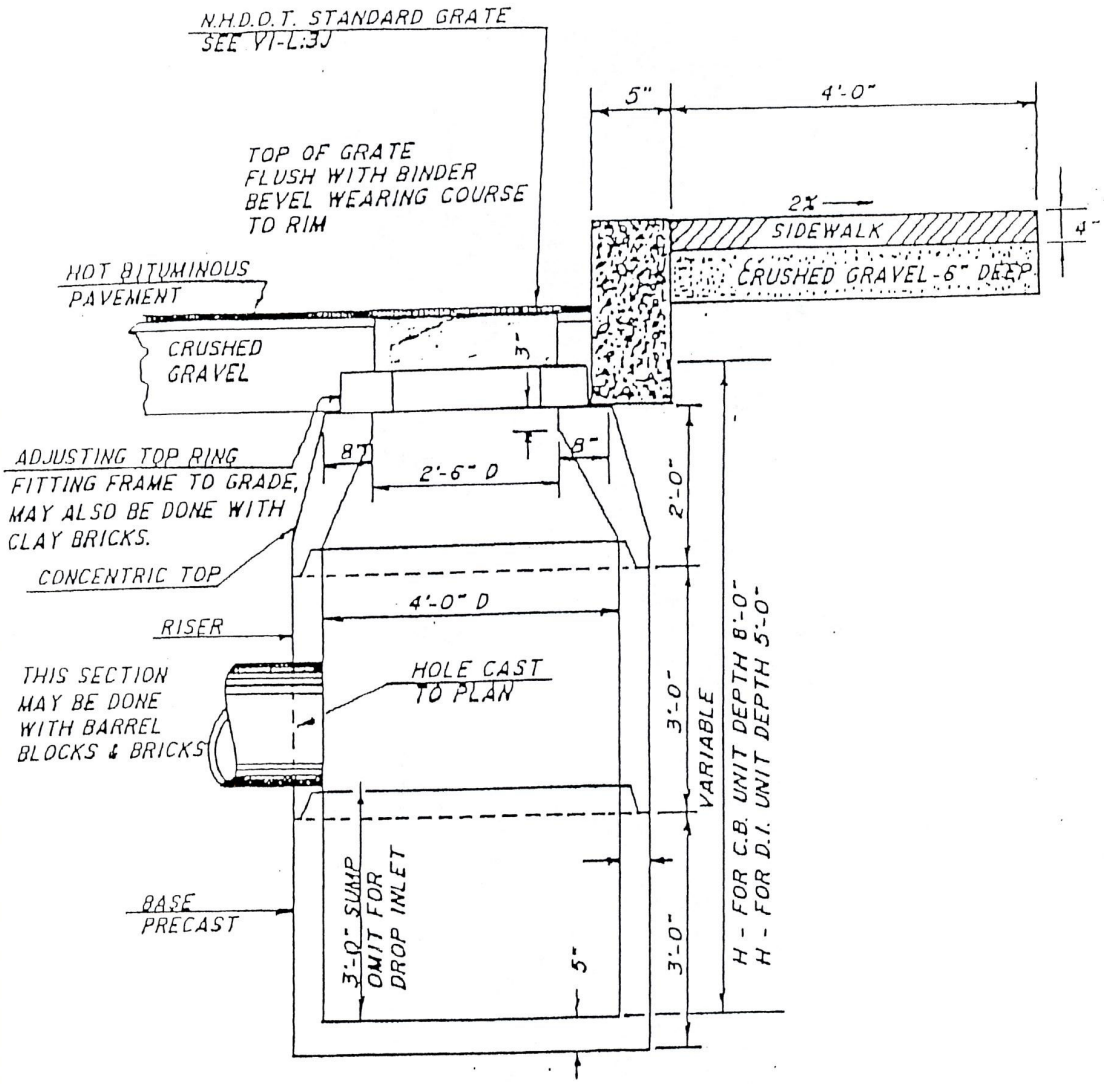
j. The type of grate chosen will be based on the following usage restrictions:

NH DOT GRATE STD.	WHERE UTILIZED
A	In roadways, ditches, medians where bicycle traffic is NOT anticipated.
B & B Alt.	In roadways, ditches, medians, where bicycle and pedestrian traffic is anticipated.
C	In ditches & sumps off the roadway where vehicles cannot make contact with the structure.
E & E Alt.	Where high grate capacity is required and bicycle or pedestrian traffic is NOT anticipated.

k. Placement of catch basins in curbed roadway sags shall conform to the following:

At least one catch basin will be located at the bottom of a sag. Depending on roadway classification and design considerations, an additional catch basin on either side could be necessary. The spacing between the three catch basins shall be such as to prevent ponding of ½ of the traveled way.

l. No surface flow shall be allowed across streets.



TYPICAL SECTION

CATCH BASIN/DROP INLET

11.1111

11. Subsurface Drainage (Underdrains)

Subsurface drainage systems (underdrain pipe) shall be provided where the seasonal high ground water table is within five feet (5') of the finished roadway grade. Test pits or borings in roadway cut sections shall be taken, as required or ordered by the Town Inspector as required by the Planning Board, to locate the Seasonal High Water (SHWT) Table and determine the need for underdrain pipe. This pipe shall be perforated PVC with a minimum diameter of 6". Alternative underdrain pipe material shall require specific approval by the Planning Board or the Town Inspector. This design and construction shall be supervised by a civil engineer.

12. Off Site Drainage Considerations

The subdivider's engineer shall determine the effect of a subdivision on the existing drainage facilities outside of the area of the subdivision ("off-site") and report the conclusions of this study to the Planning Board. Where the Planning Board anticipates that additional run-off incident to development of the subdivision will overload an existing downstream drainage facility so that there will be damage to private property or an increase in the expenditure of public funds, the Planning Board shall not approve the subdivision until adequate provision is made, at the subdivider's expense, for all downstream drainage. The Planning Board would accept a drainage easement obtained by the subdivider from downhill property owner if an increased storm water flow is expected over their property and the subdivider submits a written undertaking to hold the Town harmless for any claims for damage resulting therefrom.

M. LANDSCAPE DESIGN STANDARDS FOR STORMWATER TREATMENT

1. General Standards

a. Soil and landscaping play an important role in stormwater impacts and treatment results. From a quantity standpoint, the loss of good quality topsoil from many sites during construction results in significant increases in runoff quantities that are often not calculated in the models such as TR-55 typically used for runoff assessment. In terms of quality, high organic content of soils absorbs many pollutants. In fact, peat and compost have been shown to provide considerable pollutant removal and are sometimes used in various treatment strategies.

b. Landscaping also affects stormwater quality and quantity. Grassed areas, while not totally undesirable, may have considerably more runoff due to compaction and more pollutant contribution due to the frequently-occurring overuse of fertilizers and pesticides. Alternatively, a tiered landscape containing an overstory (typically large shade trees), understory trees, shrubs

and groundcovers provides the most absorption and natural uptake of rainfall. Some grass may be included but typically not an expansive monoculture. A more desirable landscape is diverse and provides wildlife habitat, shade, and beauty along with strips of grass for open areas. New development must meet the following standard:

- For single-family homes and single-family subdivisions, a minimum 25%, and a minimum of 15% for multi-family residential areas, of the lot area must be maintained as undisturbed natural area. * Note: If the existing land has been disturbed by prior activities, a natural vegetated buffer and/or undisturbed natural area may be proposed through restoration and revegetation.

c. Tiered landscapes, like natural landscapes, tend to require less maintenance and chemical input once established. These landscapes, including a highly organic soil profile, absorb and cleanse rainfall and runoff so that the quantity and quality are more reflective of a natural hydrology. By using these specifications, water, pesticide and fertilizer use will be minimized and vegetation will thrive with little but spring and fall cleanup.

2. Soil Preparation

a. Compacted soils restrict root penetration, impede water infiltration, and contain few macropore spaces needed for adequate aeration. In addition, compacted soils have a higher runoff coefficient and should be avoided. Preventing construction activities on parts of the site will help prevent compaction. In areas where this is not practical, methods to compensate for the compaction must be employed. Landscape areas should be deep tilled to a depth of at least 12 inches to facilitate deep water penetration and soil oxygenation. Use of soil amendments is encouraged to improve water drainage, moisture penetration, soil oxygenation, and/or water holding capacity. Soil amendments are organic matter such as compost, sewer biosolids, and forestry by-products, but do not include topsoil or any mix with soil as an element.

b. For all newly landscaped areas, including single-family residences, organic matter (three to four cubic yards of organic matter per 1,000 square feet of landscape area) shall be incorporated to a depth of four to six inches. Organic content of landscaped soils shall not be less than 18% by volume in the top six inches of the finished topsoil.

c. For newly landscaped areas where topsoil is limited or nonexistent, or where soil drainage is impeded due to subsurface hardpan or bedrock, a minimum

of 6 inches of sandy loam topsoil should be spread in all planting and turf areas, in addition to the incorporation of organic matter into the top horizon of the imported soil. Organic content of landscaped soils shall not be less than 18% by volume in the top six inches of the finished topsoil.

d. Soil analysis of new or renovated turf areas should include a determination of soil texture, including percentage of organic matter; an approximated soil infiltration rate; and a measure of pH value.

e. All grass areas to be mowed shall be prepared and compacted just enough to support conventional riding mowers.

f. Existing topsoil should not be removed during construction, but should be stockpiled on site and reused in landscaped areas to promote the retention of native seed stocks and to reduce the spread of invasive species.

3. Mulching

a. Mulch for areas not used for drainage should be applied regularly to, and maintained in all, planting areas to assist soils in retaining moisture, reducing weed growth, and minimizing erosion.

b. Mulches include organic materials such as wood chips, compost and shredded bark and inert organic materials such as decomposed lava rock, cobble, and gravel.

c. If weed barrier mats are used, the use of inert organic mulches is recommended.

d. Non-porous materials, such as plastic sheeting, are not recommended for use in any area of the landscape because of down-slope erosion, potential soil contamination from herbicide washing and increased runoff coefficients.

e. Mulches should be applied to the following depths: three inches over bare soil, and two inches where plant materials will cover.

f. Mulches for stormwater management areas should be well-aged (6 months) hardwood mulch.

4. Site Features and Layout

a. Landscaping should be designed to remain functional and attractive during all seasons of the year through a thoughtful selection of deciduous, evergreen, flowering and non-flowering plant varieties.

b. Prominent natural or man-made features of the landscape such as mature trees, surface waters, natural rock outcrops, roadways or stonewalls should be retained and incorporated into the landscape plan where possible. The addition of ornamental rocks, fencing and other features new to the landscape are encouraged.

c. Existing natural vegetation should be retained where possible. Existing trees and shrubs to be retained may be substituted for any compatible required plantings.

d. Lawn areas should be kept to a minimum (see Section M.1b). Natural re-growth, mulched planting beds and alternative groundcover plant varieties are preferred. Lawn areas of less than six feet in width, especially adjacent to roads or parking areas, are discouraged since such areas require watering but have little utility and are less likely to thrive. Narrow medians or strips between sidewalks and roads should be utilized as stormwater pretreatment or treatment BMPs (e.g., bioretention areas, grass filter strips), as feasible.

e. Native plant species, or plant species that have been naturalized in the area or the surrounding region, should be used to meet the minimum requirements of this section. Plant varieties selected should be hardy, drought and salt resistant, and require minimal maintenance. Less hardy, exotic or higher maintenance plant varieties may be used to supplement minimum landscaping requirements where appropriate, but are not encouraged.

5. Use of Compost

a. Incorporation of organic matter such as compost improves the structure (tilth) of the till and any other soil types, with the exception of soils that are already highly organic. In sandy soils, compost increases the water holding capacity and nutrient retention. The physical and chemical properties of most New England soils can be significantly improved by blending in compost.

b. Compost-amended soil has many potential benefits when instituted with establishment of turf and landscaping, including: (1) increased water

conservation, (2) increased nutrient retention, (3) better turf aesthetics, (4) reduced need for chemical use, (5) improved stormwater retention, and (6) cost-savings to the private landowner, and the Town of New London.

c. Compost shall be well-aged (6-12 months), well-aerated, leaf compost (or approved equivalent). Turf grass shall not be utilized for compost since it can have significant levels of pesticides, herbicides, nutrients, etc.

d. The quantity of compost to be incorporated into a site is determined by the final organic content goal for the soil and is dependent on its existing organic content. Organic content of landscaped soils shall not be less than six percent.

6. Low Impact Development Landscaping

a. Landscaping that incorporates Low Impact Development (LID) strategies for stormwater management should serve to meet the requirements of the Town of New London's stormwater management plan by absorbing and treating stormwater runoff to the greatest extent possible onsite. LID landscaping includes the use of vegetated BMPs (as described in Appendix A) and other features that use soil and landscaping to mimic natural hydrologic features and functions. The high organic content of the soils encourages healthy growth and absorbs and retains rainwater on site as soil moisture, minimizing irrigation needs and runoff quantities.

b. Landscape areas shall include all areas on the site that are not covered by buildings, structures, paving or impervious surface. The selection and location of turf, trees, ground cover (including shrubs, grasses, perennials, flowerbeds and slope retention), pedestrian paving and other landscaping elements shall be used to absorb rainfall, prevent erosion and meet the functional and visual purposes such as defining spaces, accommodating and directing circulation patterns, managing hardscape impacts, attracting attention to building entrances and other focal points, and visually integrating buildings with the landscape area. Where possible, the landscaping design should combine form and function, incorporating drainage features invisibly into the landscape such as through shallow detention areas, parking lot islands that provide for infiltration of parking lot runoff and sheet flow.

7. Neighboring Properties

a. Landscape Design Plans shall mitigate the impact to neighboring properties.

b. The rear elevations of buildings, loading docks, and refuse collection areas must also be addressed in the Landscape Design Plan. It is required that rear elevations adjacent to noncommercial zoned parcels will be screened to the full height of the structure within seven (7) years of occupancy of the retail space.

8. Parking Lots

a. Parking lots with more than ten (10) parking spaces shall have formal planting areas designed as bioretention areas. A minimum of one 2 ½ inch caliper deciduous tree shall be provided for each ten parking spaces.

b. When curbs are utilized around parking lot bioretention areas, they shall have a shallow descending cut that is a minimum of five feet wide to allow drainage to flow from the parking lot into the curbed planting areas for infiltration. See Appendix A for bioretention design criteria.

9. Vegetation

a. Any landscape element that dies, or is otherwise removed, within 3 years after a Final Certificate of Performance has been approved by the Planning Board as per Section VII:H of these Regulations shall be promptly replaced with the same, if not similar to, height or texture element as originally intended.

b. A split rail or picket fence, not less than two feet in height and not more than four feet in height, shall be provided, if required by the Planning Board, between or to the rear of the trees to serve as a back drop and support for the shrubs and other planting, to serve as a unifying architectural element, and to protect against damage caused by pedestrian "cut-through" traffic. Shrubs and other smaller plantings should be placed between the fence and the street or on both sides where the fence is placed toward the center of the landscaped strip.

c. Landscape strips should be mulched or planted with hardy groundcover plant varieties rather than planted as lawn areas. Where landscape strips are used as part of the drainage system, plantings shall be tolerant of periodic wet conditions and shall be shallowly sloped to allow infiltration and storage.

d. Wheel stops should be provided in all parking areas abutting landscaped strips to avoid accidental damage.

10. Maintenance

a. Low maintenance, drought, insect and disease resistant plant varieties are encouraged so that buffer areas and other required landscaping can be maintained with minimal care and the need for watering, pesticide or fertilized use is minimized. For these reasons, native species and species that have long thrived within the region are preferred since such plant species are well adapted to the local environment.

b. To avoid maintenance problems, soil testing should be conducted prior to planting to ensure that the appropriate plant varieties are selected for various portions of a site.

c. To avoid maintenance problems and excessive watering, organic matter such as compost or peat should be added to the soil before planting as appropriate to increase the water holding capacity of the soil and to provide nutrients.

d. Where used, irrigation systems should be installed with moisture meters or other devices designed to avoid unnecessary or excessive watering. Alternatively, irrigation systems should be manually activated.

11. Informal, Re-growth and Peripheral Landscape Areas

a. Disturbed areas intended for natural re-growth should be, at a minimum, graded, loamed and seeded with wildflowers, perennial rye grass or similar varieties. The planting of native trees, shrubs and other plant varieties is encouraged. The planting of blueberry, rhododendron, winterberry, bayberry, shrub dogwoods, cranberry bush, spicebush, native viburnums and other hardy shrubs along the edge of cleared woodlands provides for an attractive transition between natural woodland and more formally landscaped portions of a site. Where woodland areas are intended to serve as buffers, such plantings can fill in voids by rapidly reestablishing undergrowth. Perennial flowerbeds are also encouraged.

12. Plant Specifications

a. Trees and shrubs – installation size requirements
   1) Minimum size for shade or canopy trees shall be 2 ½ inches in diameter measured at a point six inches above grade.
   2) Minimum size for small or minor shade trees, ornamental, or flowering fruit trees shall be 2 inches in diameter measured at a point six inches above grade.
   3) Minimum size for evergreen trees shall be six feet in height.
   4) Minimum size for shrubs shall be 1.5 feet in height.

b. Planting Specifications
   1) Areas intended as planting beds for shrubs or hedges shall be cultivated to a depth of not less than 18 inches. All other planting beds shall be cultivated to a depth of not less than 12 inches.
   2) Pits for planting trees or shrubs shall be generally circular in outline with vertical sides. Pits for trees or shrubs shall be deep enough to allow one-eighth of the ball of the roots to be above the existing grade. Pits for trees shall be two times the diameter of the root ball.
   3) Cultivated areas shall be covered with not less than a two to three inch deep layer of mulch after planting.
   4) All trees and shrubs shall be appropriately pruned after planting with all broken or damaged branches removed.
   5) All plants shall be nursery grown native species. No invasive species are permitted as per the list kept by the New Hampshire Department of Environmental Services.

c. Retention of Existing Vegetation
   1) The boundary of areas to be cleared should be well defined in the field with tree markings, construction fencing or silt fencing as appropriate to avoid unnecessary cutting or removal.
   2) Care should be taken to protect root systems from damage from excavation or compaction.
   3) Individual trees, rock formations and other landscape features to be retained should also be clearly marked and bounded in the field.

N. STREET DESIGN STANDARDS

1. General

All proposed public streets shall be designed and constructed to conform with the provisions of this section. Approval of the Planning Board, the Police Chief and the Fire Chief of the Town of New London concerning minimum requirements for

passage of safety/emergency vehicles shall also be received. Please refer to the sketch to follow entitled "Minimum Turning Path for Bus Design Vehicles".

2. Master Plan

The street system shall conform to the Master Plan of principal streets as adopted in whole or in part by the Planning Board.

3. Alignment

a. Streets shall be continuous and in alignment with existing streets as far as possible.
b. Street jogs with centerline offsets of less than 125 feet shall not be allowed.
c. A tangent of at least 100 feet shall be introduced between horizontal reverse curves on all proposed streets.
d. Approval of the general development street plan shall be required before allowing construction of small integral phases of the plan.

4. Intersections

When a street, public or private, leading from a subdivision is proposed to intersect an existing Town street or state highway, the entire intersection shall be examined for safety. The subdivider shall place a STOP sign on the subdivision street and other signs as required by SECTION VI-N:14. The driver of the stopped vehicle must be able to see enough of the existing street to turn or cross before a vehicle on it from either direction reaches the intersection or overtakes him. To establish and preserve adequate safe sight distance, the following provisions shall be required of the subdivider:

a. Right-Angle: Except where it is unsuitable because of the character of the land, streets shall intersect so that within 75 feet of the intersection, the street lines shall be at right angles (90 degrees), or in no case shall they be less than 75 degrees.
b. Grade: The subdivision street within 30 feet of the edge of the existing street pavement or proposed subdivision street shall be at a 2% grade upward when approaching the existing street.
c. Sight Distance: The safe sight distance for subdivision streets intersecting with a Town street or state highway shall conform with the American Association of State Highway and Transportation Officials (AASHTO) standards, and with the AASHTO guide for low-volume roads where applicable.
d. Obstructions: The eye of the driver of a stopped passenger car at 3.5 feet above the street must be able to see the top of an approaching vehicle at 4.25

feet above the street at the above safe sight distance without obstruction. No structure, vehicle parking, trees or plantings shall impair corner visibility. A "Sight Line Easement"/Deed Restriction shall be imposed on the corner lots controlled by the subdivider adjacent to the intersection to preserve the above safe sight distances; the Easement/Deed Restriction shall provide the Town the right to trim back or remove any impairment to the required visibility at the lot owner's expense.

e. Rounded Property Lines: Property lines at street intersections shall be rounded to provide a property line radius of not less than 30 feet.

f. Rounded Pavement Edges: At all private and public street intersections, edges of the pavement, traveled way, or curb lines shall be rounded with large enough radii to allow safe passage of "emergency vehicles" as defined by the template, "Minimum Turning Path for Bus Design Vehicle".

g. Round-About: A round-about intersection design will be considered as an alternative to the traditional four-way intersection with stop signs or lights where deemed appropriate by the Planning Board.

5. Right-of-Way

a. Public Road, Immediate or Future: Any ROW intended to be immediately or in the foreseeable future deeded to the Town within a subdivision shall be clearly indicated by the two sidelines on the Plat and the area of such ROW subtracted from the land to be subdivided. The width between the two ROW sidelines shall be as specified under "Standards for Street Design" in Section VI-N:11. This type of ROW will divide the land to be subdivided.

b. Permanently Private Road: Any ROW that is never intended to be deeded to the Town shall be clearly shown on the Plat as a single centerline and shall be considered as having no width which is subtractable from the land to be subdivided. This type of ROW need not divide proposed lots through which it travels to provide legal access to lots further on in the subdivision.

6. Covenant to Release Town etc. from Furnishing Public Streets and Utilities

If the owner of the land represents to the Planning Board , and the Planning Board agrees, that he does not now desire or require public streets or roads within the subdivision, public water or public sewer facilities for all or any portion of the land, he shall submit to the Planning Board for recording a signed Covenant entitled "Covenant Relating to Release of Town of New London, the New London-Springfield Water System Precinct and New London Public Works Department from furnishing certain facilities in proposed subdivision of land, New London, NH" (Exhibit B1 or B2 of these regulations), and if such services are later desired or required, they shall be constructed and installed without cost to the Town or Water System Precinct, in accordance with the regulations then current covering such

work. Furthermore, such covenant shall become a part of every deed of transfer within the proposed subdivision.

7. Sidewalks

Sidewalks of not less than four and one-half (4.5) feet in width and conforming to the grades of the streets shall be constructed on one or both sides of the street when in the opinion of the Planning Board such sidewalks are appropriate. Further, the Planning Board may require pedestrian walks and right-of-way for access between parts of a subdivision and/or public property. Sidewalks shall be constructed in accordance with instructions from the Public Works Director. Alternative surfaces (e.g., porous pavement, grass pavers, etc.) are encouraged for sidewalks and may be removed from the total impervious area calculations when designing the stormwater system for recharge and water quality criteria only. Refer to requirements listed in L.1.b and design guidance in Appendix A.2.

8. Harmony with Topography

Street and lot pattern design shall give due consideration to contours and natural features of the land, where practical, within the standards set forth in the Zoning Ordinance. In order to minimize the amount of surface water drainage, roads shall be designed above the original ground level wherever feasible. Aesthetic values shall be considered rather than rigid straight-line, city block layout of streets and roads.

9. Plantings

The Planning Board may require planting within the street right-of-way in those subdivisions where, due to the nature and character of the land, it would be appropriate, and planting shall be indicated on the Plat. The Tree Warden or Public Works Director shall recommend to the Planning Board , when requested, the specifications for such plantings.

10. Dead-End Streets

a. Turnarounds: Streets within a subdivision shall be coordinated with existing and other planned streets. In the event that the Planning Board approves a dead-end street, it shall terminate in either of the following types of turnaround:

1) Cul-de-Sac: Only the circular type of Cul-de-Sac shall be approved. The radius to the centerline of the circular roadway shall be 50 feet and the width shall be 20 feet. Drainage should be directed to the unsurfaced center of the Cul-de-Sac to be treated/recharged by a bioretention area, as feasible, before discharging the overflow to a

downstream BMP for quantity control. Otherwise, drainage for the center area shall be provided by adequate means including culvert(s) leading to the outside of the Cul-de-Sac.

2) Hammerhead "T" Type: Hammerhead "T" type turnarounds are the preferred type of turnaround and shall be a minimum 85 feet across and at least 20 feet wide. Drainage around the hammerhead shall be adequate.

3) Grades on Turnarounds: The grade on the turnaround and on 30 feet of its approach straightaway shall be no greater than 2% to enable winter plowing.

b. Length: The maximum length of a dead-end street shall be determined by the Planning Board.

c. Isolation: A permanent dead-end street shall be isolated by not being brought to the property boundary line, but shall be placed so that the lots are contiguous with the property line of the subdivision. (This assures for a permanently dead-end street that the smallest size street based on the average daily vehicular traffic and number of housing units can be selected from the table "Standards for Street Design" provided in Section VI-N:11 since through traffic is eliminated which could necessitate selection of a larger size street.)

d. Through Circulation: The Planning Board shall ensure that there is adequate through circulation when needed as determined by the Planning Board for secondary emergency vehicle access and overall traffic circulation. Traffic circulation patterns for service and local streets shall be designed to discourage through traffic from short-cutting through residential neighborhoods. The size of street needed within a subdivision is based on traffic to be generated by the development plus through traffic anticipated to use the street from outside the development. Whenever provision is made for extending a street through to an adjourning property, the extent of outside or through traffic needs to be accounted for in determining the appropriate size street to develop within the subdivision.

11. Classification of Streets:

Classification standards for street design shall be as set forth below (See "Typical Cross Section with Open Drainage and Typical Cross Section with Closed Drainage").

STANDARDS FOR STREET DESIGN

	Service[1]	Local	Collector	Arterial
Average Daily Vehicular Traffic[2]	1-40	1-240	241-400	400+
Number of Housing Units	1-5	1-30	31-50	50+
Min. Traveled Surface Width (ft)	16	18	20	22
Min. Shoulder Width (ft) each side[12]	2	2	3	4
Min. Distance between Shoulder Break Points (ft)	20	22	26	30
Base Courses				
- Gravel (in)	12	18	27	30
- Crushed Gravel (in)	6	6	6	6
Total Depth of Base Courses (in)	18	24	33	36
Pavement Surface Material[10, 3]	Bit Con.	Bit Con.	Bit Con.	Bit. Con.
Ditch Line to Ditch Line (ft)[4]	28	33	41	46
Min. Right-of-Way (ft)[5]	40	50	50	60
Design Speed for Street (MPH)[6]	20	30	30	35
Crest Vertical Curve "K" Factor[7]	10	30	40	55
Sag Vertical Curve "K" Factor[7,11]	18	35	4	55
Min. Vertical Curve Length (ft)	60	100	125	10
Min. Vertical Curve Length (ft) Centerline of street (ft)[8,9]	140	250	325	400
Max. Curve Banking Cross Slope	4%	4%	4%	4%
Max. Profile Grade[9]	10%	10%	10%	8%

Foot Notes:

1 Service street standards may only be used on application to and with approval of the Planning Board. Extra gravel as determined by the Public Works Director shall be required when subgrade is on high silt material or clay.

