Chapter 7 Grassed Waterways

Contents

Figures

Exhibits

Chapter 7
Grassed Waterways

Introduction

Grassed waterways are natural or constructed channels shaped or graded to required dimensions, including suitable vegetation for stable conveyance of runoff.

The grass-lined waterway is one of the most commonly used conservation practices. When rainfall exceeds the infiltration rate or available water-holding capacity of the soil, surplus water will run off over the land. Since the success of any soil conservation program depends on the removal of this surplus water without undue erosion, the area needed for waterways should be dedicated to this purpose and forage production should be a secondary consideration. Grassed waterways are applicable only to those areas where rainfall or irrigation provides the moisture needed to grow and sustain a good grass cover. (fig. 7-1)

Grassed waterways are used—

- As outlets for diversions and terraces,
- As outlets for surface and subsurface drainage systems on sloping land,
- To convey water collected by road ditches or discharged through culverts,
- To rehabilitate natural draws carrying concentrations of runoff.

Requirements for Use

To ensure satisfactory performance of a vegetated waterway, prepare the area so that conditions are favorable for vegetative growth. Waterways subject to constant or prolonged flows require special supplemental treatment, such as stone centers or subsurface drains capable of carrying a portion of such flows. A grassed waterway is susceptible to considerable erosion damage until permanent vegetative cover is established. Erosion protection measures such as temporary vegetative cover, mulch, or diversion of runoff may be used to reduce the potential for erosion damage. After establishment, protective vegetative cover must be maintained.

The waterway may be protected by using a combination of the following steps that best fits the needs of the site:

1. Use stable natural waterways where possible.
2. Reduce the required capacity by dividing the runoff between two or more waterways.
3. Construct and vegetate the waterway before any other channels or structures are allowed to discharge into it.
4. Carry prolonged low flows in a subsurface drainage system or in a surface-protected section such as a stone center.
5. Design the waterway for stability under conditions of bare soil or sparse vegetation.
6. Establish the vegetative cover according to recommended techniques such as the following:
   a. Protect the channel seeding with clean mulch such as stubble, straw, hay, jute netting, and tie down materials; or strawbales, fabric, or silt fences.
   b. Sod the channel.
   c. Use supplemental irrigation on the new seeding or sodding to hasten establishment.
   d. When possible, divert major flows from the waterway during establishment period.
7. Maintain vegetative cover by mowing, spraying, fertilizing, and performing other maintenance as needed.

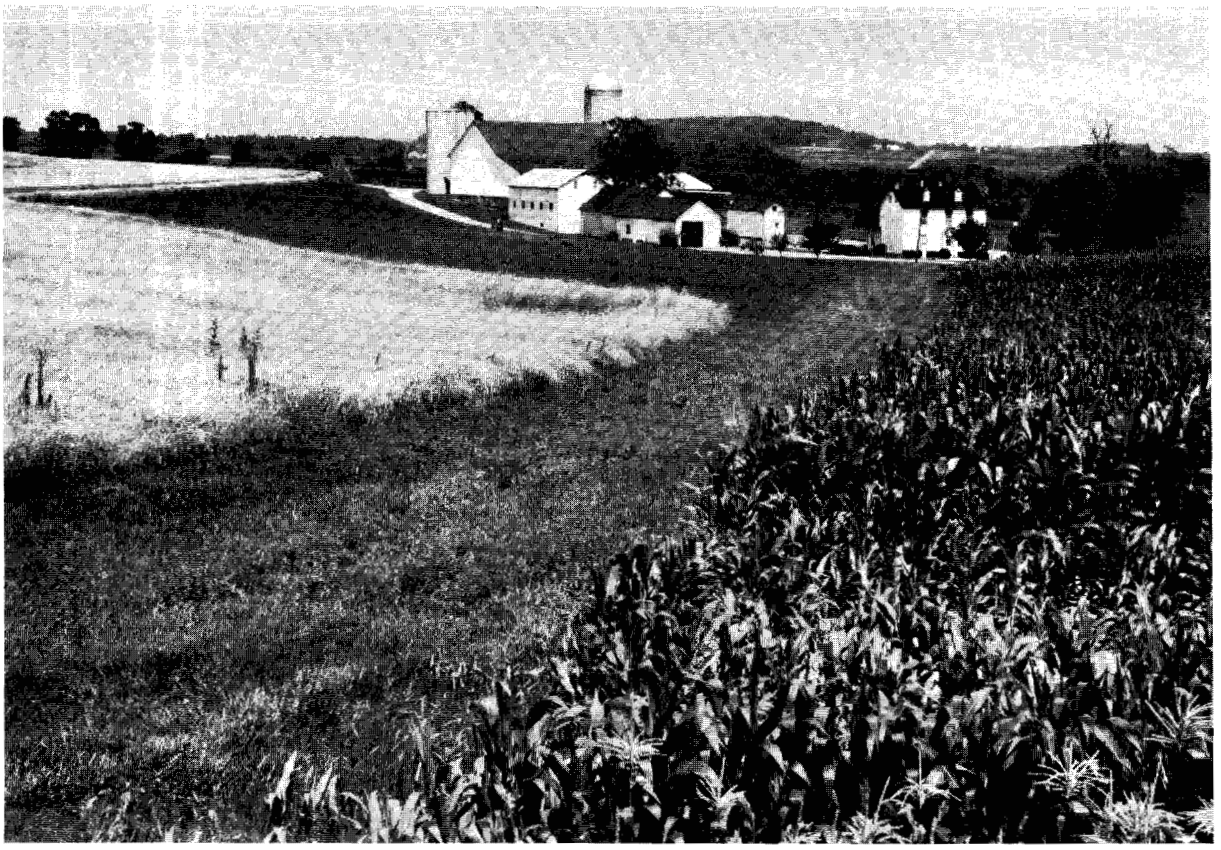


Figure 7-1.—Typical waterways.

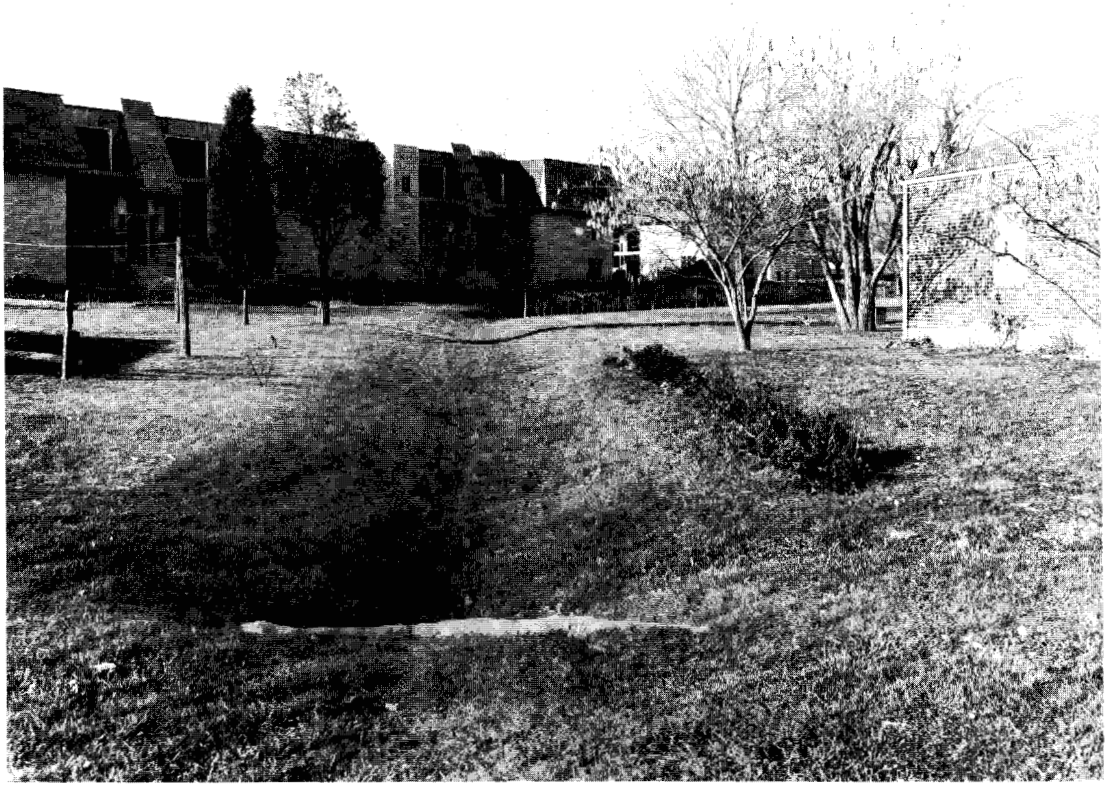


Figure 7-1.—Typical waterways (continued).

Planning Considerations

A preliminary site investigation is recommended to determine the feasibility of using a natural watercourse or constructing a waterway. Such a survey includes the study of resource information such as soil maps, aerial photography, and contour maps; visual examination of potential alignment; occasional survey shots with a hand level or dumpy level; and estimating capacity from past work experience. A preliminary investigation should provide enough information to select a final alignment. If possible, consider more than one location and select the most practical, aesthetic, and least damaging alternative. Consider outlet conditions, topography, vegetation, land use, cultural activites, visual quality, soil type, length of slope, and natural features.

The location of waterways is important to a good program of erosion and sediment control. Wherever possible, the natural drainage system should be preserved and used. Waterways should generally be located in natural drainageways where water can drain in from all sides. Moisture conditions and soil fertility are usually best in such areas for establishment of vegetation. Other advantages of natural waterways include:

1. Flattest grade in the immediate area.
2. Most stable waterway conditions.
3. Adequate capacity.
4. Sufficient depth for outletting diversions, terraces, and rows or grade.

A natural waterway may need to be selectively cleared, shaped, or enlarged to accommodate the increased flow delivered to it by terraces and diversions. It also must be checked to insure stability. Natural waterways that are providing important woody wildlife cover and are not seriously eroding should not be disturbed.

Waterways can also be located along development boundaries, road rights-of-way, property lines, or along storm sewer center lines. Special precautions should be taken when waterways start or end near property lines. Care must be taken to prevent sediment from damaging lower or downstream properties. If the upper or upstream end is near a property, the transition must be stable to prevent erosion or degradation of neighboring land.

Avoid placing waterways where there are sharp, unnatural changes in flow direction. Land management systems should be planned to conform to natural land features. The location of the alignment should not pose a threat to important landscape elements such as unique trees, geologic formations, or scenic features. The slope of the waterway should not interfere with adjacent land uses. Shallower and broader designs usually blend in better and are less disruptive.

If buried utilities cross the proposed alignment, contact the utility companies to determine the exact location of underground services and analyze compatibility.

In lieu of a constructed or natural channel, an adjoining pasture or meadow strip may be used. The surface of such areas should be checked, however, to ensure that uniform surface and adequate width are available to spread the flow, and that the type and density of vegetation are adequate to withstand the expected velocities.

An area of land parallel to a field boundary should be used for the waterway if available. One advantage of this location is that the waterway is less likely to be damaged by farm equipment. Such a location often requires the construction of a channel to—

1. Provide an outlet for terraces or diversions that cannot be extended to a natural draw.
2. Provide an outlet away from buildings or other critical areas.
3. Avoid the use of a gullied natural draw that would be impractical to stabilize, especially those with large watersheds.

The use of public road ditches for the disposal of water should be in conformance with the policy of the local highway authority and the Soil Conservation Service. Where a field road crosses a waterway, consideration should be given to providing a culvert, bridge, or lining to protect the waterway from resulting damage.

All waterways should have stable outlets with adequate capacity for the designed flow. The outlet may be another grassed waterway, an earth ditch, a structure, or other suitable outlet. In all cases, the outlet must discharge in a manner that prevents erosion. Outlets should be constructed and stabilized before the waterway is used. Applicable state laws and local ordinances and regulations must be observed in locating waterways and outlets.

A successful grassed waterway depends on good conservation treatment of the contributing watershed and a regular maintenance program. The better the erosion control in the watershed, the less

silting there will be in the waterway. Good conservation practices also reduce the peak rate of runoff and the volume of water to be carried by the waterway. When good conservation treatment of the drainage area is not obtained, greater maintenance is usually required.

Engineering Surveys

Surveys for waterways normally consist of sample field notes for waterway design, layout, and construction as shown in Technical Release Number 62. These notes are satisfactory when drainage areas are small, topography is relatively uniform, and elevations with respect to other structures are not significant. Standard forms or data sheets approved for field offices may be used to record field notes.

Survey information should include consideration of outlet conditions, topography, vegetation, land use and cultural patterns, soil type, length of slope, and other built or natural features significant to design (fig. 7-2). Determine the types of soil textures that will be encountered along the alignment of waterways to be constructed. Soil textures are needed to determine retardance for permissible velocities and channel capacities.

A profile and cross section of the original ground surface should be exhibited in enough detail to permit dividing the waterway into reaches of approximately uniform slope and shape. For typical profile and cross section survey notes, see Chapter 1 of this manual.

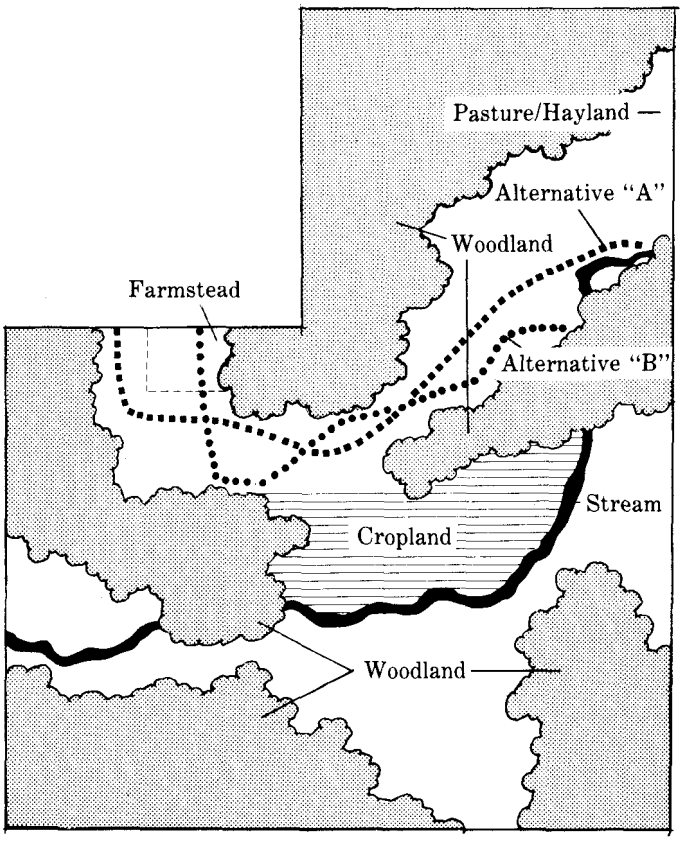


Figure 7-2.—Site survey information.

Hydrologic Investigations

Information on the watershed area, design storm frequency and duration, and runoff estimates are important in determining the capacity of a waterway. The drainage area divides can be determined by field inspection, or by using a stereoscope on aerial photographs and then sketching the drainage area divides on the photographs for measurement.

Determine the watershed area at the outlet of the waterway and at other points where it may be desirable to change the grade or cross section. Calculate the runoff in cubic meters per second (cubic feet per second), at each design point, for the frequency and duration of storm selected. Refer to Chapter 2 of this manual for the procedure.

General

A constructed waterway is designed to carry the estimated flow without damage to the waterway or its lining. Waterways should be planned and designed to fit the conditions of a particular site. Commonly needed for designing a waterway is information about the following:

1. Watershed area, in hectares (acres), together with the soil characteristics, cover, and topography. This information is used to estimate runoff by the procedures set forth in Chapter 2 of this manual.
2. Grade of the proposed waterway in percent.
3. Proposed vegetative cover suitable for site conditions.
4. Erodibility of the soil in the waterway.
5. Expected height at which vegetative cover will be maintained.
6. The permissible velocity for the conditions encountered.
7. Allowance for space that will be occupied by the vegetative lining.
8. Allowance for freeboard, if required by local standards and specifications.
9. A stable starting and ending point.
10. Existing vehicular or pedestrian circulation patterns that may influence alignment or cross section.
11. Unique landscape features that will affect alignment or other components of design.

Waterways are frequently planned for areas where the slope is variable and where there is a wide difference in the watershed area at various points along the channel. In such cases, the waterway is designed in reaches. A reach is generally a portion of the watershed having a near-uniform slope and drainage area. A point of significant break in slope is a point of division between two reaches. The point of entrance of a diversion or other tributary where the watershed area is significantly increased also may be a point of division between two reaches. Where there is a significant difference in velocity or capacity between adjoining reaches, it may be necessary to install a transition section between them.

Sometimes for ease of layout, construction, and maintenance, the width of the waterway is kept constant and the depth varied to provide required design capacities. However, equipment-crossing requirements must be considered.

When the limits of two or more reaches have been determined, each reach is designed separately by procedures given in subsequent paragraphs.

Vegetative linings vary in their protective ability according to type, density, and height. Therefore, safe velocities under various conditions are a matter of careful consideration.

Velocities

Waterways should be planned and designed to fit the conditions of a particular site. The design of a grassed waterway is complicated because the value for "n" varies with different grass linings. Tests show that vegetation tends to bend and oscillate under the influence of velocity and depth of flow. Thus, the retardance to flow varies as these factors change.

Research has shown that in both large and small waterways, or those of different cross-sectional shape and bed slope, and with different vegetative covers, the retardance coefficient "n" (Manning's coefficient of roughness) varies with VR. See exhibit 7-1, page 7-17. VR is the product of velocity and the hydraulic radius. This relationship will be referred to as the "n-VR relationship," which is the recommended basis for grassed channel design.

The five general retardance curves, designated as A, B, C, D, and E in exhibit 7-1, page 7-17, have been developed for various cover conditions. The vegetal conditions under which the various retardances apply are shown in exhibit 7-2, page 7-18. These cover classifications are based on tests performed in experimental channels when the vegetation was green and generally uniform.

Most of the vegetation used in waterways does not exceed 45 cm (18 in) in height and may be much shorter at times during the year. Therefore, it is recommended that when designing the waterway for safe velocity, a retardance no greater than D be used. After the waterway is designed for safe velocity, it must be checked for capacity to accommodate the peak flow under conditions where vegetation gives the highest retardance. The retardance used in this instance is the curve corresponding to the expected vegetal cover and, in most cases, it will be retardance C, though curves B and A may be used where considered appropriate.

