Rule J – Stormwater Management

1 Policy

It is the policy of the District to regulate the management of stormwater runoff to:

1.1 Limit the impact of runoff quality and rate on receiving waterbodies.

1.2 Improve water quality to fully support swimming in designated lakes.

1.3 Improve water quality to fully support designated uses for waterbodies, and remove waterbodies from the Minnesota Pollution Control Agency list of impaired waters.

1.4 Alter stormwater hydrographs (stream flow) through infiltrative strategies that reduce peak discharge rates and overall flow volume.

1.5 Require that onsite retention and regional water quality treatment systems operate together to provide complete and effective runoff management.

1.6 Provide for nondegradation of surface waterbodies in the watershed.

1.7 Encourage the use of Better Site Design, Low Impact Development and other techniques that minimize impervious surfaces or incorporate volume-control practices, such as infiltration, to limit runoff volumes.

1.8 Maximize opportunities to improve stormwater and snowmelt management presented by redevelopment of land.

1.9 Require governmental entities and developers to manage runoff effectively to minimize water quality impacts from new development, redevelopment and other land-disturbing activities.

1.10 Minimize the movement of chloride compounds into water resources.

2 Regulation

A permit from the District, incorporating an approved stormwater-management plan, is required under this rule prior to the commencement of any activities to which this rule applies. The District may review a stormwater-management plan at any point in the development of a regulated project and encourages project proposers to seek early review of plans by the District.

2.1 The requirements of this rule apply to any land-disturbing activity that will involve:

- a Placement, alteration or removal of 50 cubic yards or more of earth;
- b Alteration or removal of 5,000 square feet or more of land-surface area or vegetation; or
- c Subdivision of a property or properties into three or more residential lots.

2.2 **Exemptions.** The requirements of this rule do not apply to:

- a Construction or remodeling on an existing single-family home site, unless any portion of the parcel is:
  - 1 Within 300 feet of the centerline of and draining to Riley Creek, Purgatory Creek or Bluff Creek,
  - 2 Within 500 feet of the ordinary high water level of and draining to any

other public water or protected wetland, or

3 Below the 100-year flood elevation of a water body.

b Construction or remodeling on a single-family home site consistent with a subdivision, development or redevelopment plan implemented in accordance with a District permit issued after February 1, 2015, and an approved erosion prevention and sediment control plan.

c Rehabilitation of paved surfaces.

d Trails, sidewalks and retaining walls that do not exceed 10 feet in width and are bordered downgradient by a pervious area extending at least half the trail width.

e Land-disturbing activities that do not involve creation of new impervious surface, reconstruction of existing impervious surface or grading that materially alters stormwater flow at a site boundary.

2.3 **Redevelopment**. If a proposed activity will disturb more than 50 percent of the existing impervious surface on the parcel or will increase the imperviousness of the entire parcel by more than 50 percent, the criteria of section 3 will apply to the entire project parcel. Otherwise, the criteria of section 3 will apply only to the disturbed areas and additional impervious surface on the project parcel. For purposes of this paragraph, disturbed areas are those where underlying soils are exposed in the course of redevelopment.

2.4 **Linear projects**. Notwithstanding subsection 2.3, a permit under this rule is not required for a linear project if the project entails construction or reconstruction creating less than 5,000 square feet of new and/or fully reconstructed impervious surface. For linear projects creating 5,000 square feet or more of new and/or fully reconstructed impervious surface, stormwater management in accordance with the criteria of subsection 3.2 must be provided.

2.5 **Common scheme of development.** Activity subject to this rule on a parcel or adjacent parcels under common or related ownership will be considered in the aggregate, and the requirements applicable to the activity under this rule will be determined with respect to all development and redevelopment that has occurred on the site or on adjacent sites under common or related ownership since the date this rule took effect (January 1, 2015).

a For development or redevelopment under common or related ownership, compliance with the criteria of section 3 may be achieved through a shared stormwater-management facility or facilities as long as the criteria in subsection 3.1 are met for each contributing drainage area within the common or related ownership.

2.6 **Performance monitoring.** A permit granted by the District on a finding that stormwater-management facilities, as they are to be constructed and maintained under the permit, will meet applicable performance standards under this rule, does not require additional steps if the permit is complied with but standards are not met. Notwithstanding, as a specific condition to a permit, the District may impose monitoring, performance evaluation, additional compliance measures or

other requirements for the purposes of demonstrating that performance standards are being met.

3 Criteria

3.1 An applicant for a permit under this rule must demonstrate, using a model utilizing the most recent applicable National Weather Service reference data (e.g., Atlas 14), that the implementation of its stormwater-management plan will:

a **Rate.**

i Limit peak runoff flow rates to that from existing conditions for the two-, 10- and 100-year frequency storm events using a nested 24-hour rainfall distribution, and a 100-year frequency, 10-day snowmelt event, for all points where stormwater discharge leaves the site;

b **Volume**. Provide for the abstraction onsite of 1.1 inches of runoff from impervious surface of the parcel;

i Where infiltration or filtration facilities, practices or systems are proposed, pretreatment of runoff must be provided.

ii Where infiltration facilities, practices or systems are proposed, data must be submitted showing:

A. no evidence of groundwater or redoximorphic soil conditions within 3 feet of the bottom of the facility, practice or system;

B. soil conditions within 5 feet of the bottom of any stormwater treatment facility, practice or system;

C. the measured infiltration capacity of soils at the bottom of the facility, practice or system. (For purposes of calculating volume-control capacity, measured infiltration rates must be divided by 2 to provide a margin of safety.)

iii Drawdown of water levels in infiltration facilities must be within 48 hours.

iv Infiltration rates utilized to meet the 3.1b criterion may not exceed 8.3 inches per hour.

v

c **Quality**. Provide for at least 60 percent annual removal efficiency for total phosphorus (TP) and at least 90 percent annual removal efficiency for total suspended solids (TSS) from site runoff, and no net increase in TSS or TP loading leaving the site from existing conditions.

i The onsite abstraction of runoff may be included in demonstrating compliance with the total suspended solids and total phosphorus removal requirements.