2 Shall be traffic anticipated 20 years into the future (Assuming 8 trips per day per dwelling unit.) Refer to Section VI-N:10,d.

3 Streets designed with closed drainage shall have a paved surface curb to curb.

4 Ditch lines located at bottom of Base Courses on "subgrade" and on an assumed 4:1 shoulder slope. This influences amount of ROW.

5 The ROW dimension shall be measured perpendicular to straight-line sections and radial to curved sections. The right-of-way shall include five (5) feet more than the toe of the side slope and the top of the back slope (see Typical Cross Section).

6 Establishment of a design speed controls vertical and horizontal curves.

[7] Multiply the appropriate Vertical Curve "K" Factor by the algebraic difference in grades in percent to obtain the required length of vertical curve for the street's profile. Unsymmetrical vertical curves will not be accepted by the Planning Board.

[8] Radii based upon the design speed for the street.

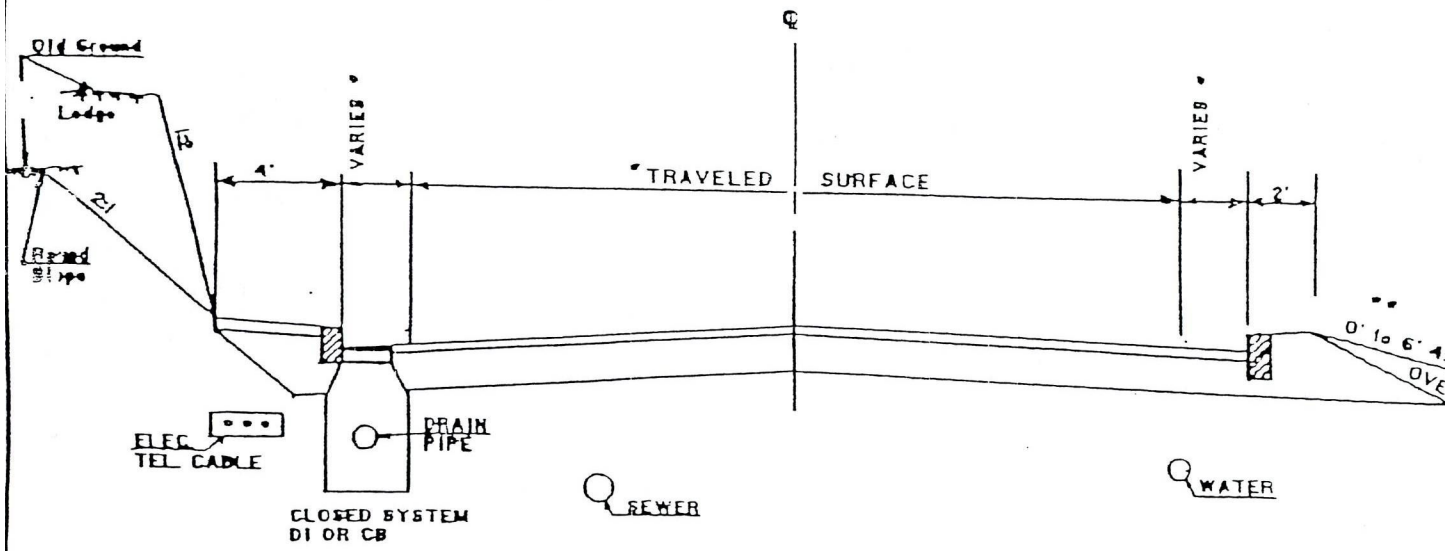
[9] When horizontal radii within ten percent of the minimum are combined with profile grades within ten percent of maximum, one or the other shall be improved by twenty percent to preserve safety.

[10] All roads proposed to be accepted by the Town for maintenance shall be paved with bituminous concrete. Service or local roads proposed to be maintained privately by a homeowner's association may have a crushed gravel top course except for profile grades equal to or over eight (8) percent shall be paved with bituminous concrete in accordance with Section VI-O:7 below and also provide a 200 foot paved run-out on each end. "Bit Conc." equals bituminous concrete obligatory per Section VI-O:7.

[11] Use 'Service Street' 'K' Factor for stop intersections.

TYPICAL CROSS SECTION

(with closed drainage)

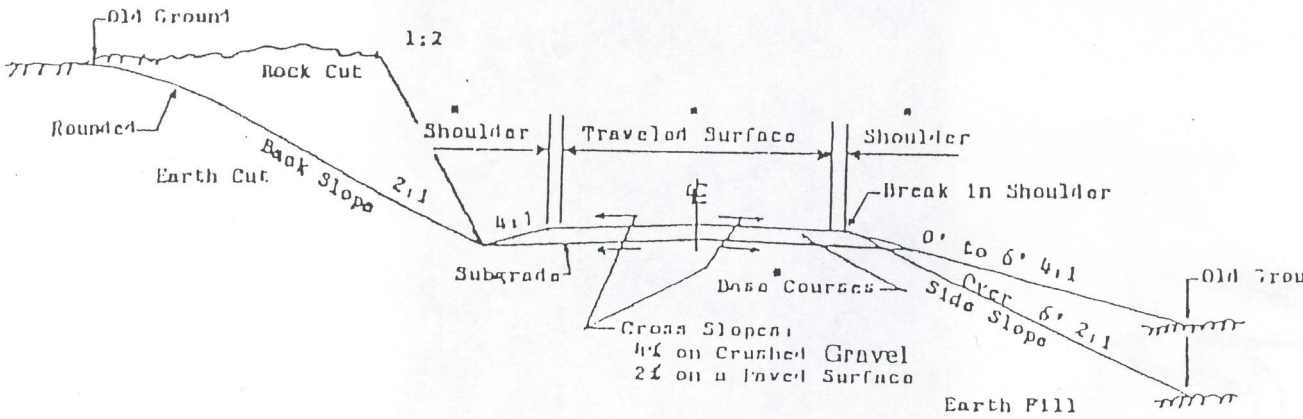


* Use dimensions specified in table, "Standards for Street Design", Section VI-H;11.

Note: 1)See requirement for guardrails in Section VI-N:6.6.
2)Utility location shown for typical location. Actual locations may vary dependent on design.
3)Distance inside curb to curb equals traveled surface width plus two times shoulder width.
4)Road surface paved from curb to curb.

** Where the height from the break in shoulder to original grade is greater than six feet at a 4:1 slope, a 2:1 slope will be constructed as relief.

TYPICAL CROSS SECTION WITH OPEN DRAINAGE



* Use dimensions specified in table, "Standards for Street Design", Section VI-M:11

** When the height from the break in shoulder to original grade is greater than six feet at a 4:1 slop
then as relief a 2:1 slope shall be constructed.

Note: See requirement for guardrails in Section VI-N:8,b.

12. Marking of Proposed Streets: At the earliest practical stage during the application, the subdivider shall place on the ground clearly observable survey stakes with ribbons marking the center line of all proposed streets.

13. Alteration of Gradient: The Planning Board may modify the maximum and minimum gradient for short lengths of street where, in the judgment of the Planning Board , existing topographic conditions or the preservation of natural features indicate that such modification will result in the best subdivision of the land.

14. Street Signs: The subdivider shall be responsible for the initial installation of all necessary road signs related to the subdivision including stop signs, road name signs, speed limit signs, dead end signs and any other road signs deemed necessary by the Planning Board after recommendation by the Public Works Director. For private roads, the subdivider is responsible for the initial installation of all street signs, and all replacements of street signs are the responsibility of the homeowners within the subdivision.

15. Fabric in Road Construction: Road design plans cannot always anticipate the conditions that will be encountered in the field during construction. If the person responsible for inspection services for the Planning Board identifies the need to install fabric due to unforeseen conditions encountered in the road construction, then the subdivider is responsible for installing the fabric as required by the Town Inspector. In the alternative, the subdivider may choose to appeal the decision to the Planning Board and to halt construction of the road until a decision is reached. This paragraph on "Fabric in Road Construction" shall be a note on all subdivision plans which involve road construction.

O. CONSTRUCTION OF STREET OR ROAD

1. Supervision
   Construction of streets, drainage facilities, sidewalks, and curbs must be done under the supervision or with the approval of the Public Works Director of the Town of New London and the Planning Board, or its agent.

2. Pre-Construction Meeting
   Before any construction begins, the subdivider, his road contractor, the Public Works Director or the Planning Board or its agent, will have a pre-construction meeting, the purpose of which is to clarify the design and construction standards contained herein.

3. Earthwork
   Earthwork consists of clearing, grubbing, excavation and embankment.

a. Clearing and Grubbing: The limits of clearing and grubbing shall be laid out on the ground before any other work commences and shall extend five (5) feet beyond the excavation and embankment slope limits. Trees designated by the Planning Board or its agent will be saved; particular reference is made to fruit, ornamental or shade trees or plants at the edge of the roadside slopes.

1) Clearing: Clearing shall be performed by cutting and disposing of trees, down timber, stubs, brush, bushes and debris.

2) Grubbing: Remove and dispose of all stumps and large roots within the limits of the roadbed (same width as the subgrade) to a depth of 3 feet below subgrade. Stumps under embankments outside the roadbed shall be cut off within 6 inches of the existing ground surface except in areas to be rounded at the top of back slopes, where stumps are to be cut off flush with the surface of the final slope line, or removed. Except in areas to be excavated, excavation caused by grubbing operations shall be filled with suitable material which shall be compacted to conform to the surrounding ground.

3) Roadside Cleanup: Roadside cleanup of leaning, dead, unsound and unsightly trees, branches, stubs, refuse, and slash, generally to a limit of approximately 15 feet outside the limits specified in VI-O:3.a. above shall be performed and the material disposed of.

4) Inspection: The Public Works Director and the Planning Board or its agent shall be notified so that approval of the Clearing and Grubbing can be made before any further work may progress.

b. Excavation and Embankment: This work shall consist of excavation, placement and compaction of embankment and the necessary disposal of other material.

1) Excavation: Excavation consists of earth, rock and muck.

a) Conservation of Growth: Excavation shall be carefully performed in the proximity of trees and shrubs designated to be saved.

b) Topsoil: Topsoil and other desirable humus material shall be removed in excavation areas and also in fill areas to such depths as directed by the Public Works Director.

c) Rock Excavation: All boulders shall be broken off to a depth of not less than 12 inches below subgrade. Solid rock shall be removed also to a depth of not less than 12 inches below subgrade and not less than 24" below subgrade for the ditches in cut sections. No rock excavation by blasting shall be performed without prior approval of the Public Works Director.

d) Muck Excavation: Muck excavation consisting of deposits of saturated or unsaturated mixtures of soils and organic matter

not suitable for foundation material regardless of moisture content shall be removed and suitable portions thereof may be used on the embankment slopes or other appropriate uses approved by the Public Works Director. The excavation work shall be handled in a manner that will not permit the entrapment of muck within the backfill; the backfilling of the excavated area shall follow immediately behind the excavation of the muck in order that any soft material which is pushed ahead of the backfill can be removed. The left and right limits of muck excavation shall, in cross section, be 45 degrees outward of the proposed points of shoulder at the bottom of muck excavation.

e) Common Excavation: Common excavation consisting of all excavation not included in the above classifications shall be removed. With the approval of the Public Works Director, suitable material may be used in fill areas and unsuitable material may be used to flatten slopes where possible.

2) Embankment: Embankments shall be formed of suitable and acceptable excavated or borrow material and brought to the required lines and grades. Embankment materials shall be placed and compacted in full uniform layers. Continuous leveling and manipulation shall be employed to insure uniform density. Where end dumping is employed, embankment material shall be dumped on the layer of embankment being constructed and bulldozed ahead into place. End dumping over compacted work which allows material to roll into place will not be permitted by the Public Works Director.

a) Backfill of Holes: Holes resulting from removal of stumps, boulders, and the like, within the zone of anticipated frost action, shall be filled and compacted with material similar to that surrounding the hole.

b) Unstable Areas: Material used to backfill excavated muck shall consist of rock or granular material, so graded that, of the material passing the No. 4 sieve, not more than 70% will pass No. 40 sieve and not more than 35% will pass the No. 200 sieve. The process shall be as specified above in VI-O:3,b.,1),d), Muck Excavation. Material shall be placed in one continuous lift of not more than 4 feet.

c) Waste Material: Waste materials from clearing, grubbing, and roadside cleanup and from rock, muck, and common excavation classified by the Public Works Director as unsuitable for use in construction of roads, streets and landscaping shall not be deposited in any New London dump,

but shall be deposited in pit(s) dug on-site and covered with material and in a manner acceptable to the Public Works Director. The pit(s) shall be away from construction areas in a location acceptable to the Public Works Director. Stumps and any woody material over 3"is not allowed in any part of road construction including subgrade and fill slopes.

d) Rock Embankment: Rock embankment shall consist of rock fragments placed in layers not to exceed 4 feet. The rock lifts shall be worked in such a manner as to close the voids with smalls and fines when available, otherwise use earth to make a tight surface prior to placing the next lift.

e) Earth Embankment: Earth shall be placed in layers the full width of the roadway, generally parallel to the finished grade. The layers shall not exceed 12 inches of loose depth. Each layer shall be spread to a uniform thickness and compacted to at least 95% of maximum density prior to placing the next layer. Density tests may be required by the Public Works Director at the subdivider's expense.

f) Grading: Loam shall be added to a depth of at least 3" on side slopes and be free of any woody or rock like material over 3" in size. Embankments shall be graded at all times to insure the run-off of water. Any saturation of nonporous material due to the subdivider's selected method of operation shall occasion suspension of additional work by the Public Works Director until the situation has been rectified.

g) Winter Construction: No embankments shall be constructed on frozen earth materials. Each layer of material shall be compacted to the specified density before it freezes.

h) Borrow: When suitable and acceptable excavated material from the job site has been exhausted, borrow material may be brought onto the job, provided prior written permission of the Public Works Director is obtained concerning the quality of the material at the source.

4. Drainage

Adequate disposal of surface water run-off shall be provided by the subdivider. Location of drainage ways, easements and structures shall have been designed using the topography contour lines on the final plat as specified in Section VI-L above.

a. Culverts: In addition to the location as determined above, the length of a culvert structure shall be graphically determined by cross-section scale drawing(s) of the proposed street showing existing ground, side ditches, back slope(s), side slopes, subgrade, finished grade and the culvert, with headwall(s) if required. For skew installations, a plan view also shall be

drawn to scale. Culvert length shall not be compromised. Culverts without headwalls or drop inlets shall extend to the intersection of the street side slope with the old ground in an earth fill section; or with the back slope in an earth cut section governed by the cover over the culvert specified below. Culverts with headwalls may be shorter as governed by the intersection of the street side slope with the back of the headwall 5 inches below the top of the headwall. Culverts also can be terminated by drop inlets or catch basins located in the nominal ditch line of an earth cut section. The minimum inside diameter of any culvert under subdivision streets shall be 15 inches; a larger size may be required as a result of the rainfall information discussed in Section VI-L above as well as the general necessity for adequate disposal of surface water. When corrugated metal pipes are to be used as culverts, they shall be no thinner than 16 gage whether galvanized steel or aluminum. Locking corrugated bands for field jointing corrugated pipe shall be not less than 7 inches wide and of the same material as the culvert. Steel corrugated pipes shall be galvanized. Driveways off the subdivision streets shall have a minimum culvert size of 12 inches. The pipe shall be placed on a prepared bedding of fine granular material to fit the lower 10% of the pipe height and to ensure that the flow line of the pipe(s) will conform to the required grade line. The minimum culvert slope required to maintain a self-cleaning water velocity is 0.4%. Acceptable material for culvert pipes and closed drainage system pipes shall include reinforced concrete, corrugated, galvanized steel, corrugated aluminum and smooth lined corrugated PVC pipes.

b. Under-Drains: Road design plans cannot always anticipate the conditions that will be encountered in the field during construction. If the Town Inspector identifies the need for under-drains due to unforeseen conditions encountered in the road construction, then the subdivider is responsible for installing the under-drains as required by the Town Inspector. In the alternative, the subdivider may choose to appeal the decision to the Planning Board and to halt construction of the road until a decision is reached. This shall be a note on all subdivision plans which involve road construction. See Section VI-L:13 for additional requirements for under-drain.

c. Ditch Grades: Road side ditch grades shall not be less than 0.5% to prevent ponding. Steep roadside ditch grades may require energy absorbing crushed stone and/or cross culvert relief if anticipated flow is significant.

d. Headwalls and Catch Basins: A stone or masonry headwall on the inlet end of a culvert, when required, shall be designed to prevent physical damage to the culvert pipe and have a base, below the pipe, to avoid seepage and erosion below the culvert.

Headwalls on the outlet end of the culvert may be required, but without a deep base. Catch basins or drop inlets may be required in developments with curb inlets or located in nominal ditch lines of an earth cut section. All stone or masonry headwalls shall be constructed in accordance to NH DOT

Standard Specifications. All drainage "catch basins, drop inlets and manholes shall be pre-cast reinforced concrete constructed to NH DOT Standard Specifications. All frames and grates shall be cast iron.

e. Backfilling: All backfill material for culvert trenches, headwalls and catch basins shall be soil approved by the Public Works Director. Backfill material shall be free of hard lumps or clods larger than 3 inches in diameter, and free of rocks and stumps. Uniformly fine material shall be placed next to any of the culverts, headwalls and basins liable to denting or breaking. Backfill shall be in layers not exceeding 6 inches at near optimum moisture content and care shall be exercised to backfill under the haunches of culverts and in firm contact with the sides. Compaction shall not be less than 95% in the vicinity of pipes.

f. Intersections: Special consideration will be needed where streets or roads intersect established streets or roads to provide proper drainage and avoid conditions leading to accumulation of ice during freezing weather.

g. Easements: Drainage easements shall be obtained by the subdivider over any adjacent land which will be subjected to an increased flow of surface water because of the alterations caused by the subdivision. Drainage easements shall be provided for all culvert discharges and drainage improvements in order to maintain drainage flows beyond the right-of-way. Please refer to Section VI-L:14.

h. Inspections: All material supplied for the drainage work shall be certified by the subdivider to the Town of New London. Material shall be inspected by the Public Works Director and the Town Inspector before placement. The Public Works Director and the Town Inspector shall be notified as to when the installation will occur. No backfilling will be done until the installation has been inspected. All backfilling will be inspected by the Public Works Director or Town Inspector.

5. Fine Grading of the Subgrade

Upon completion of excavation, placement of embankment and installation and backfilling of drainage structures, the subgrade shall be fine graded to conform to the profile grade for the subgrade and cross slope. High spots shall be honed down and low spots filled with material acceptable to the Public Works Director. If a compactor is not on the job site and being used to compact the subgrade, then the Public Works Director or Town Inspector may stop work until a compactor is on site and being used. The process of rolling or vibration compacting shall continue until no further depressions result. Shoulders, slopes and ditches shall be shaped to reasonably smooth surfaces in keeping with the character of the adjacent terrain and merge into it without any noticeable break. Culverts and waterways shall be cleared of all obstructions. Rubbish, brush, loose rock, boulders and all other debris from the construction work shall be removed and disposed of as directed by the Public Works Director with the approval of the Planning Board. The entire roadway must present a

uniformly finished appearance at the completion of fine grading. The Public Works Director and the Planning Board shall be notified so that approval of fine grading of the subgrade, side and back slopes and ditches can be made before any further work can progress.

Survey Stakes: It shall be the responsibility of the subdivider to have grade stakes put in at 50-foot intervals. Each stake shall be driven firmly beyond the tow or top of the slope in a location where it will not be disturbed by construction operations and be clearly marked to give the following information:

* Station
* Offset from center-line
* Cut or fill to finished center-line grade

Also, the subdivider shall construct grade control stakes at 50' intervals and located near the shoulder break point or 2' outside of the proposed curb line on both sides of the roadway. Each stake shall be marked with the centerline station and a finished grade mark.

The subdivider shall preserve the grade stakes until the completion of the streets and if stakes are removed or destroyed so that the Public Works Director or the Planning Board's Agent cannot readily check the grade at any location, the stakes shall be replaced at the expense of the subdivider.

6. Base Courses

Base courses shall be furnished and placed on previously prepared subgrade or base course. If a compactor is not on the job site and being used to compact the base courses, then the Public Works Director or Town Inspector may stop work until a compactor is on site and being used. The materials shall be free from injurious amounts of organic material and shall conform to the following gradations:

a. Gravel: The base shall consist of gravel to the minimum depth specified in the table, "Standards of Street Design" in Section VI-N:11 above for the size street to be constructed. The maximum size of any stone with the gravel shall not exceed 6".

c. Crushed Gravel: The top aggregate base course shall be a minimum of 6 inches of crushed gravel for all the street sizes in the table, "Standards for Street Design" in Section VI-N:11 above, regardless of whether a pavement is to be installed or not. The required grading is:

Sieve Size	Percentage by Weight Passing
3 inch	100
2 inch	95 - 100
1 inch	55 - 85
No. 4	27 - 52
No. 200 (based on the fraction passing the No. 4 sieve)	0 – 12

At least 50 percent by weight of the materials retained in the 1 inch sieve shall have a fractured face. If the crushed gravel is to be paved with bituminous concrete, the crushed gravel shall be "washed" to remove fines.

d. Placing of Sand, Gravel and Crushed Gravel:

1) The subgrade shall be to the specified crown and grade and maintained in a smooth condition, free from holes and ruts. If the hauling equipment should cause ruts in the subgrade or previously placed base course, the equipment shall be operated only on the course being placed, behind the spreading equipment.
2) Care shall be taken to avoid segregation when placing sand, gravel and crushed gravel. When base course material is dumped in piles, it shall be dumped on the course being placed, and spread at once onto the previously placed layer. If spreading equipment is not available, dumping will not be permitted. Any segregation which occurs shall be remedied or the materials removed and replaced at the subdivider's expense.
3) Each entire layer of gravel shall be thoroughly scarified for the full depth of the layer to bring all oversized stones to the surface for disposal prior to placing the subsequent course. Such scarifying will not be required when the Contractor's method of operation is such that oversized stones are not delivered to the project.
4) Prior to fine grading, hard spots in the surface of the top layer shall be eliminated by scarifying the top 4 inches.
5) Previously tested and accepted materials contaminated by earthen, organic, or other foreign matter, or degraded by hauling equipment, to such an extent that the materials cease to meet the requirements, shall be removed and replaced or otherwise made acceptable at the subdivider's expense.

6) To prevent segregation of crushed gravel during spreading and to assist in obtaining the required density of the mixture, water shall be added to the crushed gravel prior to performing the grading operations. The course shall be maintained in a moist condition until it is covered. Water shall be uniformly applied over the other base courses during compaction in the amount necessary for proper consolidation.

7) The compaction of sand, gravel and crushed gravel shall be done with an approved vibratory roller until 95% of maximum density is achieved. Each course of gravel and crushed gravel shall be compacted as it is applied.

8) The Public Works Director and the Planning Board shall be notified so that approval of the placement and compaction of the sand and/or gravel courses may be made before any further work progresses.

e. Winter Construction:

1) Winter construction on or in the roadbed is not permitted after frost sets in.

2) Winter construction of drainage or utilities outside the roadbed after frost sets in is permitted provided all the erosion control measures are installed and maintained at all times during the construction; otherwise a STOP WORK ORDER or other enforcement action shall be taken by the Board of Selectmen until the erosion control measures are in place and functioning.

3) If winter construction is permitted, then the following shall apply:

a) Base course materials shall not be placed upon or above frozen material if the depth from the top of the contemplated course to the bottom of the frozen material would exceed 2 ½ feet.

b) If the density requirements are not fulfilled for any layer before the material freezes, no further material shall be placed upon that layer.

f. Source Approval: The source(s) of sand, gravel and crushed gravel shall be as approved by the Public Works Director and the Planning Board prior to bringing the materials to the job site. Sieve analyses may be required.

g. Fine Grading of Top Course: The top course of 6 inches of crushed gravel shall be fine graded to conform to the profile grade for this course and the cross slope. High spots shall be removed and low spots filled with approved material. The process of rolling shall continue until no further depressions result.

h. Inspection: The Public Works Director and the Planning Board shall be notified so that approval of fine grading of the top course can be made before any further work progresses.

7. Pavement Surface

a. All roads proposed to be accepted by the Town for maintenance shall be paved with bituminous concrete in accordance with the standards provided below. Service or local roads proposed to be maintained privately by a homeowner's association may have a crushed gravel top course specified in Section VI-N:6, c&g above except for profile grades equal to or over eight (8) percent shall be paved with bituminous concrete in accordance with this paragraph and also provide a 200 foot paved run-out on each end.

b. The construction of a minimum of seventy-five (75) percent of the dwelling units in the subdivision must be completed before the wearing surface of pavement is laid down. The final wearing surface of pavement must be laid down, inspected and approved before a Temporary Certificate of Performance will be issued by the Planning Board.

c. Bituminous Concrete: All roads proposed to be accepted by the Town for maintenance and all collector or arterial private roads shall be paved with bituminous concrete in accordance with the standards specified in the following table:

ROAD PAVEMENT SPECIFICATIONS

	Service Road	Local Road	Collector Road	Arterial Road
Wearing Surface Pavement	1"	1 ½"	2"	2"
Base Pavement	2 ½"	2 ½"	2 ½"	3"
Total Depth of Pavement	3 ½"	4"	4 ½"	5"

The bituminous material shall be asphalt cement of penetration grade 100-200. (See footnote 10 to Standards for Street Design in Section VI-N:11)

d. Crushed Gravel: (Previously specified as the top course of the Base courses in Section VI-N:6, c&g. above; no additional pavement surface required.) As noted above, crushed gravel is permitted only for service and local roads to be privately maintained by a homeowner's association.

e. Approvals: The Public Works Director and the Planning Board or its agent shall approve the paving contractor, the bituminous concrete materials to be used and the depth of the proposed base and top coat of bituminous concrete.