On urban and recreational developments, vegetation is generally maintained at a low height of 25 to 50 mm (1 to 2 in), such as for a lawn or turf. A retardance value of E should be used under these conditions.

All pertinent design data and computations shall be recorded.

In designing grassed waterways, care must be taken to ensure that the design velocity is within the limits of permissible velocities for the soil conditions given in exhibit 7-3, page 7-19. These values apply to average, uniform stands of each type of cover.

Erosion-resistant soils are cohesive (clayey) fine-grained and coarse-grained soils that have cohesive fines and a plasticity index of 10 to 40. Unified soil classifications include CL, CH, SC, and GC. Easily eroded soils do not meet the requirements for erosion-resistant soils. Easily eroded soils do not meet the requirements for erosion-resistant soils. Erosion resistance is also affected by soil density. Some soils such as dispersed clays and nonplastic fine silty sands may be so erosive that successful grassed waterways cannot be constructed.

The prevailing range of maximum permissible velocities used for design is from 0.8 to 2.4 m/s (2.5 to 8.0 ft/s). The maximum permissible velocity will be determined by individual site conditions:

1. A velocity of 0.9 m/s (3.0 ft/s) should be the maximum if, because of shade, soils, or climate, only a sparse cover can be established or maintained.
2. A velocity of 0.9 to 1.2 m/s (3.0 to 4.0 ft/s) should be used under normal conditions if the vegetation is to be established by seeding.
3. A velocity of 1.2 to 1.5 m/s (4.0 to 5.0 ft/s) should be used only in areas if a dense, vigorous sod is obtained quickly or if water can be diverted out of the waterway while the vegetation is being established.
4. A velocity of 1.5 to 1.8 m/s (5.0 to 6.0 ft/s) may be used on well-established, good-quality sod. Special maintenance may be required.
5. A velocity of 1.8 to 2.4 m/s (6.0 to 8.0 ft/s) may be used only on established, excellent quality sod, and only under special circumstances in which the flow cannot be handled at a lower velocity. Under these conditions, special maintenance and appurtenant structures will be required.

If the vegetative lining is supplemented by stone centers, or other erosion-resistant materials, the velocity given in exhibit 7-3 may be increased by

0.06 m/s (2.0 ft/s) or in accordance with local technical guides.

Channel Cross Section

Vegetated waterways may be built in a parabolic, trapezoidal, "V," or "W" shape. Parabolic waterways are the most common and generally are the most satisfactory. This shape is ordinarily found in nature. Small flows are less likely to meander. Most waterways constructed with a trapezoidal section tend to revert to a parabolic cross section. A modified trapezoidal cross section with the bottom center constructed 0.09 to 0.15 m (0.3 to 0.5 ft) lower than the edges is sometimes used on wide waterways. The cross section should be designed to permit easy crossing by equipment where necessary. Typical waterway cross sections are shown in figure 7-3. The "W" shape is sometimes used on flat land so spoil can be placed in the center section. Other uses of "W" shape are to divide flows and to provide a roadway in the center section.

The shape selected should be compatible with surrounding landform and landscape characteristics. Side slopes may be varied to better balance cut and fill and to add visual diversity.

Capacity

Waterways are constructed to discharge the peak flow expected from at least a 10-year frequency, 24-hour duration storm, as estimated in accordance with Chapter 2. Out-of-bank flow may be permitted on land slopes parallel to the channel where the slope is not greater than one percent and where it is evident that no erosion damage or serious property damage will result. In every case it is necessary to provide adequate capacity and safe velocities in accordance with site conditions.

Exhibits 7-4, pages 7-20 through 7-33, and 7-5, pages 7-34 through 7-47, have been prepared to simplify the determination of waterway size for given site conditions. The tables conform to the principles outlined in SCS-TP-61, "Handbook of Channel Design for Soil and Water Conservation." Programmable calculators can be used instead of exhibits 7-4 and 7-5 if appropriate software is available.

Grades

Grades should be selected to meet velocity, capacity, and lining requirements. When permanently vegetated waterways are used in developments to manage or convey storm water, the grade of the channel should be such as to minimize standing water or wetness problems.

Stability

Consider the possible future conditions of the vegetative lining based upon natural succession and maintenance. In some cases the expected stand of vegetation is not attained, or frequently it will deteriorate under normal maintenance. Therefore, it is necessary to check the waterway design for stability against erosion.

Channel Lining

Vegetative channel linings should be established as soon as possible after construction. Any of the following will help achieve this:

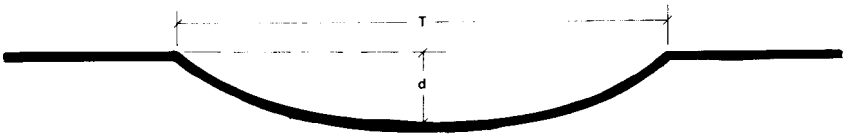
1. Establish vegetative cover by sodding part or all of the waterway channel.
2. Use mulch on all waterway seedings.
3. Irrigate sod or seedings as needed.

On sites where it is impossible to establish suitable permanent vegetation, or it is desired to determine the stability of the channel in an as-constructed condition, the design can be based on bare ground conditions. Site conditions may warrant designing the waterway with a structural lining.

Linings should be designed for capacity and stability in accordance with the principles given in the Handbook for Channel Design (SCS-TP-61) by use of Manning's velocity equation given in Chapter 3 or by other approved procedures.

Perforated concrete blocks may be used as structural lining in residential, commercial, or recreation areas where aesthetics, safety, maintenance, and rodent populations are primary design factors. First introduced as cellular concrete blocks by SCS in the 1950's, the improved versions are now referred to generally as "grid pavers." Designed to carry heavy loads and allow turf to grow within the cells, their use is becoming more widespread as an alternative to conventional pavement surfaces or rock riprap (See figure 7-4).

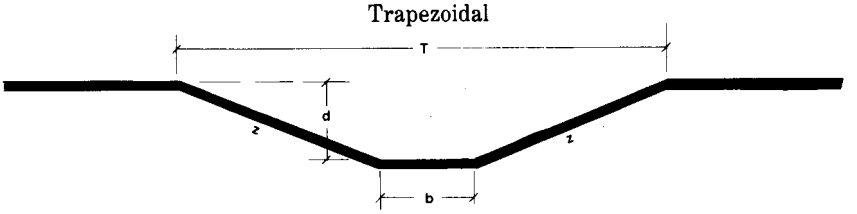
Parabolic



Cross-sectional area (A) = 2/3 Td

Design top width (T) = $\frac{1.5A}{d}$

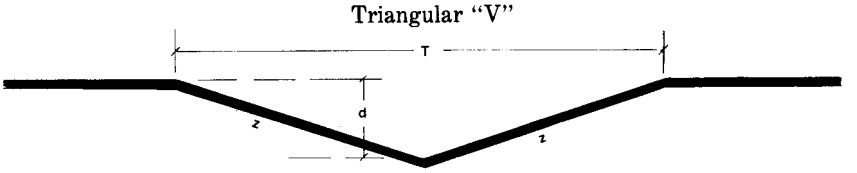
Trapezoidal



Cross-sectional area (A) = $bd + zd^2$

Design top width (T) = b + 2dz

Triangular "V"



Cross-sectional area (A) = zd^2

Design top width (T) = 2dz

d = design depth
b = design bottom width
z = side slope ratio

Figure 7-3.—Typical waterway cross sections.

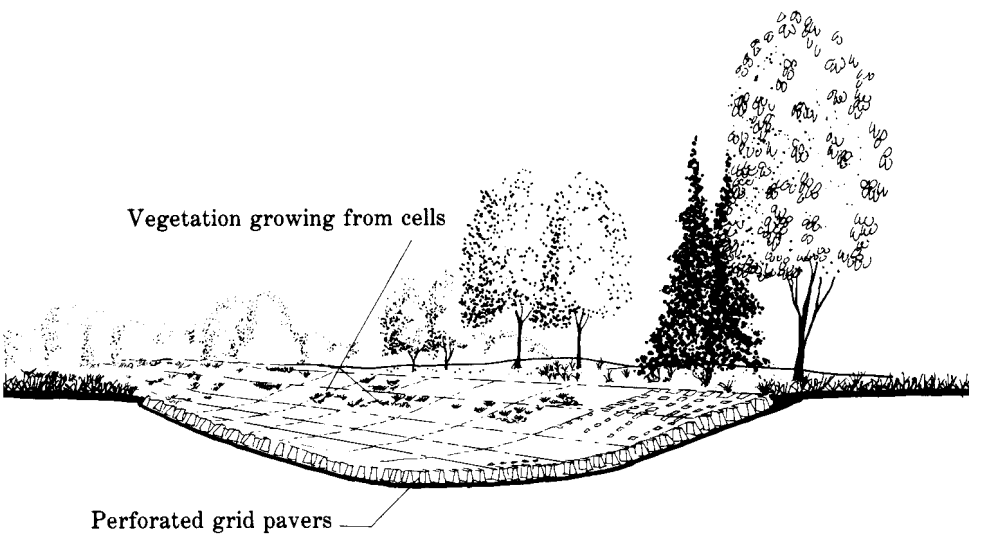


Figure 7-4.—Cross section showing perforated gird pavers.

Appurtenant Structures

Effective vegetated waterways, are not subjected to low flows of long duration nor kept wet for long periods. Subsurface drains, underground outlets, stone center drains, or other means of providing drainage and protecting the center of the waterway should be considered where low flows or wet conditions are prolonged.

Subsurface Drains

Subsurface drains should parallel the center of the vegetated waterway but be offset from the centerline at least one-fourth of the top width of the waterway. Two drains may be required in some cases, one on each side of the center. The principles outlined in Chapter 14 of this manual should be followed in designing and installing the subsurface drains. The subsurface drains may be outletted through a drop structure at the end of the waterway or through a standard pipe outlet.

Underground Outlets

Underground outlets can be used to carry prolonged low flows. Buried conduits with surface inlets are frequently used downstream of highway culverts or other locations where low flows are concentrated. Blind inlets are sometimes used, but they frequently become a maintenance problem.

Stone Center Drains

In areas where field stones or other sources of rock are plentiful, a stone center drain may be the best solution to problems of prolonged flow and wetness. A gravel bedding or filter fabric is commonly used under the rock to prevent erosion of the underlying soil. These drains are installed as shown in figure 7-5. An alternate cross section would have a stone center that could carry the flow from a 1-year, 24-hour event. Required stone size in relation to grade of waterway and depth of flow can be determined from the nomograph, exhibit 7-6, page 7-48.

Steps in the Design of a Waterway

1. Plan the location of the waterway centerline that minimizes impacts.
2. Select design points along the waterway where grades change or drainage areas and type of lining change significantly.
3. Determine the watershed area for the points in step 2 and for the outlet.
4. Find the peak runoff produced by the design storm.
5. Determine the slope of the channel from the topographic map, profiles, or cross sections.
6. Select the appropriate channel cross section and the type of channel protection to be used—bare, vegetated, or lined.
7. Design the channel for stability by selecting the maximum permissible velocity (exhibit 7-1).

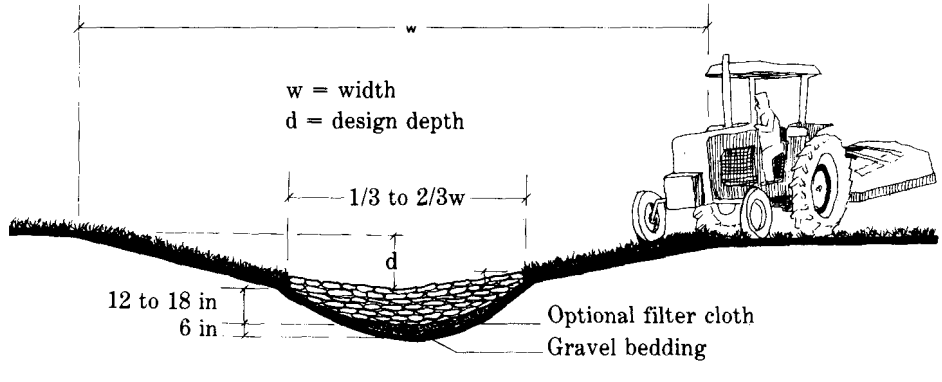


Figure 7-5.—Waterway with stone center.

8. Design the channel for adequate capacity using Manning's formula.
9. Design a system to adequately dispose of base flow and to keep the channel or lining well drained.
10. Select depth of waterway from exhibit 7-4 or 7-5.

The dimensions given by exhibits 7-4 and 7-5 are the minimums required to carry the actual flow. These tables do not include a factor for extra depth required for space occupied by sedimentation or freeboard. Where local standards require such factors, they should be added to the dimensions given in these tables. It is important that the depth be adequate to permit unimpeded discharge from terraces, diversions, and crop rows.

Permanent waterway channels should be protected from sediment. If sediment is not controlled before it reaches the waterway, several methods may be used, including the following:

1. Installing a vegetation filter strip on each side of the waterway where surface water enters.
2. Increasing the depth and channel width to store trapped sediment.
3. Providing for clearing out the channel when its design capacity deteriorates.

Example of Parabolic Waterway Design

The following example demonstrates how to use the exhibits to design a parabolic channel.

Problem—

Determine the permissible velocity and dimensions for stability and capacity for a waterway with parabolic cross section.

Given—

Runoff: Q = 1.6 m^3/s (55 ft^3/s)
Grade: 5 percent
Vegetative Cover: Kentucky Bluegrass
Soil: Easily eroded.

Condition of Vegetation—

Good stand—After cutting to 50-mm (2-in) height: D curve retardance (from exhibit 7-2)
Good stand—Headed 150 mm to 300 mm (6 in to 12 in): C curve retardance (from exhibit 7-2)
Maximum Permissible Velocity—V_1: 1.2 m/s (4.0 ft/s) (from exhibit 7-3)

Horizontally opposite 1.6 m^3/s (55 ft^3/s) in exhibit 7-4 (5 percent slope) in the columns headed V_1 = 1.2 m/s (4.0 ft/s), find T = 10.4 m (34.1 ft), D = 0.2 m (0.7 ft), and V_2 = 1.0 m/s (3.3 ft/s). Therefore, a waterway with a parabolic cross section, a top width of 10.4 m (34.1 ft), and a depth of 0.2 m (0.7 ft) will carry 1.6 m^3/s (55 ft^3/s) at a maximum velocity of 1.2 m/s (4 ft/s) when the vegetative lining is short, 50 mm to 100 mm (2 in to 4 in) in height, and 1.0 m/s (3.3 ft/s) when vegetative lining is tall, 150 mm to 300 mm (6 in to 12 in). This complies with the requirements for safe velocity when vegetation is short (D retardance) and for capacity when vegetation is tall (C retardance).

If a stone center is used, the maximum permissible velocity can be increased to 1.8 m/s (6 ft/s). In time, stone center waterways usually become vegetated; so, for practical design purposes, the same retardance values in the preceding example can be used and dimensions changed to T = 4.8 m (15.9 ft) and d = 0.3 m (0.9 ft).

If the waterway must be crossed by farm equipment and other forms of traffic, consideration should be given to the need for increased width (fig. 7-6). Large combines, pickers, sprayers, and similar equipment may require a significant increase in width over that needed for hydraulic capacity and freeboard. This problem deserves consideration so that the proper modifications are made in waterway width and side slopes to meet the needs of equipment common to the locality. Where paved channels are to be crossed, the lining must be designed to carry the expected loads. Culverts or bridges of adequate capacity may also be used.

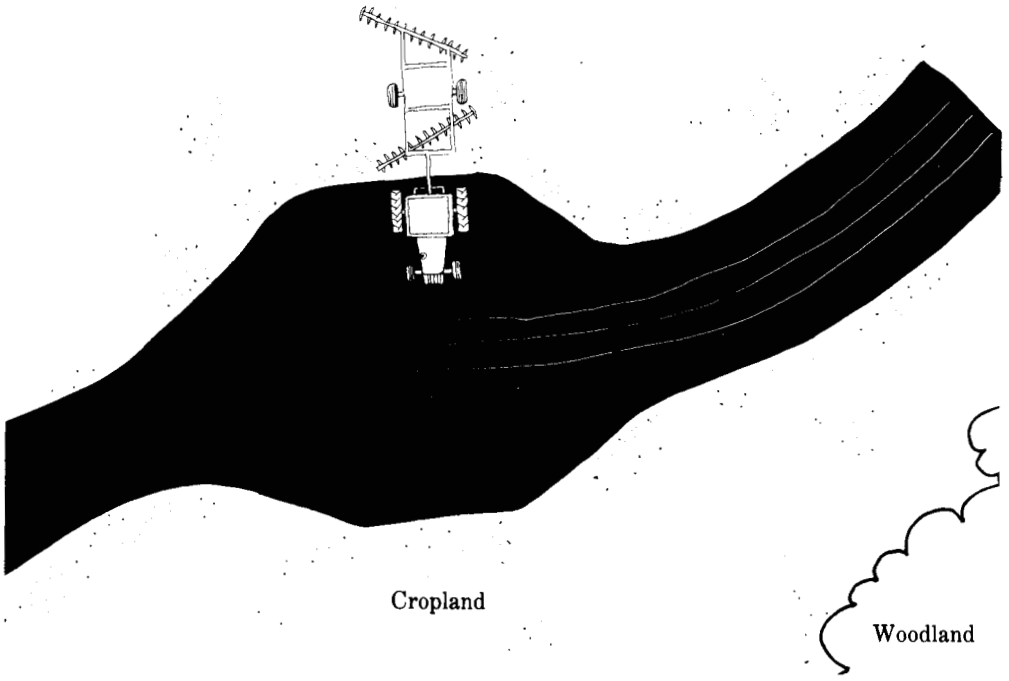


Figure 7-6.—Waterway crossing.

Layout

The layout of the waterway should begin at a key point. Usually, this is the outlet, but it may be a point determined by a building, property boundary, gully, or other landscape feature.

Adjustment and Marking

After the centerline has been staked, check and move some stakes, if necessary, to avoid landscape features or to improve alignment. The waterway should then be staked for construction. Mark all existing vegetation (trees, shrubs, etc.) and other landscape features to be protected during construction.