3.2 **Criteria for Linear Projects**. An applicant for a permit for a linear project under this rule must demonstrate, using a model utilizing the most recent applicable National Weather Service reference data (e.g., Atlas 14), that the implementation of its stormwater-management plan will:

a Achieve the rate control standard in paragraph 3.1a and the water quality

standard in paragraph 3.1c; and

b For projects creating between 5,000 square feet and 1 acre of new and/or fully reconstructed impervious surface, provide for the abstraction onsite of 1.1 inches of runoff from the net increase in impervious surface area; or

c For projects creating more than 1 acre of new and/or fully reconstructed impervious surface, provide for the abstraction onsite of the larger of the following:

i 0.55 inches of runoff from the new and fully reconstructed impervious surfaces; or

ii 1.1 inches of runoff from the net increase in impervious area.

3.3 **Criteria for restricted sites.** Where the District concurs that an applicant has demonstrated that the abstraction standard in subsection 3.1 or 3.2, as applicable, cannot practicably be met through a combination of onsite best management practices and relocation of project elements to address varying soil conditions and other site constraints or infiltration will cause or exacerbate migration of underground contaminants, the applicant must provide rate control in accordance with the standard in paragraph 3.1a, and abstraction and water-quality protection in accordance with the following priority sequence:

a Abstraction of at least 0.55 inches of runoff from site impervious surface determined in accordance with paragraphs 2.3, 3.1 or 3.2, as applicable, and treatment of all runoff to the standard in paragraph 3.1c; or

b Abstraction of runoff onsite to the maximum extent practicable and treatment of all runoff to the standard in paragraph 3.1c; or

c Off-site abstraction and treatment in the watershed to the standards in paragraph 3.1b and 3.1c.

3.4 **Criteria for projects on existing single-family home property.** The criteria in sections 3.1 to 3.3 and exhibit requirements in section 4 do not apply. An applicant for a permit for construction or reconstruction on an existing single-family home property must submit site plans and designs providing for construction, installation or implementation of a stormwater-management BMP consistent with guidance promulgated by the State of Minnesota, including but not limited to the Minnesota Stormwater Manual, Protecting Water Quality in Urban Areas Manual and Minimal Impact Design standards.

3.5 **Buffer credit.** Stormwater-management capacity of buffer area created in compliance with Rule D or otherwise will be credited toward compliance with the criteria in this rule.

3.6 **Low-floor elevation.** All new and reconstructed buildings must be constructed such that the lowest floor is:

a At least two feet above the 100-year high water elevation or one foot above the natural overflow of a waterbody;

b At least two feet above the 100-year high water elevation of any open stormwater conveyance; and

c At least two feet above the 100-year high water elevation or one foot above

the emergency overflow of a stormwater-management facility.

In addition, a stormwater-management facility must be constructed at an elevation that ensures that no adjacent habitable building will be brought into noncompliance with a standard in this subsection 3.6. Alternatively, a stormwater-management facility may be constructed at a location and elevation set according to Appendix J1 – "Low Floor Elevation Assessment," which is incorporated into and made a part of these rules. If Appendix J1 is used, the low opening where surface water can enter the structure must be a minimum of two feet above the 100-year high water elevation.

b **Landlocked basins.** Any new or reconstructed structure wholly or partially within a landlocked basin must be constructed such that its lowest floor elevation is:

i 1 foot above the surface overflow of the basin, or

ii 2 feet above the elevation resulting from two concurrent 100-year single rainfall events in a 24-hour period or a 100-year, 10-day snowmelt, whichever is higher.

iii The starting elevation of the basin prior to the runoff event will be established by the highest of one of the following:

A Existing ordinary high water elevation established by the Minnesota Department of Natural Resources;

B Mottled soil.

c Landlocked water basins may be provided with outlets if an outcome-based analysis and resource oriented management review regarding downstream impacts is completed and demonstrates that:

i A hydrologic regime is maintained that complies with all other rules;

ii Dead storage is provided to retain the fully developed future conditions back to back 100-year critical event water volume, above the highest anticipated groundwater elevation to the extent possible while preventing damage to property adjacent to the basin;

iii The outlet does not create adverse downstream flooding or water quality conditions, or materially affect stability of downstream watercourses

iv Proposed development draining to the landlocked basin has incorporated runoff volume and rate control practices to the extent practical

v There is a demonstrated need for an outlet to protect existing structures and infrastructure; and

vi The outlet design is part of an approved comprehensive local water management plan.

3.7 Maintenance

All stormwater-management structures and facilities must be designed for maintenance access and properly maintained in perpetuity to assure that they continue to function as designed. Permit applicants must provide a maintenance, inspection and, if required, monitoring plan that identifies and protects the design, capacity and functionality of onsite and offsite stormwater-management

facilities; specifies the methods, schedule and responsible parties for inspection, maintenance and monitoring; provides for the inspection and maintenance in perpetuity of the facility, with documentation retained onsite and available to the District upon reasonable notice; and contains at a minimum the requirements in the District's standard maintenance declaration. For applications managing runoff through stormwater reuse, the maintenance plan must provide for the protection of greenspace to be irrigated or other land-use restrictions, as necessary, and metering of the volume of water reused to ensure continuing treatment capacity. The plan will be recorded on the deed in a form acceptable to the District. A public entity assuming the maintenance obligation may do so by entering an agreement with the District in lieu of a recorded document.

3.8 **Chloride management**.

An applicant for a permit under this rule for land-disturbing activity on property other than a single-family home site must provide a plan for post-project management of chloride use on the site that includes, at a minimum:

a Designation of an individual authorized to implement the chloride plan; and

b Designation of a Minnesota Pollution Control Agency-certified salt applicator engaged in the implementation of the chloride plan for the site.

3.9 **Rights to Utilize Offsite Facility.** An applicant relying on regional stormwater-management treatment for compliance with the standard in paragraph 3.1c or under an approved regional plan under section 4 must demonstrate that it holds the legal rights necessary to discharge to the relevant offsite stormwater-management facility or facilities, and that the facility or facilities are subject to a maintenance document satisfying the requirements of paragraph 3.7.

3.10 **Wetland protection**.

a Bounce and inundation. No activity subject to this rule may alter a site in a manner that increases the bounce in water level, duration of inundation, or change the runout elevation in the subwatershed in which the site is located, for any wetland receiving discharge directly from the site beyond the limits specified Table J.1.

b Treatment of runoff to wetlands. Use of an existing or created wetland for stormwater treatment as part of a proposed development, redevelopment or other land-disturbing project regulated under District rules must comply with the following criteria:

i Stormwater must be treated to meet the 3.1b criterion by before discharge to a wetland.

ii Exceptional and high value wetlands may not be used for stormwater management unless no other alternative is feasible. When permitted, any discharge to a high-value wetland must be treated to at least 75 percent annual removal efficiency for phosphorus and at least 90 percent annual removal efficiency for total suspended solids prior to discharge to the wetland.