No paving shall be done until the top course of the base courses has been approved (see Section VI-N:6, h. above).

f. Placing Hot Bituminous Pavement:

1) Weather limitations. Mixtures shall be placed only when the underlying surface is substantially dry, frost-free and the surface temperature is at least 40 degrees F and rising. The Public Works Director or Planning Board's Agent may permit, in the case of sudden rain, the placing of mix then in transit from the plant, if laid on a base, free from pools of water, provided all other specifications are met. No load shall be sent out so late in the day that spreading and compaction cannot be completed during daylight. Wearing course shall not be placed after October 1st of any year.

2) In special instances, when the Public Works Director or Planning Board's Agent determines that it is in the best interest of the Town, he or she may waive the requirements of paragraph 1. above.

3) Any material delivered to the spreader having a temperature lower than 250 degrees F shall not be used.

g. Compaction of Hot Bituminous Pavement: Immediately after the bituminous mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling. The initial rolling shall be done with a static steel-wheeled roller followed by the use of a vibratory roller. The minimum weight of static steel-wheeled rollers shall be 8 tons. A vibratory steel-wheeled roller shall have minimum applied dynamic force of 27,000 pounds (Manufacturer's Rated Capacity). Vibratory rollers shall have separate controls for energy and propulsion and be specially designed to compact bituminous mixtures. When a vibratory roller is being used, the vibration shall be stopped while the roller is stopped or reversing its direction of travel.

Base courses shall be rolled until all roller marks are eliminated. The wearing course shall be rolled until all roller marks are eliminated, and a minimum density of 95 percent of laboratory specimens, made by the AASHTO T-245 method in the proportions of the job-mix formula, has been obtained.

8. Miscellaneous Items

a. Utilities: Utilities shall be installed in accordance with the plans reviewed and approved by the Planning Board. Utilities will be placed after the project has been brought to subgrade and rough slope work has been completed. The lines will be inspected by their respective companies. It is recommended that all electric, telephone, cable, and other overhead lines be placed underground.

b. Guardrail: Guardrail will be required where slopes extend more than 10 feet from the height of the break in shoulder to the original grade on a 2:1 slope or

in other hazardous areas which are determined by the Public Works Director and the Planning Board. Where guardrail is required, place face of guardrail at old "Break in Shoulder" and add 18 inches to shoulder construction to a new "Break in Shoulder" to stabilize guardrail posts. (See Typical Cross Section).

P. SUBDIVISIONS LOCATED WITHIN "SPECIAL FLOOD HAZARD AREAS"

For any subdivision located within an area designated as a "Special Flood Hazard Area", the Planning Board shall determine based on sufficient evidence such as construction drawings, grading and land treatment plans submitted by the subdivider that:

1. All such proposals are consistent with the need to minimize flood damage,
2. All public utilities and facilities, such as sewer, gas, electrical and water systems are located and constructed to minimize or eliminate flood damage, and
3. Adequate drainage is provided so as to reduce exposure to flood hazards.

Q. ENVIRONMENTAL MEASURES GOVERNING DEVELOPMENT OF NEW LOTS IN THE SHORE LAND OVERLAY DISTRICT

1. Authority: The Town authorized the Planning Board to adopt the following regulations requiring sound environmental measures governing development of new lots located in the Shore Land Overlay District. By vote at the Town meeting on March , 2003.

2. Definitions:
   a. Building Envelope: A Building Envelope is defined in **ARTICLE III** of the Zoning Ordinance as follows: Building Envelope: The portion of a lot remaining after deleting undevelopable areas including wetlands & wetland buffers, lakes ponds & their buffers, steep slopes and any applicable setback requirements and may be further restricted for new lots in the Shore Land Overlay District to protect water resources.
   b. Development: Development is defined in **ARTICLE III** of the Zoning Ordinance as follows: Any man-made change to improved or unimproved real estate, including but not limited to, Buildings or other Structures, mining, dredging, filling, grading, paving, excavation, or drilling operation.

3. Building Envelope Specifications:
   a. The building envelope must include a minimum of 3/4 acre of contiguous area excluding wetlands, wetland buffers, building setbacks and areas with slopes in excess of 25%;
   b. Building Envelopes shall be located at least fifty (50) feet back from Normal High Water of the lakes and ponds regulated by the Shore Land Overlay District. Unless special construction practices ensure that no land disturbance

will occur in the fifty (50) foot vegetative buffer as a result of construction activities, then all Structures shall be set back a minimum of sixty (60) feet from Normal High Water to accommodate land disturbance resulting from such construction activities.

c. All Development on the new Lot, including Development of the primary building, accessory building(s), a water well and all components of the on-site wastewater treatment system, shall be done within the Building Envelope excluding the driveway and any utility lines leading to the Building Envelope.

d. Building Envelopes shall not exceed a maximum size of one-half of the size of the proposed new lot or 1 ½ acres, whichever is less.

4. Cutting Restrictions:

a. A healthy well-distributed stand of trees, saplings, shrubs, and ground cover and their living, undamaged root systems shall be left in place. Tree-cutting is permitted in accordance with the applicable provisions of ARTICLE XVI Shore Land Overlay District.

b. Tree cutting in the right-of ways should be minimized. Only those sections of the right-of-ways related to the construction of roads or necessary for sight distance requirements should have trees or other vegetation removed.

c. Land clearing within the Development areas of each lot shall be minimized and only those areas actually required shall be cleared and have vegetation removed. Development and erosion and sedimentation control plans shall be submitted to the Town for approval prior to any land clearing activities relating to intent to cut or building permit applications. Erosion and sedimentation control plans shall comply with the applicable provisions of ARTICLE XVI Shore Land Overlay District.

d. Any proposed tree cutting within the fifty (50) feet of Normal High Water of the lakes and ponds regulated by the Shore Land Overlay District shall comply with the applicable provisions of ARTICLE XVI Shore Land Overlay District, including the requirement for approval of a cutting or clearing plan by the Planning Board.

e. Cutting in common land and in the one hundred (100) foot wide perimeter vegetative buffer surrounding a Cluster Development shall be restricted to removing dead or diseased trees and clearing underbrush of invasive species. A healthy well-distributed stand of trees, saplings, shrubs, and ground cover and their living, undamaged root systems shall be left in place.

5. Environmental Inspection during Construction:

a. Before an intent to cut permit or a building permit is issued by the Town, the landowner shall establish an escrow account with the Town to pay for a qualified environmental consultant selected by the Town to conduct periodic site visits during active construction periods.

b. Prior to any tree cutting or construction-related activities, the consultant shall meet with the contractor and landowner.

c. During construction, the consultant shall make periodic inspections of the lot at reasonable times to confirm compliance with all relevant conservation and environmental regulations and restrictions, including after major rainfalls and upon written complaint.

d. The consultant shall advise the landowner and the Town in writing of his/her findings and any recommendations if problems are identified.

e. If the landowner fails to address any problems in a timely manner, then the Town may issue a STOP WORK ORDER for all construction on the site until the problem has been satisfactorily resolved.

R. UTILITIES: All proposed utilities, including lines and associated facilities for water, sewer, telephone, electric, gas and cable shall be located outside the road right-of-way. The subdivision plat shall show any necessary utility easements.

VII. DEVELOPERS RESPONSIBILITIES

In addition to Section VI and other requirements specified in these Land Subdivision Control Regulations and the Zoning Ordinance, the developer is responsible for the following;

A. PLAT APPROVAL

Once a preliminary major subdivision application is submitted that includes proposed roads and/or utilities, then the subdivider shall not cut trees in accordance with SECTION II -Q TREE CUTTING FOR SUBDIVISION LAYOUT and no street or utility construction shall be started until the subdivider has satisfied one of the options provided in SECTION IV-A:j Signing of the Plat.

B. PERMIT TO CONSTRUCT A SUBDIVISION ROAD

Following approval by the Planning Board of the Final Plat including a subdivision road, the Board of Selectmen shall issue a permit to construct a subdivision road under such terms and conditions as it shall determine are appropriate. Before issuing the permit to construct the road, the Board of Selectmen shall ensure that:

1. the escrow account(s) for all inspection services has been established as required by the Planning Board in accordance with SECTION II-H. INSPECTION SERVICES;
2. a copy of the final subdivision plans as approved by the Planning Board, including any revisions required by conditional approval by the Planning Board, have been provided to each applicable Town department and to the Public Works Director and/or the Town Inspector as required by the Planning Board;
3. the required pre-construction meeting between the subdivider, the contractor(s) and the Public Works Director and/or the Town Inspector as

required by the Planning Board has taken place in accordance with SECTION VI-O:2;

4. all of the temporary erosion control measures shall be installed in accordance with the plans approved by the Planning Board.

Such permit shall be enforced by the Board of Selectmen under the same terms and conditions as a Building Permit including the right to issue STOP WORK ORDERS for violations of any of the procedures or requirements of the Planning Board.

C. INSPECTION

Inspections by the Town Public Works Director and/or the Town Inspector as required by the Planning Board , with or for the Planning Board are required when:

1. Temporary erosion control measures have been installed in accordance with the plans approved by the Planning Board. These erosion control measures must be maintained at all times during construction. If they are not maintained and functioning at all times during construction, then the Board of Selectmen shall issue a STOP WORK ORDER on all construction on the site until all erosion control measures are brought into compliance with the plans approved by the Planning Board.
2. Right-of-way has been cleared and before base has been laid. (Section VI-O:3,a.,4)
3. Culverts and other drainage improvements are installed. (Section VI-O:4,h)
4. Fine grading of the subgrade, side and back slopes. (Section VI-O:5)
5. Base course(s) of sand and/or gravel have been laid and compacted. (Section VI-O:6,d.,8)
6. Finish course of crushed gravel and shoulders have been laid, compacted and fine graded. (Section VI-O:6,h)
7. Inspection within 48 hours of surfacing with bituminous concrete.
8. Surfacing with bituminous courses is in progress. (Section VI-O:7,c through e)
9. Such other operations as may be found necessary by the Public Works Director or the Planning Board or its agent.

D. NOTICE BEFORE INSPECTION

For required inspections during construction, the Contractor, Owner or Developer shall give at least 48 hours (2 working days) notice to the Public Works Director and/or the Town Inspector as required by the Planning Board in order to coordinate schedules. The Public Works Director and/or the Town Inspector as required by the Planning Board may make such additional inspections as he deems necessary.

E. TESTING

All testing requested by the Public Works Director and/or the Town Inspector as required by the Planning Board will be done by a laboratory approved by the Planning Board and shall be paid for by the subdivider.

F. SUBDIVISION IMPROVEMENTS REQUIRED BEFORE ISSUANCE OF BUILDING PERMITS

The subdivider shall complete the subdivision improvements as provided below before a building permit will be issued by the Town for one or more dwellings in the subdivision:

1. Erosion Control: The subdivider shall install the temporary erosion control measures as required by the plans approved by the Planning Board before construction of any of the subdivision improvements. The subdivider shall maintain the erosion control measures to function properly throughout the construction period. If the erosion control measures are not maintained to function properly, then the Town shall issue a STOP WORK ORDER for all construction until the erosion control measures have been properly reinstalled.

2. Roads: The required base courses of gravel and crushed gravel for the subdivision roads must be installed and compacted, and then inspected before a building permit will be issued.
   The Fire Chief needs to certify that the roads are capable of providing safe emergency vehicle access before a building permit will be issued.

3. Domestic Water Supply Improvements:
   a. Water Service provided by the New London/Springfield Water System Precinct: If water service is to be provided by the New London/Springfield Water System Precinct, then the water distribution system shall be installed and then inspected and approved by the Precinct before a building permit will be issued.
   b. Water System serving more than one Dwelling Unit: If a water system is to serve more than one dwelling unit, then the water system, except individual water service lines to dwelling units, must be installed and then inspected and approved by the Town and/or state before a building permit will be issued. If a water system is to serve fifteen (15) or more service connections, then the system must be installed and then inspected and approved by the Department of Environmental Services before a building permit will be issued.
   c. Water well serving an Individual Dwelling Unit: If an individual water well is to serve an individual dwelling unit, then a building permit can be issued before the well is drilled.

4. Wastewater Treatment Improvements:
   a. Town Sewer Service: If the lots are to be served by Town sewer, then all components of the sewer system, except individual sewer service lines to dwelling units, must be installed by the subdivider and then inspected and approved by the Public Works Director before a building permit will be issued.
   b. Sewer System Serving more than one Dwelling Unit: If a sewer system is to serve more than one dwelling unit, then the sewer system, except individual sewer service lines to dwelling units, must be installed and then inspected and approved by the Town and/or state before a building permit will be issued.
   c. Septic System serving an Individual Dwelling Unit: If an individual septic system is to serve an individual dwelling unit, then a building permit can be issued after the septic design plans have been approved by the New Hampshire Department of Environmental Services, but before the septic system is constructed.

5. Water Supply for Firefighting Purposes:
   a. Water Service provided by the New London/Springfield Water System Precinct: If water service is to be provided by the New London/Springfield Water System Precinct, then the water distribution system and fire hydrants shall be installed to the Precinct specifications and then inspected and approved by the Precinct before a building permit will be issued.
   b. Rural Water Supply: If a rural water supply (cistern or fire pond) is required by the Planning Board for the subdivision, then the rural water supply shall be installed and then inspected and approved for use by the Fire Department before a building permit will be issued.

G. SUBDIVISION AS-BUILT PLANS

Following completion of all improvements, the subdivider shall submit As-Built Plan(s) to the Planning Board. This plan shall be drawn to scale and shall indicate by angles and dimensions, all underground utilities, road profiles and centerline elevations and final grading plan showing swales and ditches. The plan shall show easements, dedicated roadways and road beds. This plan shall be submitted to the Planning Board with a request for a Temporary Certificate of Performance specified in the paragraph to follow.

H. CERTIFICATE OF PERFORMANCE OF IMPROVEMENTS

1. Temporary Certificate of Performance: Upon completion of all the required improvements associated with the subdivision approval, the subdivider may make application to the Planning Board in writing for a Temporary Certificate of

Performance. The construction of a minimum of seventy-five (75) percent of the dwelling units in the subdivision must be completed before the wearing surface of pavement is laid down. The final wearing surface of pavement must be laid down, inspected and approved before a Temporary Certificate of Performance will be issued by the Planning Board in accordance with this section. This application shall include the Subdivision As-Built Plans specified above, inspection reports from all affected Town departments and/or applicable outside agencies including, but not limited to, the Public Works Director, the Fire Department, the New London-Springfield Water Precinct, the N.H. Department of Transportation and the Town Inspector required by the Planning Board. The Planning Board shall issue the Temporary Certificate of Performance and release the original security filed with the Planning Board if the Planning Board determines that the following have been met:

a. All of the improvements are without material defects which need correction as determined by the Planning Board, and

b. The subdivider has submitted maintenance security for a period of one year which is acceptable to the Planning Board to cover corrections of defects, omissions or failure of installation of the subdivision improvements to comply with the approved plans. The amount of security shall be determined by the Planning Board and shall be sufficient to cover the costs of any defects, omissions, as well as failures of installation of the subdivision improvements and shall be determined using the following formula:

   Length of the Roadway x $22 per linear foot x Engineering News Record (ENR) Construction Cost Index at the time of the calculation/ 7900.

   In addition, the maintenance security shall include 10% of the cost of construction for subdivision improvements for any drainage, utility and water supplies for firefighting purposes.

2. Final Certificate of Performance: After the one year waiting period has expired, then the subdivider may make application to the Planning Board for a Final Certificate of Performance. This application shall include inspection reports from all affected Town departments, applicable outside agencies such as the NH Department of Transportation and the Town Inspector required by the Planning Board indicating the acceptability of the completed improvements after completion of the one year waiting period. If all the improvements are without material defects which need correction as determined by the Planning Board, then the Planning Board shall issue a Final Certificate of Performance and release the remaining security. The exception is the subdivider shall provide the Planning Board with adequate security to cover the cost of replacing any landscape element that dies within three years of issuing the Final Certificate of Performance if the subdivider fails to comply with Section VI:L,9, (a) of these Regulations.

If any of the subdivision improvements are proposed to be turned over to the Town as public improvements with the Town being responsible for maintenance, then the subdivider may apply to the Town for acceptance of these improvements only after the Planning Board has issued a Final Certificate of Performance.

I. STREET ACCEPTANCE PLANS

When the subdivider has completed all the improvements required for the subdivision as specified in the approved plans and as stipulated in the Planning Board's vote of subdivision approval and has met all other requirements of these regulations including obtaining a Final Certificate of Performance from the Planning Board, then the subdivider may file with the Board of Selectmen for acceptance of the completed street(s) as public way(s) under the following requirements:

1. The subdivider shall file with the Board of Selectmen a copy of the approved subdivision as-built plans required under Section VII-G. above.

2. Street Layout Plans:
   The subdivider shall file with the Board of Selectmen, street layout plans (2 original type mylars and 4 paper prints) of the roadway that clearly shows all details, measurements, distances, drainage easements, rights-of-way, and bounds to the same scale and under the same conditions and requirements as for the subdivision plan for the plat.

3. Deeds and Easements:
   The subdivider shall file with the Board of Selectmen completed deeds and easements for all property within the subdivision to become public. Such deeds shall be warranted to transfer complete and absolute title to the Town of New London. Such easements shall grant the specified usage and rights in perpetuity. The deeds and/or easements shall include such other reasonable conditions as required by the Board of Selectmen.

4. Other Requirements:
   The subdivider shall provide all other materials or documents as required by law or the Board of Selectmen to facilitate the maintenance or layout of streets or properties.

SECTION VIII: CLUSTER AND PLANNED UNIT DEVELOPMENTS

Proposals for Cluster and Planned Unit Developments shall conform to all Subdivision Regulations. Such developments shall have the approval of the state and local agencies concerned. See also RSA 356 and 356B.

Application and plat submission procedure shall conform with Sections IV of these regulations. The fee shall be established periodically by the Planning Board.

Failure to comply subjects the developer or owner to penalties provided in Section II.F

SECTION IX - CERTIFICATION

Certified to be a true copy, attest:

_____	_____
Chair	
_____	_____
Vice-Chair	
_____	_____
Secretary	
_____	_____
_____	

Adopted: August 29, 1984
Amended: January 7, 1986
Amended: March 7, 1988
Amended: April 19, 1988
Amended: September 6, 1988
Amended: January 15, 1991
Amended: February 22, 1994
Amended: March 28, 2000
Amended October 23, 2007
Amended July 28, 2009

CREDITS: Adapted from and may be used with the following documents:
*Handbook of Subdivision, State of New Hampshire, Office of State Planning, 1972.
*Highway Design Manual, Vol. I & II, New Hampshire Department of Public Works and Highways, Highway Design Division, 1983.
*Standard Specifications for Road and Bridge Construction, New Hampshire Department of Public Works and Highways, 1983.

*Model Bylaws, Model Stormwater Regulations, Appendix A: Stormwater Technical Design Criteria, and Appendix B: Landscape Design Standards for Stormwater Treatment to achieve Phase II Compliance and Promote Low Impact Development, Comprehensive Environmental, Inc., June, 2005.
Appendix A – Stormwater Low Impact Development Practice – Design Criteria and Appendix B – Downstream Analysis prepared by Richard A. Claytor, Jr., P.E., Principal Engineer, Horsley Witten Group, September, 2007.

EXHIBIT A1
APPLICATION FOR SUBDIVISION REVIEW

APPLICATION FOR:_____ **DATE APPLICATION SUBMITTED**:_____

___ Phase I Conceptual Review Phase
___ Phase II Preliminary Plan or Design Review Phase
___ Phase III: Final Subdivision Plat Phase

NAME OF APPLICANT:_____
ADDRESS:_____
DAYTIME PHONE NUMBER:_____

NAME OF PROPERTY OWNER:_____
(If other than applicant)
ADDRESS:_____
DAYTIME PHONE NUMBER:_____

LOCATION OF PROPERTY:_____

TAX MAP(S): _____ **LOT(S)**:_____ **ZONE DISTRICT(S)**:_____

NUMBER OF LOTS PROPOSED:_____

WATER SERVICE: ___ New London/Springfield Water System Precinct
___ On-site Water Well
___ Community Water System
___ Other:_____

SEWER SERVICE: ___ New London Sewer
___ On-site Septic System
___ Community Septic System
___ Other: _____

ROAD(S) PROVIDING ACCESS: ___ Town Road:_____
___ State Highway:_____

The Zoning Administrator or Land Use Coordinator can assist applicants identify whether the following natural resources will be impacted and which sub-watershed the property is located in.

WETLAND IMPACTED?	___	Yes	___	No
WETLAND BUFFERS IMPACTED?	___	Yes	___	No
STEEP SLOPE AREA IMPACTED?	___	Yes	___	No
STREAM(S) IMPACTED?	___	Yes	___	No
STREAM BUFFER(S) IMPACTED?	___	Yes	___	No
LOCATED OVER AN AQUIFER?	___	Yes	___	No
LOCATED WITHIN A 100 YEAR FLOODPLAIN?	___	Yes	___	No

SURFACE WATER – WATERSHED:
___ Pleasant Lake, Blackwater River
___ Little Lake Sunapee
___ Goose Hole Pond
___ Otter Pond
___ Lake Sunapee
___ Lyon Brook, Kezar Lake
___ Messer Pond, Clark Pond, Kezar Lake

CURRENT USE:
Does the proposed subdivision affect land held in Current Use? ___ Yes ___ No
CONSERVATION EASEMENT:
Does the subdivision affect land held in a Conservation Easement? ___ Yes ___ No

I certify that this Subdivision Application, including the supporting plan and documents, has been completed in accordance with the latest adopted version of the Land Subdivision Control Regulations of the Town of New London.

I certify that this Subdivision Application, including the supporting plan and documents, complies with the standards specified in the New London Land Subdivision Control Regulations, unless a specific waiver has been applied for and granted by the Planning Board, and that I will continue to comply with those standards on an on-going basis.

I understand and agree that if I propose to change the subdivision and related materials from the approved application that I will contact the Planning Board, or their designee, to see if a new application for the amended subdivision application is required and file that amended application if required.

I agree to obtain all the subsequent Town permits needed for this Subdivision Application including all of the applicable Developers Responsibilities specified in SECTION VII of the Land Subdivision Control Regulations.

I agree to comply with all required inspections during construction and to pay for all required inspection services.

In making this application, I agree to permit the members of the Planning Board and their agents to enter upon the subject property for the purpose of inspecting the property for this application.

DATE: _____ **SIGNATURE OF PROPERTY OWNER**
_____
SIGNATURE OF AGENT FOR PROPERTY OWNER
(Need letter of authorization from property owner if agent)
_____

EXHIBIT A2

MAJOR SUBDIVISION CHECKLIST of APPLICATION REQUIREMENTS

# in Regulations		Application Requirement	Submitted	Not Applicable	Waiver by PB
1.		Application Form			
2.		Letter of Authorization			
3.		Impact Assessment			
4.		Abutters List			
5.		Application Fee			
6.		Waiver Requests in Writing			
7.	a.	Survey Plat			
	b.	Topographic Map			
	c.	Soils Map			
	d.	Utilities & Fire Protection Plan Map			
	e.	Drainage Plan Map			
8.		Erosion & Sediment Control Plan			
9.		Stormwater Management Plan			
10.		Drainage Construction Plans & Details			
11.		Soils Report			
12.		Wildlife Habitat Impact Report			
13.		Road Profiles, Cross Sections & Details			
14.		Information on Special Flood Hazard Areas			
15.		Legal Documents			
	a.	Agreement to convey land to be used for public purposes			
	b.	Easements & Rights-of-Way			
	c.	Drainage Easements			
	d.	Covenants - Refer to Exhibits B1, B2 & B3			
	e.	Security and/or Performance Bond			

	f.	Covenant Restricting Lot Sales			
	g.	Indemnification			
	h.	Maintenance until Acceptance			
	i.	Easements for Water Supplies for Firefighting Purposes			
16.		Agency or Permit Approvals			
	a.	Access Permit			
	b.	NHDES Subdivision Approval and/or approval of Community Water System			
	c.	NHDES 485-A:17 Permit for Land Disturbance			
	d.	NH Wetlands Board Dredge & Fill Permit (Wetlands Permit)			
	e.	Approval of Water System Precinct			
	f.	Approval from Public Works Director for Sewer Service			
17.		Additional Information as required by the Planning Board			

EXHIBIT A3

MINOR SUBDIVISION CHECKLIST of APPLICATION REQUIREMENTS

# in Regulations	Application Requirement	Submitted	Not Applicable	Waived by PB
1.	Application Form			
2.	Letter of Authorization			
3.	Abutters List			
4.	Application Fee			
5.	Waiver Requests in Writing			
6.	Site Survey Map - 3 Copies of Full-Scale & 10 Copies Reduced-Scale			
7.	Topographic Map - 3 Copies of Full-Scale & 10 Copies Reduced-Scale			
8.	Soils Map - 3 Copies of Full-Scale & 10 Copies Reduced-Scale			
9.	Information on Special Flood Hazard Areas			
10.	Applicable agency or Permit Approvals			
11.	Additional Information Required by he Planning Board			

EXHIBIT B1 - FORM FOR INDIVIDUALS

COVENANT RELATING TO RELEASE OF
TOWN OF NEW LONDON,
NEW LONDON-SPRINGFIELD WATER SYSTEM PRECINCT
AND NEW LONDON PUBLIC WORKS DEPARTMENT
FROM FURNISHING CERTAIN FACILITIES IN
PROPOSED SUBDIVISION OF LAND,
NEW LONDON, NEW HAMPSHIRE

The undersigned developer, (1) having proposed to subdivide a certain tract or parcel of land situate in New London in the County of Merrimack and State of New Hampshire, as more particularly described in deed to the undersigned dated _____ and recorded in Merrimack County Registry of Deeds, Book _____, Page _____, to which reference is made, and (2) having requested approval of the proposed subdivision by the Planning Board of the Town of New London, and (3) having represented to said Planning Board that he does not now desire or require public highway, public water or public sewer services and facilities for all or any of the land in said subdivision as described in the foregoing deed, (4) in consideration of the approval of the proposed subdivision by said Planning Board, for himself, his heirs, administrators, successors and assigns, does hereby covenant, grant and agree to and with the Town of New London, the New London-Springfield Water System Precinct and the New London Public Works Department, and their respective successors and assigns, as follows:

A. On behalf of himself, and his successors in title of all or any part of said tract of land, he and they hereby absolve, release and forever discharge the Town of New London, the New London-Springfield Water System Precinct and New London Public Works Department from all obligation to provide, at public expense, any public highways (including drainage, sidewalks and curbs), public water service and public sewer service for the benefit of all or any portion of said tract of land.