Construction

Site Preparation

A good time to build waterways is when the site has a good cover so that runoff and silting will be at a minimum. All debris and vegetation not marked for retention should be removed from the site and disposed of in such a manner that does not adversely affect the environment or proper function of the waterway. For typical design and construction survey notes see Chapter 1 of this manual.

Excavation

The soil removed from the waterway should be deposited where it will not interfere with the flow of water into the waterway. Normally, the soil can be shaped and graded to fill low spots in the nearby fields or mounded to create visual interest and screening or to reduce noise and control wind.

The topsoil may be saved and spread in the constructed waterway if necessary for obtaining a good vegetative cover. Where this is done, the waterway should be overexcavated to allow for replacement of the topsoil without encroaching on the design cross section.

Equipment

Many kinds of farming and construction equipment are adapted to the construction of waterways. However, it may be necessary to use equipment that will load and transport the excavated material to locations where it is needed, such as low spots in the surrounding field or washes in the waterway. Although scrapers that can be pulled by farm tractors are satisfactory for waterway construction, large self-propelled scrapers, bulldozers, and motor graders are the preferred equipment.

Appurtenant structures

Special features such as subsurface drains, underground outlets, stone center drains, drop structures, energy dissipators, and traffic crossings should be installed as designed.

Establishment of vegetation

If vegetation is to be used for erosion protection, it should be established as soon after construction as weather conditions permit. (Check technical guide for local planting dates.) Prepare a seedbed and seed with a mixture of grasses and legumes adapted to soil conditions and local climate. Most excavated areas will require fertilizers to establish good cover. If weather conditions are not favorable for permanent seeding, it may be necessary to use a temporary seeding, mulch, or lining. Irrigation may be needed to assure adequate germination and growth initially. If an immediate turf cover is desired or if it is difficult to establish turf from seed, it may be necessary to use sod. Sodding by sprigging or broadcasting root stalks and stolons give good results with bermudagrass and other grasses in favorable climates. In other areas, direct planting of sod in strips is practical. Woody plantings may be appropriate on channel back slopes to improve screening, wildlife habitat, space definition, and climate control (fig. 7-7). Check technical guides for tree planting dates.

Mulching materials such as straw, hay, jute, paper, or plastic mesh should be used to protect new

seeding. At least the center-third portion of the cross section should be anchored. If temporary seedings or nurse crops are used, they should be mowed to reduce competition to permanent seeding. All seeding, planting, sodding, and mulching should conform to standards as given in the local technical guide.

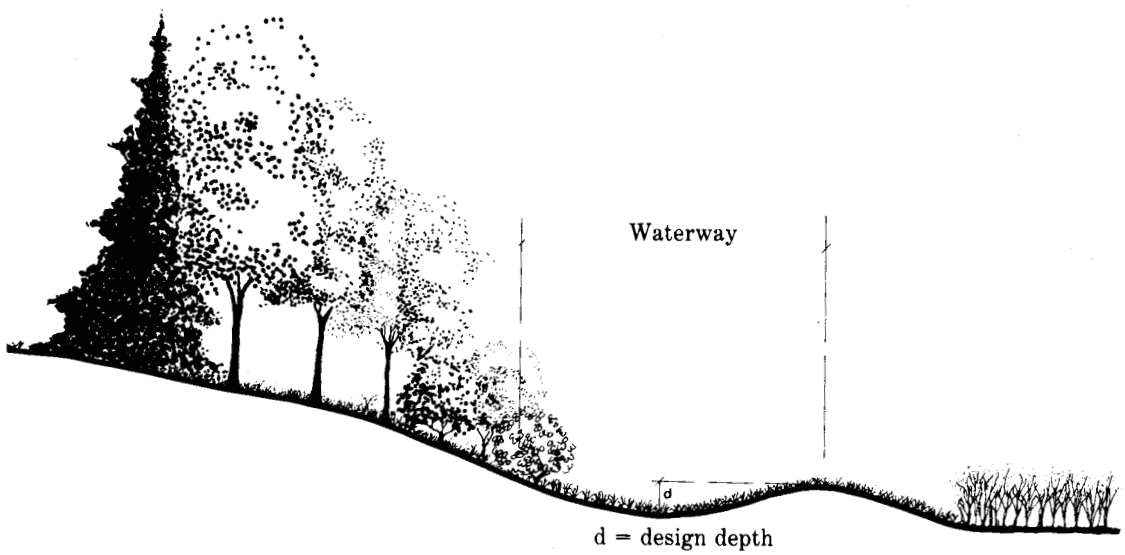


Figure 7-7.—Woody vegetation on back slope.

General

Timely maintenance is important for keeping a waterway in good working condition. Recommended maintenance generally requires mowing of waterways and removing vegetation so as not to retard water flow and cause excessive sedimentation in the channel. Timely mowing is critical for wildlife. The cool season grasses typically should be fertilized for hay production, while the native grasses may not need fertilizer. Very often herbicides in field runoff can kill introduced grass species, while native grasses may not be affected as much by this problem. Grazing, if permitted, should be rigidly controlled. Livestock should be excluded during wet periods. Vehicular traffic should be excluded except at designated crossings.

Removal of Sediment

The waterway channel may require maintenance to remove small sediment deposits. However, if the deposit extends over long reaches or for the full length of the waterway, the channel should be reconstructed by use of appropriate construction equipment. Sediment should be used onsite or disposed of properly.

Repair Work

Eroded areas or damage to lining materials should be repaired promptly. This will prevent or reduce further degradation of the waterway system.

The transition section of waterway outlets is the most susceptible to erosion damage. Repairs should be made promptly to prevent gullying from advancing up the waterway channel. If vegetation proves inadequate in the transition section, it may be necessary to line this section of channel or construct a grade stabilization structure.

If the outlet is under ground, it is important to keep it free of trash that may plug it and cause failure.

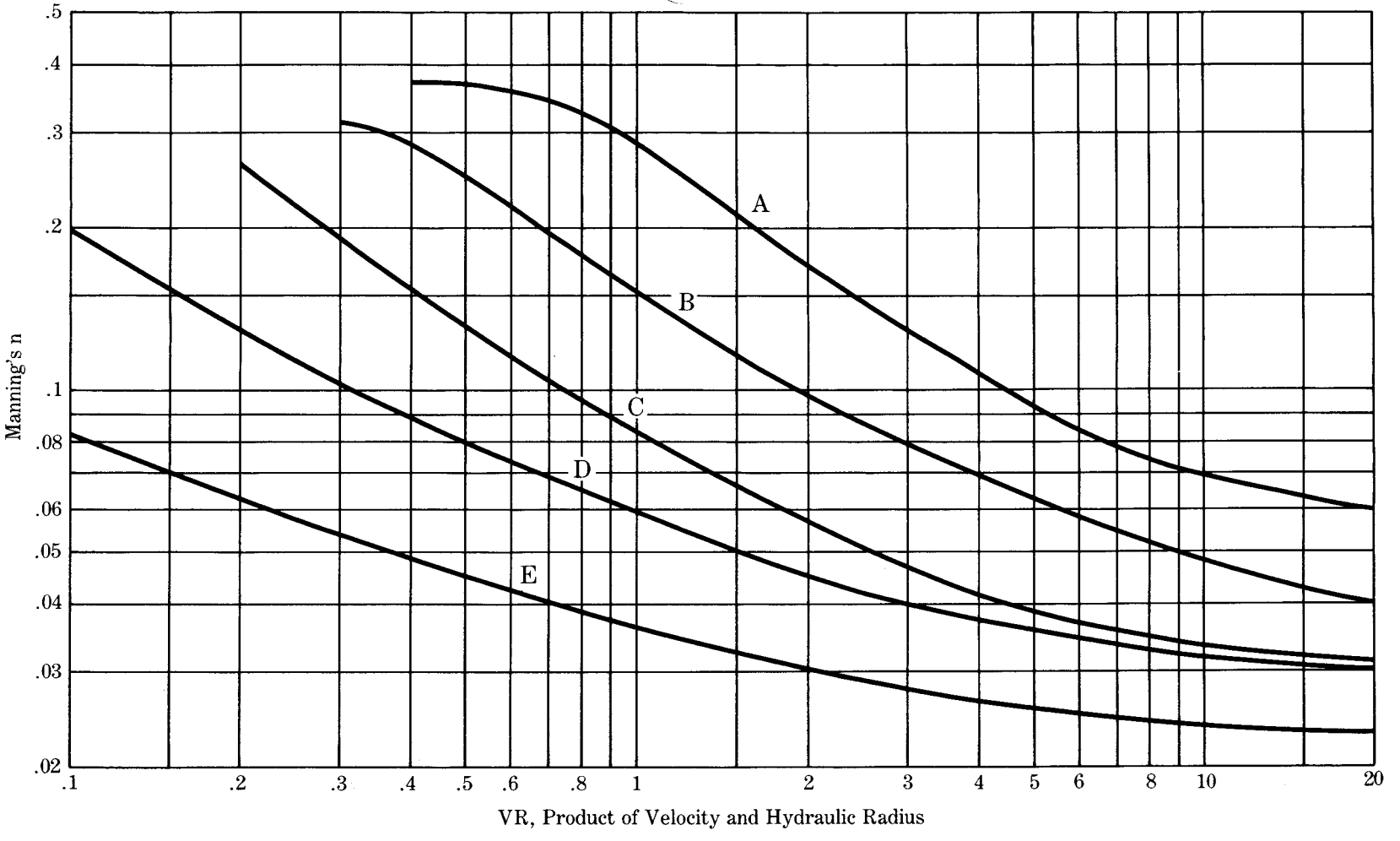


Exhibit 7-1.—Manning's "n" related to velocity, hydraulic radius, and vegetal retardance. (Ref: SCS-TP-61, Handbook of Channel Design for Soil and Water Conservation).

Retardance	Cover	Condition
A	Weeping lovegrass	Excellent stand, tall (average 30 inches)
	Reed canarygrass or Yellow bluestem ischaemum	Excellent stand, tall (average 36 inches)
B	Smooth bromegrass	Good stand, mowed (average 12 to 15 inches)
	Bermudagrass	Good stand, tall (average 12 inches)
	Native grass mixture (little bluestem, blue grama, and other long and short midwest grasses	Good stand, unmowed
	Tall fescue	Good stand, unmowed (average 18 inches)
	Sericea lespedeza	Good stand, not woody, tall (average 19 inches)
	Grass-legume mixture—Timothy, smooth bromegrass, or orchardgrass	Good stand, uncut (average 20 inches)
	Reed canarygrass	Good stand, uncut (average 12 to 15 inches)
	Tall fescue, with birdsfoot trefoil or ladino clover	Good stand, uncut (average 18 inches)
	Blue grama	Good stand, uncut (average 13 inches)
C	Bahiagrass	Good stand, uncut (6 to 8 inches)
	Bermudagrass	Good stand, mowed (average 6 inches)
	Redtop	Good stand, headed (15 to 20 inches)
	Grass-legume mixture—summer (orchardgrass, redtop, Italian ryegrass, and common lespedeza)	Good stand, uncut (6 to 8 inches)
	Centipedegrass	Very dense cover (average 6 inches)
	Kentucky bluegrass	Good stand, headed (6 to 12 inches)
D	Bermudagrass	Good stand, cut to 2.5-inch height
	Red fescue	Good stand, headed (12 to 18 inches)
	Buffalograss	Good stand, uncut (3 to 6 inches)
	Grass-legume mixture—fall, spring (orchardgrass, redtop, Italian ryegrass, and common lespedeza)	Good stand, uncut (4 to 5 inches)
	Sericea lespedeza or Kentucky bluegrass	Good stand, cut to 2-inch height. Very good stand before cutting
E	Bermudagrass	Good stand, cut to 1.5-inch height
	Bermudagrass	Burned stubble

Exhibit 7-2.—Classification of vegetation cover as to degree of retardance.

Cover	Slope range[2]	Permissible velocity[1] Erosion resistant soils[3]	Easily eroded soils[4]
	percent	*m/s (ft/s)*	*m/s (ft/s)*
Bermudagrass	<5	2.43 (8)	1.82 (6)
	5-10	2.13 (7)	1.22 (4)
	over 10	1.82 (6)	0.91 (3)
Bahiagrass Buffalograss Kentucky bluegrass Smooth brome Blue grama Tall fescue	<5	2.13 (7)	1.52 (5)
	5-10	1.82 (6)	1.22 (4)
	over 10	1.52 (5)	0.91 (3)
Grass mixture	[2]<	1.52 (5)	1.22 (4)
Reed canarygrass	5-10	1.22 (4)	0.91 (3)
Sericea lespedeza Weeping lovegrass Yellow bluestem Redtop Alfalfa Red fescue	[5]<5	1.06 (3.5)	0.76 (2.5)
Common lespedeza[6] Sudangrass[6]	[7]<5	1.06 (3.5)	0.76 (2.5)

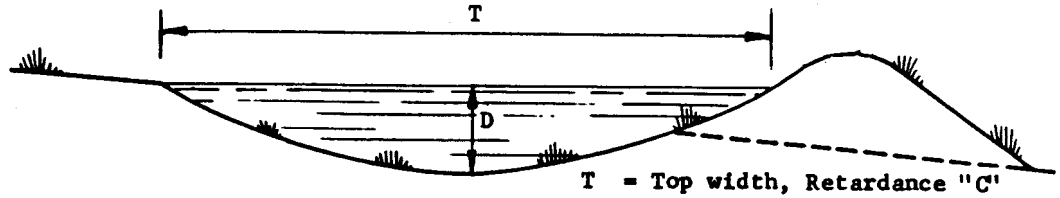
[1]Use velocities exceeding 1.52 m/s(5ft/s) only where good covers and proper maintenance can be obtained.
[2]Do not use on slopes steeper than 10 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
[3]Cohesive (clayey) fine-grain soils and coarse-grain soils with cohesive fines with a plasticity index of 10 to 40 (CL, CH, SC, and CG).
[4]Soils that do not meet requirements for erosion-resistant soils.
[5]Do not use on slopes steeper than 5 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
[6]Annuals—use on mild slope or as temporary protection until permanent covers are established.
[7]Use on slopes steeper than 5 percent is not recommended.

Exhibit 7-3.—Permissible velocities for channels lined with vegetation.

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 0.25 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10																											
15																											
20																											
25	11.0	3.2	1.1																								
30	13.8	3.0	1.1																								
35	16.4	2.9	1.1																								
40	19.0	2.8	1.1																								
45	21.5	2.8	1.1	11.9	3.7	1.5																					
50	24.0	2.8	1.1	14.1	3.4	1.5																					
55	26.5	2.8	1.1	15.8	3.3	1.6																					
60	29.0	2.8	1.1	17.5	3.3	1.6																					
65	31.5	2.7	1.1	19.2	3.2	1.6	11.8	4.4	1.9																		
70	34.0	2.7	1.1	20.8	3.2	1.6	13.7	4.0	1.9																		
75	37.0	2.7	1.1	22.4	3.2	1.6	15.3	3.8	1.9																		
80	39.4	2.7	1.1	24.1	3.2	1.6	16.6	3.7	1.9																		
85	41.9	2.7	1.1	25.7	3.1	1.6	17.9	3.7	1.9																		
90	44.3	2.7	1.1	27.2	3.1	1.6	19.1	3.6	1.9																		
95	46.7	2.7	1.1	28.8	3.1	1.6	20.3	3.6	2.0																		
100	49.2	2.7	1.1	30.4	3.1	1.6	21.5	3.6	2.0																		
105	51.6	2.7	1.1	32.0	3.1	1.6	22.7	3.5	2.0																		
110	54.1	2.7	1.1	33.6	3.1	1.6	23.9	3.5	2.0	14.4	4.8	2.4															
115	56.5	2.7	1.1	35.1	3.1	1.6	25.1	3.5	2.0	15.7	4.6	2.4															
120	59.0	2.7	1.1	36.7	3.1	1.6	26.2	3.5	2.0	17.0	4.4	2.4															
125	61.4	2.7	1.1	38.3	3.1	1.6	27.3	3.5	2.0	17.9	4.3	2.4															
130	63.9	2.7	1.1	39.7	3.1	1.6	28.5	3.4	2.0	18.8	4.3	2.4															
135	66.3	2.7	1.1	41.3	3.1	1.6	29.7	3.4	2.0	19.7	4.2	2.4															
140	68.8	2.7	1.1	43.4	3.0	1.6	30.8	3.4	2.0	20.6	4.2	2.4															
145	71.2	2.7	1.1	44.9	3.0	1.6	32.0	3.4	2.0	21.5	4.1	2.4															
150	73.7	2.7	1.1	46.5	3.0	1.6	33.1	3.4	2.0	22.4	4.1	2.5															



T = Top width, Retardance "C"
D = Depth, Retardance "C"
V_2 = Velocity, Retardance "C"
V_1 = Velocity, Retardance "D"

Note - Depth "D" does not include allowance for freeboard and settlement.