4 Regional Stormwater Management. An applicant may comply with the criteria in subsection 3.1 for all parcels within a catchment area or areas through a regional or subwatershed plan approved by the District. A regional plan must provide stormwater management that meets or exceeds the criteria in subsection 3.1. The regional plan must provide for an annual accounting to the District of treatment capacity created and utilized by projects or land-disturbing activities within the drainage and treatment area to which the plan pertains.

4.1 District approval of a regional plan will be based on a determination that:

a The use of a regional facility in place of onsite stormwater management is not likely to result in adverse impacts to local groundwater or natural resources located upstream of the regional facility or facilities, including, for example, reduced water quality, altered wetland hydrology, changes to stream velocities or base flow, erosion or reduced groundwater recharge; and

b The plan incorporates onsite BMPs where necessary to mitigate impacts and provide local benefits not provided by the regional facility.

5 Required exhibits

The following exhibits must accompany the permit application:

5.1 One 11 inch-by-17 inch plan set , and electronic files in a format acceptable to the District, as well as a plan set 22 inches by 34 inches if requested by the District.

5.2 Stormwater-management system modeling in a form acceptable to the District engineer. For example, HydroCAD, SWMM, MIDS calculator, P8 or alternative method as approved by the District engineer in advance of submission.

5.3 A site plan showing:

a Property lines and delineation of lands under ownership of the applicant.

b Existing and proposed elevation contours.

c Identification of existing and proposed normal, and ordinary high and 100-year water elevations onsite.

5.4 A stormwater-management plan certified by a registered engineer including, at a minimum:

a Proposed and existing stormwater-management facilities' location, alignment and elevation.

b Delineation of existing wetlands, marshes, shoreland and/or floodplain areas onsite or to which any portion of the project parcel drains, except that where a project will not change the hydrology of a wetland, the wetland need only be identified on the plan.

c Geotechnical analysis including soil borings and, where applicable, data developed in accordance with the Minnesota Stormwater Manual supporting existing and designed infiltration rates, at all proposed stormwater-management facility locations.

d Construction plans and specifications for all proposed stormwater-management facilities, including design details for outlet control structures.

e Stormwater runoff volume and rate analyses for the 24-hour, 2-, 10- and 100-year critical events, existing and proposed conditions.

f All hydrologic, water quality, and hydraulic computations completed to design the proposed stormwater-management facilities, including calculation of stormwater-management capacity of buffer, as applicable.

g Narrative addressing incorporation of retention BMPs.

h Platting or easement documents showing drainage and ponding/flowage easements over hydrologic features such as floodplains, storm sewers, ponds, ditches, swales, wetlands and waterways, where required by the relevant city.

i Documentation as to the status of the project's National Pollutant Discharge Elimination System stormwater permit, if applicable.

j If infiltration of runoff is proposed, the District may require submission of a phase I environmental site assessment and/or other documentation to facilitate analysis by the District of the suitability of soils for infiltration.

k If a stormwater harvest and reuse practice is proposed to meet applicable requirements, submission of:

i An analysis using a stormwater reuse calculator or equivalent methodology approved by the District engineer documenting how the annual volume of reuse water translates to the abstraction criterion in subsection 3.1b;

ii documentation of the adequacy of soils, storage capacity and delivery systems;

iii delineation of greenspace area to be irrigated, if applicable; and

iv an irrigation or usage plan.

5.5 An erosion control plan complying with District Rule C.

5.6 Upon completion of site work, a permittee must submit as-built drawings demonstrating that at the time of final stabilization, stormwater-management facilities conform to design specifications as approved by the District.

Table J.1: Impacts on onsite wetland[5]

Wetland Value/ Waterbody	**Permitted Bounce for, 10-Year Event**	**Inundation Period for 1- and 2-Year Event**	**Inundation Period for 10-Year Event**	**Runout Control Elevation**
Exceptional	Existing	Existing	Existing	No change

[5] Adopted from *Wetland Management Classification System*
http://bwsr.state.mn.us/wetlands/mnram/MnRAM_Wetland_Mgmt_Classification_Guidance.pdf

High	Existing plus 0.5 feet	Existing plus 1 day	Existing plus 7 days	No change
Medium	Existing plus 1.0 feet	Existing plus 2 days	Existing plus 14 days	0 to 1.0 ft above existing runout
Low	No limit	Existing plus 7 days	Existing plus 21 days	0 to 4.0 ft above existing runout

Appendix J1 – Low-Floor Elevation Assessment

Overview of Lowest Floor Issue

There seems to be two reasons for establishing a minimum lowest floor elevation in the vicinity of a pond – to prevent flooding of the structure by surface water and to prevent seepage or damage from uplift pressures that could result from a rise in the water table elevation. The first reason (direct flooding) can easily be established with knowledge of the maximum flood elevation of a pond (or the 100-year elevation, if this is used) and ground surface topography. The second reason (a rise in the water table due to increased pond elevations) is not so straight forward. This second area is the subject of this memo.

When a formerly dry pond becomes wet (or when a wet pond's water elevation increases) due to a storm event, downward seepage of the ponded water begins. The rate of seepage through the bottom of the pond is dependent upon:

1) The elevation of the water surface above the pond bottom

2) The soil type at the bottom of the pond (i.e. the pond bottom's thickness and permeability)

3) The type of soil underneath the pond (e.g., clay, silt, sand, gravel)

4) The degree of saturation of the soils beneath the pond

5) The depth to the water table

In general, higher seepage through the bottom of the pond will occur when the water surface elevation is high, the pond's bottom sediments are thin and/or sandy, the soils underneath the pond are permeable (such as sand or gravel), the soils underneath the pond have a high moisture content (i.e., they are at field capacity or higher), and the water table is well below the bottom of the pond (i.e. the soils are freely draining).

Higher seepage rates through the bottom of the pond will cause the water table elevation to rise by creating a "mounding condition" below the pond. How high and how widespread the water table mound becomes are contributing factors to whether or not basements will be affected. *However, the single most important factor that will determine if seepage from a pond will cause wet basement problems is the depth to the water table, below the basement.*

The magnitude and extent of the groundwater mounding conditions is also contingent upon the aquifer's transmissivity (aquifer permeability multiplied by aquifer thickness), the specific yield of the aquifer materials, and the duration of the high water levels in the pond. In general, thicker aquifers with higher permeability will experience less mounding than thinner aquifers of lower permeability. Perched aquifers (i.e. groundwater zones less than about 10 feet that overlie extensive clay layers) typically experience the greatest amount of mounding.