B. On behalf of himself, and his successors in title of all or any part of said tract of land, he and they jointly and severally undertake that, whenever any of the foregoing public services or facilities are desired or required for the benefit of all or any part of said tract of land, they will cause the same to be constructed at their own expense and without cost to the Town of New London, the New London-Springfield Water System Precinct and the New London Public Works Department, in accordance with the then current subdivision regulations of the Town of New London and the then current specifications and standards of the municipal officers having jurisdiction thereof.

C. This covenant shall run with and be binding upon the foregoing tract of land and every part thereof and shall be recorded in Merrimack County Registry of Deeds as evidence thereof. In each and every deed of a lot in said subdivision the developer

undertakes to insert a clause referring to this covenant and binding the grantee to it.

Given under the hand seal of the undersigned developer(s) this day of _____-_____, 20__.

Witness:

_____ _____

_____ _____

The State of New Hampshire
Merrimack, ss.

Personally appeared the above subscriber(s) and each acknowledged the foregoing instrument to be his (her) free act and deed. Before me:

_____

Justice of the Peace/Notary Public

EXHIBIT B2 - FORM FOR CORPORATIONS

COVENANT RELATING TO RELEASE OF
TOWN OF NEW LONDON,
NEW LONDON-SPRINGFIELD WATER SYSTEM PRECINCT
AND NEW LONDON PUBLIC WORKS DEPARTMENT
FROM FURNISHING CERTAIN FACILITIES IN
PROPOSED SUBDIVISION OF LAND,
NEW LONDON, NEW HAMPSHIRE

The undersigned developer, (1) having proposed to subdivide a certain tract or parcel of land situate in New London in the County of Merrimack and State of New Hampshire, as more particularly described in deed to the undersigned dated _____ and recorded in Merrimack County Registry of Deeds, Book _____, Page _____, to which reference is made, and (2) having requested approval of the proposed subdivision by the Planning Board of the Town of New London and (3) having represented to said Planning Board that it does not now desire or require public highway, public water or public sewer services and facilities for all or any of the land in said subdivision as described in the foregoing deed, (4) in consideration of the approval of the proposed subdivision by said Planning Board, for itself, its successors and assigns, does hereby covenant, grant and agree to and with the Town of New London, the New London-Springfield Water System Precinct and the New London Public Works Department and their respective successors and assigns, as follows:

A. On behalf of itself, its successors and assigns in title of all or any part of said tract of land, it and they hereby absolve, release and forever discharge the Town of New London, the New London-Springfield Water System Precinct and the New London Public Works Department from all obligation to provide, at public expense, any public highways (including drainage, sidewalks and curbs), public water service and public sewer service for the benefit of all or any portion of said tract of land.

B. On behalf of itself, its successors and assigns in title of all or any part of said tract of land, it and they jointly and severally undertake that, whenever any of the foregoing public services or facilities are desired or required for the benefit of all or any part of said tract of land, they will cause the same to be constructed at their own expense and without cost to the Town of New London, the New London-Springfield Water System Precinct and the New London Public Works Department, in accordance with the then current subdivision regulations of the Town of New London and the then current specifications and standards of the municipal officers having jurisdiction thereof.

C. This covenant shall run with and be binding upon the foregoing tract of land and every part thereof and shall be recorded in Merrimack County Registry of Deeds as evidence thereof. In each and every deed of a lot in said subdivision the developer undertakes to insert a clause referring to this covenant and binding the grantee to it.

Given under the hand and seal of the undersigned developer(s) this day of _____, 20 __.
Witness:

_____ _____

_____ _____

The State of New Hampshire
Merrimack, ss.

Personally appeared the above subscriber(s) and each acknowledged the foregoing instrument to be his (her) free act and deed. Before me:

_____
Justice of the Peace/Notary Public

EXHIBIT B3

COVENANT RELATING TO RELEASE OF
TOWN OF NEW LONDON,
FROM FURNISHING CERTAIN FACILITIES
IN PROPOSED SUBDIVISION OF LAND,
NEW LONDON, NEW HAMPSHIRE

The undersigned developer, (1) having proposed to subdivide a certain tract or parcel of land situate in New London in the County of Merrimack and State of New Hampshire, as more particularly described in deed to the undersigned dated _____ Book _____ Page _____, to which reference is made, and (2) having requested approval of the proposed subdivision by the Planning Board of the Town of New London and (3) having represented to said Planning Board that he does now desire or require fire protection and facilities for all or any of the land in said subdivision as described in the foregoing deed, (4) in consideration of the approval of the proposed subdivision by said Planning Board, for himself, his heirs, administrators, successors and assigns, does hereby covenant, grant, and agree to and with the Town of New London, and their respective successors and assigns, as follows:

A. On behalf of himself, and his successors in title of all or any part of said tract of land, he and they hereby absolve, release and forever discharge the Town of New London, from all obligation to provide, at public expense, any public cisterns or fire facilities, piping, and maintenance, for the benefit of all or any portion of said tract of land.

B. On behalf of himself, and his successors in title of all or any part of said tract of land, he and they jointly and severally undertake that, whenever any of the foregoing public services or facilities are desired or required for the benefit of all or any part of said tract of land, they will cause the same to be constructed at their own expense, and without the cost to the Town of New London, in accordance with the then current subdivision regulations of said Town and the then current specifications and standards of the municipal officers having jurisdiction thereof.

C. On behalf of himself, and his successors in title of all or any part of said tract of land, he and they jointly and severally undertake that they will maintain the same at their sole expense and in accordance with the directions of the Town of New London, and if they shall fail to maintain in accordance with such directions, that the Town will maintain the same in accordance with its requirements and if the Town is required to maintain the same, the Town will file a lien upon the foregoing tract of land and every part thereof and shall record such lien in the Merrimack County Registry of Deeds.

D. This covenant shall run with and be binding upon the foregoing tract of land and every part thereof and shall be recorded in Merrimack County Registry of Deeds as evidence thereof. In each and every deed of a lot in said subdivision the developer undertakes to insert a clause referring to this covenant and binding the grantee to it.

Given under the hand seal of the undersigned developer(s) this day of _____ 20___.

WITNESS:

_____ _____

_____ _____

The State of New Hampshire
Merrimack, ss.

Personally appeared the above subscriber(s) and each acknowledged the foregoing instrument to be his (her) free act and deed. Before me:

_____
Justice of the Peace/Notary Public

EXHIBIT C MINIMUM LOT SIZE BY SOIL TYPE USING HIS MAPS

Soil Type	Slope B	C	D	E
111-H	35500	42000	51500	68000
112-H	35500	42000	51500	68000
11X-H	68000	76000	86000	100000
121-H	35500	42000	51500	68000
122-H	35500	42000	51500	68000
12X-H	68000	76000	86000	100000
161-H	35500	42000	51500	68000
16X-H	68000	76000	86000	100000
211-H	35500	42000	51500	68000
212-H	35500	42000	51500	68000
213-H	68000	76000	86000	100000
21X-H	68000	76000	86000	100000
221-H	44500	56000	68000	86000
222-H	44500	56000	68000	86000
223-H	68000	76000	86000	100000
22X-H	68000	76000	86000	100000
231-H	44500	56000	68000	86000
233-H	68000	76000	86000	100000
23X-H	68000	76000	86000	100000
241-H	68000	76000	86000	100000
243-H	68000	76000	86000	100000
24X-H	68000	76000	86000	100000
251-H	68000	76000	86000	100000
253-H	68000	76000	86000	100000
25X-H	68000	76000	86000	100000
261-H	44500	56000	68000	86000
263-H	68000	76000	86000	100000
26X-H	68000	76000	86000	100000
275-H	44500	56000		
311-H	44500	56000	68000	86000
312-H	44500	56000	68000	86000
313-H	68000	76000	86000	100000
31X-H	68000	76000	86000	100000
321-H	44500	56000	68000	86000
322-H	44500	56000	68000	86000
323-H	68000	76000	86000	100000
325-H	68000	76000		
32X-H	68000	76000	86000	100000
331-H	44500	56000	68000	86000

EXHIBIT C (continued)

Soil Type	Slope B	C	D	E
333-H	68000	76000	86000	100000
33X-H	68000	76000	86000	100000
341-H	68000	76000	86000	100000
343-H	68000	76000	86000	100000
34X-H	68000	76000	86000	100000
351-H	68000	76000	86000	100000
353-H	68000	76000	86000	100000
35X-H	68000	76000	86000	100000
361-H	44500	56000	68000	86000
363-H	68000	76000	86000	100000
36X-H	68000	76000	86000	100000
375-H	44500	56000		
411-H	44500	56000	68000	
412-H	44500	56000		
413-H	68000	76000		
41X-H	68000	76000		
421-H	68000	76000	86000	
422-H	68000	76000	86000	
423-H	68000	76000	86000	
42X-H	68000	76000	86000	
431-H	68000	76000		
433-H	68000	76000		
43X-H	68000	76000		
441-H	68000	76000		
443-H	68000	76000		
44X-H	68000	76000		
451-H	68000	76000		
453-H	68000	76000		
45X-H	68000	76000		
461-H	68000	76000		
463-H	68000	76000		
46X-H	68000	76000		
475-H	68000			
511-H	44500	56000	68000	
512-H	44500	56000		
513-H	68000	76000		
51X-H	68000	76000		
521-H	68000	76000	86000	
522-H	68000	76000	86000	
523-H	68000	76000	86000	
52X-H	68000	76000	86000	
531-H	68000	76000		
533-H	68000	76000		
53X-H	68000	76000		
541-H	68000	76000		
543-H	68000	76000		
54X-H	68000	76000		
551-H	68000	76000		

EXHIBIT C (continued)

Soil Type	Slope B	C	D	E
553-H	68000	76000		
55X-H	68000	76000		
561-H	68000	76000		
563-H	68000	76000		
56X-H	68000	76000		
575-H	68000			

The soil types listed below have one or more limiting characteristics that make the soil type "NA" or require on-site investigation, no matter what other characteristics of the soil may be present.

Soil Type	Minimum Lot Size
6***H	NA, very poorly drained soil, Type A hydric
*66*H	NA, fill does not meet the Standards for Fill Material (see Key to Soil Types)
76**H	On-site evaluation needed

The Soil Type symbols are explained in "High Intensity Soil Maps for New Hampshire, Standards and Origins. SSSNNE Special Publication No. 1".

"NA" means not allowed.
"*" means any slope or any number.

EXHIBIT D
SUGGESTED FORM OF ACCEPTABLE IRREVOCABLE LETTER OF CREDIT

Board of Selectmen
Town of New London
Town Hall, Box 240
New London, N.H. 03257

Dear Town Officials:

RE: _____ Subdivision

By this document the _____ Bank (hereinafter "issuer") hereby issues an irrevocable letter of credit in the amount of $_____ to the Town of New London on behalf of _____ (hereinafter "developer"). This irrevocable letter of credit is issued to guaranty completion of all improvements required by the New London Planning Board and the Town of New London Land Subdivision Control Regulations in conjunction with a subdivision plan entitled "_____", dated _____, prepared by _____, and approved by the New London Planning Board on _____.

It is understood that the improvements guaranteed by this irrevocable letter of credit include but are not limited to the following:

1. Construction of _____ linear feet of roadway along with all associated utilities. Said roadway being shown on the above referenced plan as _____.
2.
3.

It is agreed and understood by the issuer of this letter of credit that it shall be issued for a period of ____ months. If all improvements guaranteed by this letter of credit are not completed by _____(date) and if a certificate indicating completion of all improvements has not been issued by the Town of New London Planning Board, then this letter of credit shall be automatically

considered to have been called and without further action by the Town of New London or its Planning Board, the _____ Bank shall forward a check in the amount of $_____ to the Treasurer of the Town of New London. The funds so forwarded to the Town Treasurer shall be used exclusively for the purpose of completing the improvements which are guaranteed by this letter of credit. Any funds not needed by the Town to complete improvements required by the subdivision plan referred to above shall be returned to the _____ Bank.

_____
(Signature of Bank Official)

Date: _____

I have read this letter of credit and agree to its terms.

_____
(Signature of Developer)

EXHIBIT E
COVENANT RESTRICTING LOT SALES
_____ SUBDIVISION
NEW LONDON, N.H.

This covenant relates to property in New London, Merrimack County, New Hampshire, and is made on this _____ day of _____, 20 ___, by (Subdivider Name)_____,
(Address)_____.

RECITALS

1. The subdivider has proposed to subdivide land
located_____
_____ New London, Merrimack County, New Hampshire.

The proposed subdivision is shown on a plan entitled,
_____,
dated_____, 20___, prepared by _____
which plan is to be recorded in the Merrimack County Registry of Deeds.

2. The land for the subdivision was conveyed to the subdivider by deed of
_____, dated _____,
20___, and recorded at the Merrimack County Registry of Deeds in Book ___ ,
Page ___.

3. The subdivider will be constructing and installing improvements for the subdivision, and, in accord with Section IV-A:3,j of the New London Land Subdivision Control Regulations, the New London Planning Board has required the subdivider to do one of the following in order for the Planning Board to sign the plat: (1) complete the improvements, (2) post security for completion of the improvements, or (3) record a Covenant Restricting Lot Sales with the Merrimack County Registry of Deeds.

4. This restrictive covenant is filed pursuant to Section IV-A:3,j,3) of the New London Land Subdivision Control Regulations last amended on _____,
20___.

PROVISIONS

1. The Planning Board shall approve the plan and record the plan as an approved subdivision, subject to this covenant.

2. The subdivider will not sell interior lots in the subdivision until this covenant is released as provided below. This release may be done in phases. The interior lots that will not be sold until this covenant is released are Lot Numbers:_____.

3. The following lots are not subject to this covenant, and the subdivider may sell these lots prior to this covenant being released: Lot Numbers:_____.

4. The subdivider shall furnish security to the Planning Board in an amount sufficient to stabilize the site and prevent erosion from exiting the site in the event the subdivider chooses to proceed with construction of the improvements as provided in 5., b. below before having provided security for all the subdivision improvements and having the Planning Board sign and record the plat.

5. In accord with Section IV-A:3,j,3) of the New London Land Subdivision Control Regulations, the Planning Board shall release this covenant by approving and recording an instrument that indicates that either:

a. Security in the form and amount acceptable to the Planning Board for the then required subdivision improvements has been furnished to and accepted by the Planning Board; or

b. The required subdivision improvements have been constructed and a Temporary Certificate of Performance required by Section VII-H of the New London Land Subdivision Control Regulations has been approved by the Planning Board.

6. The subdivider's breach of this covenant may result in the Board of Selectmen's refusal of a building permit for construction.

7. As indicated in Section IV-A:3,j,3),c) of the New London Land Subdivision Control Regulations, nothing in this covenant shall obligate the Planning Board to approve either the certificate of performance of improvements or the proposed security. If at the time the certificate is requested or the security is proposed and the Planning Board determines that circumstances in the Town of New London have so substantially changed so that the continued sale of lots in the subdivision results in the need for either Off-Site Improvements, impact fees, restrictions on the issuance of building, sewer or water permits, or other material or substantial changes have

occurred in the Town of New London since the subdivision was approved, the Planning Board shall consider the request for the certificate or approval of security as a new subdivision application.

8. Once approved, this subdivision is subject to and benefited by Section II-N FOUR YEAR EXEMPTION of the New London Land Subdivision Control Regulations.

By: (Subdivider Signature)_____

STATE OF NEW HAMPSHIRE
COUNTY OF MERRIMACK

Personally appeared before me this ____ day of _____, 20___, _____, duly authorized owner of _____, a New Hampshire Corporation, on its behalf.

_____
Notary Public
My Commission expires _____

The New London Planning Board has read and approved this covenant.

THE TOWN OF NEW LONDON PLANNING BOARD

By:_____
Chair

EXHIBIT F1
APPLICATION FOR ANNEXATIONS,
LOT LINE ADJUSTMENTS, & BOUNDARY AGREEMENTS

APPLICATION FOR: **DATE APPLICATION SUBMITTED**:_____

___ Phase I Conceptual Review Phase
___ Phase II Preliminary Review Phase
___ Phase III: Final Annexation Phase

NAME OF APPLICANT:_____
ADDRESS:_____
DAYTIME PHONE NUMBER:_____

NAME OF PROPERTY OWNER:_____
(If other than applicant)
ADDRESS:_____
DAYTIME PHONE NUMBER:_____

LOCATION OF PROPERTY:_____

TAX MAP(S): _____ **LOT(S)**:_____ **ZONE DISTRICT(S)**:_____

WATER SERVICE: ___ New London/Springfield Water System Precinct
___ On-site Water Well
__ Community Water System
___ Other:_____

SEWER SERVICE: ___ New London Sewer
___ On-site Septic System
__ Community Septic System
___ Other: _____

ROAD(S) PROVIDING ACCESS: ___ Town Road:_____
___ State Highway:_____

The Zoning Administrator or Land Use Coordinator can assist applicants identify whether the following natural resources will be impacted and which sub-watershed the property is located in.

WETLAND IMPACTED?	___ Yes	___ No		
WETLAND BUFFERS IMPACTED?		___ Yes	___ No	
STEEP SLOPE AREA IMPACTED?	___ Yes	___ No		
STREAM(S) IMPACTED?	___ Yes	___ No		
STREAM BUFFER(S) IMPACTED?	___ Yes	___ No		
LOCATED OVER AN AQUIFER?	___ Yes	___ No		
LOCATED WITHIN A 100 YEAR FLOODPLAIN?	___ Yes	___ No		

SURFACE WATER – WATERSHED:

___ Pleasant Lake, Blackwater River
___ Little Lake Sunapee
___ Goose Hole Pond
___ Otter Pond
___ Lake Sunapee
___ Lyon Brook, Kezar Lake
___ Messer Pond, Clark Pond, Kezar Lake

CURRENT USE:
Does the proposed subdivision affect land held in Current Use? ___ Yes ___ No

CONSERVATION EASEMENT:
Does the subdivision affect land held in a Conservation Easement? ___ Yes ___ No

I certify that this Annexation Application, including the supporting plan and documents, has been completed in accordance with the latest adopted version of the Land Subdivision Control Regulations of the Town of New London.

I certify that this Annexation Application, including the supporting plan and documents, complies with the standards specified in the New London Land Subdivision Control Regulations, unless a specific waiver has been applied for and granted by the Planning Board, and that I will continue to comply with those standards on an on-going basis.

I understand and agree that if I propose to change the annexation and related materials from the approved application that I will contact the Planning Board, or their designee, to see if a new application for the amended subdivision application is required and file that amended application if required.

In making this application, I agree to permit the members of the Planning Board and their agents to enter upon the subject property for the purpose of inspecting the property for this application.

DATE: _____ **SIGNATURE OF PROPERTY OWNER**

_____

SIGNATURE OF AGENT FOR PROPERTY OWNER
(Need letter of authorization from property owner if agent)

_____

EXHIBIT F2

ANNEXATION CHECKLIST of APPLICATION REQUIREMENTS

# in Regulations		Application Requirement	Submitted	Not Applicable	Waived by P B
1.		Application Form			
2.		Letter of Authorization			
3.		Abutters List			
4.		Application Fee			
5.		Waiver Requests in Writing			
6.		3 Fill-Scale & 10 Reduced-Scale Sets of Plans			
	a.	Surveyor or Engineer Signature & Seal			
	b.	Name of Town & Annexation			
	c.	Names & Addresses of Property Owners			
	d.	Names & Tax Map & Lot Numbers of Abutters			
	e.	Boundary Survey of each Property in Annexation showing New & Old Property Lines			
	f.	Notation explaining Parcel Sizes & Frontages before & after Annexation			
	g.	North Point, Bar Scale, Dates of Preparation & Revisions & Tax Map & Lot Numbers of Properties in Annexation			
	h.	Location of Easements or Covenants Benefiting or Bordering the Properties			
	i.	Annexation Notation			
	j.	Title Block			

EXHIBIT G1
VOLUNTARY MERGER OF LOTS OF RECORD FORM FOR DEEDS

Planning Board
Town of New London
Post Office Box 240
New London, NH 03257

Form to Use Merging Lots of Record Described by Recorded Deeds

TOWN OF NEW LONDON

VOLUNTARY MERGER OF LOTS OF RECORD

The undersigned, being the owner of _____certain parcels of land situate in New London, in the County of Merrimack, and State of New Hampshire, as more particularly described in a deed to the undersigned dated and recorded in the Merrimack County Register of Deeds, book , page , a deed dated and recorded in the Merrimack County Register of Deeds, book , page , and a deed dated and recorded in the Merrimack County Register of Deeds, book , page , to which reference is made, and having requested approval by the Planning Board of the Town of New London to declare the land described in said deeds to be, in fact, a single lot of record, in consideration of mutual agreements, does hereby covenant, grant, and agree to, and with, the Town of New London, its successors, and assigns, as follows:

A. On behalf of himself, and his successors in title of this tract of land, agrees that those portions of this parcel or tract cannot be sold separately without lawful subdivision from the New London Planning Board.

B. On behalf of himself, and his successors in title of this tract or parcel of land, understands and agrees that this tract or parcel of land will be treated as a single parcel of land for tax and other purposes.

C. This Covenant shall run with and be binding upon the foregoing tract of land and every part thereof and shall be recorded in the Merrimack County Register of Deeds as evidence thereof. In each and every Deed to this parcel or tract, the owner will undertake to insert a clause referring to this Covenant and binding the Grantee to it.

Current Tax Map & Lot Numbers for properties referenced above:

TAX MAP #_____ LOT #_____ TAX MAP #_____ LOT #_____

NAME OF PROPERTY OWNER (Please print or type):_____

ADDRESS:_____

SIGNATURE OF PROPERTY OWNER_____DATE:_____

APPROVED BY NEW LONDON PLANNING BOARD ON_____, 2_____

SIGNATURE (CHAIRPERSON)_____

SIGNATURES (PLANNING BOARD MEMBERS):

_____ _____

_____ _____

_____ _____

Official Town Use Only – **New Tax Map Number** assigned to merged lot after recording:

New Tax Map #:_____ New Lot #:_____

EXHIBIT G2
VOLUNTARY MERGER OF LOTS OF RECORD FORM FOR SUBDIVISION LOTS

Planning Board
Town of New London
P.O. Box 240
New London, NH 03257

Form to Use Merging Lots of Record Described by a Recorded Subdivision

TOWN OF NEW LONDON
VOLUNTARY MERGER OF LOTS OF RECORD

The undersigned, being the owner of two certain parcels of land situate in New London, in the County of Merrimack and State of New Hampshire, known as Lot Numbers ____ and ____ in Section ____ on a plan of lots in _____, which plan was recorded in the Merrimack County Registry of Deeds on _____, ____ as Plan Number _____, to which reference is made, and having requested approval by the Planning Board of the Town of New London to declare the land described on said referenced plan to be, in fact, a single lot of record, in consideration of mutual agreements, does hereby covenant, grant and agree to and with the Town of New London, its successors, and assigns, as follows:

A. On behalf of himself, and his successors in title of this tract of land, agrees that those portions of this parcel or tract cannot be sold separately without lawful subdivision from the New London Planning Board.
B. On behalf of himself, and his successors in title of this tract or parcel of land, understands and agrees that this tract or parcel will be treated as a single parcel of land for tax and other purposes.
C. This Covenant shall run with and be binding upon the forgoing tract of land and every part thereof and shall be recorded in the Merrimack County Registry of Deeds as evidence thereof. In each and every Deed to this parcel or tract the owner will undertake to insert a clause referring to this Covenant and binding the Grantee to it.

Current Tax Map and Lot Numbers for Properties referenced above:
TAX MAP #_____ LOT #_____ TAX MAP #_____ LOT #_____
NAME OF PROPERTY OWNER (Please print or type):_____
ADDRESS:_____
SIGNATURE OF PROPERTY OWNER_____DATE:_____
APPROVED BY NEW LONDON PLANNING BOARD ON_____, 2_____
SIGNATURE (CHAIRPERSON)_____
SIGNATURES (PLANNING BOARD MEMBERS):
_____ _____
_____ _____
_____ _____

Official Town Use Only – **New Tax Map Number** assigned to merged lot after recording:
New Tax Map #:_____ New Lot #:_____

APPENDIX A

STORMWATER LOW IMPACT DEVELOPMENT PRACTICE – DESIGN CRITERIA

Acceptable Post-construction Low Impact Development (LID) Best Management Practices (BMPs)

This appendix outlines minimum design criteria for six groups of structural best management practices (BMPs) to meet water quality treatment goals. The practice groups include ponds/wetlands, infiltration practices, alternative paving, bioretention systems, open channels, and green roofs. This appendix also provides some minimum design criteria and guidance for structural management options for stormwater quantity control (i.e., storage for C_{pv} and Q_p) and pretreatment. Some "storage" practices not included in this appendix (e.g., dry detention ponds) are explicitly designed to provide stormwater detention; these practices can be used to meet channel protection and flood protection, but must be combined with other BMPs for meeting water quality and recharge criteria. Pretreatment BMPs are designed to improve water quality and enhance the effective design life of practices by consolidating sedimentation location, but cannot meet the pollutant removal targets. Pretreatment practices must be combined in a "treatment train" with other water quality BMPs to meet the water quality criteria.

For each Post-construction BMP group, design and performance criteria are provided for the following six categories:

Feasibility
Identify site considerations that may restrict the use of a practice.

Conveyance
Convey runoff to the practice in a manner that is safe, minimizes erosion and disruption to natural channels, and promotes filtering and infiltration.

Pretreatment
Trap coarse elements before they enter the facility, thus reducing the maintenance burden and ensuring a long-lived practice.

Treatment/Geometry
Provide water quality treatment, through design elements that provide the maximum pollutant removal as water flows through the practice.

Environmental/ Landscaping
Reduce secondary environmental impacts of facilities through features that minimize disturbance of natural stream systems and comply with environmental regulations. Provide landscaping that enhances the pollutant removal and aesthetic value of the practice.

Maintenance
Maintain the long-term performance of the practice through regular maintenance activities, and through design elements that ease the maintenance burden.

Table A.1 lists and describes the BMPs in each of the groups that are acceptable for treatment of the WQ_v.

Table A.1 List of BMPs Acceptable for Water Quality

Group	Practice	Description
Ponds/Wetlands	Micropool[1] Extended Detention Pond	Pond that treats the majority of the water quality volume through extended detention[2], and incorporates a micropool at the outlet of the pond to prevent sediment resuspension.
	Wet Pond	Pond that provides storage for the entire water quality volume in the permanent pool.
	Shallow Marsh	A wetland that provides water quality treatment primarily in wet shallow marsh.
	Extended Detention Wet Pond/Wetland	Pond/wetland that treats a portion of the water quality volume by detaining storm flows above the permanent pool for a specified minimum detention time.
Infiltration	Infiltration Trenches/Chambers/ Dry Wells	An infiltration practice that stores the water quality volume in the void spaces of a gravel trench or within an open chamber before it is infiltrated into underlying soils within the B or C soil horizons.
	Infiltration Basin	An infiltration practice that stores the water quality volume in a shallow surface depression before it is infiltrated into the underlying soils within the B or C soil horizons.
Alternative Paving Surfaces		A practice that stores the water quality volume in the void spaces of a gravel base before it is infiltrated into the underlying soils within the B or C soil horizons.
Filtering Practices	Bioretention	A shallow depression that treats stormwater as it flows through a soil matrix, and is returned to the storm drain system, or infiltrated into underlying soils or substratum.
Open Channels	Dry Swale	An open vegetated channel or depression explicitly designed to detain and promote filtration of stormwater runoff into an underlying fabricated soil matrix.