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 0.50 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10																											
15	10.0	2.2	1.0																								
20	13.7	2.1	1.0	8.4	2.7	1.3																					
25	17.4	2.1	1.0	11.3	2.4	1.4																					
30	21.0	2.0	1.0	13.9	2.3	1.4																					
35	24.6	2.0	1.1	16.4	2.3	1.4	10.7	2.8	1.8																		
40	28.5	2.0	1.0	18.9	2.3	1.4	12.6	2.7	1.8																		
45	31.9	2.0	1.1	21.4	2.3	1.4	14.4	2.6	1.8																		
50	35.5	2.0	1.1	23.9	2.2	1.4	16.2	2.5	1.8	9.9	3.4	2.2															
55	39.0	2.0	1.1	26.3	2.2	1.4	17.9	2.5	1.8	11.9	3.1	2.3															
60	42.5	2.0	1.1	28.8	2.2	1.4	19.7	2.5	1.8	13.2	3.0	2.3															
65	46.1	2.0	1.1	31.6	2.2	1.4	21.4	2.5	1.8	14.5	2.9	2.3															
70	49.6	2.0	1.1	34.0	2.2	1.4	23.1	2.5	1.8	15.8	2.9	2.3	11.0	3.6	2.6												
75	53.1	2.0	1.1	36.4	2.2	1.4	24.9	2.5	1.8	17.1	2.8	2.3	12.7	3.4	2.7												
80	56.6	2.0	1.1	38.8	2.2	1.4	26.6	2.5	1.8	18.4	2.8	2.3	13.7	3.3	2.7												
85	60.2	2.0	1.1	41.2	2.2	1.4	28.3	2.5	1.8	19.7	2.8	2.3	14.8	3.2	2.7												
90	63.7	2.0	1.1	43.6	2.2	1.4	30.0	2.4	1.8	20.9	2.8	2.3	15.9	3.2	2.7												
95	67.2	2.0	1.1	46.1	2.2	1.4	31.7	2.4	1.8	22.1	2.8	2.3	16.9	3.1	2.7												
100	70.8	2.0	1.1	48.5	2.2	1.4	33.7	2.4	1.8	23.4	2.8	2.3	17.9	3.1	2.7	12.3	3.9	3.1									
105	74.3	2.0	1.1	50.9	2.2	1.4	35.4	2.4	1.8	24.5	2.7	2.4	18.9	3.1	2.7	13.7	3.7	3.1									
110	77.8	2.0	1.1	53.3	2.2	1.4	37.1	2.4	1.8	25.8	2.7	2.4	19.9	3.1	2.7	14.6	3.6	3.1									
115	81.4	2.0	1.1	55.7	2.2	1.4	38.7	2.4	1.8	27.0	2.7	2.4	20.8	3.0	2.7	15.4	3.6	3.1									
120	84.9	2.0	1.1	58.1	2.2	1.4	40.4	2.4	1.9	28.2	2.7	2.4	21.8	3.0	2.7	16.3	3.5	3.1									
125	88.4	2.0	1.1	60.6	2.2	1.4	42.1	2.4	1.9	29.4	2.7	2.4	22.8	3.0	2.7	17.1	3.5	3.1									
130	92.0	2.0	1.1	63.0	2.2	1.4	43.8	2.4	1.9	30.6	2.7	2.4	23.8	3.0	2.7	17.9	3.5	3.1									
135	95.5	2.0	1.1	65.4	2.2	1.4	45.4	2.4	1.9	31.8	2.7	2.4	24.8	3.0	2.7	18.7	3.4	3.2									
140	99.0	2.0	1.1	67.8	2.2	1.4	47.1	2.4	1.9	33.1	2.7	2.4	25.7	3.0	2.8	19.4	3.4	3.2									
145	102.6	2.0	1.1	70.2	2.2	1.4	48.8	2.4	1.9	34.3	2.7	2.4	26.7	3.0	2.8	20.2	3.4	3.2	13.5	4.4	3.6						
150	106.1	2.0	1.1	72.6	2.2	1.4	50.5	2.4	1.9	35.5	2.7	2.4	27.7	3.0	2.8	21.0	3.4	3.2	14.4	4.3	3.6						

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 0.75 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10	8.3	1.9	1.0																								
15	12.9	1.8	1.0	8.4	2.1	1.3																					
20	17.4	1.7	1.0	11.6	2.0	1.3	7.2	2.6	1.6																		
25	22.2	1.7	1.0	14.8	1.9	1.3	10.0	2.2	1.7																		
30	26.6	1.7	1.0	17.9	1.9	1.3	12.3	2.1	1.7	7.7	2.9	2.0															
35	31.0	1.7	1.0	20.9	1.9	1.4	14.5	2.1	1.7	10.0	2.5	2.1															
40	35.4	1.7	1.0	23.9	1.9	1.4	16.7	2.1	1.7	11.8	2.4	2.1															
45	39.8	1.7	1.0	27.3	1.8	1.3	18.9	2.1	1.7	13.5	2.3	2.2	8.9	3.0	2.6												
50	44.2	1.7	1.0	30.3	1.8	1.3	21.1	2.0	1.7	15.1	2.3	2.2	10.7	2.7	2.6												
55	48.7	1.7	1.0	33.3	1.8	1.3	23.3	2.0	1.7	16.7	2.3	2.2	12.1	2.6	2.6												
60	53.1	1.7	1.0	36.3	1.8	1.4	25.5	2.0	1.7	18.4	2.3	2.2	13.4	2.6	2.6												
65	57.5	1.7	1.0	39.3	1.8	1.4	28.0	2.0	1.7	20.0	2.2	2.2	14.7	2.5	2.6	9.5	3.3	3.1									
70	61.9	1.7	1.0	42.3	1.8	1.4	30.2	2.0	1.7	21.6	2.2	2.2	15.9	2.5	2.6	11.2	3.0	3.1									
75	66.3	1.7	1.0	45.3	1.8	1.4	32.3	2.0	1.7	23.2	2.2	2.2	17.2	2.5	2.6	12.3	2.9	3.1									
80	70.7	1.7	1.0	48.3	1.8	1.4	34.4	2.0	1.7	24.8	2.2	2.2	18.4	2.5	2.6	13.3	2.9	3.1									
85	75.2	1.7	1.0	51.4	1.8	1.4	36.6	2.0	1.7	26.3	2.2	2.2	19.6	2.5	2.6	14.3	2.8	3.1	10.2	3.6	3.4						
90	79.6	1.7	1.0	54.4	1.8	1.4	38.7	2.0	1.7	27.9	2.2	2.2	20.8	2.4	2.7	15.3	2.8	3.1	11.4	3.4	3.5						
95	84.0	1.7	1.0	57.4	1.8	1.4	40.9	2.0	1.7	29.5	2.2	2.2	22.0	2.4	2.7	16.3	2.8	3.1	12.7	3.2	3.5						
100	88.4	1.7	1.0	60.4	1.8	1.4	43.0	2.0	1.7	31.4	2.2	2.2	23.2	2.4	2.7	17.2	2.8	3.1	13.5	3.2	3.5						
105	92.8	1.7	1.0	63.4	1.8	1.4	45.1	2.0	1.7	33.0	2.2	2.2	24.4	2.4	2.7	18.2	2.7	3.2	14.4	3.1	3.5						
110	97.2	1.7	1.0	66.4	1.8	1.4	47.3	2.0	1.7	34.6	2.2	2.2	25.6	2.4	2.7	19.1	2.7	3.2	15.2	3.1	3.5						
115	101.7	1.7	1.0	69.4	1.8	1.4	49.4	2.0	1.7	36.1	2.2	2.2	26.8	2.4	2.7	20.0	2.7	3.2	16.0	3.0	3.5	11.6	3.8	3.9			
120	106.1	1.7	1.0	72.5	1.8	1.4	51.6	2.0	1.7	37.7	2.2	2.2	28.0	2.4	2.7	21.0	2.7	3.2	16.8	3.0	3.5	12.6	3.6	3.9			
125	110.5	1.7	1.0	75.5	1.8	1.4	53.7	2.0	1.7	39.2	2.2	2.2	29.2	2.4	2.7	21.9	2.7	3.2	17.6	3.0	3.5	13.7	3.5	3.9			
130	114.9	1.7	1.0	78.5	1.8	1.4	55.8	2.0	1.7	40.8	2.2	2.2	30.4	2.4	2.7	22.8	2.7	3.2	18.4	3.0	3.6	14.4	3.4	3.9			
135	119.3	1.7	1.0	81.5	1.8	1.4	58.0	2.0	1.7	42.4	2.2	2.2	31.6	2.4	2.7	23.8	2.7	3.2	19.1	2.9	3.6	15.1	3.4	4.0			
140	123.7	1.7	1.0	84.5	1.8	1.4	60.1	2.0	1.7	43.9	2.2	2.2	32.8	2.4	2.7	24.7	2.7	3.2	19.9	2.9	3.6	15.8	3.4	4.0			
145	128.2	1.7	1.0	87.5	1.8	1.4	62.3	2.0	1.7	45.5	2.2	2.2	34.5	2.4	2.7	25.6	2.7	3.2	20.7	2.9	3.6	16.5	3.3	4.0			
150	132.6	1.7	1.0	90.6	1.8	1.4	64.4	2.0	1.7	47.1	2.2	2.2	35.7	2.4	2.7	26.5	2.6	3.2	21.5	2.9	3.6	17.1	3.3	4.0			

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 1.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10	9.7	1.6	1.0	6.2	2.0	1.2																					
15	14.8	1.5	1.0	10.2	1.7	1.3	6.5	2.2	1.5																		
20	20.2	1.5	1.0	13.8	1.7	1.3	9.6	1.9	1.6																		
25	25.1	1.5	1.0	17.4	1.7	1.3	12.2	1.9	1.6	8.5	2.2	2.0															
30	30.1	1.5	1.0	21.0	1.6	1.3	14.9	1.8	1.7	10.6	2.1	2.1															
35	35.1	1.5	1.0	24.7	1.6	1.3	17.5	1.8	1.7	12.6	2.0	2.1	8.9	2.4	2.5												
40	40.1	1.5	1.0	28.2	1.6	1.3	20.0	1.8	1.7	14.5	2.0	2.1	10.5	2.3	2.5												
45	45.1	1.5	1.0	31.7	1.6	1.3	22.5	1.8	1.7	16.4	2.0	2.1	12.1	2.2	2.5	9.2	2.8	2.9									
50	50.2	1.5	1.0	35.2	1.6	1.3	25.4	1.8	1.7	18.3	2.0	2.1	13.6	2.2	2.5	10.0	2.6	2.9									
55	55.2	1.5	1.0	38.8	1.6	1.3	27.9	1.8	1.7	20.3	1.9	2.1	15.1	2.2	2.5	11.2	2.5	3.0									
60	60.2	1.5	1.0	42.3	1.6	1.3	30.4	1.8	1.7	22.2	1.9	2.1	16.6	2.1	2.5	12.4	2.4	3.0									
65	65.2	1.5	1.0	45.8	1.6	1.3	32.9	1.8	1.7	24.0	1.9	2.1	18.0	2.1	2.5	13.6	2.4	3.0	8.9	3.1	3.5						
70	70.2	1.5	1.0	49.3	1.6	1.3	35.5	1.8	1.7	25.9	1.9	2.1	19.5	2.1	2.6	14.8	2.4	3.0	10.6	2.8	3.5						
75	75.2	1.5	1.0	52.8	1.6	1.3	38.0	1.8	1.7	28.2	1.9	2.1	20.9	2.1	2.6	16.0	2.3	3.0	11.5	2.8	3.5						
80	80.2	1.5	1.0	56.3	1.6	1.3	40.5	1.8	1.7	30.0	1.9	2.1	22.3	2.1	2.6	17.1	2.3	3.0	12.5	2.7	3.5						
85	85.2	1.5	1.0	59.8	1.6	1.3	43.0	1.8	1.7	31.9	1.9	2.1	23.7	2.1	2.6	18.3	2.3	3.0	13.5	2.7	3.6	9.8	3.3	3.9			
90	90.2	1.5	1.0	63.3	1.6	1.3	45.6	1.8	1.7	33.6	1.9	2.1	25.2	2.1	2.6	19.4	2.3	3.1	14.4	2.6	3.6	10.9	3.1	3.9			
95	95.2	1.5	1.0	66.9	1.6	1.3	48.1	1.8	1.7	35.5	1.9	2.1	26.6	2.1	2.6	20.5	2.3	3.1	15.3	2.6	3.6	12.0	3.0	3.9			
100	100.2	1.5	1.0	70.4	1.6	1.3	50.6	1.8	1.7	37.4	1.9	2.1	28.0	2.1	2.6	21.6	2.3	3.1	16.2	2.6	3.6	12.9	2.9	4.0			
105	105.3	1.5	1.0	73.9	1.6	1.3	53.1	1.8	1.7	39.2	1.9	2.1	29.8	2.1	2.6	22.8	2.3	3.1	17.1	2.6	3.6	13.7	2.9	4.0	10.8	3.4	4.3
110	110.3	1.5	1.0	77.4	1.6	1.3	55.7	1.8	1.7	41.1	1.9	2.1	31.3	2.1	2.6	23.9	2.3	3.1	18.0	2.6	3.6	14.4	2.9	4.0	12.0	3.2	4.3
115	115.3	1.5	1.0	80.9	1.6	1.3	58.2	1.8	1.7	42.9	1.9	2.1	32.7	2.1	2.6	25.0	2.3	3.1	18.9	2.5	3.6	15.2	2.8	4.0	12.7	3.2	4.3
120	120.3	1.5	1.0	84.4	1.6	1.3	60.7	1.8	1.7	44.8	1.9	2.1	34.1	2.1	2.6	26.1	2.2	3.1	19.7	2.5	3.6	16.0	2.8	4.0	13.4	3.1	4.3
125	125.3	1.5	1.0	88.0	1.6	1.3	63.2	1.8	1.7	46.7	1.9	2.1	35.5	2.1	2.6	27.2	2.2	3.1	20.6	2.5	3.6	16.8	2.8	4.0	14.1	3.1	4.3
130	130.3	1.5	1.0	91.5	1.6	1.3	65.8	1.8	1.7	48.5	1.9	2.1	36.9	2.1	2.6	28.4	2.2	3.1	21.5	2.5	3.6	17.4	2.8	4.0	14.8	3.1	4.3
135	135.3	1.5	1.0	95.0	1.6	1.3	68.3	1.8	1.7	50.4	1.9	2.1	38.3	2.1	2.6	29.5	2.2	3.1	22.4	2.5	3.6	18.2	2.8	4.0	15.5	3.0	4.3
140	140.3	1.5	1.0	98.5	1.6	1.3	70.8	1.8	1.7	52.2	1.9	2.1	39.7	2.0	2.6	30.6	2.2	3.1	23.2	2.5	3.6	18.9	2.7	4.0	16.1	3.0	4.4
145	145.3	1.5	1.0	102.0	1.6	1.3	73.3	1.8	1.7	54.1	1.9	2.1	41.1	2.0	2.6	32.1	2.2	3.0	24.1	2.5	3.6	19.7	2.7	4.0	16.8	3.0	4.4
150	150.3	1.5	1.0	105.5	1.6	1.3	75.9	1.8	1.7	56.0	1.9	2.1	42.5	2.0	2.6	33.2	2.2	3.0	25.0	2.5	3.6	20.4	2.7	4.1	17.5	2.9	4.4

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 1.25 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	5.0	1.8	0.8																								
10	11.1	1.4	0.9	7.4	1.6	1.2																					
15	16.9	1.4	1.0	11.6	1.5	1.3	8.1	1.8	1.6																		
20	22.8	1.4	0.9	15.6	1.5	1.3	11.1	1.7	1.6	7.8	2.0	1.9															
25	28.4	1.4	1.0	19.9	1.5	1.3	14.1	1.7	1.6	10.1	1.9	2.0	6.8	2.4	2.3												
30	34.1	1.4	1.0	23.8	1.5	1.3	17.0	1.6	1.6	12.4	1.8	2.0	9.0	2.1	2.4												
35	39.8	1.4	1.0	27.8	1.5	1.3	19.8	1.6	1.6	14.6	1.8	2.0	10.8	2.0	2.4	7.4	2.5	2.8									
40	45.4	1.4	1.0	31.7	1.5	1.3	23.0	1.6	1.6	16.8	1.8	2.0	12.5	2.0	2.5	9.3	2.3	2.9									
45	51.1	1.4	1.0	35.6	1.5	1.3	25.8	1.6	1.6	19.0	1.8	2.0	14.2	1.9	2.5	10.7	2.2	2.9									
50	56.8	1.4	1.0	39.5	1.5	1.3	28.7	1.6	1.6	21.1	1.7	2.0	15.9	1.9	2.5	12.1	2.1	2.9	8.7	2.6	3.3						
55	62.5	1.4	1.0	43.5	1.5	1.3	31.5	1.6	1.6	23.6	1.7	2.0	17.6	1.9	2.5	13.4	2.1	2.9	10.2	2.4	3.4						
60	68.1	1.4	1.0	47.4	1.5	1.3	34.4	1.6	1.6	25.7	1.7	2.0	19.2	1.9	2.5	14.7	2.1	2.9	11.3	2.4	3.4						
65	73.8	1.4	1.0	51.4	1.5	1.3	37.2	1.6	1.6	27.9	1.7	2.0	20.9	1.9	2.5	16.1	2.1	2.9	12.4	2.3	3.4	9.0	2.9	3.8			
70	79.5	1.4	1.0	55.3	1.5	1.3	40.1	1.6	1.6	30.0	1.7	2.0	22.5	1.9	2.5	17.4	2.1	2.9	13.5	2.3	3.4	10.3	2.7	3.8			
75	85.2	1.4	1.0	59.2	1.5	1.3	43.0	1.6	1.6	32.1	1.7	2.0	24.1	1.9	2.5	18.6	2.0	3.0	14.6	2.3	3.4	11.3	2.6	3.8			
80	90.8	1.4	1.0	63.2	1.5	1.3	45.8	1.6	1.6	34.2	1.7	2.0	26.1	1.9	2.5	19.9	2.0	3.0	15.7	2.2	3.4	12.2	2.5	3.9			
85	96.5	1.4	1.0	67.1	1.5	1.3	48.7	1.6	1.6	36.4	1.7	2.0	27.7	1.8	2.5	21.2	2.0	3.0	16.7	2.2	3.4	13.1	2.5	3.9			
90	102.2	1.4	1.0	71.1	1.5	1.3	51.5	1.6	1.6	38.5	1.7	2.0	29.3	1.8	2.5	22.5	2.0	3.0	17.7	2.2	3.5	14.0	2.5	3.9	10.1	3.1	4.4
95	107.9	1.4	1.0	75.0	1.5	1.3	54.4	1.6	1.6	40.6	1.7	2.0	30.9	1.8	2.5	23.8	2.0	3.0	18.8	2.2	3.5	14.9	2.5	3.9	11.3	2.9	4.4
100	113.5	1.4	1.0	79.0	1.5	1.3	57.2	1.6	1.6	42.8	1.7	2.0	32.6	1.8	2.5	25.1	2.0	3.0	19.8	2.2	3.5	15.8	2.4	3.9	12.1	2.8	4.4
105	119.2	1.4	1.0	82.9	1.5	1.3	60.1	1.6	1.6	44.9	1.7	2.0	34.2	1.8	2.5	26.4	2.0	3.0	20.8	2.2	3.5	16.6	2.4	3.9	12.8	2.8	4.4
110	124.9	1.4	1.0	86.9	1.5	1.3	63.0	1.6	1.6	47.0	1.7	2.0	35.8	1.8	2.5	27.6	2.0	3.0	21.9	2.2	3.5	17.5	2.4	3.9	13.6	2.8	4.4
115	130.6	1.4	1.0	90.8	1.5	1.3	65.8	1.6	1.6	49.2	1.7	2.0	37.4	1.8	2.5	29.3	2.0	3.0	22.9	2.2	3.5	18.3	2.4	3.9	14.3	2.7	4.4
120	136.2	1.4	1.0	94.8	1.5	1.3	68.7	1.6	1.6	51.3	1.7	2.0	39.0	1.8	2.5	30.5	2.0	3.0	23.9	2.2	3.5	19.2	2.4	3.9	15.0	2.7	4.4
125	141.9	1.4	1.0	98.7	1.5	1.3	71.5	1.6	1.6	53.4	1.7	2.0	40.6	1.8	2.5	31.8	2.0	3.0	25.0	2.2	3.5	20.0	2.4	3.9	15.8	2.7	4.4
130	147.6	1.4	1.0	102.7	1.5	1.3	74.4	1.6	1.6	55.6	1.7	2.0	42.3	1.8	2.5	33.1	2.0	3.0	26.0	2.2	3.5	20.9	2.4	3.9	16.4	2.7	4.5
135	153.3	1.4	1.0	106.6	1.5	1.3	77.3	1.6	1.6	57.7	1.7	2.0	43.9	1.8	2.5	34.3	2.0	3.0	27.0	2.2	3.5	21.7	2.4	3.9	17.1	2.6	4.5
140	158.9	1.4	1.0	110.5	1.5	1.3	80.1	1.6	1.6	59.8	1.7	2.0	45.5	1.8	2.5	35.6	2.0	3.0	28.0	2.2	3.5	22.6	2.4	3.9	17.8	2.6	4.5
145	164.6	1.4	1.0	114.5	1.5	1.3	83.0	1.6	1.6	62.0	1.7	2.0	47.1	1.8	2.5	36.9	2.0	3.0	29.1	2.2	3.5	23.4	2.4	3.9	18.5	2.6	4.5
150	170.3	1.4	1.0	118.4	1.5	1.3	85.8	1.6	1.6	64.1	1.7	2.0	48.8	1.8	2.5	38.1	2.0	3.0	30.1	2.2	3.5	24.3	2.3	4.0	19.2	2.6	4.5