Overview of Evaluation Method

All of the combinations of settings, pond configurations, aquifer parameters, and distances from ponds cannot be anticipated beforehand in coming up with a method to quickly evaluate whether or not a variance to the minimum floor elevation ordinance should be considered. However, by making some generalities, the most commonly encountered situations can be evaluated. This is the approach taken here.

A groundwater flow model of a "typical" pond and aquifer setting was developed. Aquifer parameters and pond elevations were varied and the resulting water table mounding conditions were simulated. The following conditions were evaluated:

1. Pond elevation increases of 2 feet, 4 feet, and 6 feet above normal or dry conditions

2. Depth to the water table (before flooding) of 3 feet (to represent conditions of 3 feet or less) and 10 feet (to represent conditions where the depth to the water table is greater than 3 feet). The purpose of simulating these two conditions is that with shallow water tables, the rate of infiltration is substantially reduced as the groundwater mound rises into the pond. For deeper aquifer conditions, the pond bottom is always above the water table and the depth to the water table has no bearing on the seepage rate.

3. Three aquifer conditions: clay or perched aquifers (transmissivities of 7 ft^2/day and specific yield values of 0.1); silt aquifers (transmissivity of 70 ft^2/day and specific yield values of 0.2) and sand and gravel aquifers (transmissivities of 2000 ft^2/day and specific yield values of 0.2).

4. Pond bottom sediment thickness of 1 feet and bottom sediment hydraulic conductivity of 1 ft/day.

5. Instantaneous occurrence of a flood condition in the pond, which lasts for 25 days, followed by instantaneous reduction to normal conditions. The purpose of using this condition is that the effects of aquifer storage (specific yield) are taken into account. A duration of 25 days was selected as being a reasonable time period of flood conditions.
6. Increases in the water table elevation were recorded at several distances between 5 feet and 200 feet from the pond. The maximum rise during the modeled period was selected for plotting.

The U.S. Geological Survey's groundwater modeling code, MODFLOW, was used for this analysis.

How to Determine if a Variance is Warranted

In order to determine if a proposed lowest floor elevation is acceptable, the following need to be known:

1. Depth to the water table and an estimation of the water table's seasonally high elevation.

2. Type of aquifer materials – e.g., clay, silt, sand, gravel

3. Information as to whether or not the water table is perched or is part of a deeper, thicker aquifer system.

4. An estimate of the flood elevation of the pond.

5. The distance of the proposed floor to the pond.

Depth to the water table and the type of aquifer material needs to be determined through the installation of soil borings. The other information should be estimated from other sources.

Once this information is obtained, the minimum depth to the water table from the bottom of the proposed floor slab can be determined from one of six plots, attached to this memorandum. Which of the six plots to use depends on the depth of the water table with respect to the pond's bottom and the type of aquifer material (e.g., clay, silt, sand, gravel). The following steps should be used:

1. Determine the closest distance of the proposed floor to the pond (if the pond size increases during flooding, the distance should be from the flooded perimeter of the pond to the proposed floor).

2. Using Plot 1, determine the minimum permissible depth to the water table for the specified distance from the pond. If the actual depth to the water table (see discussion below for determining this) is greater than the value on Plot 1, no further evaluation is necessary – the floor is sufficiently high with respect to the water table that the water table will not reach the bottom of the slab, regardless of the soil type or transmissivity. If the depth to the water table is less than the value from Plot 1, further evaluation is necessary.

3. If the soil type of the aquifer, below the water table, is mostly clay OR if the aquifer is perched (a continuous clay layer is less than 5 feet below the water table), Plot 2 must be used. The appropriate pond level increase (2, 4, or 6 feet) for flood conditions must be used in Plot 2 to find the minimum permissible depth to the water table. If the depth to the water table from Plot 2 is less than the actual depth to the water table, the proposed floor elevation is too low and must be raised to equal the value from Plot 2.

4. If the soil type of the aquifer is mostly silt AND the pond bottom is 3 feet or less above the water table, Plot 3 should be used.

5. If the soil type of the aquifer is mostly sand or gravel AND the pond bottom is 3 feet or less above the water table, Plot 4 should be used.

6. If the soil type of the aquifer is mostly silt AND the pond bottom is 3 feet or more above the water table, Plot 5 should be used.

7. If the soil type of the aquifer is mostly sand or gravel AND the pond bottom is 3 feet or more above the water table, Plot 5 should be used.

The values from the plots are guidelines, based on typical conditions. If the plots indicate the proposed floor elevation is too low, additional analyses and data collection could be pursued by the applicant. These additional analyses could include additional soil borings, long-term monitoring of piezometers, or more sophisticated modeling.

Determining Depth to the Water Table

If a variance to a lowest floor elevation ordinance is to be considered, the depth to the water table at the location in question must be known. Without this knowledge, there cannot be a technical basis for approving a variance. Furthermore, the applicant should demonstrate that the measured water-table elevation is both representative of conditions over the entire floor area and is representative of values typical for seasonally high conditions (e.g. spring conditions). A suggested requirement for collecting this information is the following:

1. A minimum of two soil borings must be installed at or near the perimeter of the lowest floor. At least one of these borings must be where the floor is closest to the nearest pond.

2. Soil borings must extend to a depth of at least 7 feet below the water table. The borings must be left open for a time sufficient to determine the stabilized water level in the borehole. The water level must be measured with reference to a known bench mark that can relate the water table elevation to the proposed floor elevation. Soils at or immediately below the water table must be sampled and texturally classified using an approved classification method.