[1] Micropool is the term to define a small permanent pool 4-8 feet deep, typically with a minimum storage of 0.1 inches per impervious acre of drainage.
[2] Extended detention involves providing temporary storage above the permanent pool or micropool for at least a portion of the WQv that is released over a specified period of time (i.e., 24 hours).

Group	Practice	Description
	Wet Swale	An open vegetated channel or depression designed to retain water or intercept groundwater for water quality treatment.
Green Roofs	Extensive	Rooftop vegetated with low, drought-tolerant plant species and a shallow planting media designed for performance. Not typically designed for public access.
	Intensive	Rooftop vegetated with trees and shrubs with a deeper planting soil and walkways, typically designed for both performance and public access.

Which practices are best suited for the proposed land use at this site? The designer should make an initial screen to select practices that are best suited to a particular land use or to exclude those practices that are ill suited for certain land uses. For example, infiltration practices should not be utilized where runoff is expected to contain high levels of dissolved constituents, such as metals or hydrocarbons or where prior subsurface contamination is evident. Increased hydraulic loading to contaminated soils can accelerate pollutant migration and/or leaching into underlying groundwater. Table A.2 describes which BMPs are appropriate for various land uses.

Table A.2 BMP Selection Matrix 1-Land Use

BMP Group	BMP Design	Residential	Roads and Highways	Commercial/ High Density	Hotspots3	Village Centers
Pond/ Wetland	**Micropool ED**	○	○	◗	①	●
	Wet Pond	○	○	◗	①	●
	Shallow Marsh	○	◗	◗	①	●
	ED Wet Pond/Wetland	○	○	◗	①	●
Infiltration	**Infiltration Trench/Chambers**	◗	○	○	●	◗
	Dry Wells	○	◗	◗	●	◗
	Shallow I-Basin	◗	◗	◗	●	◗
Alt. Paving		○	◗	◗	●	◗
Filters	**Bioretention**	◗	○	○	②	○
Open Channels	**Dry Swale**	◗	○	◗	②	◗
	Wet Swale	●	○	●	●	●
Green Roofs	**Extensive**	◗	●	○	○	○
	Intensive	◗	●	◗	○	○

○: Yes. Good option in most cases.
◗: Depends. Suitable under certain conditions, or may be used to treat a portion of the site.
●: No. Seldom or never suitable.
①: Acceptable option, but may require a pond liner to reduce risk of groundwater contamination.
②: Acceptable option, if <u>not</u> designed as an exfilter. (An exfilter is a conventional stormwater filter without an underdrain system. The filtered volume ultimately infiltrates into the underlying soils.)

Several practices are not recommended for providing the target water quality treatment as "stand alone" practices. Many of these practices have little monitoring data, or available data suggest less than optimum pollutant removal capability. The following practices do not meet the water quality treatment target, but may have some applicability in site design in conjunction with the acceptable practices:

3 Hotspots are defined as sites with high potential pollutant loads, including: auto salvage yards; auto fueling stations; fleet storage areas; vehicle service and maintenance areas; vehicle and equipment cleaning facilities; commercial parking lots with average trip generation rates of 1,000 or greater per day, such as fast-food restaurants, convenience stores, high-turnover (chain) restaurants, and shopping centers; road salt storage and loading areas if exposed to rainfall; commercial nurseries; flat metal (galvanized metal or copper) rooftops of industrial facilities; outdoor storage and loading/unloading areas of hazardous substances; SARA 312 generators, if materials or containers are exposed to rainfall; and marinas (service, repainting and hull maintenance areas).

- Filter Strips
- Grass Channels
- Deep Sump Catch Basins and Catch Basin Inserts
- Oil/Grit Separators and Hydrodynamic Structures

Minimum Design Criteria for Low Impact Design Practices
This section presents two types of criteria for the BMPs listed above—required design elements and design guidelines. Required design elements are features that shall be used in all applications. Design guidelines are features that enhance practice performance, and are therefore optional and may not be necessary for all applications.

A.1 Stormwater Ponds/Wetlands

Stormwater ponds and wetlands are practices that have either a permanent pool of water, a permanent pool with shallow marsh wetlands, or a combination of a permanent pool/wetland and extended detention, equivalent to the entire WQ_v. Ponds/wetlands can be created by either excavating an existing depression or creating embankments.* Three design variants include:

- Micropool Extended Detention Pond (Figure A.1)
- Wet Pond (Figure A.2)
- Shallow Marsh (Figure A.3)
- Extended Detention Wet Pond/Wetland (Figure A.4)

Treatment Suitability:
All stormwater pond/wetland design variations can be used to provide channel protection volume (Cp_v) as well as overbank flood attenuation (Q_p). Dry extended detention ponds without a permanent pool are not considered an acceptable option for meeting water quality treatment goals; however, they may be appropriate to meet water quantity criteria.

*NOTE: Any practice that creates an embankment that meets the State's definition of a dam is required to follow the requirements presented in the *New Hampshire Dam Rules* (http://www.des.state.nh.us/rules/envwr100700.pdf).

Graphics adopted from CWP, 2002.

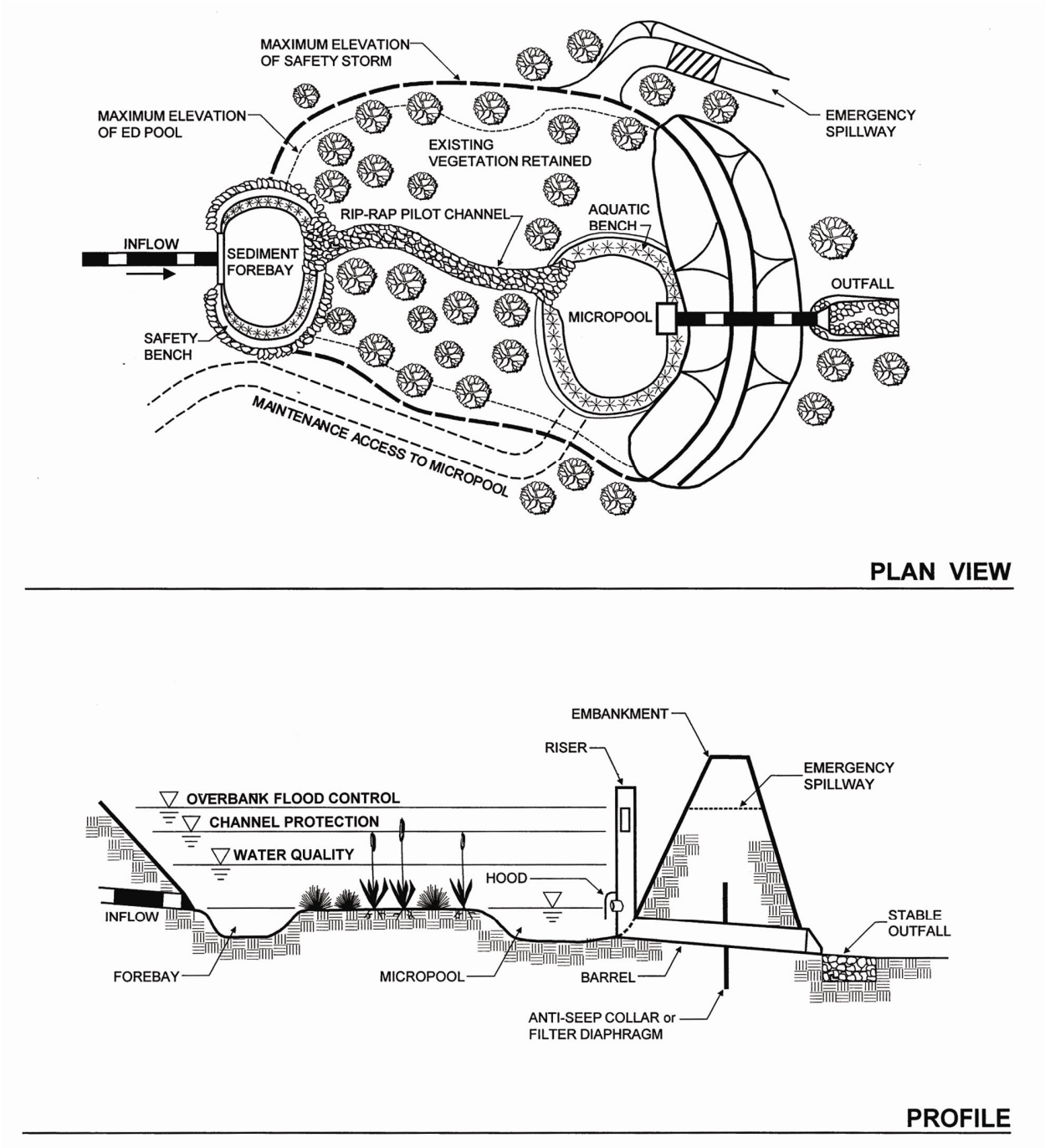


Figure A.1 Micropool Extended Detention Pond

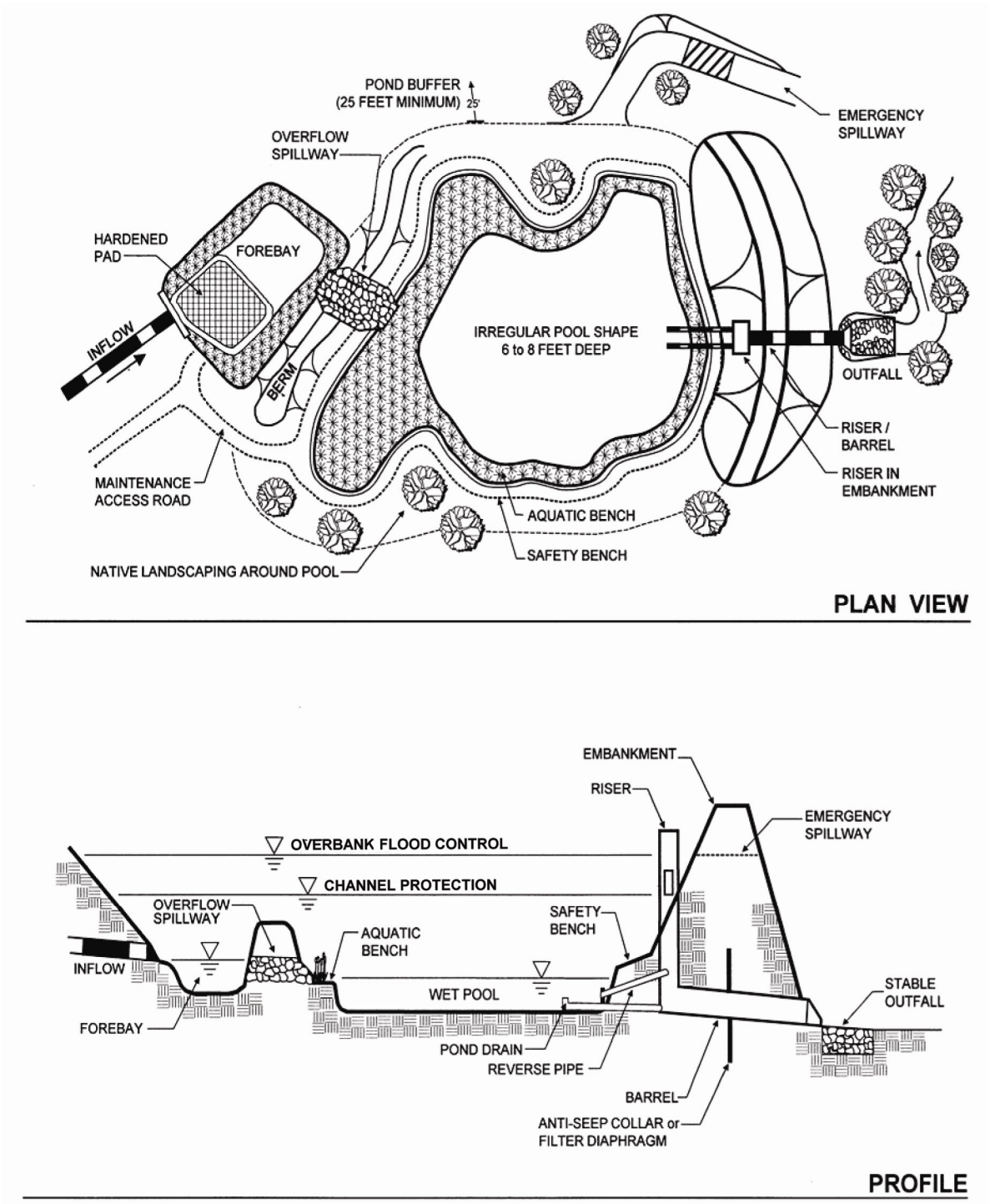


Figure A.2 Wet Pond

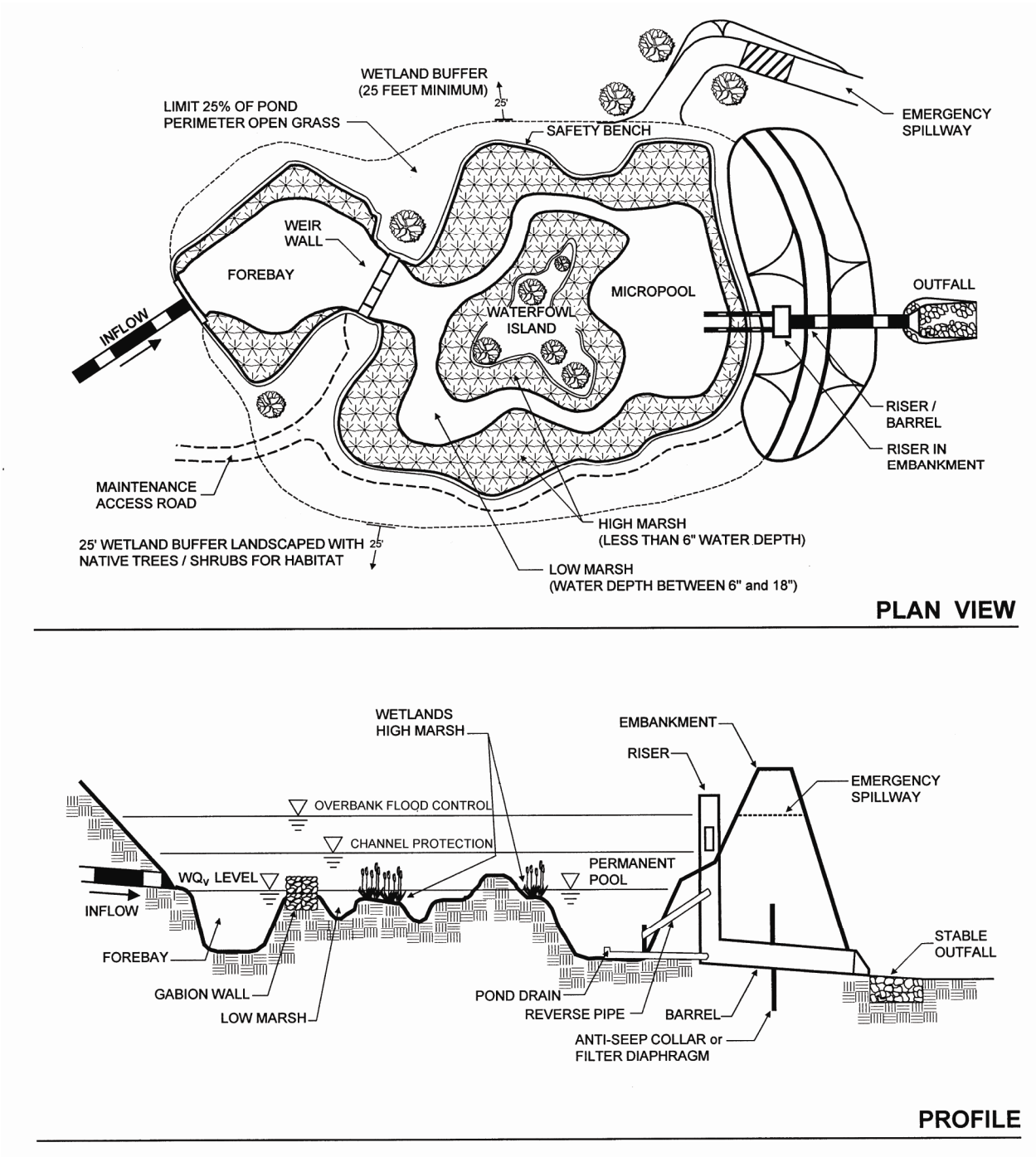


Figure A.3 Shallow Marsh

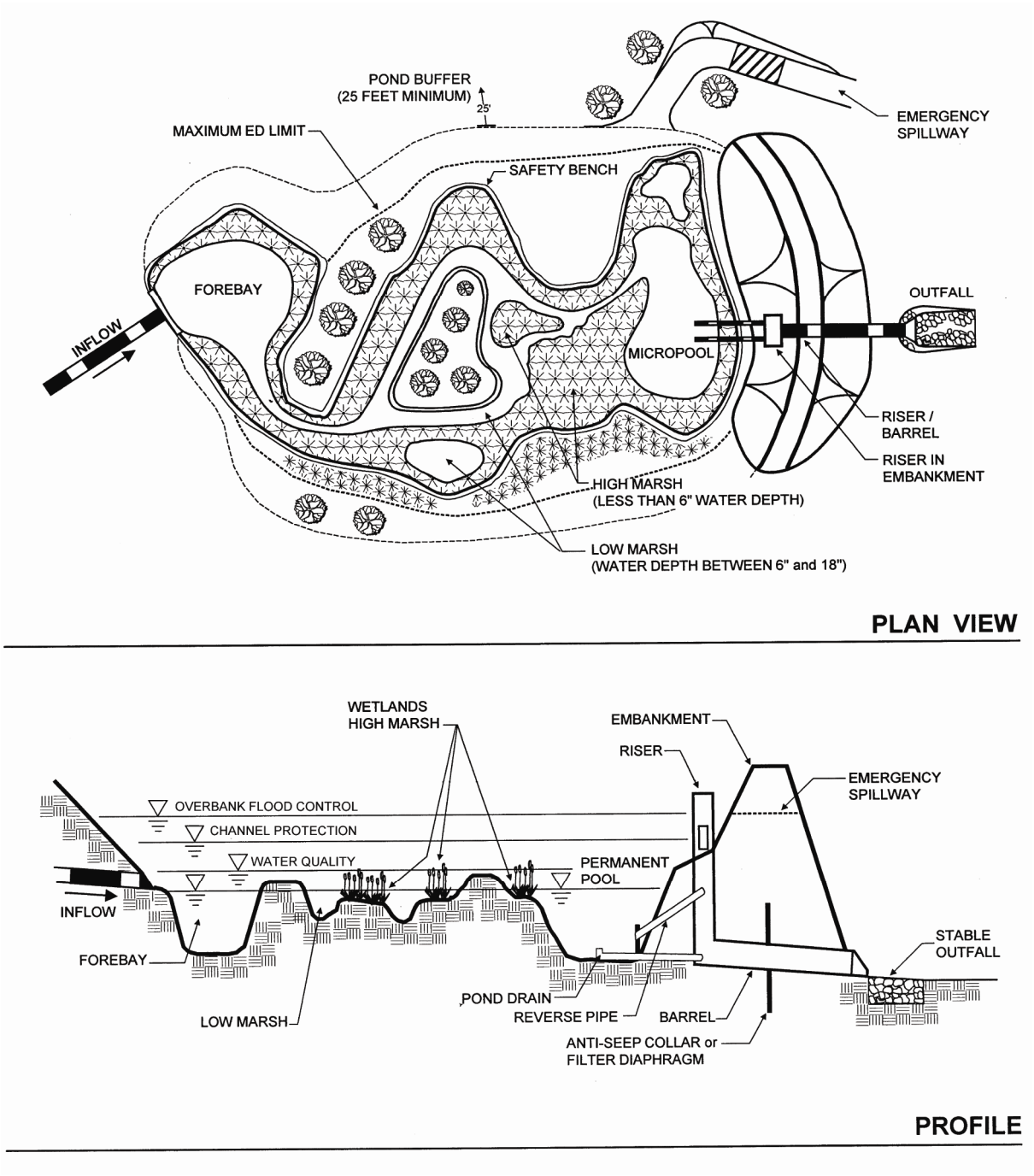


Figure A.4 Extended Detention Wet Pond/Wetland

A.1a Feasibility

Required Elements

- Wet pond and extended detention wet pond/wetland designs shall have a minimum contributing drainage area of 25 acres.
- Stormwater ponds/wetlands shall not be located within jurisdictional waters, including wetlands.
- Evaluate the site to determine the Hazard Class[4] and to determine what design elements are required to ensure dam safety.

Design Guidance

- Avoid location of pond designs within the stream channel, to prevent habitat degradation caused by these structures.
- The use stormwater ponds on cold-water fish waters may have limited applicability, as available evidence suggests that these practices can increase stream temperatures.

A.1b Conveyance

Inlet Protection

Required Elements

- A forebay shall be provided at each inlet, unless the inlet provides less than 10% of the total design storm inflow to the pond.
- Flow paths from the inflow points to the outflow points of stormwater ponds/wetlands shall be maximized.

Design Guidance

- Inlet areas should be stabilized to ensure that non-erosive conditions exist for at least the 1-year frequency storm event.
- Inlet pipes should be set at the permanent pool or slightly above to limit erosive conditions.
- The bed of stormwater ponds/wetlands should be graded to create maximum internal flow path and microtopography. Microtopography (complex contours along the bottom of the wetland system, providing greater depth variation) is encouraged to enhance wetland diversity.

Adequate Outfall Protection

Required Elements

4 Hazard Class is a classification system that ranks the relative risk of a pond embankment should it fail. Risk is a function of pond storage volume, embankment height, and the presence of downstream properties. A tall embankment with a large volume of water impounded by an earthen dam immediately above an inhabited structure will likely be a High Hazard Facility and subject to more stringent design criteria. Applicants must consult the New Hampshire Dam Bureau to determine the exact criteria.

- The channel immediately below a pond/wetland outfall shall be modified to prevent erosion and conform to natural dimensions in the shortest possible distance, typically by use of appropriately sized riprap placed over filter cloth.
- A stilling basin or outlet protection shall be used to reduce flow velocities from the principal spillway to non-erosive velocities (3.5 to 5.0 fps).

Design Guidance

- Outfalls should be constructed such that they do not increase erosion or have undue influence on the downstream geomorphology of the stream.
- Flared pipe sections that discharge at or near the stream invert or into a step-pool arrangement should be used at the spillway outlet.
- If a pond daylights to a channel with dry weather flow (baseflow), care should be taken to minimize tree clearing along the downstream channel, and to reestablish a forested riparian zone in the shortest possible distance.

Pond Liners

Design Guidance

- When a pond/wetland is located in medium to coarse sands, a liner may be needed to sustain a permanent pool of water. If geotechnical tests confirm the need for a liner, acceptable options include: (a) 6 to 12 inches of clay soil (minimum 30% passing the #200 sieve and a minimum permeability of 1×10^{-7} cm/sec), (b) a 30 mil poly-liner (c) bentonite, or (d) use of chemical additives.

A.1c Pretreatment
Sediment Forebay

Required Elements

- A sediment forebay is important for maintenance and longevity of a stormwater treatment pond. Each pond/wetland shall have a sediment forebay or equivalent upstream pretreatment. The forebay shall consist of a separate cell, formed by an acceptable barrier. Typical examples include earthen berms, concrete weirs, and gabion baskets.
- The forebay shall be sized to contain a minimum of 10% of the water quality volume (WQ_v), and shall be four to six feet deep. The forebay storage volume counts toward the total WQ_v requirement.
- The forebay shall be designed with non-erosive outlet conditions.
- Direct access for appropriate maintenance equipment shall be provided to the forebay.

Design Guidance

- A fixed vertical sediment depth marker should be installed in the forebay to measure sediment deposition over time.
- The bottom of the forebay may be hardened (i.e., concrete, asphalt, grouted riprap) to make sediment removal easier.

A.1d Treatment

Minimum Water Quality Volume (WQ_v)

Required Elements

- Provide water quality treatment storage to capture the computed WQ_v from the contributing drainage area through a combination of permanent pool, extended detention and marsh. Storage in permanent pool and extended detention is outlined in Table A.3.
- The surface area of the entire stormwater wetland shall be at least one percent of the contributing drainage area (1.5% for shallow marsh design).
- At least 25% of the WQ_v of a stormwater wetland shall be in deepwater zones with a depth greater than four feet.
- A minimum of 35% of the total surface of area of stormwater wetlands can have a depth of six inches or less, and at least 65% of their total surface area shall be shallower than 18 inches.

Table A.3 Water Quality Volume Distribution in Pond Designs

Design Variation	%WQ_v	
	Permanent Pool	Extended Detention
Micropool Extended Detention	20% min.	80% max.
Wet Pond	100%	0%
Shallow Marsh	100%	0%
Extended Detention Wet Pond/Wetland	50% min.	50% max.

Design Guidance

- It is generally desirable to provide water quality treatment off-line5 when topography, head and space permit.
- Water quality storage can be provided in multiple cells. Performance is enhanced when multiple treatment pathways are provided by using multiple cells, longer flow paths, high surface area to volume ratios, complex microtopography, and/or redundant treatment methods (combinations of pool, ED, and marsh).

5 Off-line stormwater management systems are designed to manage a storm event by diverting a percentage of stormwater events from a stream or storm drainage system.

- To promote greater nutrient removal, rock beds may be used as a medium for growth of wetland plants. The rock should be one to three inches in diameter, placed up to the normal pool elevation, and open to flow-through from either direction.

Minimum Pond Geometry

Required Elements

- The minimum length to width ratio for ponds/wetlands is 2:1 (i.e., length relative to width). This path may be achieved by constructing internal berms (e.g., high marsh wedges or rock filter cells).
- Provide a minimum Drainage Area: Surface Area Ratio of 75:1.