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 1.50 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	5.9	1.5	0.9																								
10	12.4	1.3	0.9	8.3	1.5	1.2	5.5	1.9	1.5																		
15	18.9	1.3	0.9	12.8	1.4	1.2	9.1	1.6	1.6	6.2	1.9	1.9															
20	25.1	1.3	0.9	17.2	1.4	1.2	12.4	1.5	1.6	9.0	1.7	1.9	6.0	2.2	2.2												
25	31.4	1.3	0.9	21.8	1.4	1.2	15.6	1.5	1.6	11.5	1.7	2.0	8.4	1.9	2.4												
30	37.7	1.3	0.9	26.1	1.4	1.2	18.8	1.5	1.6	14.0	1.6	2.0	10.4	1.8	2.4	7.6	2.1	2.8									
35	43.9	1.3	0.9	30.4	1.4	1.2	22.2	1.5	1.6	16.4	1.6	2.0	12.3	1.8	2.4	9.2	2.0	2.8									
40	50.2	1.3	0.9	34.8	1.4	1.3	25.3	1.5	1.6	18.8	1.6	2.0	14.2	1.8	2.4	10.8	2.0	2.8	7.8	2.4	3.2						
45	56.5	1.3	0.9	39.1	1.4	1.3	28.5	1.5	1.6	21.2	1.6	2.0	16.1	1.7	2.4	12.3	1.9	2.9	9.4	2.2	3.3						
50	62.7	1.3	0.9	43.5	1.4	1.3	31.7	1.5	1.6	23.9	1.6	2.0	17.9	1.7	2.4	13.8	1.9	2.9	10.6	2.1	3.3						
55	69.0	1.3	0.9	47.8	1.4	1.3	34.8	1.5	1.6	26.2	1.6	2.0	19.8	1.7	2.4	15.3	1.9	2.9	11.9	2.1	3.3	9.1	2.4	3.7			
60	75.3	1.3	0.9	52.1	1.4	1.3	38.0	1.5	1.6	28.6	1.6	2.0	21.6	1.7	2.4	16.7	1.9	2.9	13.1	2.1	3.3	10.1	2.4	3.8			
65	81.5	1.3	0.9	56.5	1.4	1.3	41.1	1.5	1.6	31.0	1.6	2.0	23.8	1.7	2.4	18.2	1.9	2.9	14.3	2.0	3.3	11.2	2.3	3.8			
70	87.8	1.3	0.9	60.8	1.4	1.3	44.3	1.5	1.6	33.3	1.6	2.0	25.6	1.7	2.4	19.6	1.8	2.9	15.5	2.0	3.3	12.2	2.3	3.8	9.2	2.7	4.2
75	94.1	1.3	0.9	65.2	1.4	1.3	47.4	1.5	1.6	35.7	1.6	2.0	27.4	1.7	2.4	21.0	1.8	2.9	16.6	2.0	3.4	13.2	2.2	3.8	10.3	2.6	4.2
80	100.3	1.3	0.9	69.5	1.4	1.3	50.6	1.5	1.6	38.1	1.6	2.0	29.1	1.7	2.4	22.5	1.8	2.9	17.8	2.0	3.4	14.2	2.2	3.8	11.2	2.5	4.3
85	106.6	1.3	0.9	73.8	1.4	1.3	53.7	1.5	1.6	40.5	1.6	2.0	30.9	1.7	2.4	23.9	1.8	2.9	18.9	2.0	3.4	15.2	2.2	3.8	12.1	2.5	4.3
90	112.9	1.3	0.9	78.2	1.4	1.3	56.9	1.5	1.6	42.8	1.6	2.0	32.7	1.7	2.4	25.7	1.8	2.9	20.1	2.0	3.4	16.1	2.2	3.9	12.9	2.4	4.3
95	119.1	1.3	0.9	82.5	1.4	1.3	60.0	1.5	1.6	45.2	1.6	2.0	34.5	1.7	2.4	27.1	1.8	2.9	21.2	2.0	3.4	17.0	2.2	3.9	13.8	2.4	4.3
100	125.4	1.3	0.9	86.9	1.4	1.3	63.2	1.5	1.6	47.6	1.6	2.0	36.3	1.7	2.4	28.5	1.8	2.9	22.4	2.0	3.4	18.0	2.2	3.9	14.6	2.4	4.3
105	131.7	1.3	0.9	91.2	1.4	1.3	66.4	1.5	1.6	50.0	1.6	2.0	38.1	1.7	2.4	29.9	1.8	2.9	23.5	2.0	3.4	19.0	2.1	3.9	15.4	2.4	4.3
110	138.0	1.3	0.9	95.5	1.4	1.3	69.5	1.5	1.6	52.3	1.6	2.0	40.0	1.7	2.4	31.3	1.8	2.9	24.7	2.0	3.4	19.9	2.1	3.9	16.2	2.3	4.3
115	144.2	1.3	0.9	99.9	1.4	1.3	72.7	1.5	1.6	54.7	1.6	2.0	41.8	1.7	2.4	32.8	1.8	2.9	25.8	2.0	3.4	20.9	2.1	3.9	17.0	2.3	4.3
120	150.5	1.3	0.9	104.2	1.4	1.3	75.8	1.5	1.6	57.1	1.6	2.0	43.6	1.7	2.4	34.2	1.8	2.9	27.0	2.0	3.4	21.8	2.1	3.9	17.8	2.3	4.4
125	156.8	1.3	0.9	108.6	1.4	1.3	79.0	1.5	1.6	59.5	1.6	2.0	45.4	1.7	2.4	35.6	1.8	2.9	28.5	2.0	3.4	22.7	2.1	3.9	18.6	2.3	4.4
130	163.0	1.3	0.9	112.9	1.4	1.3	82.2	1.5	1.6	61.8	1.6	2.0	47.2	1.7	2.4	37.0	1.8	2.9	29.6	2.0	3.4	23.7	2.1	3.9	19.3	2.3	4.4
135	169.3	1.3	0.9	117.2	1.4	1.3	85.3	1.5	1.6	64.2	1.6	2.0	49.0	1.7	2.4	38.4	1.8	2.9	30.8	1.9	3.4	24.6	2.1	3.9	20.1	2.3	4.4
140	175.6	1.3	0.9	121.6	1.4	1.3	88.5	1.5	1.6	66.6	1.6	2.0	50.8	1.7	2.4	39.8	1.8	2.9	31.9	1.9	3.4	25.6	2.1	3.9	20.9	2.3	4.4
145	181.8	1.3	0.9	125.9	1.4	1.3	91.6	1.5	1.6	69.0	1.6	2.0	52.6	1.7	2.4	41.3	1.8	2.9	33.0	1.9	3.4	26.5	2.1	3.9	21.7	2.3	4.4
150	188.1	1.3	0.9	130.3	1.4	1.3	94.8	1.5	1.6	71.3	1.6	2.0	54.4	1.7	2.4	42.7	1.8	2.9	34.2	1.9	3.4	27.4	2.1	3.9	22.5	2.3	4.4

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 1.75 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	6.5	1.3	0.9																								
10	13.5	1.2	0.9	9.1	1.4	1.2	6.4	1.6	1.5																		
15	20.5	1.2	0.9	13.9	1.3	1.2	10.0	1.4	1.6	7.2	1.7	1.9															
20	27.3	1.2	0.9	18.8	1.3	1.2	13.6	1.4	1.6	10.0	1.6	1.9	7.3	1.8	2.3												
25	34.1	1.2	0.9	23.5	1.3	1.2	17.0	1.4	1.6	12.7	1.5	1.9	9.5	1.7	2.3	6.8	2.0	2.7									
30	40.9	1.2	0.9	28.2	1.3	1.2	20.7	1.4	1.6	15.4	1.5	1.9	11.6	1.7	2.3	8.7	1.9	2.8									
35	47.7	1.2	0.9	32.8	1.3	1.2	24.1	1.4	1.6	17.9	1.5	2.0	13.6	1.6	2.4	10.4	1.8	2.8	7.9	2.1	3.2						
40	54.5	1.2	0.9	37.5	1.3	1.2	27.5	1.4	1.6	20.8	1.5	1.9	15.7	1.6	2.4	12.1	1.8	2.8	9.3	2.0	3.2						
45	61.3	1.2	0.9	42.2	1.3	1.2	30.9	1.4	1.6	23.4	1.5	1.9	17.7	1.6	2.4	13.7	1.8	2.8	10.7	1.9	3.3	7.9	2.3	3.7			
50	68.1	1.2	0.9	46.9	1.3	1.2	34.4	1.4	1.6	26.0	1.5	1.9	19.7	1.6	2.4	15.3	1.7	2.8	12.0	1.9	3.3	9.3	2.2	3.7			
55	74.9	1.2	0.9	51.6	1.3	1.2	37.8	1.4	1.6	28.5	1.5	1.9	22.1	1.6	2.3	16.9	1.7	2.8	13.3	1.9	3.3	10.5	2.1	3.7	7.5	2.7	4.1
60	81.7	1.2	0.9	56.2	1.3	1.2	41.2	1.4	1.6	31.1	1.5	2.0	24.0	1.6	2.3	18.5	1.7	2.8	14.6	1.9	3.3	11.6	2.1	3.7	9.0	2.4	4.1
65	88.5	1.2	0.9	60.9	1.3	1.2	44.6	1.4	1.6	33.7	1.5	2.0	26.0	1.6	2.4	20.1	1.7	2.8	15.9	1.9	3.3	12.7	2.1	3.7	10.0	2.3	4.2
70	95.4	1.2	0.9	65.6	1.3	1.2	48.1	1.4	1.6	36.3	1.5	2.0	28.0	1.6	2.4	21.6	1.7	2.9	17.2	1.8	3.3	13.8	2.0	3.8	11.0	2.3	4.2
75	102.2	1.2	0.9	70.3	1.3	1.2	51.5	1.4	1.6	38.9	1.5	2.0	30.0	1.6	2.4	23.2	1.7	2.9	18.4	1.8	3.3	14.8	2.0	3.8	11.9	2.2	4.2
80	109.0	1.2	0.9	75.0	1.3	1.2	54.9	1.4	1.6	41.5	1.5	2.0	32.0	1.6	2.4	25.1	1.7	2.8	19.7	1.8	3.3	15.8	2.0	3.8	12.8	2.2	4.2
85	115.8	1.2	0.9	79.6	1.3	1.2	58.3	1.4	1.6	44.1	1.5	2.0	34.0	1.6	2.4	26.6	1.7	2.8	21.0	1.8	3.3	16.9	2.0	3.8	13.7	2.2	4.2
90	122.6	1.2	0.9	84.3	1.3	1.2	61.8	1.4	1.6	46.6	1.5	2.0	36.0	1.6	2.4	28.2	1.7	2.8	22.2	1.8	3.3	17.9	2.0	3.8	14.6	2.2	4.3
95	129.4	1.2	0.9	89.0	1.3	1.2	65.2	1.4	1.6	49.2	1.5	2.0	37.9	1.6	2.4	29.8	1.7	2.8	23.5	1.8	3.3	19.0	2.0	3.8	15.5	2.2	4.3
100	136.2	1.2	0.9	93.7	1.3	1.2	68.6	1.4	1.6	51.8	1.5	2.0	39.8	1.6	2.4	31.3	1.7	2.8	24.8	1.8	3.3	20.0	2.0	3.8	16.3	2.1	4.3
105	143.0	1.2	0.9	98.4	1.3	1.2	72.1	1.4	1.6	54.4	1.5	2.0	41.8	1.6	2.4	32.9	1.7	2.8	26.4	1.8	3.3	21.1	2.0	3.8	17.2	2.1	4.3
110	149.8	1.2	0.9	103.1	1.3	1.2	75.5	1.4	1.6	57.0	1.5	2.0	43.8	1.6	2.4	34.4	1.7	2.8	27.6	1.8	3.3	22.1	2.0	3.8	18.1	2.1	4.3
115	156.6	1.2	0.9	107.7	1.3	1.2	78.9	1.4	1.6	59.6	1.5	2.0	45.8	1.6	2.4	36.0	1.7	2.8	28.9	1.8	3.3	23.1	2.0	3.8	19.0	2.1	4.3
120	163.4	1.2	0.9	112.4	1.3	1.2	82.3	1.4	1.6	62.2	1.5	2.0	47.8	1.6	2.4	37.6	1.7	2.8	30.1	1.8	3.3	24.2	1.9	3.8	19.8	2.1	4.3
125	170.3	1.2	0.9	117.1	1.3	1.2	85.8	1.4	1.6	64.8	1.5	2.0	49.8	1.6	2.4	39.1	1.7	2.9	31.4	1.8	3.3	25.2	1.9	3.8	20.7	2.1	4.3
130	177.1	1.2	0.9	121.8	1.3	1.2	89.2	1.4	1.6	67.3	1.5	2.0	51.8	1.6	2.4	40.7	1.7	2.9	32.6	1.8	3.3	26.2	1.9	3.8	21.5	2.1	4.3
135	183.9	1.2	0.9	126.5	1.3	1.2	92.6	1.4	1.6	69.9	1.5	2.0	53.8	1.6	2.4	42.2	1.7	2.9	33.9	1.8	3.3	27.3	1.9	3.8	22.4	2.1	4.3
140	190.7	1.2	0.9	131.2	1.3	1.2	96.1	1.4	1.6	72.5	1.5	2.0	55.7	1.6	2.4	43.8	1.7	2.9	35.1	1.8	3.3	28.7	1.9	3.8	23.3	2.1	4.3
145	197.5	1.2	0.9	135.8	1.3	1.2	99.5	1.4	1.6	75.1	1.5	2.0	57.7	1.6	2.4	45.3	1.7	2.9	36.4	1.8	3.3	29.7	1.9	3.8	24.1	2.1	4.3
150	204.3	1.2	0.9	140.5	1.3	1.2	102.9	1.4	1.6	77.7	1.5	2.0	59.7	1.6	2.4	46.9	1.7	2.9	37.6	1.8	3.3	30.7	1.9	3.8	25.0	2.1	4.3