Water levels measured during dry summer months or during the winter may be lower than water levels during the spring. The applicant should be required to make an effort to determine the likely amount of seasonal fluctuation in the water table in the area. Water level records from wells completed in the area could be used. If information is unavailable, the applicant should be required to add a value to the measured water table elevation. One suggestion would be to assume 25% of the total annual precipitation (29 inches), divided by the average effective porosity for non-cohesive soils (0.3), which is:

$$(29 \text{ inches}/4) \times (1 \text{ foot}/12 \text{ inches})/0.3 = 2 \text{ feet}$$

If the seasonally adjusted maximum water-table elevation is eight (8) feet or below the bottom of the slab of the lowest floor, it is unlikely that temporary flood conditions in the pond will cause the water table to rise to the level of the floor.[6]

Determining Soil Type at the Water Table

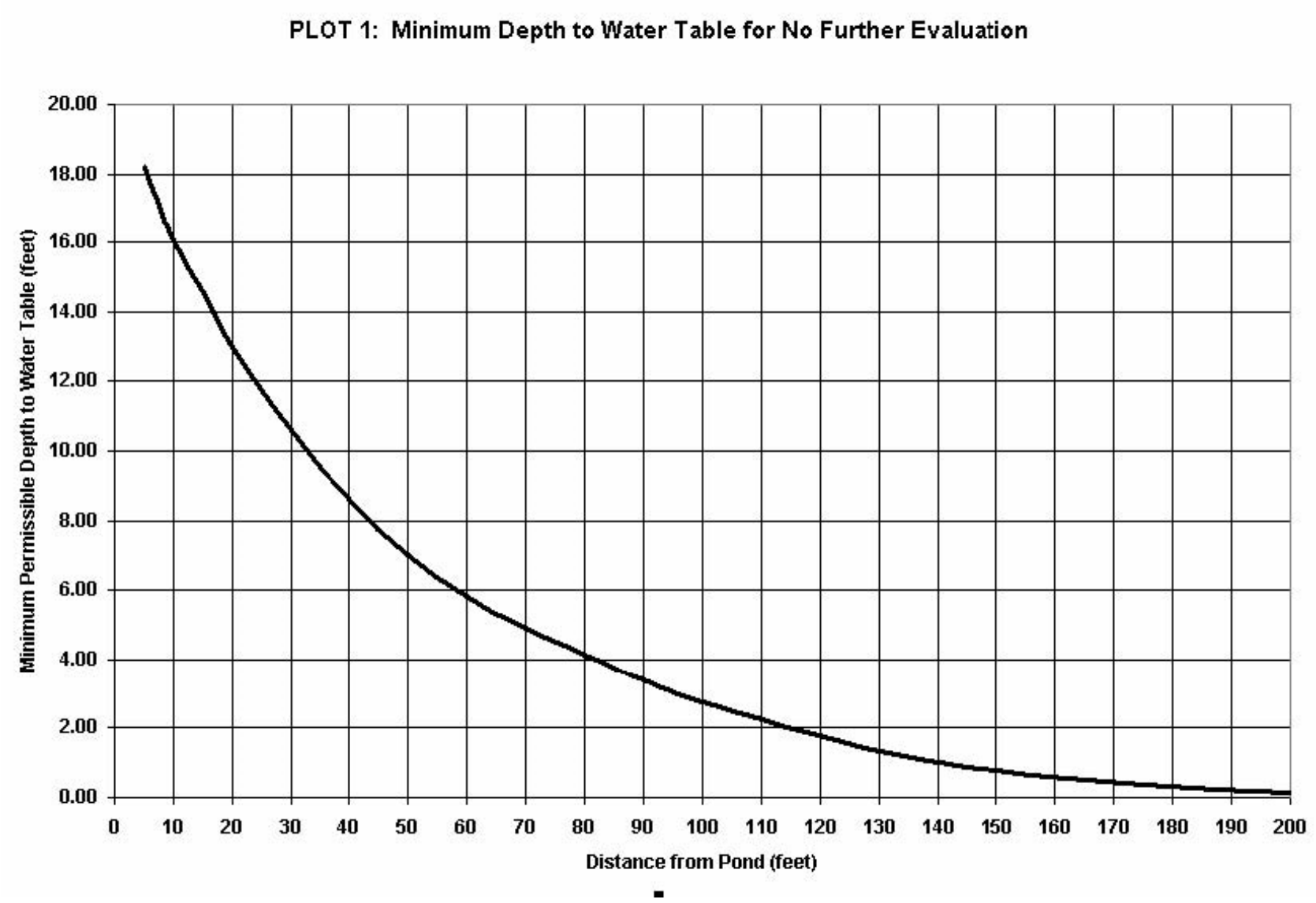
6 This assumes that the pond level begins to return to normal within about 30 days and the pond level's increase is not greater than 6 feet.

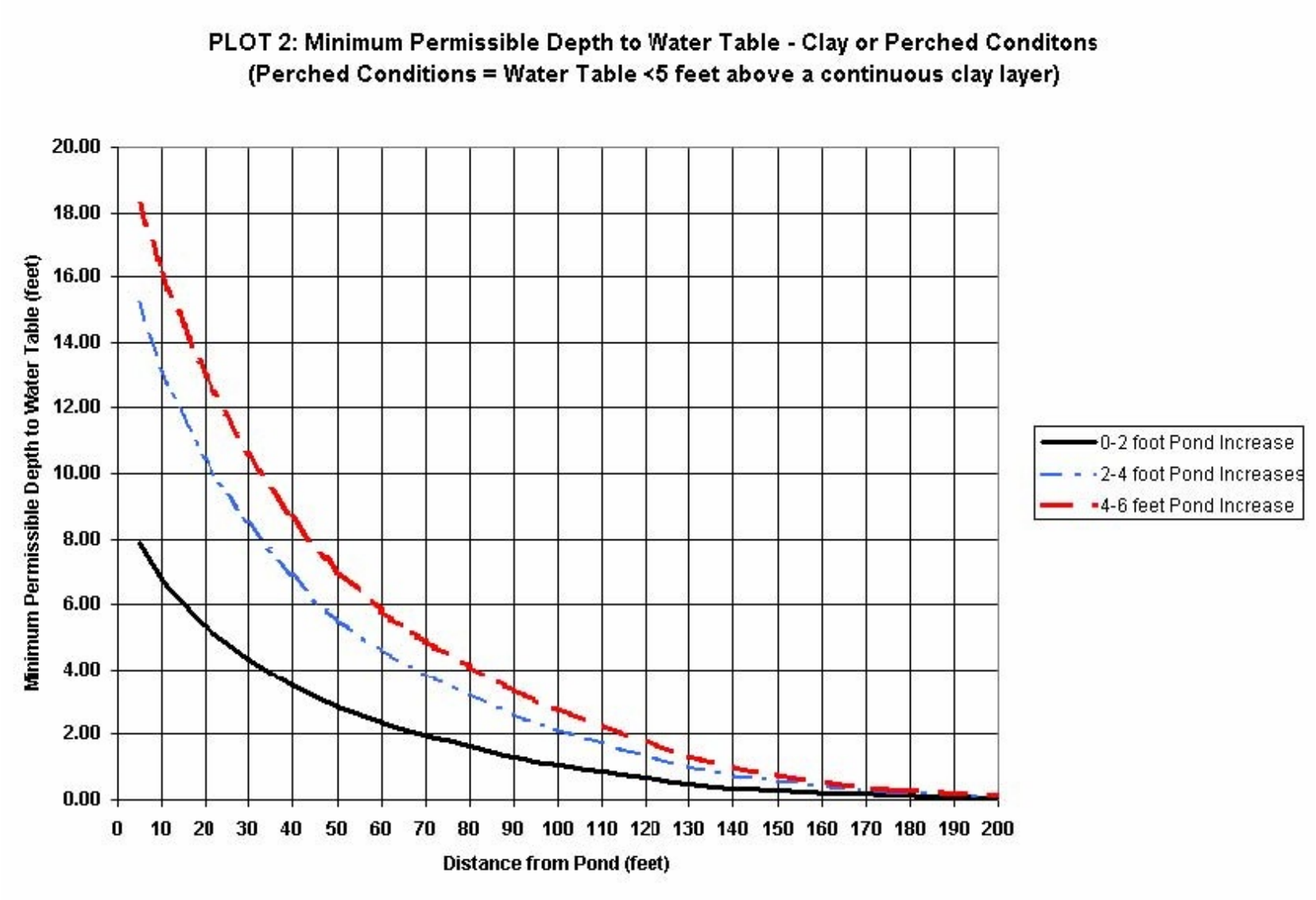
The textural classification from the soil borings will be necessary for determining the expected rise in the water table caused by an increase in pond elevation. At a minimum, the soil should be classified as one of the following:

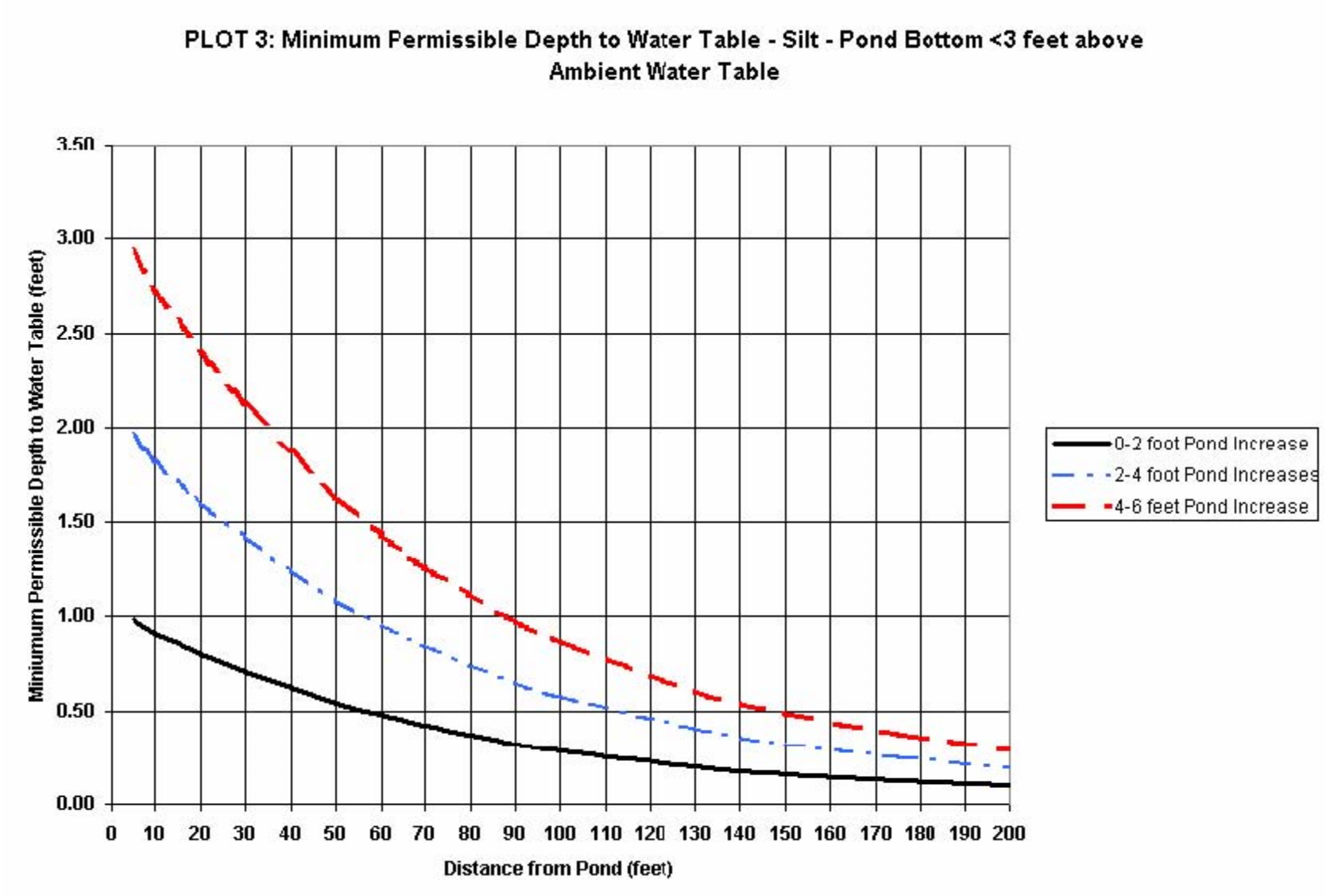
1. Sandy or gravely soils – consisting of predominantly sand or gravel, with minor amounts of silt and clay