Design Guidance

- To the greatest extent possible, maintain a long flow path through the system, and design ponds with irregular shapes. A more traditionally shaped (oval or rectangular) basin may be permitted when conditions such as topography, parcel size, or other site conditions warrant. Basins shall follow natural landforms to the greatest extent possible or be shaped to mimic a naturally formed depression.

A.1e Landscaping
Pond Benches

Required Elements

- The perimeter of all deep pool areas (four feet or greater in depth) shall be surrounded by two benches:
  1. Except when pond side slopes are 4:1 (h:v) or flatter, provide a safety bench that generally extends 15 ft outward (a 10ft minimum bench is allowable on sites with extreme space limitations at the discretion of the reviewing authority) from the normal water edge to the toe of the pond side slope. The maximum slope of the safety bench shall be 6%; *and*
  2. Incorporate an aquatic bench that generally extends up to 15 feet inward from the normal shoreline, has an irregular configuration, and a maximum depth of 18 inches below the normal pool water surface elevation.

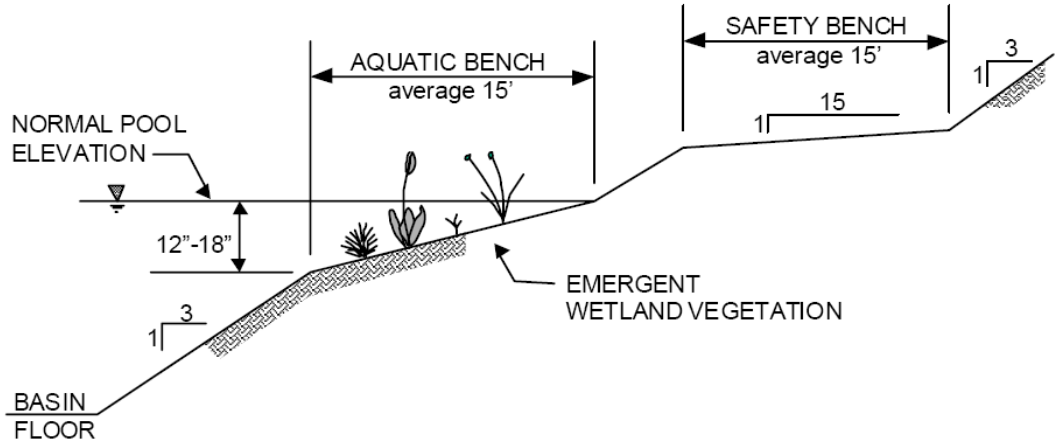


Figure A.4. Typical Stormwater Pond Geometry Criteria (ARC, 2001)

Landscaping Plan

Required Elements

- A landscaping plan for a stormwater pond/wetland and its buffer shall be prepared to indicate how aquatic and terrestrial areas will be stabilized and established with vegetation. Minimum elements of a plan include: delineation of pondscaping zones, selection of corresponding plant species, planting plan, sequence for preparing wetland bed (including soil amendments, if needed), and sources of plant material.
- Donor soils for wetland mulch shall not be removed from natural wetlands.

Design Guidance

- Wherever possible, wetland plants should be encouraged in a pond design, either along the aquatic bench (fringe wetlands), the safety bench and side slopes or within shallow areas of the pool itself.
- The best elevations for establishing wetland plants, either through transplantation or volunteer colonization, are within six inches (plus or minus) of the normal pool.
- The soils of a pond/wetland buffer are often severely compacted during the construction process to ensure stability. The density of these compacted soils is so great that it effectively prevents root penetration, and therefore, may lead to premature mortality or loss of vigor. Consequently, it is advisable to excavate large and deep holes around the proposed planting sites, and backfill these with uncompacted topsoil.
- As a rule of thumb, planting holes should be three times deeper and wider than the diameter of the rootball (of balled and burlap stock), and five times deeper and wider for container grown stock. This practice should enable the stock to develop unconfined root systems. Avoid species that require full shade or are prone to wind damage. Extra mulching around the base of the tree

or shrub is strongly recommended as a means of conserving moisture and suppressing weeds. Consider salt-tolerant plants if pond/wetland treats runoff from roads or parking lots that are treated with salt.

- Structures such as fascines, coconut rolls, or carefully designed stone weirs can be used to create shallow marsh cells in high-energy flow areas of the stormwater wetland.
- The landscaping plan should provide elements that promote greater wildlife and waterfowl use within the pond/wetland and buffers.

Pond/Wetland Buffers and Setbacks

Required Elements

- A pond/wetland buffer shall be provided that extends 25 feet outward from the maximum design water surface elevation of the pond. The pond buffer shall be contiguous with other buffer areas that are required by other regulations. An additional setback may be provided to permanent structures.
- Woody vegetation may not be planted or allowed to grow on an earthen dam embankment, within 15 feet of the toe of the embankment or 25 feet from the principal spillway outlet structure.

Design Guidance

- Existing trees should be preserved in the buffer area during construction. It is desirable to locate forest conservation areas adjacent to ponds. To help encourage reforestation and discourage resident geese populations, the buffer can be planted with trees, shrubs and native ground covers.
- Annual mowing of the pond/wetland buffer is only required along maintenance rights-of-way and the embankment. The remaining buffer can be managed as a meadow (mowing every other year) or forest.

A.1f Maintenance

Required Elements

- Maintenance responsibility for a pond and its buffer shall be vested with a responsible authority by means of a legally binding and enforceable maintenance agreement that is executed as a condition of plan approval.
- The principal spillway shall be equipped with a removable trash rack, and generally accessible from dry land.
- A maintenance and operation plan must specify that sediment removal in the forebay shall occur every 5 to 6 years or after 50% of total forebay capacity has been lost, whichever is greater.
- An operation and maintenance plan shall specify that if a minimum coverage of 50% of shallow marsh areas is not achieved in the planted areas after the second growing season, a reinforcement planting is required.

Design Guidance

- Sediments excavated from stormwater ponds that do not receive runoff from designated hotspots are generally not considered toxic or hazardous material, and can be safely disposed by either land application or land filling. Sediment testing may be required prior to sediment disposal when a hotspot land use is present.
- Sediment removed from stormwater ponds should be disposed of according to an approved comprehensive operation and maintenance plan.

Maintenance Access

Required Elements

- A maintenance right of way or easement shall extend to a pond from a public or private road.

Design Guidance

- Maintenance access should be at least 12 feet wide, have a maximum slope of no more than 15%, and be appropriately stabilized to withstand maintenance equipment and vehicles.
- The maintenance access should extend to the forebay(s), safety bench, emergency spillway, outlet control structure, and outlet and be designed to allow vehicles to turn around.

Non-clogging Low-flow Orifice/Weir

Required Elements

- A low-flow orifice or weir shall be provided, with the size for the orifice sufficient to ensure that no clogging shall occur.

Design Guidance

- The low-flow orifice/weir should be adequately protected from clogging by either an acceptable external trash rack (recommended minimum orifice of 3 in) or by internal orifice protection that may allow for smaller diameters (recommended minimum orifice of 1 in).
- The preferred method is a submerged reverse-slope pipe that extends downward from the outlet control structure to an inflow point one foot below the normal pool elevation.
- Alternative methods are to employ a broad-crested rectangular, V-notch, or proportional weir, protected by a half-round pipe or "hood" that extends at least 12 inches below the normal pool.
- The use of horizontally extended perforated pipe protected by geotextile fabric and gravel is not recommended. Vertical pipes may be used as an alternative if a permanent pool is present.

Outlet Control Structure in Embankment

Required Elements

- The outlet control structure shall be located within the embankment for maintenance access, safety and aesthetics.

Design Guidance

- Access to the outlet control structure should be provided by lockable manhole covers, and manhole steps within easy reach of valves and other controls. The principal spillway opening should be "fenced" with pipe or rebar at 8-inch intervals (for safety purposes).

Pond/Wetland Drain

Required Elements

- Except where local slopes (e.g., coastal areas) prohibit this design, each pond/wetland shall have a drain pipe that can completely or partially drain the pond/wetland. The drain pipe shall have an elbow or protected intake within the pond to prevent sediment deposition, and a diameter capable of draining the permanent pool within 24 hours.

Safety Features

Required Elements

- Side slopes to the pond/wetland shall not exceed 3:1 (h:v), and shall terminate on the safety bench.
- The principal spillway opening shall not permit access by small children, and endwalls above pipe outfalls greater than 48 inches in diameter shall be fenced to prevent a hazard.
- "Token" or emergency spillways (those placed above the water elevation of the largest managed storm) are required and must be a minimum 8 ft wide, 1 ft deep, with 2:1 side slopes.

Design Guidance

- Both the safety bench and the aquatic bench may be landscaped to prevent access to the pool.

- Warning signs prohibiting swimming and skating may be posted.
- Pond fencing is generally not encouraged, but may be required by some owners and/or agencies. A preferred method is to manage the contours of the pond to eliminate dropoffs or other safety hazards.

A.2 Stormwater Infiltration

Stormwater infiltration practices capture and temporarily store the WQ_v before allowing it to infiltrate into the soil over a maximum period of two days. Design variants include:

- Infiltration Trench/Chamber (Figure A.5)
- Dry Well (Figure A.6)
- Infiltration Basin (Figure A.7)

Treatment Suitability: Infiltration practices typically cannot provide channel protection (Cp_v) and/or overbank flood control (Q_p) storage, except on sites where the soil infiltration rate is greater than 5.0 in/hr. Extraordinary care should be taken to assure that long-term infiltration rates are achieved through the use of performance bonds, post construction inspection and long-term maintenance. Infiltration within sand/gravel formations that have very high permeability rates may allow for infiltration of large volumes of stormwater. Applicants must provide treatment of 100% of the WQ_v prior to direct infiltration into soils with infiltration rates exceeding 5.0 in/hr. Infiltration practices can be used for treating the WQ_v <u>only</u> if located within the soil profile at least 3 feet above the bedrock. Roof runoff can be infiltrated directly, without treatment, and counted toward both Re_v and WQ_v requirements.

A.2a Feasibility

<u>Required Elements</u>

- To be suitable for infiltration, underlying soils shall have an infiltration rate (f_c) of at least 0.5 inches per hour, as initially determined from NRCS soil textural classification, and subsequently confirmed by field geotechnical tests. The minimum geotechnical testing at the site of a proposed infiltration practice is one test hole per 5,000 ft^2, with a minimum of two borings per infiltration facility (taken within the proposed limits of the facility).
- Soils shall also have a clay content of less than 20% and a silt/clay content of less than 40%.
- Infiltration practices cannot be located on areas with natural slopes greater than 15%.

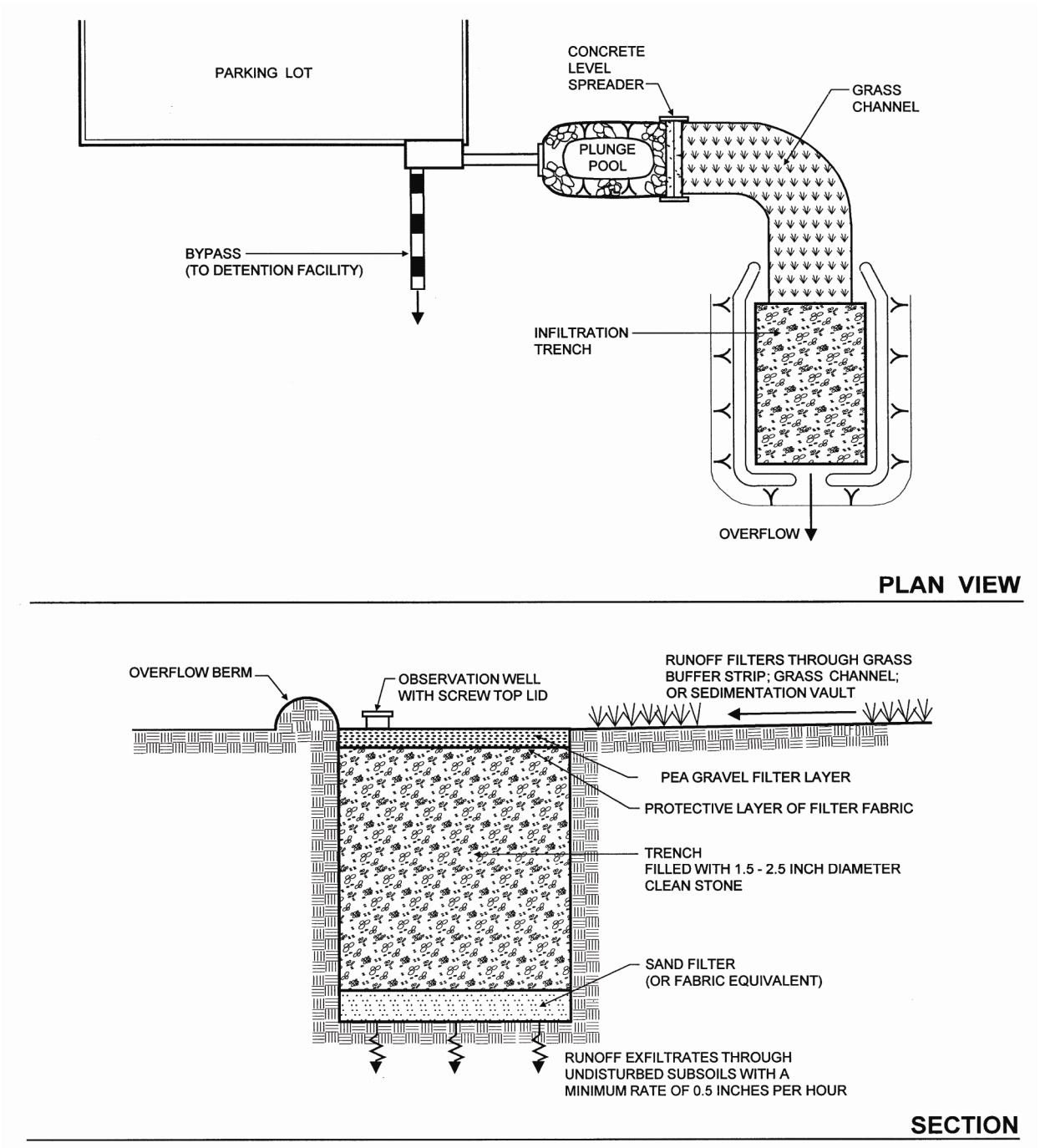


Figure A.5 Infiltration Trench/Chamber

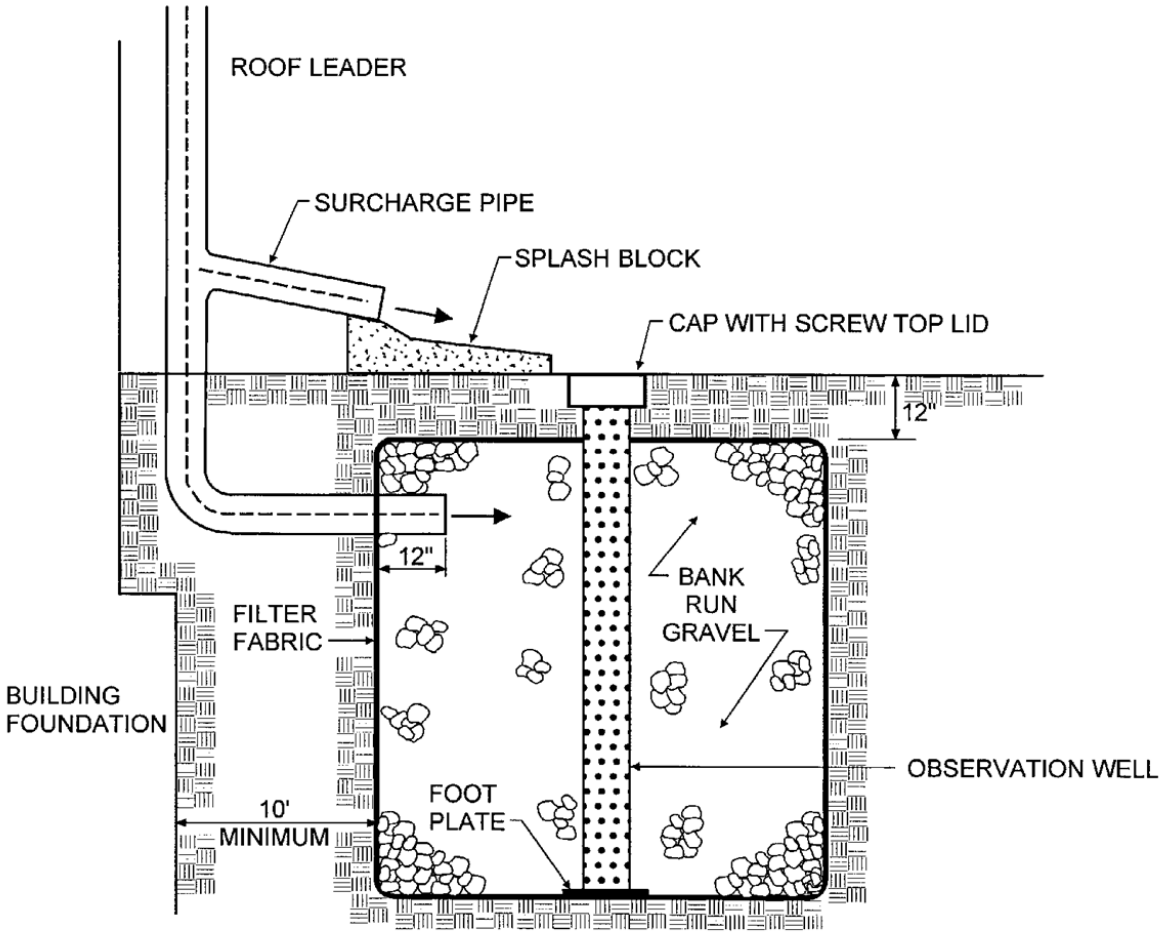


Figure A.6 Dry Well

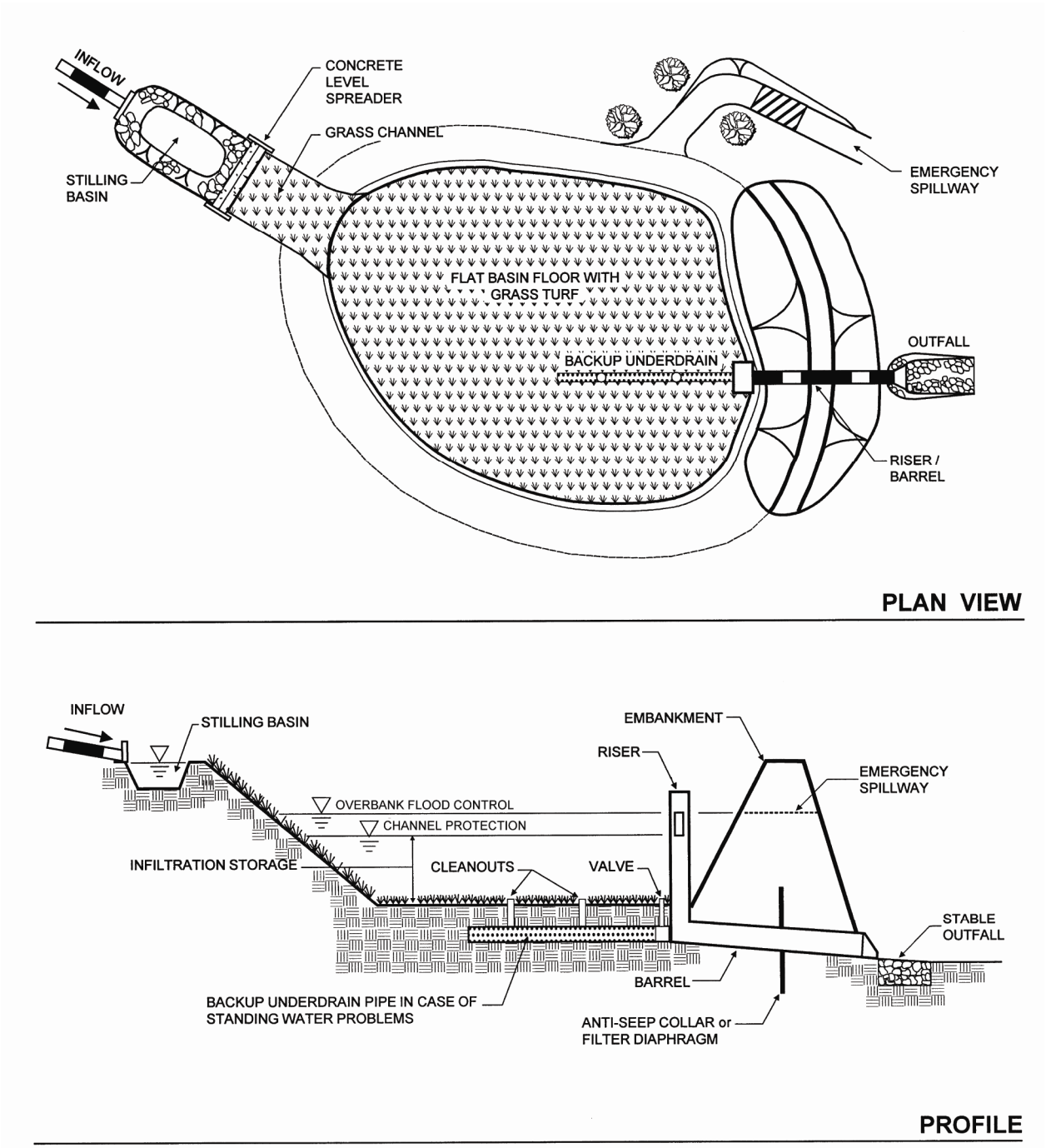


Figure A.7 Infiltration Basin

- Infiltration practices cannot be located in fill soils, except the top quarter of an infiltration trench.
- To protect groundwater from possible contamination, runoff from designated hotspot land uses or activities must not be directed to an infiltration facility, without 100% treatment of WQ_v by another practice.
- The bottom of the infiltration facility shall be separated by at least three (3) feet vertically from the seasonally high water table or bedrock layer (when treating WQ_v), as documented by on-site soil testing.
- Infiltration facilities shall be located at least 100 feet horizontally from any water supply well.
- Infiltration practices cannot be placed in locations that cause water problems (such as seepage which may cause slope failure) to downgrade properties. Infiltration trenches, chambers and basins shall be setback 25 feet down-gradient from building structures and 50 feet from on-site wastewater disposal systems (OSDS).

Design Guidance

- The maximum contributing area to infiltration basins, chambers, and trenches should generally be less than 5 acres. The infiltration basin can theoretically receive runoff from larger areas, provided that the soil is highly permeable.
- Dry wells are most appropriate for clean rooftop runoff.

A.2b Conveyance

Required Elements

- The overland flow path of surface runoff exceeding the capacity of the infiltration system shall be evaluated to preclude erosive concentrated flow during the overbank events. If computed flow velocities exiting the system over-bank exceed erosive velocities (3.5 to 5.0 fps), an overflow channel shall be provided to a stabilized watercourse.
- All infiltration systems shall be designed to fully de-water the entire WQ_v within 48 hours after the storm event.
- If runoff is delivered by a storm drain pipe or along the main conveyance system, the infiltration practice must be designed as an off-line practice, except when used as a regional flood control practice.

Design Guidance

- Adequate stormwater outfalls should be provided for the overflow associated with the 2-year design storm event (non-erosive velocities on the down-slope).

A.2c Pretreatment

Required Elements

- For infiltration basins, chambers, and trenches, a minimum pretreatment volume of at least 25% of the WQ_v must be provided prior to entry to an infiltration facility, and can be provided in

the form of a sedimentation basin, sump pit, grass channel, stilling basin or other similar sediment particle settling device.

- If the f_c for the underlying soils is greater than 2.0 inches per hour, a minimum pretreatment volume of at least 50% of the WQ_v must be provided.
- If the f_c for the underlying soils is greater than 5.0 inches per hour, 100% of the WQ_v shall be pre-treated prior to entry into an infiltration facility.
- Exit velocities from pretreatment chambers flowing over vegetated channels shall be non-erosive (3.5 to 5.0 fps) during the 2-year design storm.

Pretreatment Techniques to Prevent Clogging

Infiltration basins or trenches can have redundant methods to protect the long-term integrity of the infiltration rate. Three or more of the following techniques must be installed for infiltration basins or trenches:

- Grass channel (Maximum velocity of 1 fps for flow from the water quality storm (i.e., 1-inch storm event).
- Grass filter strip (minimum 20 feet and only if sheet flow is established and maintained)
- Bottom sand layer
- Upper sand layer (6in minimum with filter fabric at the sand/gravel interface)
- Use of washed gravel (1/8in to 3/8in)
- Alternatively, a pre-treatment settling chamber may be provided and sized to capture the pretreatment volume.

Design Guidance

- The sides of infiltration trenches and dry wells should be lined with an acceptable filter fabric that prevents soil piping.
- In infiltration trench designs, incorporate filter fabric over washed gravel or sand above the coarse gravel treatment reservoir to serve as a filter layer.

A.2d Treatment

Required Elements

- Infiltration practices shall be designed to exfiltrate the entire WQ_v through the floor of each practice (sides are not considered in sizing).
- The construction sequence and specifications for each infiltration practice shall be precisely followed. Experience has shown that the longevity of infiltration practices is strongly influenced by the care taken during construction.
- Design infiltration rates (f_c) should be determined by using Table A.4. These are conservative values that take into account future clogging as the practice is used over the years.
- Calculate the surface area of infiltration trenches as:

$$A_p = V_W / (nd_t + f_cT/12)$$

Where:

A_p	=	surface area at the bottom of the trench (ft^2)
V_W	=	design volume (e.g., WQ_v) (ft^3)
n	=	porosity of gravel fill (assume 0.4)
d_t	=	trench depth (separated at least three feet from seasonally high groundwater) (ft)
f_c	=	infiltration rate (in/hr)
T	=	time to fill trench (hours) (assumed to be 2 hours for design purposes)

Table A.4. Design Infiltration Rates for Different Soil Texture Classes (Rawls et al., 1982)

USDA Soil Texture	Infiltration Rate (f_c) (in/hr)	Infiltration Rate (f_c) (ft/min)
Sand	8.27	0.0115
Loamy Sand	2.41	0.0033
Sandy Loam	1.02	0.0014
Loam	0.52	0.0007
Silt Loam	0.27	0.0004
Sandy Clay Loam	0.17	0.0002
Clay Loam	0.09	0.0001
Silty Clay Loam	0.06	0.0001
Sandy Clay	0.05	0.0001
Silty Clay	0.04	0.0001
Clay	0.02	0.0000

- Calculate the design volume of infiltration chambers as:

$$Vw = L*[(w*d*n) - (\#*Ac*n) + (\#*Ac) + (w*\ f_c\ *T/12)]$$

Where:

Vw=	design volume (e.g., WQ_v) (ft^3)
L =	length of infiltration facility (ft)
w =	width of infiltration facility (ft)
h =	depth of infiltration facility (ft)
# =	number of rows of chambers
Ac=	cross-sectional area of chamber (see manufacturer's specifications)
n =	porosity (assume 0.4)
f_c =	infiltration rate (in/hr)
T =	time to fill chambers (hours) (assumed to be 2 hours for design purposes)

- One way to calculate the surface area of trapezoidal infiltration basins is to use the following equation:

$$A_b = (2V_w - A_t d_b)/(d_b - P/6 + f_c T/6)$$

Where:

A_b	=	surface area at the bottom of the basin (ft^2)
Vw	=	design volume (e.g., WQ_v) (ft^3)
A_t	=	area at the top of the basin (ft^2)
d_b	=	depth of the basin (ft)
P	=	design rainfall depth (inches)
f_c	=	infiltration rate (in/hr)
T	=	time to fill basin (hours) (assumed to be 2 hrs for design purposes)

Design Guidance

- Infiltration practices are best used in conjunction with other practices, and often downstream detention is still needed to meet the Cp_v and Q_p sizing criteria.
- A porosity value (V_v/V_t) of 0.4 can be used to design stone reservoirs for infiltration practices.
- The bottom of the stone reservoir should be completely flat so that infiltrated runoff will be able to infiltrate through the entire bottom surface area.