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 2.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	7.1	1.2	0.9																								
10	14.7	1.2	0.9	9.5	1.3	1.2	7.0	1.4	1.5																		
15	22.0	1.2	0.9	14.5	1.3	1.2	10.8	1.4	1.5	8.0	1.5	1.9	5.5	1.9	2.1												
20	29.3	1.2	0.9	19.6	1.2	1.2	14.6	1.3	1.5	10.9	1.5	1.9	8.1	1.6	2.3	5.5	2.1	2.6									
25	36.6	1.2	0.9	24.4	1.2	1.2	18.5	1.3	1.5	13.8	1.4	1.9	10.4	1.6	2.3	7.9	1.8	2.7									
30	43.9	1.2	0.9	29.3	1.2	1.2	22.2	1.3	1.6	16.6	1.4	1.9	12.7	1.5	2.3	9.7	1.7	2.7	7.3	2.0	3.1						
35	51.2	1.2	0.9	34.2	1.2	1.2	25.8	1.3	1.6	19.6	1.4	1.9	14.9	1.5	2.3	11.5	1.7	2.7	8.9	1.9	3.2						
40	58.5	1.2	0.9	39.0	1.2	1.2	29.5	1.3	1.6	22.4	1.4	1.9	17.1	1.5	2.3	13.3	1.6	2.8	10.4	1.8	3.2	8.0	2.1	3.6			
45	65.8	1.2	0.9	43.9	1.2	1.2	33.2	1.3	1.6	25.2	1.4	1.9	19.3	1.5	2.3	15.0	1.6	2.8	11.8	1.8	3.2	9.2	2.0	3.7			
50	73.1	1.2	0.9	48.8	1.2	1.2	36.8	1.3	1.6	28.0	1.4	1.9	21.7	1.5	2.3	16.7	1.6	2.8	13.2	1.8	3.2	10.5	1.9	3.7	7.9	2.3	4.1
55	80.4	1.2	0.9	53.6	1.2	1.2	40.5	1.3	1.6	30.7	1.4	1.9	23.9	1.5	2.3	18.5	1.6	2.8	14.6	1.7	3.2	11.7	1.9	3.7	9.2	2.2	4.1
60	87.7	1.2	0.9	58.5	1.2	1.2	44.2	1.3	1.6	33.5	1.4	1.9	26.0	1.5	2.3	20.2	1.6	2.8	16.0	1.7	3.2	12.8	1.9	3.7	10.2	2.1	4.1
65	95.0	1.2	0.9	63.4	1.2	1.2	47.9	1.3	1.6	36.3	1.4	1.9	28.2	1.5	2.3	22.1	1.6	2.8	17.4	1.7	3.3	14.0	1.9	3.7	11.3	2.1	4.2
70	102.3	1.2	0.9	68.2	1.2	1.2	51.6	1.3	1.6	39.1	1.4	1.9	30.3	1.5	2.3	23.8	1.6	2.8	18.8	1.7	3.3	15.2	1.9	3.7	12.3	2.1	4.2
75	109.6	1.2	0.9	73.1	1.2	1.2	55.2	1.3	1.6	41.9	1.4	1.9	32.5	1.5	2.3	25.5	1.6	2.8	20.1	1.7	3.3	16.2	1.8	3.7	13.2	2.0	4.2
80	116.9	1.2	0.9	78.0	1.2	1.2	58.9	1.3	1.6	44.7	1.4	1.9	34.6	1.5	2.3	27.2	1.6	2.8	21.5	1.7	3.3	17.4	1.8	3.8	14.2	2.0	4.2
85	124.2	1.2	0.9	82.9	1.2	1.2	62.6	1.3	1.6	47.4	1.4	1.9	36.8	1.5	2.3	28.9	1.6	2.8	22.9	1.7	3.3	18.5	1.8	3.8	15.1	2.0	4.2
90	131.5	1.2	0.9	87.7	1.2	1.2	66.3	1.3	1.6	50.2	1.4	1.9	39.0	1.5	2.3	30.6	1.6	2.8	24.6	1.7	3.2	19.6	1.8	3.8	16.1	2.0	4.2
95	138.8	1.2	0.9	92.6	1.2	1.2	69.9	1.3	1.6	53.0	1.4	1.9	41.1	1.5	2.3	32.3	1.6	2.8	25.9	1.7	3.3	20.8	1.8	3.8	17.0	2.0	4.2
100	146.1	1.2	0.9	97.5	1.2	1.2	73.6	1.3	1.6	55.8	1.4	1.9	43.3	1.5	2.3	34.0	1.6	2.8	27.3	1.7	3.3	21.9	1.8	3.8	18.0	2.0	4.2
105	153.4	1.2	0.9	102.3	1.2	1.2	77.3	1.3	1.6	58.6	1.4	1.9	45.4	1.5	2.3	35.7	1.6	2.8	28.6	1.7	3.3	23.0	1.8	3.8	18.9	2.0	4.2
110	160.7	1.2	0.9	107.2	1.2	1.2	81.0	1.3	1.6	61.4	1.4	1.9	47.6	1.5	2.3	37.3	1.6	2.8	30.0	1.7	3.3	24.1	1.8	3.8	19.8	2.0	4.2
115	168.0	1.2	0.9	112.1	1.2	1.2	84.7	1.3	1.6	64.2	1.4	1.9	49.8	1.5	2.3	39.0	1.6	2.8	31.3	1.7	3.3	25.3	1.8	3.8	20.8	2.0	4.2
120	175.3	1.2	0.9	117.0	1.2	1.2	88.3	1.3	1.6	67.0	1.4	1.9	51.9	1.5	2.3	40.7	1.6	2.8	32.7	1.7	3.3	26.7	1.8	3.7	21.7	2.0	4.2
125	182.6	1.2	0.9	121.8	1.2	1.2	92.0	1.3	1.6	69.7	1.4	1.9	54.1	1.5	2.3	42.4	1.6	2.8	34.1	1.7	3.3	27.8	1.8	3.7	22.6	1.9	4.3
130	189.9	1.2	0.9	126.7	1.2	1.2	95.7	1.3	1.6	72.5	1.4	1.9	56.2	1.5	2.3	44.1	1.6	2.8	35.4	1.7	3.3	28.9	1.8	3.7	23.6	1.9	4.3
135	197.3	1.2	0.9	131.6	1.2	1.2	99.4	1.3	1.6	75.3	1.4	1.9	58.4	1.5	2.3	45.8	1.6	2.8	36.8	1.7	3.3	30.0	1.8	3.7	24.5	1.9	4.3
140	204.6	1.2	0.9	136.5	1.2	1.2	103.1	1.3	1.6	78.1	1.4	1.9	60.6	1.5	2.3	47.5	1.6	2.8	38.1	1.7	3.3	31.1	1.8	3.7	25.4	1.9	4.3
145	211.9	1.2	0.9	141.3	1.2	1.2	106.7	1.3	1.6	80.9	1.4	1.9	62.7	1.5	2.3	49.2	1.6	2.8	39.5	1.7	3.3	32.3	1.8	3.7	26.4	1.9	4.3
150	219.2	1.2	0.9	146.2	1.2	1.2	110.4	1.3	1.6	83.7	1.4	1.9	64.9	1.5	2.3	50.9	1.6	2.8	40.8	1.7	3.3	33.4	1.8	3.7	27.3	1.9	4.3

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 3.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	8.8	1.0	0.8	5.8	1.1	1.1	3.9	1.5	1.3																		
10	18.0	1.0	0.8	12.1	1.1	1.2	8.9	1.1	1.5	6.6	1.3	1.8	4.7	1.5	2.1												
15	27.0	1.0	0.8	18.3	1.1	1.2	13.5	1.1	1.5	10.3	1.2	1.8	7.9	1.3	2.2	6.0	1.5	2.5									
20	35.9	1.0	0.8	24.4	1.1	1.2	18.2	1.1	1.5	13.8	1.2	1.8	10.7	1.3	2.2	8.3	1.4	2.6	6.4	1.6	3.0						
25	44.9	1.0	0.8	30.5	1.1	1.2	22.8	1.1	1.5	17.5	1.2	1.8	13.4	1.3	2.2	10.6	1.4	2.6	8.3	1.5	3.0	6.4	1.7	3.4			
30	53.9	1.0	0.8	36.6	1.1	1.2	27.3	1.1	1.5	20.9	1.2	1.8	16.2	1.3	2.2	12.8	1.4	2.6	10.2	1.5	3.0	8.1	1.6	3.5	6.0	1.9	3.9
35	62.8	1.0	0.8	42.7	1.1	1.2	31.8	1.1	1.5	24.4	1.2	1.8	19.1	1.2	2.2	15.0	1.3	2.6	12.0	1.4	3.0	9.6	1.6	3.5	7.6	1.7	3.9
40	71.8	1.0	0.8	48.8	1.1	1.2	36.4	1.1	1.5	27.9	1.2	1.8	21.9	1.2	2.2	17.2	1.3	2.6	13.8	1.4	3.1	11.1	1.5	3.5	9.0	1.7	4.0
45	80.8	1.0	0.8	54.9	1.0	1.2	40.9	1.1	1.5	31.3	1.2	1.8	24.6	1.2	2.2	19.6	1.3	2.6	15.5	1.4	3.1	12.6	1.5	3.5	10.2	1.7	4.0
50	89.7	1.0	0.8	60.9	1.0	1.2	45.4	1.1	1.5	34.8	1.2	1.8	27.3	1.2	2.2	21.8	1.3	2.6	17.3	1.4	3.1	14.1	1.5	3.5	11.5	1.6	4.0
55	98.7	1.0	0.8	67.0	1.0	1.2	50.0	1.1	1.5	38.3	1.2	1.8	30.0	1.2	2.2	24.0	1.3	2.6	19.1	1.4	3.1	15.5	1.5	3.5	12.7	1.6	4.0
60	107.7	1.0	0.8	73.1	1.0	1.2	54.5	1.1	1.5	41.8	1.2	1.8	32.7	1.2	2.2	26.1	1.3	2.6	21.0	1.4	3.1	16.9	1.5	3.6	14.0	1.6	4.0
65	116.6	1.0	0.8	79.2	1.0	1.2	59.0	1.1	1.5	45.2	1.2	1.8	35.5	1.2	2.2	28.3	1.3	2.6	22.8	1.4	3.1	18.4	1.5	3.6	15.1	1.6	4.0
70	125.6	1.0	0.8	85.3	1.0	1.2	63.6	1.1	1.5	48.7	1.2	1.8	38.2	1.2	2.2	30.5	1.3	2.6	24.5	1.4	3.1	19.8	1.5	3.6	16.3	1.6	4.1
75	134.6	1.0	0.8	91.4	1.0	1.2	68.1	1.1	1.5	52.2	1.2	1.9	40.9	1.2	2.2	32.6	1.3	2.6	26.2	1.4	3.1	21.5	1.5	3.5	17.5	1.6	4.1
80	143.6	1.0	0.8	97.5	1.0	1.2	72.7	1.1	1.5	55.7	1.2	1.9	43.6	1.2	2.2	34.8	1.3	2.6	28.0	1.4	3.1	23.0	1.5	3.5	18.8	1.6	4.1
85	152.5	1.0	0.8	103.6	1.0	1.2	77.2	1.1	1.5	59.1	1.2	1.9	46.3	1.2	2.2	37.0	1.3	2.6	29.7	1.4	3.1	24.4	1.5	3.6	20.0	1.6	4.1
90	161.5	1.0	0.8	109.7	1.0	1.2	81.7	1.1	1.5	62.6	1.2	1.9	49.1	1.2	2.2	39.1	1.3	2.6	31.5	1.4	3.1	25.8	1.5	3.6	21.2	1.6	4.1
95	170.5	1.0	0.8	115.8	1.0	1.2	86.3	1.1	1.5	66.1	1.2	1.9	51.8	1.2	2.2	41.3	1.3	2.6	33.2	1.4	3.1	27.2	1.5	3.6	22.6	1.6	4.0
100	179.5	1.0	0.8	121.9	1.0	1.2	90.8	1.1	1.5	69.6	1.2	1.9	54.5	1.2	2.2	43.5	1.3	2.6	35.0	1.4	3.1	28.7	1.5	3.6	23.8	1.6	4.0
105	188.4	1.0	0.8	128.0	1.0	1.2	95.4	1.1	1.5	73.0	1.2	1.9	57.2	1.2	2.2	45.6	1.3	2.6	36.7	1.4	3.1	30.1	1.5	3.6	25.0	1.6	4.0
110	197.4	1.0	0.8	134.1	1.0	1.2	99.9	1.1	1.5	76.5	1.2	1.9	60.0	1.2	2.2	47.8	1.3	2.6	38.4	1.4	3.1	31.5	1.5	3.6	26.2	1.6	4.0
115	206.4	1.0	0.8	140.1	1.0	1.2	104.4	1.1	1.5	80.0	1.2	1.9	62.7	1.2	2.2	50.0	1.3	2.6	40.2	1.4	3.1	32.9	1.5	3.6	27.4	1.6	4.0
120	215.3	1.0	0.8	146.2	1.0	1.2	109.0	1.1	1.5	83.5	1.2	1.9	65.4	1.2	2.2	52.2	1.3	2.6	41.9	1.4	3.1	34.4	1.5	3.6	28.6	1.6	4.0
125	224.3	1.0	0.8	152.3	1.0	1.2	113.5	1.1	1.5	86.9	1.2	1.9	68.1	1.2	2.2	54.3	1.3	2.6	43.7	1.4	3.1	35.8	1.5	3.6	29.8	1.6	4.0
130	233.3	1.0	0.8	158.4	1.0	1.2	118.1	1.1	1.5	90.4	1.2	1.9	70.9	1.2	2.2	56.5	1.3	2.6	45.4	1.4	3.1	37.2	1.5	3.6	30.9	1.6	4.0
135	242.3	1.0	0.8	164.5	1.0	1.2	122.6	1.1	1.5	93.9	1.2	1.9	73.6	1.2	2.2	58.7	1.3	2.6	47.2	1.4	3.1	38.6	1.5	3.6	32.1	1.6	4.1
140	251.2	1.0	0.8	170.6	1.0	1.2	127.1	1.1	1.5	97.4	1.2	1.9	76.3	1.2	2.2	60.8	1.3	2.6	48.9	1.4	3.1	40.1	1.5	3.6	33.3	1.6	4.1
145	260.2	1.0	0.8	176.7	1.0	1.2	131.7	1.1	1.5	100.9	1.2	1.9	79.0	1.2	2.2	63.0	1.3	2.6	50.7	1.4	3.1	41.5	1.5	3.6	34.5	1.6	4.1
150	269.2	1.0	0.8	182.8	1.0	1.2	136.2	1.1	1.5	104.3	1.2	1.9	81.7	1.2	2.2	65.2	1.3	2.6	52.4	1.4	3.1	42.9	1.5	3.6	35.7	1.6	4.1

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 4.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	10.1	0.9	0.8	7.0	1.0	1.1	4.9	1.1	1.4																		
10	20.5	0.9	0.8	14.4	0.9	1.1	10.3	1.0	1.4	7.9	1.1	1.8	6.1	1.2	2.1	4.5	1.4	2.4									
15	30.7	0.9	0.8	21.5	0.9	1.1	15.7	1.0	1.4	12.0	1.1	1.8	9.4	1.1	2.1	7.4	1.2	2.5	5.8	1.4	2.8						
20	40.9	0.9	0.8	28.6	0.9	1.1	20.9	1.0	1.4	16.3	1.0	1.8	12.6	1.1	2.1	10.1	1.2	2.5	8.0	1.3	2.9	6.3	1.4	3.3			
25	51.1	0.9	0.8	35.8	0.9	1.1	26.1	1.0	1.4	20.3	1.0	1.8	16.0	1.1	2.1	12.7	1.2	2.5	10.2	1.3	2.9	8.2	1.4	3.4	6.5	1.5	3.8
30	61.3	0.9	0.8	42.9	0.9	1.1	31.4	1.0	1.4	24.4	1.0	1.8	19.2	1.1	2.1	15.2	1.2	2.5	12.3	1.3	2.9	10.0	1.3	3.4	8.1	1.5	3.8
35	71.5	0.9	0.8	50.1	0.9	1.1	36.6	1.0	1.4	28.3	1.0	1.8	22.4	1.1	2.1	18.0	1.2	2.5	14.4	1.2	2.9	11.7	1.3	3.4	9.6	1.4	3.8
40	81.8	0.9	0.8	57.2	0.9	1.1	41.8	1.0	1.5	32.4	1.0	1.8	25.6	1.1	2.1	20.6	1.2	2.5	16.5	1.2	2.9	13.5	1.3	3.4	11.1	1.4	3.8
45	92.0	0.9	0.8	64.4	0.9	1.1	47.0	1.0	1.5	36.4	1.0	1.8	28.8	1.1	2.1	23.1	1.2	2.5	18.8	1.2	2.9	15.2	1.3	3.4	12.6	1.4	3.9
50	102.2	0.9	0.8	71.5	0.9	1.1	52.2	1.0	1.5	40.5	1.0	1.8	32.0	1.1	2.1	25.7	1.2	2.5	20.9	1.2	2.9	17.0	1.3	3.4	14.0	1.4	3.9
55	112.4	0.9	0.8	78.7	0.9	1.1	57.5	1.0	1.5	44.5	1.0	1.8	35.2	1.1	2.1	28.2	1.2	2.5	23.0	1.2	2.9	18.9	1.3	3.4	15.4	1.4	3.9
60	122.6	0.9	0.8	85.8	0.9	1.1	62.7	1.0	1.5	48.5	1.0	1.8	38.4	1.1	2.2	30.8	1.2	2.5	25.1	1.2	2.9	20.6	1.3	3.4	16.9	1.4	3.9
65	132.8	0.9	0.8	93.0	0.9	1.1	67.9	1.0	1.5	52.6	1.0	1.8	41.5	1.1	2.2	33.4	1.2	2.5	27.2	1.2	2.9	22.3	1.3	3.4	18.3	1.4	3.9
70	143.1	0.9	0.8	100.1	0.9	1.1	73.1	1.0	1.5	56.6	1.0	1.8	44.7	1.1	2.2	35.9	1.2	2.5	29.2	1.2	2.9	24.0	1.3	3.4	20.0	1.4	3.9
75	153.3	0.9	0.8	107.3	0.9	1.1	78.3	1.0	1.5	60.7	1.0	1.8	47.9	1.1	2.2	38.5	1.2	2.5	31.3	1.2	2.9	25.7	1.3	3.4	21.4	1.4	3.9
80	163.5	0.9	0.8	114.4	0.9	1.1	83.6	1.0	1.5	64.7	1.0	1.8	51.1	1.1	2.2	41.0	1.2	2.5	33.4	1.2	2.9	27.4	1.3	3.4	22.8	1.4	3.9
85	173.7	0.9	0.8	121.6	0.9	1.1	88.8	1.0	1.5	68.8	1.0	1.8	54.3	1.1	2.2	43.6	1.2	2.5	35.5	1.2	2.9	29.1	1.3	3.4	24.2	1.4	3.9
90	183.9	0.9	0.8	128.7	0.9	1.1	94.0	1.0	1.5	72.8	1.0	1.8	57.5	1.1	2.2	46.2	1.2	2.5	37.6	1.2	2.9	30.8	1.3	3.4	25.7	1.4	3.9
95	194.1	0.9	0.8	135.9	0.9	1.1	99.2	1.0	1.5	76.8	1.0	1.8	60.7	1.1	2.2	48.7	1.2	2.5	39.7	1.2	2.9	32.5	1.3	3.4	27.1	1.4	3.9
100	204.4	0.9	0.8	143.0	0.9	1.1	104.4	1.0	1.5	80.9	1.0	1.8	63.9	1.1	2.2	51.3	1.2	2.5	41.7	1.2	2.9	34.2	1.3	3.4	28.5	1.3	3.9
105	214.6	0.9	0.8	150.2	0.9	1.1	109.7	1.0	1.5	84.9	1.0	1.8	67.1	1.1	2.2	53.9	1.2	2.5	43.8	1.2	2.9	35.9	1.3	3.4	29.9	1.3	3.9
110	224.8	0.9	0.8	157.4	0.9	1.1	114.9	1.0	1.5	89.0	1.0	1.8	70.3	1.1	2.2	56.4	1.2	2.5	45.9	1.2	2.9	37.6	1.3	3.4	31.3	1.3	3.9
115	235.0	0.9	0.8	164.5	0.9	1.1	120.1	1.0	1.5	93.0	1.0	1.8	73.5	1.1	2.2	59.0	1.2	2.5	48.0	1.2	2.9	39.3	1.3	3.4	32.7	1.3	3.9
120	245.2	0.9	0.8	171.7	0.9	1.1	125.3	1.0	1.5	97.1	1.0	1.8	76.7	1.1	2.2	61.5	1.2	2.5	49.9	1.2	3.0	41.0	1.3	3.4	34.2	1.3	3.9
125	255.5	0.9	0.8	178.8	0.9	1.1	130.5	1.0	1.5	101.1	1.0	1.8	79.9	1.1	2.2	64.1	1.2	2.5	52.0	1.2	3.0	42.7	1.3	3.4	35.6	1.3	3.9
130	265.7	0.9	0.8	186.0	0.9	1.1	135.8	1.0	1.5	105.1	1.0	1.8	83.0	1.1	2.2	66.7	1.2	2.5	54.1	1.2	3.0	44.4	1.3	3.4	37.0	1.3	3.9
135	275.9	0.9	0.8	193.1	0.9	1.1	141.0	1.0	1.5	109.2	1.0	1.8	86.2	1.1	2.2	69.2	1.2	2.5	56.1	1.2	3.0	46.1	1.3	3.4	38.4	1.3	3.9
140	286.1	0.9	0.8	200.3	0.9	1.1	146.2	1.0	1.5	113.2	1.0	1.8	89.4	1.1	2.2	71.8	1.2	2.5	58.2	1.2	3.0	47.8	1.3	3.4	39.9	1.3	3.9
145	296.3	0.9	0.8	207.4	0.9	1.1	151.4	1.0	1.5	117.3	1.0	1.8	92.6	1.1	2.2	74.4	1.2	2.5	60.3	1.2	3.0	49.6	1.3	3.4	41.3	1.3	3.9
150	306.5	0.9	0.8	214.6	0.9	1.1	156.7	1.0	1.5	121.3	1.0	1.8	95.8	1.1	2.2	76.9	1.2	2.5	62.4	1.2	3.0	51.3	1.3	3.4	42.7	1.3	3.9