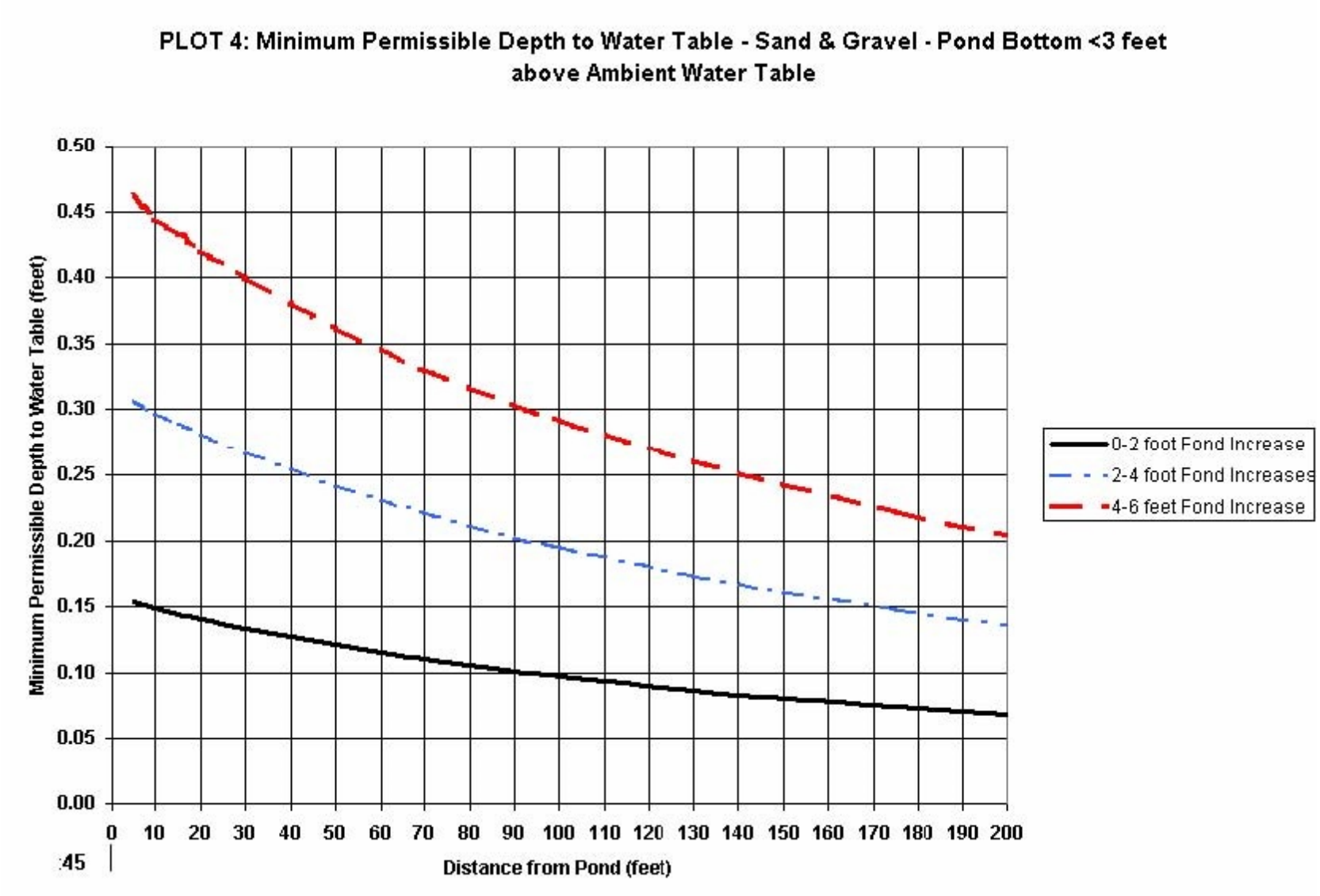
2. Silty soils – consisting predominantly of silt

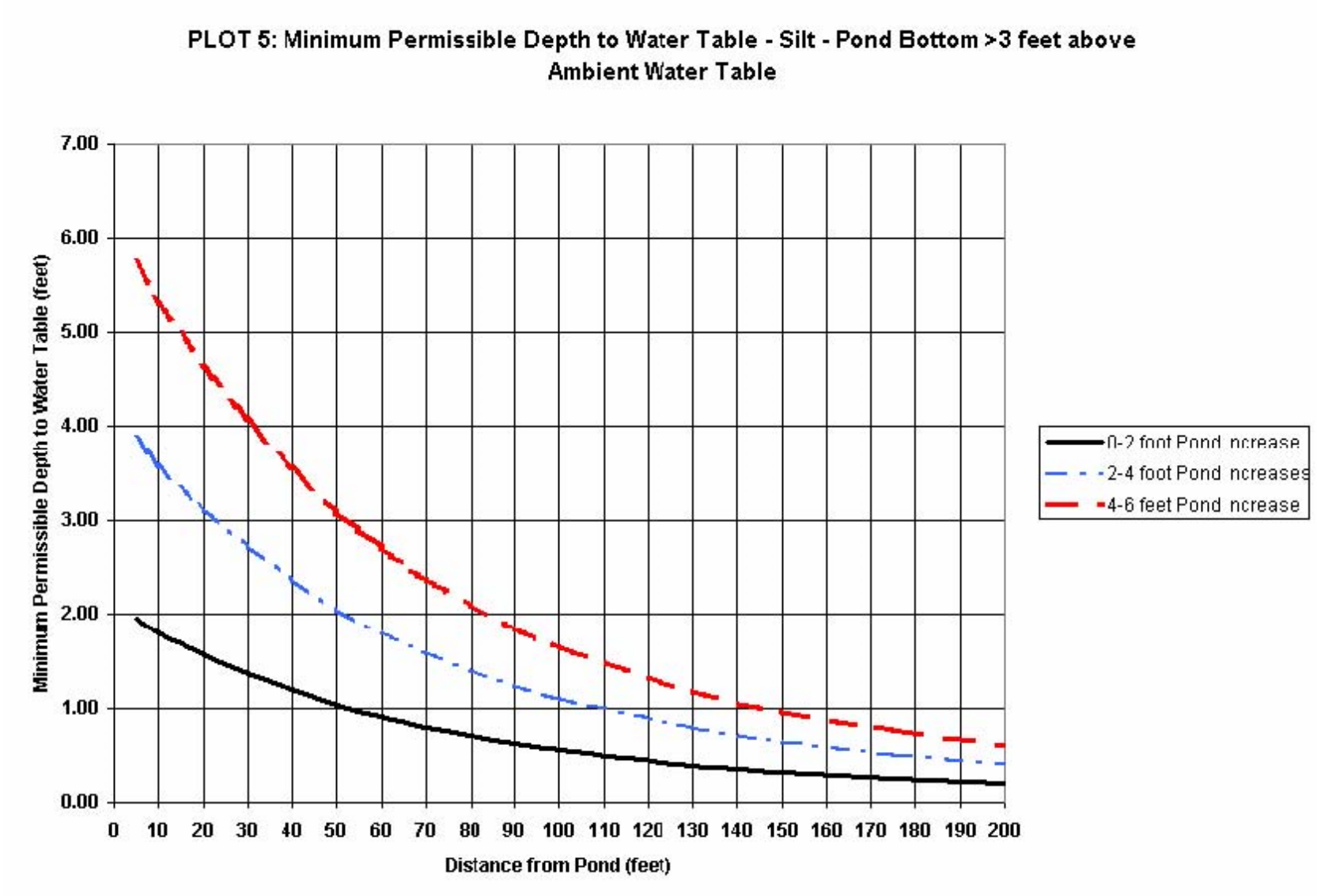
3. Clayey soils – consisting predominantly of clay.