A.2e Landscaping

Required Elements

- Upstream construction shall be completed and stabilized before connection to a downstream infiltration facility. A dense and vigorous vegetative cover shall be established over the contributing pervious drainage areas before runoff can be accepted into the facility.

Design Guidance

- Mow upland and adjacent areas, and seed bare areas.

A.2f Maintenance

Required Elements

- Infiltration practices shall never serve as a sediment control device during site construction phase. In addition, the Erosion and Sediment Control plan for the site shall clearly indicate how sediment will be prevented from entering the site of an infiltration facility. Normally, using diversion berms around the perimeter of the infiltration practice, along with immediate vegetative stabilization and/or mulching does this.

- An observation well shall be installed in every infiltration trench or chamber, consisting of an anchored 4 to 6-inch diameter perforated PVC pipe with a lockable cap installed flush with the ground surface.
- Preferably, direct access should be provided to infiltration practices for maintenance and rehabilitation. For stone reservoirs (trenches) or perforated pipes (chambers), which are used to temporarily store runoff prior to infiltration, the practice should ideally not be completely covered by an impermeable surface unless design constraints exist.

Design Guidance

- OSHA trench safety standards should be consulted if the infiltration trench will be excavated more than five feet.
- Infiltration designs should include dewatering methods in the event of failure. Dewatering can be accomplished with underdrain pipe systems that accommodate drawdown.

A.3 Permeable Paving

Permeable paving practices capture and temporarily store the WQ_v before allowing it to infiltrate into the soil or conveying it to another stormwater practice. There are three major types of permeable paving:

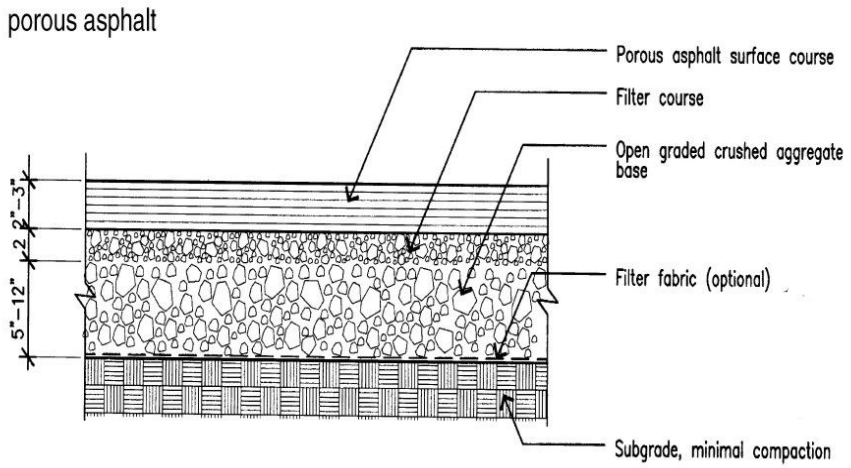
- Porous asphalt and pervious concrete. Although they appear to be the same as traditional asphalt or concrete pavement, they are mixed with a very low content of fine sand, so that they have 10%-25% void space and a runoff coefficient that is almost zero.
- Paving stones (also known as unit pavers) are impermeable blocks made of brick, stone, or concrete, set on a prepared sand base. The joints between the blocks are filled with sand or stone dust to allow water to percolate to the subsurface. Runoff coefficients range from 0.1 – 0.7, depending on rainfall intensity, joint width, and materials. Some concrete paving stones have an open cell design to increase permeability.
- Grass pavers (also known as turf blocks) are a type of open-cell unit paver in which the cells are filled with soil and planted with turf. The pavers, made of concrete or synthetic material, distribute the weight of traffic and prevent compression of the underlying soil. Runoff coefficients are similar to grass, 0.15 to 0.6.

Each of these products is constructed over a base course that doubles as a reservoir for the stormwater before it infiltrates into the subsoil.

Treatment Suitability: Alternative paving practices typically cannot provide overbank flood control (Q_p) storage. Combine with other practices to handle runoff from large storm events. Extraordinary care should be taken to assure that clogging does not occur through the use of performance bonds, post construction inspection and long-term maintenance. Permeable paving practices can be used for treating the WQ_v only if located within the soil profile at least 3 feet above the bedrock.

There are three categories of permeable pavement:

- Full exfiltration – performs as an infiltration facility. The base stores water and drains to underlying soil. There are no perforated drain pipes at bottom of base; however, they may have overflow pipes for saturated conditions and extreme storm events.
- Partial exfiltration – performs as an infiltration and detention facility. The base stores runoff, with some infiltration into the underlying soil, and some discharging via pipes at bottom of base.
- No exfiltration – used for detention only. This design includes an impermeable liner at the bottom of the base aggregate, which then flows to a downstream facility for additional treatment and storage. This category is useful in sites with high groundwater, bedrock, hotspots, wellhead protection areas, and areas with fill soils.



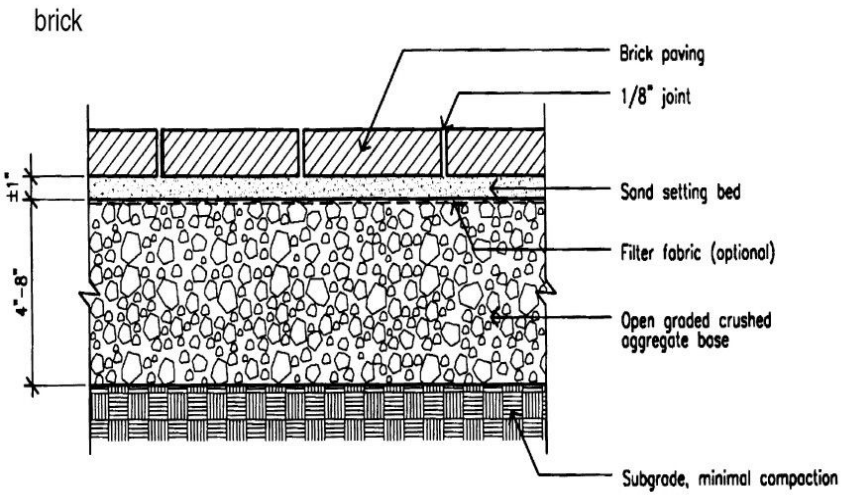


Figure A.8 Two Types of Alternative Paving Surfaces (City of Portland, 2002)

A.3a Feasibility

Required Elements

- To be suitable for infiltration, underlying soils shall have an infiltration rate (f_c) of at least 0.5 inches per hour, as initially determined from NRCS soil textural classification, and subsequently confirmed by field geotechnical tests. The minimum geotechnical testing at the site of a proposed infiltration practice is one test hole per 5,000 ft^2, with a minimum of two borings per infiltration facility (taken within the proposed limits of the facility).
- Underlying soils shall also have a clay content of less than 20% and a silt/clay content of less than 40%.
- To protect groundwater from possible contamination, runoff from designated hotspot land uses or activities must not be directed to permeable pavement unless designed with impermeable liner.
- The bottom of the permeable pavement area shall be separated by at least three (3) feet vertically from the seasonally high water table or bedrock layer (when treating WQ_v), as documented by on-site soil testing.
- Areas paved with permeable surfaces shall be located at least 100 feet horizontally from any water supply well, septic system, or surface water.
- This practice is not appropriate for high traffic/high speed areas, due to load bearing limitations and clogging potential.
- To avoid frost heave, design base to drain quickly (depth > 24 inches).
- Permeable paving should not receive stormwater from other drainage areas, especially any areas that are not fully stabilized.
- Use permeable paving only on gentle slopes (less than 5%).

Design Guidance

- Alternative paving surfaces are best used in low traffic areas such as overflow parking, residential driveways, sidewalks, plazas and courtyard areas. Areas with high amounts of sediment particles and high traffic volumes may cause system failures. Do not construct adjacent to areas subject to significant wind erosion. Contributing drainage areas should be less than 5 acres.
- Typically, reservoirs consist of uniformly sized crushed stone, with a depth sufficient to store all of the rainfall from the design storm. Some designs incorporate an "overflow edge," which is a trench surrounding the edge of the pavement. The trench connects to the stone reservoir below the surface of the pavement and acts as a backup in case the surface clogs.

A.3b Conveyance

Required Elements

- The overland flow path of surface runoff exceeding the capacity of the permeable paving system shall be evaluated to preclude erosive concentrated flow during the overbank events. If computed flow velocities exiting the system over-bank exceed erosive velocities (3.5 to 5.0 fps), an overflow channel shall be provided to a stabilized watercourse.
- All permeable pavement systems shall be designed to fully de-water the entire WQ_v within 24 hours after the storm event.

Design Guidance

- Permeable pavement areas should include dewatering methods in the event of failure. Dewatering can be accomplished with underdrain pipe systems that accommodate drawdown.

A.3c Pretreatment

Design Guidance

- Pretreatment is not possible for this practice. Frequent maintenance is required to prevent clogging of the surface.

A.3.d Treatment

Required Elements

- Permeable pavement practices used as infiltration practices shall be designed to exfiltrate the entire WQ_v through the floor of each practice (sides are not considered in sizing).
- Base course is a reservoir layer of 12 to 24 inches (function of storage needed and frost heave resistance). Base material must be poorly graded (single size material, must evaluate bearing capacity against storage capacity (compaction). Base often includes a filter course above reservoir layer (2" to 6" of smaller material)
- The construction sequence and specifications for permeable pavement areas shall be precisely followed. Experience has shown that the longevity of any infiltration practice is strongly influenced by the care taken during construction.
- Design infiltration rates (f_c) should be determined by using the Table A.4. These are conservative values that take into account future clogging as the practice is used over the years.
- Calculate the surface area of alternative paving surfaces as:

$$A_p = V_W / (nd_t + f_cT/12)$$

Where:

A_p	=	surface area (ft^2)
V_W	=	design volume (e.g., WQ_v) (ft^3)
n	=	porosity of gravel fill (assume 0.4)
d_t	=	depth of aggregate base (separated at least three feet from seasonally high groundwater) (ft)
f_c	=	infiltration rate (in/hr)
T	=	time to fill (hours) (assumed to be 2 hours for design purposes)

Design Guidance

- Permeable paving practices are best used in conjunction with other practices, and often downstream detention is still needed to meet the Q_p sizing criteria.
- A porosity value (V_v/V_t) of 0.4 can be used to design stone reservoirs for infiltration practices.
- The bottom of the stone reservoir should be completely flat so that infiltrated runoff will be able to infiltrate through the entire bottom surface area.

A.3e Landscaping

Required Elements

- Upstream construction shall be completed and stabilized before connection to a permeable pavement area. A dense and vigorous vegetative cover shall be established over the contributing pervious drainage areas before runoff can be accepted into the facility.
- Grass pavers require specific grasses with deep root systems.

Design Guidance

- Mow upland and adjacent areas, and seed bare areas.

A.3f Maintenance

Required Elements

- Permeable pavement performing as infiltration practices shall never serve as a sediment control device during site construction phase. In addition, the Erosion and Sediment Control plan for the site shall clearly indicate how sediment will be prevented from entering the site. Normally, using diversion berms around the perimeter, along with immediate vegetative stabilization and/or mulching does this.

Design Guidance

- Alternative paving surfaces require regular vacuum sweeping or hosing (minimum every three months or as recommended by manufacturer) to keep the surface from clogging. Maintenance frequency needs may be more or less depending on the traffic volume at the site.
- Minimize use of sand and salt in winter months
- Keep adjacent landscape areas well maintained and stabilized
- Post signs identifying permeable pavement
- Do not repave or reseal with impermeable materials
- Grass pavers need mowing and often need reseeding of bare areas.
- For paving stones, periodically add joint material (sand) to replace material that has been transported.
- Monitoring regularly to ensure that the paving surface drains properly after storms.
- Inspecting the surface annually for deterioration or spalling.

- Attaching rollers to the bottoms of snowplows to prevent them from catching on the edges of grass pavers and some paving stones.

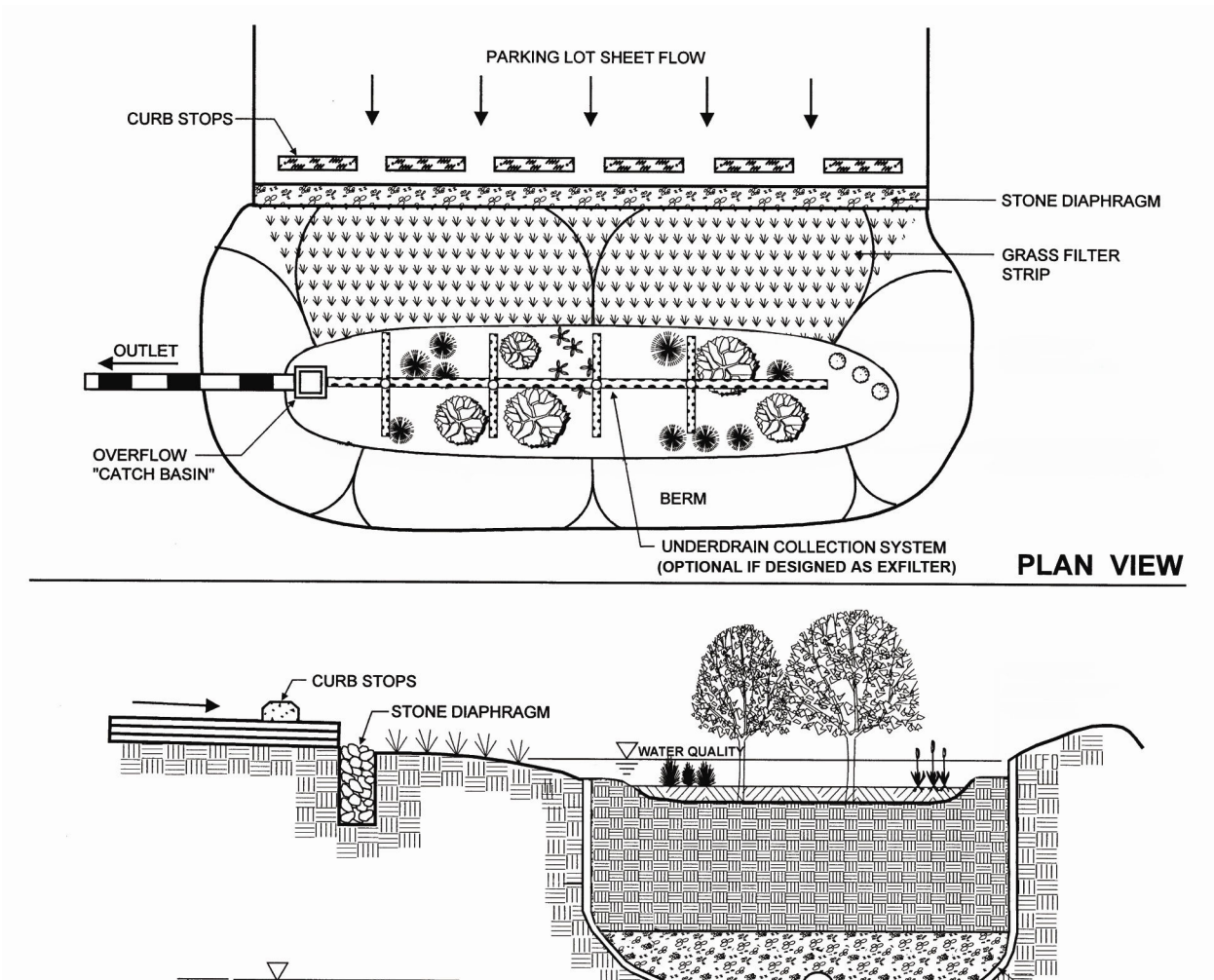
A.4 Bioretention Areas

Bioretention systems (Figure A.9) capture and temporarily store the WQ_v and pass it through a filter media. Filtered runoff may be collected and returned to the conveyance system, or allowed to partially exfiltrate into the soil. Treatment Suitability: Bioretention should not be designed to provide channel protection (Cp_v) or overbank flood control (Q_p) except under extremely unusual conditions. Bioretention systems shall generally be combined with a separate facility to provide those controls.

A.4a Feasibility

<u>Design Guidance</u>

- Most bioretention systems normally require four to six feet of head, depending on site configuration and land area available.
- The recommended maximum contributing area to an individual bioretention system is usually less than 10 acres. In some situations, larger areas may be acceptable.



A.4b Conveyance

Required Elements

- If runoff is delivered by a storm drain pipe or is along the main conveyance system, the bioretention practice shall be designed off-line. In these cases, a flow regulator (or flow splitter diversion structure) shall be supplied to divert the WQ_v to the bioretention, and allow larger flows to bypass the practice.
- An overflow shall be provided for runoff greater than the WQ_v to a non-erosive outlet point (i.e., prevent downstream slope erosion).
- Bioretentions shall be equipped with a minimum 4-in perforated pipe underdrain in a gravel layer, unless designing an exfiltrating system in which case an underdrain may not be necessary. *Note: Synthetic fabrics may not be used to separate the soil filter media from the underdrain bedding material. Experience has shown this to be a major source of failure for underdrained filters.*

A.4c Pretreatment

Required Elements

- Dry or wet pretreatment shall be provided prior to filter media equivalent to at least 25% of the computed WQ_v. One method is to design a sedimentation basin as described below; other pretreatment techniques are specified under design guidance to this section and also under Section A.2c. Sedimentation basins shall have a minimum depth of 3.0 ft. Assume a length to width ratio of 1.5:1, and use the Camp-Hazen equation to solve for surface area. With these assumptions, the equation reduces as follows:

$A_s = (0.066)\ (WQ_v)\ ft^2$ (WSDE, 1992)

Design Guidance

- Adequate pretreatment for bioretention systems should incorporate all of the following: (a) grass filter strip below a level spreader or grass channel, (b) pea gravel diaphragm and (c) a mulch layer.
- The grass filter strip should be sized using the guidelines in Table A.5.

Table A.5 Guidelines for Filter Strip Pretreatment Sizing

Parameter	Impervious Parking Lots				Residential Lawns			
Maximum Inflow Approach Length (ft.)	35		75		75		150	
Filter Strip Slope	#2%	∃2%	#2%	∃2%	#2%	∃2%	#2%	∃2%
Filter Strip Minimum Length	10’	15’	20’	25’	10’	12’	15’	18’

- The grass channel can be sized using the following procedure:

- Determine the volume needed to treat the WQ_v and multiply by 25% for pretreatment volume.
- Choose the cross-sectional area of your channel (Assume trapezoidal channel with minimum of 2ft bottom width, 2:1 side slopes, and 1ft depth).
- Determine the channel length by dividing the pretreatment volume by the cross-sectional area.

A.4d Treatment

Required Elements

- Bioretention systems shall consist of the following treatment components: A 2- to 4-ft deep planting soil bed, a surface mulch layer, and a 6-in deep surface ponding area. Soils shall meet the design criteria outlined in Table A.6. The depth of bioretention systems may be reduced to 18in on a case-by-case basis as demonstrated by the designer that the 2- to 4-ft range is not feasible, such as sites with high groundwater or shallow depth to bedrock or clay soils, or in retrofit situations where pre-existing site constraints exist.

Table A.6. Soil Specifications for Bioretention Areas

Parameter	Specification	Notes
Planting Soil*	sand 80% silt 15 - 20% clay 0 - 5%	USDA soil types loamy sand or sandy loam
Mulch	shredded hardwood	aged 6 months, minimum

Note**: **For bioretention applications with a planting soil depth of 18 inches, add 20% (by volume) of well aged (6-12 months), well aerated, leaf compost (or approved equivalent) to the above planting soil mixture.

Design Guidance

- The filter area should be sized based on the principles of Darcy's Law. A coefficient of permeability (k) should be used as follows:

Bioretention Soil: 1.0 ft/day for sandy-loam soils

The required filter bed area is computed using the following equation:

$$A_f = (WQ_v)\,(d_f) / [(k)\,(h_f + d_f)\,(t_f)]$$

Where:

A_f	=	Surface area of filter bed (ft^2)
d_f	=	Filter bed depth (ft)
k	=	Coefficient of permeability of filter media (ft/day)
h_f	=	Average height of water above filter bed (ft)

t_f = Design filter bed drain time (days)
(2 days is recommended maximum t_f for bioretention)

A.4e Landscaping

Required Elements

- A dense and vigorous vegetative cover shall be established over the contributing pervious drainage areas before runoff can be accepted into the facility.
- Landscaping is critical to the performance and function of bioretention areas; therefore, a landscaping plan must be provided.

Design Guidance

- Planting recommendations for bioretention facilities are as follows:
  - Native plant species should be specified over non-native species.
  - Vegetation should be selected based on a specified zone of hydric tolerance.
  - A selection of trees with an understory of shrubs and herbaceous materials should be provided.
  - Woody vegetation should not be specified at inflow locations.
  - Trees should be planted primarily along the perimeter of the facility.
  - A tree density of approximately one tree per 100 ft^2 (i.e., 10 ft on-center) is recommended. Shrubs and herbaceous vegetation should generally be planted at higher densities (5 ft on-center and 2.5 ft on center, respectively).

A.4f Maintenance

Required Elements

- A legally binding and enforceable maintenance agreement shall be executed between the facility owner and the local review authority to ensure the following:

  - Sediment shall be cleaned out of the sedimentation chamber when it accumulates to a depth of more than ½ the design depth. Vegetation within the sedimentation chamber shall be limited to a height of 18 inches. The sediment chamber outlet devices shall be cleaned/repaired when drawdown times exceed 36 hours. Trash and debris shall be removed as necessary.
  - Silt/sediment shall be removed from the filter bed when the accumulation exceeds one inch. When the filtering capacity of the filter diminishes substantially (i.e., when water ponds on the surface of the filter bed for more than 48 hours), the top few inches of discolored material shall be removed and shall be replaced with fresh material. The removed sediments shall be disposed in an acceptable manner.

Design Guidance

- A stone drop or diaphragm of at least six inches should be provided at the inlet of bioretention facilities (pea gravel diaphragm). Areas devoid of mulch shall be re-mulched on an annual basis. Dead or diseased plant material shall be replaced.

A.5 Open Channel Systems

Open channel systems are vegetated open channels that are explicitly designed to capture and treat the full WQ_v within dry or wet cells formed by check dams or other means. Design variants include:

- Dry Swale (Figure A.10)
- Wet Swale (Figure A.11)

Treatment Suitability: Open Channel Systems can meet water quality treatment goals only, and are not appropriate for Cp_v or Q_p.

NOTE: Graphics adopted from CWP, 2002.

A.5a Feasibility

Required Elements

- The system shall have a maximum longitudinal slope of 4.0%.

Design Guidance

- Dry Swales are primarily applicable for land uses such as roads, highways, residential development, and pervious areas.
- Wet Swales should be restricted in residential areas because of the potential for stagnant water and other nuisance ponding.

A.5b Conveyance

Required Elements

- The peak velocity for the 1-year storm must be non-erosive (i.e., 3.5-5.0 fps).
- Open channels shall be designed to safely convey the 2-year storm.
- The maximum allowable temporary ponding time within a channel shall be less than 48 hours. An underdrain system shall be used in the dry swale to ensure this ponding time, unless designed as an exfilter in which case an underdrain may not be necessary.
- Channels shall be designed with moderate side slopes (flatter than 3:1) for most conditions. Designers may utilize a 2:1 maximum side slope, where 3:1 slopes are not feasible.

Design Guidance

- Open channel systems which directly receive runoff from non-roadway impervious surfaces may have a 6-inch drop onto a protected shelf (pea gravel diaphragm) to minimize the clogging potential of the inlet. Runoff from roads shall drain over a vegetative slope prior to flowing into a swale.
- The underdrain system should be composed of a 6-in gravel bed with a 4-in PVC pipe.
- If the site slope is greater than 2%, check dams may be needed to retain the water quality volume within the swale system.