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 5.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	11.3	0.8	0.8	8.0	0.9	1.1	5.6	1.0	1.4	4.2	1.1	1.6															
10	22.5	0.8	0.8	16.3	0.9	1.1	11.5	0.9	1.4	8.9	1.0	1.7	7.0	1.0	2.0	5.5	1.2	2.4	4.0	1.4	2.6						
15	33.7	0.8	0.8	24.3	0.9	1.1	17.4	0.9	1.4	13.7	1.0	1.7	10.7	1.0	2.1	8.5	1.1	2.4	6.8	1.2	2.8	5.4	1.3	3.2			
20	45.0	0.8	0.8	32.4	0.9	1.1	23.2	0.9	1.4	18.2	1.0	1.7	14.5	1.0	2.1	11.5	1.1	2.5	9.3	1.1	2.8	7.5	1.2	3.2	6.1	1.4	3.7
25	56.2	0.8	0.8	40.5	0.9	1.1	28.9	0.9	1.4	22.8	1.0	1.7	18.1	1.0	2.1	14.6	1.1	2.4	11.7	1.1	2.8	9.6	1.2	3.3	7.8	1.3	3.7
30	67.4	0.8	0.8	48.7	0.9	1.1	34.7	0.9	1.4	27.3	1.0	1.7	21.7	1.0	2.1	17.5	1.1	2.4	14.1	1.1	2.8	11.6	1.2	3.3	9.5	1.3	3.7
35	78.7	0.8	0.8	56.8	0.9	1.1	40.5	0.9	1.4	31.8	1.0	1.7	25.3	1.0	2.1	20.4	1.0	2.5	16.7	1.1	2.8	13.6	1.2	3.3	11.2	1.3	3.7
40	89.9	0.8	0.8	64.9	0.9	1.1	46.3	0.9	1.4	36.4	1.0	1.7	28.8	1.0	2.1	23.3	1.0	2.5	19.1	1.1	2.8	15.6	1.2	3.3	12.9	1.2	3.7
45	101.1	0.8	0.8	73.0	0.9	1.1	52.1	0.9	1.4	40.9	1.0	1.7	32.4	1.0	2.1	26.2	1.0	2.5	21.5	1.1	2.8	17.7	1.2	3.3	14.6	1.2	3.7
50	112.4	0.8	0.8	81.1	0.9	1.1	57.9	0.9	1.4	45.5	1.0	1.7	36.0	1.0	2.1	29.1	1.0	2.5	23.9	1.1	2.8	19.7	1.2	3.3	16.2	1.2	3.7
55	123.6	0.8	0.8	89.2	0.9	1.1	63.6	0.9	1.4	50.0	1.0	1.7	39.6	1.0	2.1	32.0	1.0	2.5	26.2	1.1	2.8	21.7	1.2	3.3	18.0	1.2	3.8
60	134.8	0.8	0.8	97.3	0.9	1.1	69.4	0.9	1.4	54.5	1.0	1.7	43.2	1.0	2.1	34.9	1.0	2.5	28.6	1.1	2.8	23.6	1.2	3.3	19.7	1.2	3.8
65	146.1	0.8	0.8	105.4	0.9	1.1	75.2	0.9	1.4	59.1	1.0	1.7	46.8	1.0	2.1	37.8	1.0	2.5	31.0	1.1	2.8	25.6	1.2	3.3	21.3	1.2	3.8
70	157.3	0.8	0.8	113.5	0.9	1.1	81.0	0.9	1.4	63.6	1.0	1.7	50.4	1.0	2.1	40.7	1.0	2.5	33.4	1.1	2.8	27.5	1.2	3.3	22.9	1.2	3.8
75	168.6	0.8	0.8	121.6	0.9	1.1	86.8	0.9	1.4	68.2	1.0	1.7	54.0	1.0	2.1	43.6	1.0	2.5	35.8	1.1	2.8	29.4	1.2	3.3	24.5	1.2	3.8
80	179.8	0.8	0.8	129.7	0.9	1.1	92.6	0.9	1.4	72.7	0.9	1.7	57.6	1.0	2.1	46.5	1.0	2.5	38.1	1.1	2.8	31.4	1.2	3.3	26.2	1.2	3.8
85	191.0	0.8	0.8	137.8	0.9	1.1	98.3	0.9	1.4	77.3	0.9	1.7	61.2	1.0	2.1	49.4	1.0	2.5	40.5	1.1	2.8	33.3	1.2	3.3	27.8	1.2	3.8
90	202.3	0.8	0.8	145.9	0.9	1.1	104.1	0.9	1.4	81.8	0.9	1.7	64.9	1.0	2.1	52.3	1.0	2.5	42.9	1.1	2.8	35.3	1.2	3.3	29.4	1.2	3.8
95	213.5	0.8	0.8	154.0	0.9	1.1	109.9	0.9	1.4	86.3	0.9	1.7	68.5	1.0	2.1	55.2	1.0	2.5	45.3	1.1	2.8	37.2	1.2	3.3	31.1	1.2	3.8
100	224.7	0.8	0.8	162.1	0.9	1.1	115.7	0.9	1.4	90.9	0.9	1.7	72.1	1.0	2.1	58.1	1.0	2.5	47.7	1.1	2.8	39.2	1.2	3.3	32.7	1.2	3.8
105	236.0	0.8	0.8	170.2	0.9	1.1	121.5	0.9	1.4	95.4	0.9	1.7	75.7	1.0	2.1	61.0	1.0	2.5	50.0	1.1	2.8	41.1	1.2	3.3	34.3	1.2	3.8
110	247.2	0.8	0.8	178.3	0.9	1.1	127.3	0.9	1.4	100.0	0.9	1.7	79.3	1.0	2.1	64.0	1.0	2.5	52.4	1.1	2.8	43.1	1.2	3.3	35.0	1.2	3.8
115	258.5	0.8	0.8	186.4	0.9	1.1	133.0	0.9	1.4	104.5	0.9	1.7	82.9	1.0	2.1	66.9	1.0	2.5	54.8	1.1	2.8	45.0	1.2	3.3	37.6	1.2	3.8
120	269.7	0.8	0.8	194.6	0.9	1.1	138.8	0.9	1.4	109.1	0.9	1.7	86.5	1.0	2.1	69.8	1.0	2.5	57.2	1.1	2.8	47.0	1.2	3.3	39.2	1.2	3.8
125	280.9	0.8	0.8	202.7	0.9	1.1	144.6	0.9	1.4	113.6	0.9	1.7	90.1	1.0	2.1	72.7	1.0	2.5	59.6	1.1	2.8	48.9	1.2	3.3	40.9	1.2	3.8
130	292.2	0.8	0.8	210.8	0.9	1.1	150.4	0.9	1.4	118.2	0.9	1.7	93.7	1.0	2.1	75.6	1.0	2.5	61.9	1.1	2.8	50.9	1.2	3.3	42.5	1.2	3.8
135	303.4	0.8	0.8	218.9	0.9	1.1	156.2	0.9	1.4	122.7	0.9	1.7	97.3	1.0	2.1	78.5	1.0	2.5	64.3	1.1	2.8	52.9	1.2	3.3	44.1	1.2	3.8
140	314.6	0.8	0.8	227.0	0.9	1.1	162.0	0.9	1.4	127.2	0.9	1.7	100.9	1.0	2.1	81.4	1.0	2.5	66.7	1.1	2.8	54.8	1.2	3.3	45.8	1.2	3.8
145	325.9	0.8	0.8	235.1	0.9	1.1	167.8	0.9	1.4	131.8	0.9	1.7	104.5	1.0	2.1	84.3	1.0	2.5	69.1	1.1	2.8	56.8	1.2	3.3	47.4	1.2	3.8
150	337.1	0.8	0.8	243.2	0.9	1.1	173.5	0.9	1.4	136.3	0.9	1.7	108.1	1.0	2.1	87.2	1.0	2.5	71.5	1.1	2.8	58.7	1.2	3.3	49.0	1.2	3.8

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 6.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	12.4	0.7	0.8	8.7	0.8	1.0	6.2	0.9	1.4	4.7	1.0	1.6	3.5	1.2	1.9												
10	24.7	0.7	0.8	17.6	0.8	1.0	12.8	0.9	1.4	9.8	0.9	1.7	7.8	1.0	2.0	6.2	1.0	2.3	4.9	1.1	2.7						
15	37.1	0.7	0.8	26.4	0.8	1.1	19.2	0.8	1.4	15.0	0.9	1.7	11.8	0.9	2.0	9.5	1.0	2.4	7.7	1.1	2.7	6.2	1.2	3.1	5.0	1.3	3.5
20	49.4	0.7	0.8	35.1	0.8	1.1	25.6	0.8	1.4	19.9	0.9	1.7	16.0	0.9	2.0	12.9	1.0	2.4	10.4	1.0	2.8	8.5	1.1	3.2	7.0	1.2	3.6
25	61.8	0.7	0.8	43.9	0.8	1.1	32.0	0.8	1.4	24.9	0.9	1.7	19.9	0.9	2.0	16.1	1.0	2.4	13.1	1.0	2.8	10.8	1.1	3.2	8.9	1.2	3.6
30	74.1	0.7	0.8	52.7	0.8	1.1	38.4	0.8	1.4	29.9	0.9	1.7	23.8	0.9	2.1	19.3	1.0	2.4	15.9	1.0	2.8	13.0	1.1	3.2	10.8	1.1	3.6
35	86.5	0.7	0.8	61.5	0.8	1.1	44.8	0.8	1.4	34.8	0.9	1.7	27.8	0.9	2.1	22.5	1.0	2.4	18.5	1.0	2.8	15.4	1.1	3.2	12.7	1.1	3.6
40	98.9	0.7	0.8	70.2	0.8	1.1	51.2	0.8	1.4	39.8	0.9	1.7	31.8	0.9	2.1	25.7	1.0	2.4	21.2	1.0	2.8	17.6	1.1	3.2	14.5	1.1	3.6
45	111.2	0.7	0.8	79.0	0.8	1.1	57.6	0.8	1.4	44.8	0.9	1.7	35.7	0.9	2.1	29.0	1.0	2.4	23.8	1.0	2.8	19.8	1.1	3.2	16.6	1.1	3.6
50	123.6	0.7	0.8	87.8	0.8	1.1	64.0	0.8	1.4	49.7	0.9	1.7	39.7	0.9	2.1	32.2	1.0	2.4	26.4	1.0	2.8	22.0	1.1	3.2	18.4	1.1	3.6
55	135.9	0.7	0.8	96.6	0.8	1.1	70.4	0.8	1.4	54.7	0.9	1.7	43.6	0.9	2.1	35.4	1.0	2.4	29.1	1.0	2.8	24.2	1.1	3.2	20.2	1.1	3.7
60	148.3	0.7	0.8	105.3	0.8	1.1	76.8	0.8	1.4	59.7	0.9	1.7	47.6	0.9	2.1	38.6	1.0	2.4	31.7	1.0	2.8	26.3	1.1	3.2	22.0	1.1	3.7
65	160.6	0.7	0.8	114.1	0.8	1.1	83.2	0.8	1.4	64.7	0.9	1.7	51.6	0.9	2.1	41.8	1.0	2.4	34.3	1.0	2.8	28.5	1.1	3.2	23.8	1.1	3.7
70	173.0	0.7	0.8	122.9	0.8	1.1	89.6	0.8	1.4	69.6	0.9	1.7	55.5	0.9	2.1	45.0	1.0	2.4	37.0	1.0	2.8	30.7	1.1	3.2	25.6	1.1	3.7
75	185.4	0.7	0.8	131.7	0.8	1.1	96.0	0.8	1.4	74.6	0.9	1.7	59.5	0.9	2.1	48.2	1.0	2.4	39.6	1.0	2.8	32.9	1.1	3.2	27.4	1.1	3.7
80	197.7	0.7	0.8	140.4	0.8	1.1	102.3	0.8	1.4	79.6	0.9	1.7	63.5	0.9	2.1	51.4	1.0	2.4	42.2	1.0	2.8	35.1	1.1	3.2	29.3	1.1	3.7
85	210.1	0.7	0.8	149.2	0.8	1.1	108.7	0.8	1.4	84.5	0.9	1.7	67.4	0.9	2.1	54.7	1.0	2.4	44.9	1.0	2.8	37.3	1.1	3.2	31.1	1.1	3.7
90	222.4	0.7	0.8	158.0	0.8	1.1	115.1	0.8	1.4	89.5	0.9	1.7	71.4	0.9	2.1	57.9	1.0	2.4	47.5	1.0	2.8	39.5	1.1	3.2	32.9	1.1	3.7
95	234.8	0.7	0.8	166.8	0.8	1.1	121.5	0.8	1.4	94.5	0.9	1.7	75.4	0.9	2.1	61.1	1.0	2.4	50.2	1.0	2.8	41.7	1.1	3.2	34.7	1.1	3.7
100	247.1	0.7	0.8	175.5	0.8	1.1	127.9	0.8	1.4	99.5	0.9	1.7	79.3	0.9	2.1	64.3	1.0	2.4	52.8	1.0	2.8	43.9	1.1	3.2	36.6	1.1	3.7
105	259.5	0.7	0.8	184.3	0.8	1.1	134.3	0.8	1.4	104.4	0.9	1.7	83.3	0.9	2.1	67.5	1.0	2.4	55.4	1.0	2.8	46.1	1.1	3.2	38.4	1.1	3.7
110	271.8	0.7	0.8	193.1	0.8	1.1	140.7	0.8	1.4	109.4	0.9	1.7	87.3	0.9	2.1	70.7	1.0	2.4	58.1	1.0	2.8	48.2	1.1	3.2	40.2	1.1	3.7
115	284.2	0.7	0.8	201.9	0.8	1.1	147.1	0.8	1.4	114.4	0.9	1.7	91.2	0.9	2.1	73.9	1.0	2.4	60.7	1.0	2.8	50.4	1.1	3.2	42.0	1.1	3.7
120	296.6	0.7	0.8	210.7	0.8	1.1	153.5	0.8	1.4	119.3	0.9	1.7	95.2	0.9	2.1	77.2	1.0	2.4	63.3	1.0	2.8	52.6	1.1	3.2	43.9	1.1	3.7
125	308.9	0.7	0.8	219.4	0.8	1.1	159.9	0.8	1.4	124.3	0.9	1.7	99.2	0.9	2.1	80.4	1.0	2.4	66.0	1.0	2.8	54.8	1.1	3.2	45.7	1.1	3.7
130	321.3	0.7	0.8	228.2	0.8	1.1	166.3	0.8	1.4	129.3	0.9	1.7	103.1	0.9	2.1	83.6	1.0	2.4	68.6	1.0	2.8	57.0	1.1	3.2	47.5	1.1	3.7
135	333.6	0.7	0.8	237.0	0.8	1.1	172.7	0.8	1.4	134.3	0.9	1.7	107.1	0.9	2.1	86.8	1.0	2.4	71.3	1.0	2.8	59.2	1.1	3.2	49.3	1.1	3.7
140	346.0	0.7	0.8	245.8	0.8	1.1	179.1	0.8	1.4	139.2	0.9	1.7	111.0	0.9	2.1	90.0	1.0	2.4	73.9	1.0	2.8	61.4	1.1	3.2	51.2	1.1	3.7
145	358.3	0.7	0.8	254.5	0.8	1.1	185.5	0.8	1.4	144.2	0.9	1.7	115.0	0.9	2.1	93.2	1.0	2.4	76.5	1.0	2.8	63.6	1.1	3.2	53.0	1.1	3.7
150	370.7	0.7	0.8	263.3	0.8	1.1	191.9	0.8	1.4	149.2	0.9	1.7	119.0	0.9	2.1	96.4	1.0	2.4	79.2	1.0	2.8	65.8	1.1	3.2	54.8	1.1	3.7