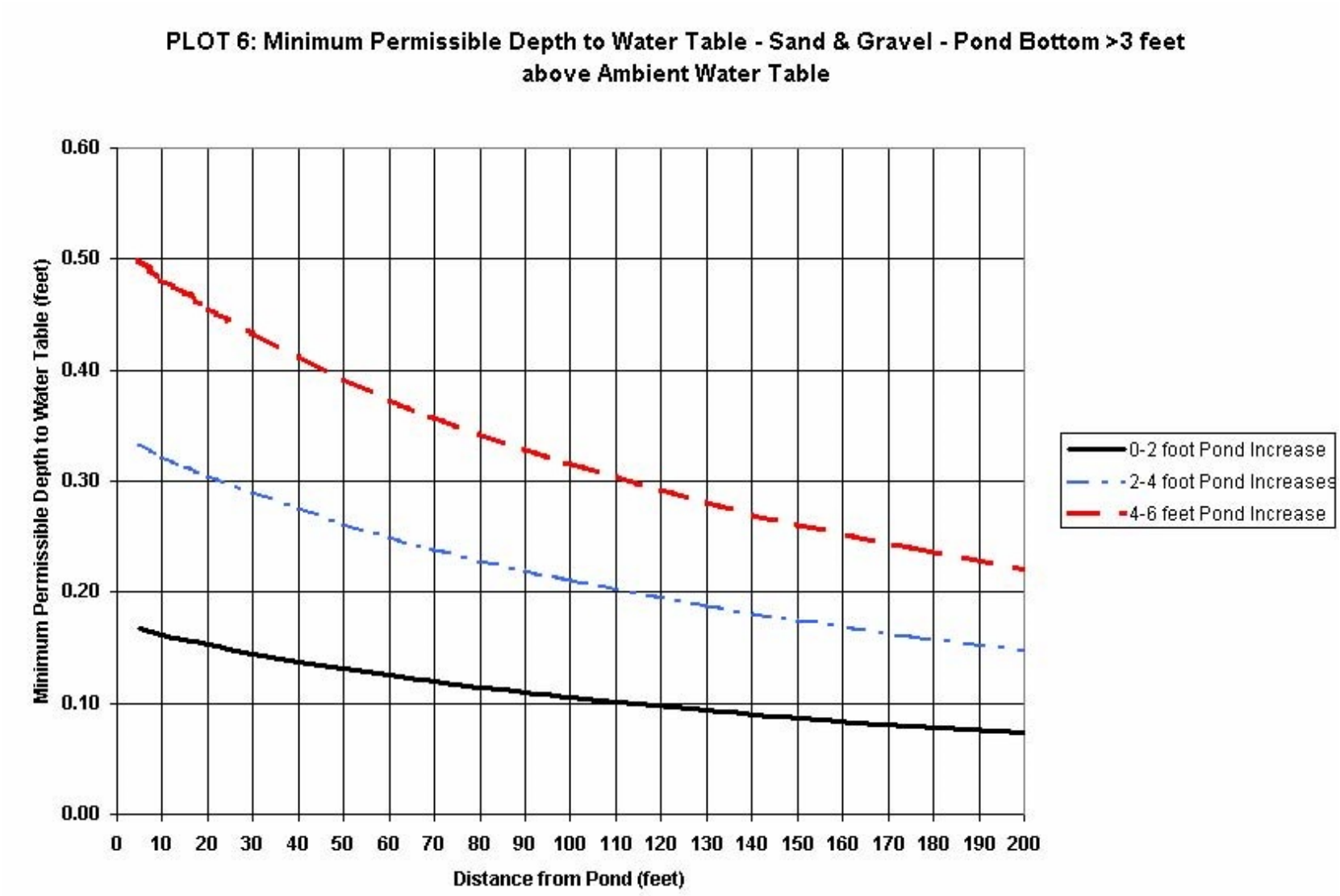

PLOT 1: Minimum Depth to Water Table for No Further Evaluation
Minimum Permissible Depth to Water Table (feet)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Distance from Pond (feet)


PLOT 2: Minimum Permissible Depth to Water Table - Clay or Perched Conditons
(Perched Conditions = Water Table <5 feet above a continuous clay layer)
Minimum Permissible Depth to Water Table (feet)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Distance from Pond (feet)
0-2 foot Pond Increase
2-4 foot Pond Increases
4-6 feet Pond Increase


PLOT 3: Minimum Permissible Depth to Water Table - Silt - Pond Bottom <3 feet above Ambient Water Table
Miniumum Permissible Depth to Water Table (feet)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Distance from Pond (feet)
0-2 foot Pond Increase
2-4 foot Pond Increases
4-6 feet Pond Increase


PLOT 4: Minimum Permissible Depth to Water Table - Sand & Gravel - Pond Bottom <3 feet above Ambient Water Table
Minimum Permissible Depth to Water Table (feet)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
:45
Distance from Pond (feet)
0-2 foot Fond Increase
2-4 foot Fond Increases
4-6 feet Fond Increase


PLOT 5: Minimum Permissible Depth to Water Table - Silt - Pond Bottom >3 feet above Ambient Water Table
Minimum Permissible Depth to Water Table (feet)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Distance from Pond (feet)
0-2 foot Pond ncrease
2-4 foot Pond ncreases
4-6 feet Pond ncrease


PLOT 6: Minimum Permissible Depth to Water Table - Sand & Gravel - Pond Bottom >3 feet above Ambient Water Table
Minimum Permissible Depth to Water Table (feet)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Distance from Pond (feet)
0-2 foot Pond Increase
2-4 foot Pond Increases
4-6 feet Pond Increase