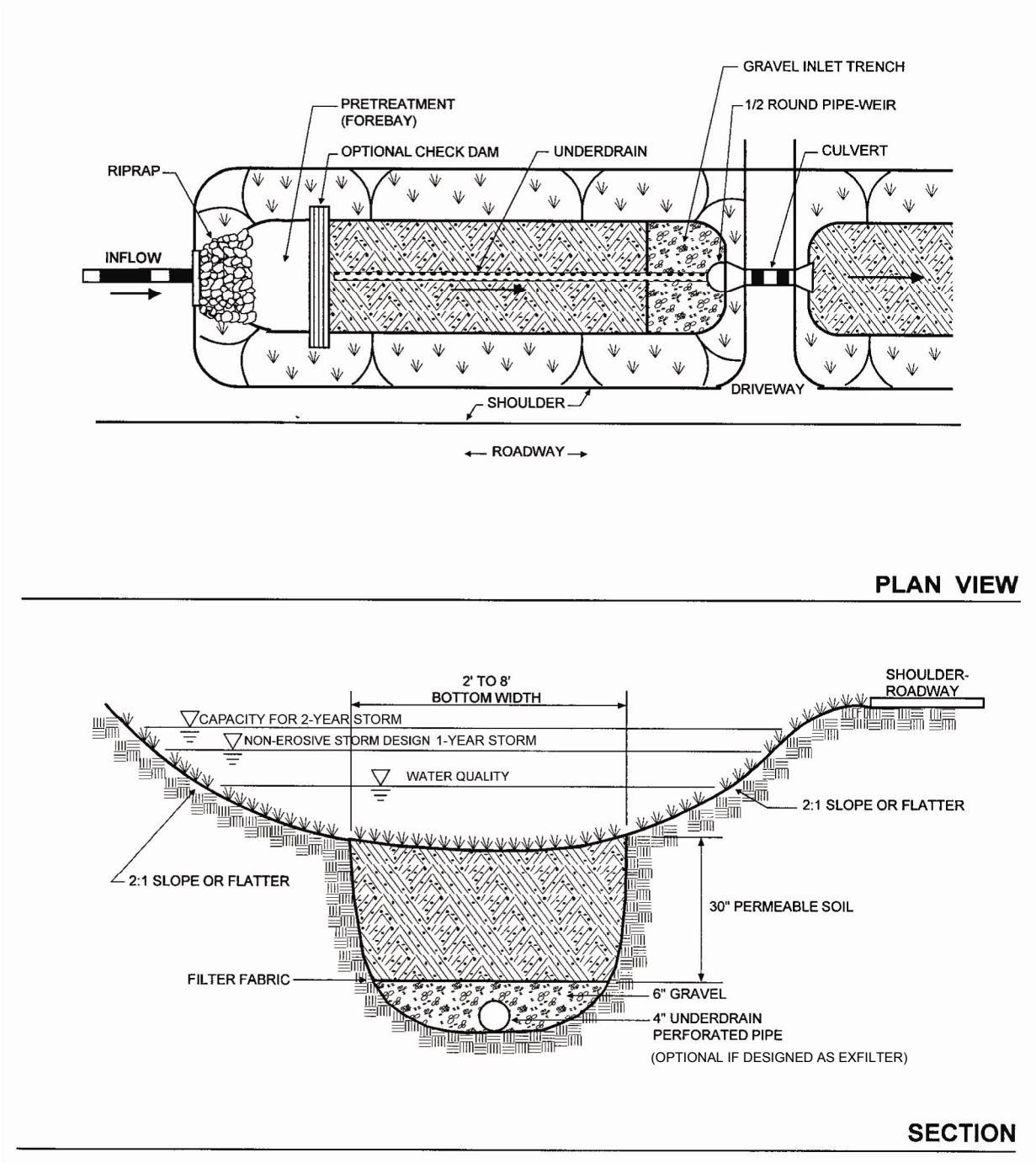


Figure A.10 Dry Swale

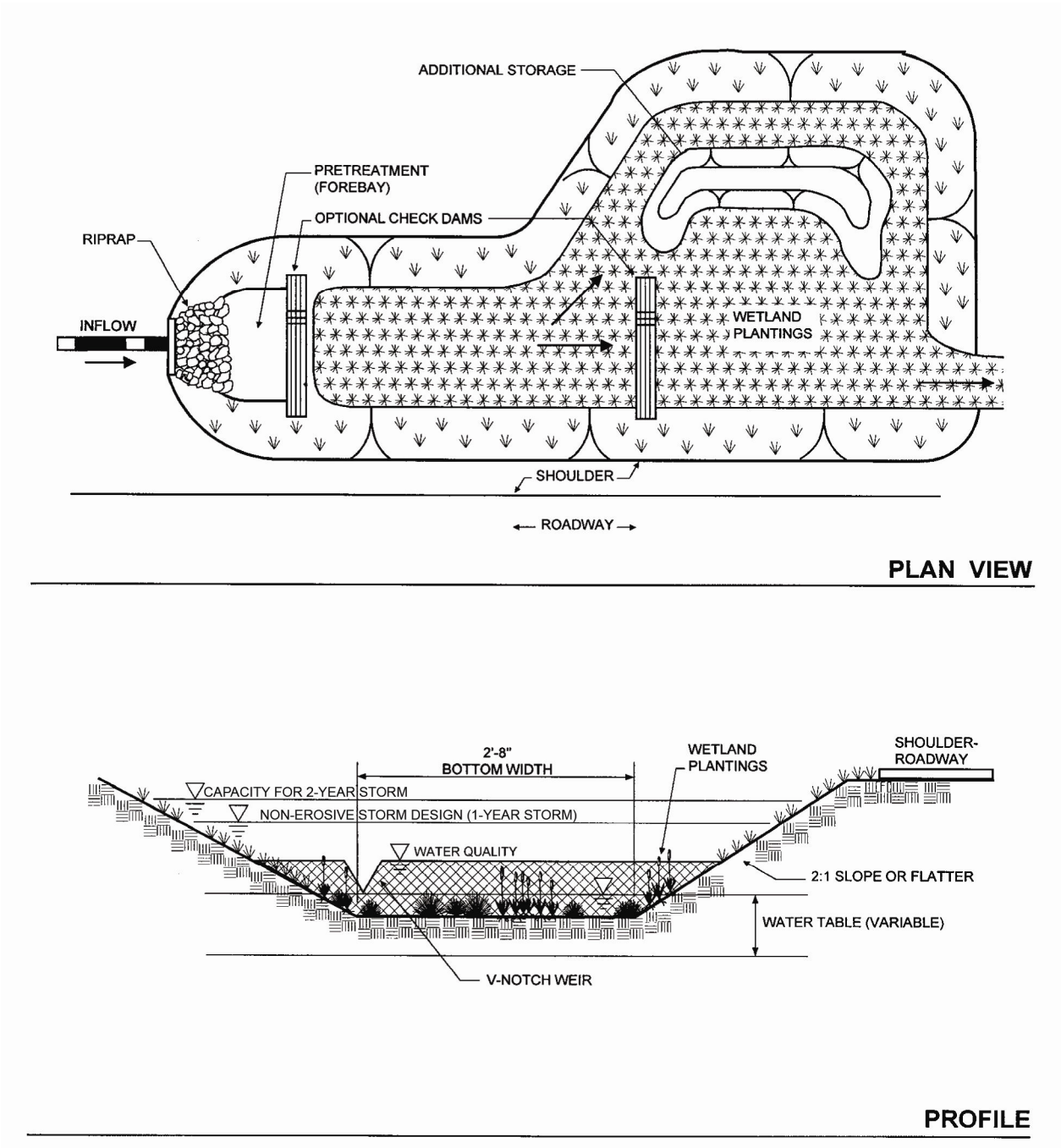


Figure A.11 Wet Swale

A.5c Pretreatment

Required Elements

- Provide 10% of the WQ_v in pretreatment. This storage is usually obtained by providing checkdams at pipe inlets and/or driveway crossings. Road drainage entering a swale along the length of the road may pre-treat runoff using a vegetative filter strip. An effective filter strip shall be no steeper than 6% slope and 4 ft wide for each travel lane draining to the swale.

Design Guidance

- Utilize a washed, rounded gravel diaphragm and gentle side slopes along the top of channels to provide pretreatment for lateral sheet flows.

A.5d Treatment

Required Elements

- Wet and dry swale length, width, depth, and slope shall be designed to temporarily accommodate the WQv through surface ponding.
- For the dry swale, the treatment design criteria are similar to those of a bioretention area. The surface area of the swale bottom should be sized to drain the WQv within 48 hours (Darcy's equation in Section A.4d should be used for this sizing). The average head should not exceed 12 inches.
- Design with a bottom width no greater than 8 ft to avoid potential gullying and channel braiding, but no less than 2 ft.
- Soil media for the dry swale shall meet the specifications outlined for bioretention areas in Section A.4d.

Design Guidance

- Open channels should maintain a maximum ponding depth of one foot at the mid-point of the channel, and a maximum depth of 18 in at the end point of the channel (for storage of the WQ_v).

A.5e Landscaping

Design Guidance

- Landscape design should specify proper grass species and wetland plants based on specific site, soils and hydric conditions present along the channel.

A.5f Maintenance

Required Elements

- A legally binding and enforceable maintenance agreement shall be executed between the facility owner and the local review authority to ensure the following:

- Sediment build-up within the bottom of the channel or filter strip is removed when 25% of the original WQ_v volume has been exceeded.
- Vegetation in dry swales is mowed as required to maintain grass heights in the 4-6 in range, with mandatory mowing once grass heights exceed 10 in.

A.6 Green Roofs

Green rooftops are rooftop areas that have been landscaped with grasses, shrubs and, in some cases, trees. "Intensive" rooftops are designed with pedestrian access and deep soil layers to provide for complex planting schemes. "Extensive" rooftops are designed with a more shallow soil foundation and generally do not incorporate pedestrian access. Stormwater runoff from small storms is retained until uptake can occur, while runoff from larger events is conveyed to downstream stormwater facilities for quantity control.

Treatment Suitability: Green roofs can meet water quality treatment goals only, and are not appropriate for Cp_v or Q_p.

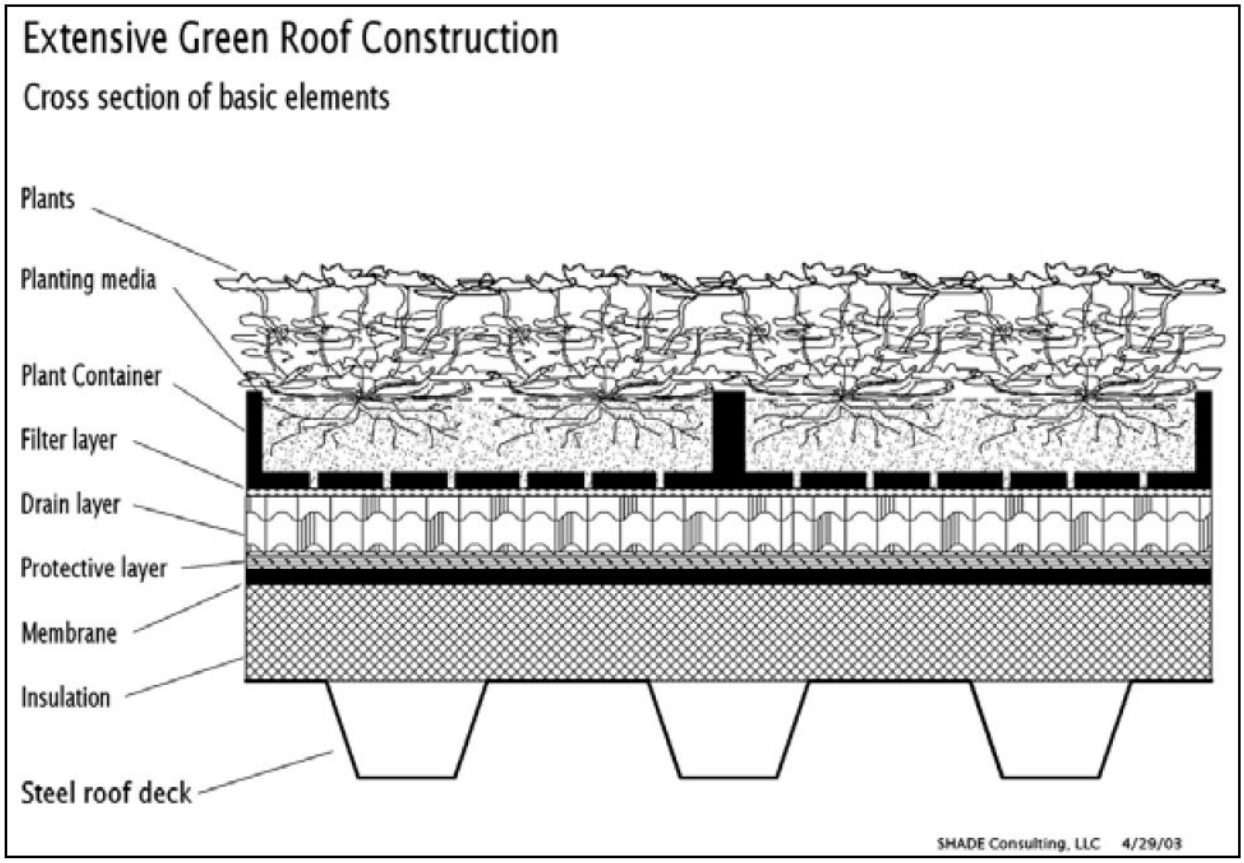


Figure A.12 Extensive Green Roof Construction Cross Section (Wark and Wark, 2003)

A.6a Feasibility

Required Elements

- The system shall have a maximum slope of 20%, unless specific measures from the manufacturer are provided to retain soils on steeper slopes.

Design Guidance

- Extensive rooftops are commonly designed for maximum thermal and drainage performance and minimum weight load. Aesthetics are not as important for this type of green roof since, typically, only maintenance personnel have access to this type of roof. It can be installed on either a flat or pitched roof.
- Intensive rooftops are designed with a deeper planting media, larger plants which may include trees and shrubs, and incorporate public walkways and benches. These are installed on flat roofs.

Filter layer

A filter separates the planting media and drain layer, which not only allows water to flow through while retaining the planting media, but serves as a root barrier. The filter usually is comprised of one or two layers of non-woven geotextile, where one of the layers may be treated with a root inhibitor (*i.e.* copper or a mild herbicide). Extensive green roofs usually utilize plants with manageable roots, whereas intensive green roofs may contain deeper rooting plants requiring multiple filter layers. Since root and media particle diameters can vary, filters should be specified for different media and plant types to ensure adequate flow rates for a given planting mix without losing too much silt or allowing excessive root penetration.

Containment

In modular systems, containment refers to actual plant containers. In non-modular systems, the planting medium is supported by the drain layer and contained at the perimeter by a metal or plastic barrier, or the roof parapet.

Drain layer

Between the planting medium and roof membrane is a layer through which water can flow from anywhere on the green roof to the drainage system. Some systems simply use a layer of large-diameter expanded clay, but the preferred method is to use a corrugated plastic drain mat with a structural pattern resembling an egg carton or landscape paver. The minimum drain layer thickness is usually less than 20 mm (0.8 in), but a thicker mat can provide additional insulation and root restriction.

The critical specification for a drain layer is the maximum volumetric flow rate, which is determined based on the WQ_v. Minimum passage area should be standardized for various locations. Since the drain layer supports the planting medium and vegetation, the compression strength should be specified. Many drain mat products are segmented or baffled to get the necessary compression strength, and hence, have insulating qualities that should be considered.

Protective layer
The roof membrane needs protection, primarily from damage during green roof installation, but also from fertilizers and possible root penetrations. The protective layer can be a slab of lightweight concrete, sheet of rigid insulation, thick plastic sheet, copper foil, or a combination of these, depending on the particular design and green roof application.

Since current standards do not recognize the insulating qualities of green roofs, a local code variance would probably be needed to install one on an under-insulated roof. Rigid insulation can certainly by used as a protective layer. Insulation may be above or below the rigid roof surface shown in Figure A.12.

Waterproofing
A green roof can be installed with any kind of waterproofing system, but single-ply membranes have become very popular in recent years and are specified by nearly all green roof companies for their cost effectiveness and simplicity. As such, the waterproofing layer is typically assumed to be a membrane.

A membrane is actually protected, not degraded, by a green roof. Without one, a membrane is subjected to UV radiation, extreme heat cycling, wind, rain, pollution (especially when ponding occurs), and damage from maintenance activities. With a properly designed green roof incorporating a protective layer, the membrane is subjected to nothing more than a small amount of moisture. Since a green roof keeps the membrane surface temperature much closer to the roof deck temperature, mechanical stress within the membrane is tremendously reduced. This helps maintain joint integrity, adherence to the deck, and reduces water vapor transfer.

The design criteria of the system should include provisions in case an exceptional situation develops, such as particularly invasive roots or excessive fertilizer from a rooftop garden. Here, an appropriate protective layer must be selected. Vegetation that can root through an undamaged, watertight membrane is rarely used in green roof construction. Some companies now offer membranes incorporating a layer of copper foil for added protection against root penetration.

Existing standards and codes for membrane installation are more than sufficient for green roof applications. The only additional requirements might involve special provisions for the inspection of a membrane before and after the subsequent green roof layers are installed.

Vapor restriction
Since a green roof reduces the temperature gradients throughout the roof system, condensation is less likely to occur beneath the membrane. Situations requiring an additional vapor restricting sheet should be determined on an individual basis.

(Above Guidance from Wark and Wark, 2003)

A.6b Conveyance

Required Elements

- The runoff exceeding the capacity of the green roof system shall be safely conveyed to a drainage system or BMP without causing erosion. If an overland path is used, a stabilized channel shall be provided for erosive velocities (3.5 to 5.0 fps) for the 1-year storm event.
- The green roof system shall safely convey runoff from the 100-year storm away from the building and into a downstream drainage structure or channel.

A.6c Pretreatment

Required Elements

- No pretreatment is required for direct rainfall.

A.6d Treatment

Required Elements

- Green roofs shall be designed to manage the WQv.

Design Guidance

- The following ASTM Standards should be used for determining the appropriate planting medium and calculating the resulting loads on the roof.

E2396-05 Standard Test Method for Saturated Water Permeability of Granular Drainage Media [Falling-Head Method] for Green Roof Systems

This test method is used to determine the water permeability of coarse granular materials used in the drainage layer (100% of material retained on a 2.25 mm sieve) under low-head conditions typical of horizontal flow in green roofs. The method allows for direct comparison with alternative components, such as geocomposite drain layers. Also measured in the test is the wet density of the granular medium. The resultant water permeability is used to calculate the runoff coefficient.

E2397-05 Standard Practice for Determination of Dead Loads and Live Loads associated with Green Roof Systems

This method is used to predict the overall weight of a green roof system, including components typically encountered (membranes, non-absorptive plastic sheets, metallic layers, fabrics, geocomposite drain layers, synthetic reinforcing layers, protection boards, insulation, growing media, granular drainage media and plants. The procedure addresses the weight under two different conditions: 1) weight under drained conditions following rainfall or irrigation (including retained and captured water) and 2) weight during active rainfall when the drainage layer is completely saturated. The first condition is considered the dead load and the difference between the two conditions, approximated by the weight of transient water in the drainage layer is considered the live load. The

procedure does not account for live loads associated with architectural elements, construction activities, snow or wind.

E2398-05 Standard Test Method for Water Capture and Media Retention of Geocomposite Drain Layers for Green Roof Systems

This method determines the water and media retention of synthetic drain layers used in green roof systems typically consisting of cup-like receptacles on the upper surface (shaped plastic membranes and closed-cell plastic foam boards). The standard does not apply to products manufactured from water-absorptive materials. The standard involves filling the drain layer with sand and water to determine the volume. To account for the difference in water capture depending on roof slope, the tests are performed under different inclinations of the drainage layer. The resultant water retention is used to calculate the runoff coefficient.

E2399-05 Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems

This test method is used to determine the maximum density of media used for dead load analysis. The method also provides a measure of the moisture content and the water permeability measured at the maximum media density. The procedure is suitable for media with less than 30% organic content. The test comprises of compressing moist media into a perforated cylinder using a Proctor hammer, immersed it in water and then determining the density and moisture content using standard gravimetric procedures. The sample is allowed to dry for 2 hours and is again measured to determine the maximum media density. The 2-hr value can be directly compared to media densities determined using the most common international procedures for establishing green roof dead load values.

(*Above guidance from Halsall, 2007*)

A.6e Landscaping

<u>Design Guidance</u>

Landscape design should specify proper plant species based on specific site, structural design, and hydric conditions present on the roof. Plant species range from sedums, grasses, and wildflowers on extensive green roofs to trees and shrubs in intensive green roofs.

The ASTM *E2400-06 Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems* covers the criteria considered for the selection, installation and maintenance of plants of a green roof system and applies to both intensive and extensive roof types. The primary considerations for plant selection are design intent, aesthetics, climate, plant characteristics including longevity, rate of establishment and pest resistance, and, media composition and depth. Also covered are installation methods including precultivation (followed by transplant to the roof), direct seeding and seasonal issues.
(Halsall, 2007)

A.6f Maintenance

Required Elements

- A legally binding and enforceable maintenance agreement shall be executed between the facility owner and the local review authority to ensure the following:

  Extensive
  - Vegetation may need to be watered periodically during the first season and during exceptionally dry periods.
  - Vegetation may need to be lightly fertilized and weeded once a year.

  Intensive
  - Vegetation should be maintained as any other landscaped area, which may involve gardening and irrigation.

- Inspect green roof for leaks on a quarterly basis.

A.7 References

Atlanta Regional Commission. 2001. *Georgia Stormwater Management Manual*. Atlanta, GA. Available from www.georgiastormwater.com.

Center for Watershed Protection. 2002. The Vermont Stormwater Management Manual. Vermont Agency of Natural Resources, Waterbury, VT. Available from www.vtwaterquality.org/stormwater.htm.

City of Portland. 2002. Stormwater Management Manual. Environmental Services Department.

Claytor, R. and T. Schueler. 1996. Design of Stormwater Filtering Systems. Center for Watershed Protection. Ellicott City, MD.

Halsall. 2007. Green Vegetative Roof Building Standard for the City of Toronto. 207x5064A. http://www.toronto.ca/legdocs/mmis/2007/pg/bgrd/backgroundfile-5165.pdf

Massachusetts Department of Environmental Protection (MADEP) and Massachusetts Office of Coastal Zone Management (MACZM). *In Press*. Draft Stormwater Management Handbook Updates. Volumes 1 and 2.

Rawls, W. I., D. L. Brakensiek, and K. E. Saxton. 1982. Soil water characteristics. Trans. ASAE 25(5):13l6-1328.

Schueler, T.R. 1987. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs, Department of Environmental Programs, Metropolitan Washington Council of Governments, Washington, DC.

USEPA. 2005. National Menu of Best Management Practices for Stormwater Phase II. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cfm.

Wark, C.G. and W.W. Wark. 2003. Green Roof Specifications and Standards: Establishing an Emerging Technology. The Construction Specifier, Vol. 56, No.8.

Washington State Department of Ecology (WSDE). 1992. Stormwater Management Manual for the Puget Sound Basin. Olympia, WA.

APPENDIX B

DOWNSTREAM ANALYSIS

Downstream Analysis

A number of hydrologists have noted that overbank and extreme flood control approaches may not always provide full downstream control from the out-of-bank events, due to differences in timing of individual peak discharges in the downstream portion of the watershed. Depending on the shape and land use of a watershed, it is possible that upstream peak discharge may arrive at the same time a downstream structure is releasing its peak discharge, thus increasing the total discharge (see Figure B.1). As a result of this "coincident peaks" problem, it is often necessary to evaluate conditions downstream from a site to ensure that effective out-of-bank control is being provided.

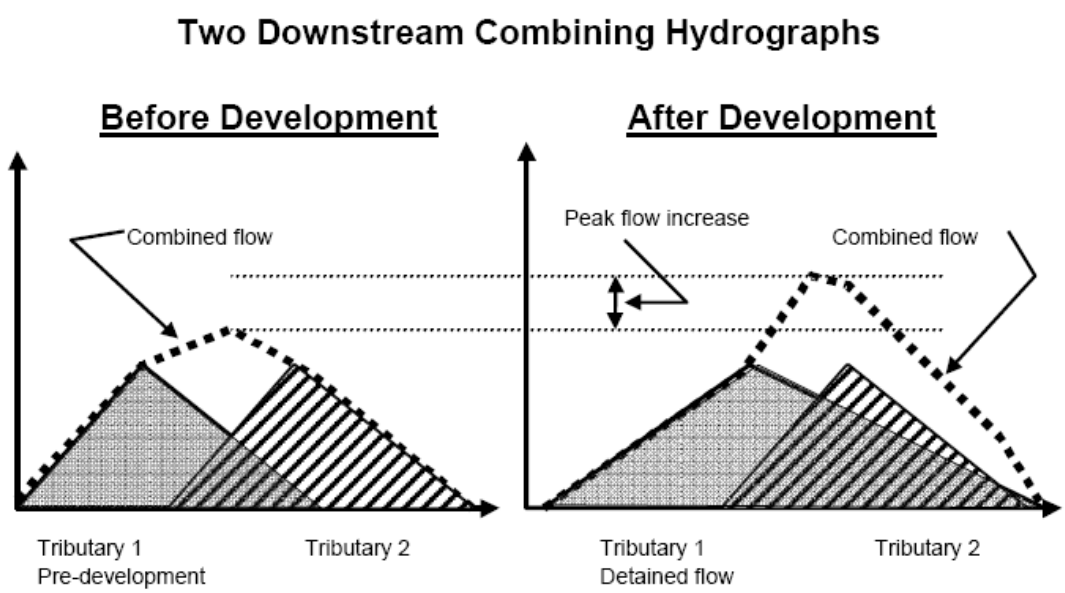


Figure B.1 Graphical Depiction of Coincident Peak Phenomena (Ogden, 2000)

A downstream analysis is required for all projects that are over 50 acres and have greater than 25% impervious cover, or when deemed appropriate by the Planning Board when existing conditions are already causing a problem (e.g., known drainage or flooding conditions or existing channel erosion is evident). The criteria used for the downstream analysis is referred to as the "10% rule." Under the 10% rule, a hydrologic and hydraulic analysis is extended downstream to the point where the site represents 10% of the total drainage area. For example, a 10-acre site would be analyzed to the point downstream with a drainage area of 100 acres.

As a minimum, the analysis should include the hydrologic and hydraulic effects of all culverts and/or obstructions within the downstream channel and assess whether an increase in water surface

elevations will impact existing buildings or other structures. The analysis should compute flow rates and velocities (for the overbank and extreme flood control storms) downstream to the location of the 10% rule for pre-developed conditions and proposed conditions both with and without the detention facility. If flow rates and velocities (for Q_p) with the proposed detention facility increase by less than 5% from the pre-developed condition, and no existing structures are impacted, then no additional analysis is necessary. If the flow rates and velocities increase by more than 5%, then the designer must either redesign the detention structure, evaluate the effects of no detention structure, or propose corrective actions to the impacted downstream areas. Additional investigations may be required by the approving authority on a case-by-case basis depending on the magnitude of the project, the sensitivity of the receiving water resource, or other issues such as past drainage or flooding complaints.

Special caution should be employed where the analysis shows that no detention structure is required. Stormwater designers must be able to demonstrate that runoff will not cause downstream flooding within the stream reach to the location of the 10% rule. The absence of on-site detention shall not be perceived to waive or eliminate groundwater recharge (Re_v), water quality control (WQ_v), or stream channel protection requirements (Cp_v).

A typical downstream analysis will require a hydrologic investigation of the site area draining to a proposed detention facility and of the contributory watershed to the location of the 10% rule for the 10-, 25- and 100-year storms. A hydraulic analysis of the stream channel below the facility to the location of the 10% rule will also be necessary (e.g., a HECRAS water surface profile analysis). Depending on the magnitude of the impact and the specific conditions of the analysis, additional information and data may be necessary such as collecting field run topography, establishing building elevations and culvert sizes or investigating specific drainage concerns or complaints.