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 8.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	14.0	0.7	0.8	10.1	0.7	1.0	7.4	0.8	1.3	5.5	0.8	1.6	4.4	0.9	1.9	3.4	1.0	2.1									
10	28.0	0.7	0.8	20.1	0.7	1.0	15.0	0.8	1.3	11.3	0.8	1.7	9.1	0.8	2.0	7.4	0.9	2.3	6.0	0.9	2.6	4.9	1.0	3.0	3.8	1.2	3.3
15	41.9	0.7	0.8	30.1	0.7	1.0	22.4	0.8	1.3	17.0	0.8	1.7	13.9	0.8	2.0	11.4	0.9	2.3	9.2	0.9	2.7	7.6	1.0	3.0	6.3	1.0	3.4
20	55.9	0.7	0.8	40.1	0.7	1.0	29.9	0.8	1.3	22.6	0.8	1.7	18.5	0.8	2.0	15.1	0.9	2.3	12.5	0.9	2.7	10.2	1.0	3.1	8.5	1.0	3.5
25	69.9	0.7	0.8	50.1	0.7	1.0	37.3	0.8	1.3	28.2	0.8	1.7	23.1	0.8	2.0	18.8	0.9	2.3	15.6	0.9	2.7	13.0	0.9	3.1	10.8	1.0	3.5
30	83.9	0.7	0.8	60.1	0.7	1.0	44.8	0.8	1.3	33.9	0.8	1.7	27.7	0.8	2.0	22.6	0.9	2.3	18.6	0.9	2.7	15.6	0.9	3.1	13.0	1.0	3.5
35	97.9	0.7	0.8	70.1	0.7	1.0	52.3	0.8	1.3	39.5	0.8	1.7	32.3	0.8	2.0	26.3	0.9	2.3	21.7	0.9	2.7	18.2	0.9	3.1	15.3	1.0	3.5
40	111.8	0.7	0.8	80.2	0.7	1.0	59.7	0.8	1.3	45.1	0.8	1.7	36.9	0.8	2.0	30.1	0.9	2.3	24.8	0.9	2.7	20.8	0.9	3.1	17.5	1.0	3.5
45	125.8	0.7	0.8	90.2	0.7	1.0	67.2	0.8	1.3	50.8	0.8	1.7	41.5	0.8	2.0	33.8	0.9	2.3	27.9	0.9	2.7	23.3	0.9	3.1	19.7	1.0	3.5
50	139.8	0.7	0.8	100.2	0.7	1.0	74.7	0.8	1.3	56.4	0.8	1.7	46.1	0.8	2.0	37.6	0.9	2.3	31.0	0.9	2.7	25.9	0.9	3.1	21.9	1.0	3.5
55	153.8	0.7	0.8	110.2	0.7	1.0	82.1	0.8	1.3	62.1	0.8	1.7	50.7	0.8	2.0	41.3	0.9	2.3	34.1	0.9	2.7	28.5	0.9	3.1	24.0	1.0	3.5
60	167.8	0.7	0.8	120.2	0.7	1.0	89.6	0.8	1.3	67.7	0.8	1.7	55.3	0.8	2.0	45.1	0.9	2.3	37.2	0.9	2.7	31.1	0.9	3.1	26.2	1.0	3.5
65	181.7	0.7	0.8	130.3	0.7	1.0	97.0	0.8	1.3	73.3	0.8	1.7	60.0	0.8	2.0	48.8	0.9	2.3	40.3	0.9	2.7	33.7	0.9	3.1	28.4	1.0	3.5
70	195.7	0.7	0.8	140.3	0.7	1.0	104.5	0.8	1.3	79.0	0.8	1.7	64.6	0.8	2.0	52.6	0.9	2.3	43.4	0.9	2.7	36.3	0.9	3.1	30.6	1.0	3.5
75	209.7	0.7	0.8	150.3	0.7	1.0	112.0	0.8	1.3	84.6	0.8	1.7	69.2	0.8	2.0	56.3	0.9	2.3	46.5	0.9	2.7	38.9	0.9	3.1	32.8	1.0	3.5
80	223.7	0.7	0.8	160.3	0.7	1.0	119.4	0.8	1.3	90.3	0.8	1.7	73.8	0.8	2.0	60.1	0.9	2.3	49.6	0.9	2.7	41.4	0.9	3.1	35.0	1.0	3.5
85	237.7	0.7	0.8	170.3	0.7	1.0	126.9	0.8	1.3	95.9	0.8	1.7	78.4	0.8	2.0	63.8	0.9	2.3	52.7	0.9	2.7	44.0	0.9	3.1	37.1	1.0	3.5
90	251.6	0.7	0.8	180.3	0.7	1.0	134.4	0.8	1.3	101.6	0.8	1.7	83.0	0.8	2.0	67.6	0.9	2.3	55.8	0.9	2.7	46.6	0.9	3.1	39.3	1.0	3.5
95	265.6	0.7	0.8	190.4	0.7	1.0	141.8	0.8	1.3	107.2	0.8	1.7	87.6	0.8	2.0	71.3	0.9	2.3	58.9	0.9	2.7	49.2	0.9	3.1	41.5	1.0	3.5
100	279.6	0.7	0.8	200.4	0.7	1.0	149.3	0.8	1.3	112.8	0.8	1.7	92.2	0.8	2.0	75.1	0.9	2.3	62.0	0.9	2.7	51.8	0.9	3.1	43.7	1.0	3.5
105	293.6	0.7	0.8	210.4	0.7	1.0	156.8	0.8	1.3	118.5	0.8	1.7	96.8	0.8	2.0	78.9	0.9	2.3	65.1	0.9	2.7	54.4	0.9	3.1	45.9	1.0	3.5
110	307.6	0.7	0.8	220.4	0.7	1.0	164.2	0.8	1.3	124.1	0.8	1.7	101.4	0.8	2.0	82.6	0.9	2.3	68.2	0.9	2.7	57.0	0.9	3.1	48.0	1.0	3.5
115	321.5	0.7	0.8	230.4	0.7	1.0	171.7	0.8	1.3	129.8	0.8	1.7	106.1	0.8	2.0	86.4	0.9	2.3	71.3	0.9	2.7	59.6	0.9	3.1	50.2	1.0	3.5
120	335.5	0.7	0.8	240.5	0.7	1.0	179.1	0.8	1.3	135.4	0.8	1.7	110.7	0.8	2.0	90.1	0.9	2.3	74.4	0.9	2.7	62.2	0.9	3.1	52.4	1.0	3.5
125	349.5	0.7	0.8	250.5	0.7	1.0	186.6	0.8	1.3	141.0	0.8	1.7	115.3	0.8	2.0	93.9	0.9	2.3	77.5	0.9	2.7	64.7	0.9	3.1	54.6	1.0	3.5
130	363.5	0.7	0.8	260.5	0.7	1.0	194.1	0.8	1.3	146.7	0.8	1.7	119.9	0.8	2.0	97.6	0.9	2.3	80.6	0.9	2.7	67.3	0.9	3.1	56.8	1.0	3.5
135	377.5	0.7	0.8	270.5	0.7	1.0	201.5	0.8	1.3	152.3	0.8	1.7	124.5	0.8	2.0	101.4	0.9	2.3	83.7	0.9	2.7	69.9	0.9	3.1	59.0	1.0	3.5
140	391.5	0.7	0.8	280.5	0.7	1.0	209.0	0.8	1.3	158.0	0.8	1.7	129.1	0.8	2.0	105.1	0.9	2.3	86.8	0.9	2.7	72.5	0.9	3.1	61.1	1.0	3.5
145	405.4	0.7	0.8	290.6	0.7	1.0	216.5	0.8	1.3	163.6	0.8	1.7	133.7	0.8	2.0	108.9	0.9	2.3	89.9	0.9	2.7	75.1	0.9	3.1	63.3	1.0	3.5
150	419.4	0.7	0.8	300.6	0.7	1.0	223.9	0.8	1.3	169.3	0.8	1.7	138.3	0.8	2.0	112.6	0.9	2.3	93.0	0.9	2.7	77.7	0.9	3.1	65.5	1.0	3.5

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "B"

GRADE 10.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	15.3	0.6	0.8	11.1	0.7	1.0	8.1	0.7	1.3	6.3	0.7	1.6	4.8	0.8	1.9	4.0	0.9	2.2	3.1	1.0	2.4						
10	30.6	0.6	0.8	22.1	0.7	1.0	16.5	0.7	1.3	12.8	0.7	1.6	10.0	0.8	2.0	8.4	0.8	2.2	6.9	0.8	2.6	5.7	0.9	2.9	4.7	1.0	3.3
15	45.9	0.6	0.8	33.2	0.7	1.0	24.7	0.7	1.3	19.2	0.7	1.6	15.0	0.8	2.0	12.7	0.8	2.2	10.5	0.8	2.6	8.7	0.9	3.0	7.3	0.9	3.3
20	61.2	0.6	0.8	44.2	0.7	1.0	32.9	0.7	1.3	25.6	0.7	1.6	20.0	0.8	2.0	17.0	0.8	2.2	14.1	0.8	2.6	11.8	0.9	3.0	9.8	0.9	3.4
25	76.5	0.6	0.8	55.3	0.7	1.0	41.1	0.7	1.3	32.0	0.7	1.6	25.0	0.8	2.0	21.2	0.8	2.3	17.6	0.8	2.6	14.7	0.9	3.0	12.5	0.9	3.4
30	91.8	0.6	0.8	66.3	0.7	1.0	49.3	0.7	1.3	38.3	0.7	1.6	29.9	0.8	2.0	25.4	0.8	2.3	21.1	0.8	2.6	17.7	0.8	3.0	15.0	0.9	3.3
35	107.1	0.6	0.8	77.4	0.7	1.0	57.5	0.7	1.3	44.7	0.7	1.6	34.9	0.8	2.0	29.7	0.8	2.3	24.6	0.8	2.6	20.6	0.8	3.0	17.5	0.9	3.4
40	122.4	0.6	0.8	88.4	0.7	1.0	65.7	0.7	1.3	51.1	0.7	1.6	39.9	0.8	2.0	33.9	0.8	2.3	28.1	0.8	2.6	23.5	0.8	3.0	20.0	0.9	3.4
45	137.8	0.6	0.8	99.5	0.7	1.0	73.9	0.7	1.3	57.5	0.7	1.6	44.9	0.8	2.0	38.0	0.8	2.3	31.6	0.8	2.6	26.5	0.8	3.0	22.5	0.9	3.4
50	153.1	0.6	0.8	110.6	0.7	1.0	82.1	0.7	1.3	63.9	0.7	1.6	49.9	0.8	2.0	42.2	0.8	2.3	35.1	0.8	2.6	29.4	0.8	3.0	25.0	0.9	3.4
55	168.4	0.6	0.8	121.6	0.7	1.0	90.3	0.7	1.3	70.3	0.7	1.6	54.9	0.8	2.0	46.4	0.8	2.3	38.6	0.8	2.6	32.3	0.8	3.0	27.5	0.9	3.4
60	183.7	0.6	0.8	132.7	0.7	1.0	98.5	0.7	1.3	76.7	0.7	1.6	59.9	0.8	2.0	50.7	0.8	2.3	42.1	0.8	2.6	35.3	0.8	3.0	30.0	0.9	3.4
65	199.0	0.6	0.8	143.7	0.7	1.0	106.7	0.7	1.3	83.1	0.7	1.6	64.8	0.8	2.0	54.9	0.8	2.3	45.6	0.8	2.6	38.2	0.8	3.0	32.5	0.9	3.4
70	214.3	0.6	0.8	154.8	0.7	1.0	115.0	0.7	1.3	89.4	0.7	1.6	69.8	0.8	2.0	59.1	0.8	2.3	49.1	0.8	2.6	41.2	0.8	3.0	35.0	0.9	3.4
75	229.6	0.6	0.8	165.8	0.7	1.0	123.2	0.7	1.3	95.8	0.7	1.6	74.8	0.8	2.0	63.3	0.8	2.3	52.6	0.8	2.6	44.1	0.8	3.0	37.4	0.9	3.4
80	244.9	0.6	0.8	176.9	0.7	1.0	131.4	0.7	1.3	102.2	0.7	1.6	79.8	0.8	2.0	67.6	0.8	2.3	56.1	0.8	2.6	47.0	0.8	3.0	39.8	0.9	3.4
85	260.2	0.6	0.8	187.9	0.7	1.0	139.6	0.7	1.3	108.6	0.7	1.6	84.8	0.8	2.0	71.8	0.8	2.3	59.6	0.8	2.6	50.0	0.8	3.0	42.3	0.9	3.4
90	275.5	0.6	0.8	199.0	0.7	1.0	147.8	0.7	1.3	115.0	0.7	1.6	89.8	0.8	2.0	76.0	0.8	2.3	63.1	0.8	2.6	52.9	0.8	3.0	44.8	0.9	3.4
95	290.8	0.6	0.8	210.0	0.7	1.0	156.0	0.7	1.3	121.4	0.7	1.6	94.8	0.8	2.0	80.2	0.8	2.3	66.6	0.8	2.6	55.8	0.8	3.0	47.3	0.9	3.4
100	306.1	0.6	0.8	221.1	0.7	1.0	164.2	0.7	1.3	127.8	0.7	1.6	99.8	0.8	2.0	84.4	0.8	2.3	70.1	0.8	2.6	58.8	0.8	3.0	49.7	0.9	3.4
105	321.4	0.6	0.8	232.2	0.7	1.0	172.4	0.7	1.3	134.2	0.7	1.6	104.7	0.8	2.0	88.7	0.8	2.3	73.6	0.8	2.6	61.7	0.8	3.0	52.2	0.9	3.4
110	336.7	0.6	0.8	243.2	0.7	1.0	180.6	0.7	1.3	140.5	0.7	1.6	109.7	0.8	2.0	92.9	0.8	2.3	77.1	0.8	2.6	64.7	0.8	3.0	54.7	0.9	3.4
115	352.0	0.6	0.8	254.3	0.7	1.0	188.8	0.7	1.3	146.9	0.7	1.6	114.7	0.8	2.0	97.1	0.8	2.3	80.6	0.8	2.6	67.6	0.8	3.0	57.2	0.9	3.4
120	367.3	0.6	0.8	265.3	0.7	1.0	197.1	0.7	1.3	153.3	0.7	1.6	119.7	0.8	2.0	101.3	0.8	2.3	84.1	0.8	2.6	70.5	0.8	3.0	59.7	0.9	3.4
125	382.6	0.6	0.8	276.4	0.7	1.0	205.3	0.7	1.3	159.7	0.7	1.6	124.7	0.8	2.0	105.5	0.8	2.3	87.6	0.8	2.6	73.5	0.8	3.0	62.2	0.9	3.4
130	397.9	0.6	0.8	287.4	0.7	1.0	213.5	0.7	1.3	166.1	0.7	1.6	129.7	0.8	2.0	109.8	0.8	2.3	91.1	0.8	2.6	76.4	0.8	3.0	64.7	0.9	3.4
135	413.2	0.6	0.8	298.5	0.7	1.0	221.7	0.7	1.3	172.5	0.7	1.6	134.7	0.8	2.0	114.0	0.8	2.3	94.6	0.8	2.6	79.3	0.8	3.0	67.2	0.9	3.4
140	428.6	0.6	0.8	309.5	0.7	1.0	229.9	0.7	1.3	178.9	0.7	1.6	139.7	0.8	2.0	118.2	0.8	2.3	98.1	0.8	2.6	82.3	0.8	3.0	69.6	0.9	3.4
145	443.9	0.6	0.8	320.6	0.7	1.0	238.1	0.7	1.3	185.3	0.7	1.6	144.6	0.8	2.0	122.4	0.8	2.3	101.7	0.8	2.6	85.2	0.8	3.0	72.1	0.9	3.4
150	459.2	0.6	0.8	331.7	0.7	1.0	246.3	0.7	1.3	191.6	0.7	1.6	149.6	0.8	2.0	126.7	0.8	2.3	105.2	0.8	2.6	88.2	0.8	3.0	74.6	0.9	3.4

EXHIBIT 7-4 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "B")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 0.25 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10																											
15																											
20																											
25	9.3	2.3	1.7																								
30	11.7	2.2	1.8																								
35	14.1	2.1	1.7																								
40	16.3	2.1	1.8																								
45	18.5	2.1	1.8	10.4	2.8	2.3																					
50	20.7	2.1	1.8	12.3	2.6	2.3																					
55	22.9	2.1	1.8	13.8	2.6	2.3																					
60	25.0	2.0	1.8	15.3	2.5	2.3																					
65	27.2	2.0	1.8	16.8	2.5	2.3	10.4	3.4	2.8																		
70	29.3	2.0	1.8	18.2	2.5	2.3	12.1	3.1	2.8																		
75	31.9	2.0	1.7	19.7	2.4	2.3	13.5	3.0	2.8																		
80	34.0	2.0	1.7	21.1	2.4	2.3	14.7	2.9	2.8																		
85	36.1	2.0	1.7	22.5	2.4	2.3	15.8	2.9	2.8																		
90	38.2	2.0	1.7	23.9	2.4	2.3	16.9	2.8	2.8																		
95	40.3	2.0	1.7	25.3	2.4	2.3	18.0	2.8	2.8																		
100	42.4	2.0	1.7	26.7	2.4	2.3	19.1	2.8	2.8																		
105	44.6	2.0	1.7	28.1	2.4	2.3	20.2	2.8	2.8																		
110	46.7	2.0	1.7	29.5	2.4	2.3	21.3	2.8	2.8	12.9	3.8	3.4															
115	48.8	2.0	1.7	30.8	2.4	2.3	22.3	2.8	2.8	14.0	3.7	3.4															
120	50.9	2.0	1.7	32.2	2.4	2.3	23.4	2.8	2.8	15.3	3.5	3.4															
125	53.0	2.0	1.8	33.6	2.4	2.3	24.4	2.8	2.8	16.1	3.5	3.4															
130	55.1	2.0	1.8	35.0	2.4	2.3	25.5	2.8	2.8	16.9	3.4	3.4															
135	57.3	2.0	1.8	36.4	2.4	2.3	26.5	2.7	2.8	17.7	3.4	3.4															
140	59.4	2.0	1.8	38.3	2.4	2.3	27.6	2.7	2.8	18.5	3.4	3.4															
145	61.5	2.0	1.8	39.7	2.4	2.3	28.6	2.7	2.8	19.3	3.3	3.4															
150	63.6	2.0	1.8	41.1	2.4	2.3	29.6	2.7	2.8	20.1	3.3	3.4															

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 0.50 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10																											
15	8.4	1.6	1.7																								
20	11.7	1.5	1.7	7.1	2.0	2.2																					
25	14.9	1.5	1.7	9.7	1.8	2.2																					
30	18.0	1.5	1.7	12.0	1.7	2.2																					
35	21.0	1.5	1.7	14.2	1.7	2.2	9.3	2.1	2.7																		
40	24.4	1.5	1.7	16.3	1.7	2.2	10.9	2.0	2.7																		
45	27.4	1.5	1.7	18.5	1.7	2.2	12.5	2.0	2.7																		
50	30.5	1.5	1.7	20.6	1.7	2.2	14.1	1.9	2.7	8.7	2.6	3.3															
55	33.5	1.5	1.7	22.7	1.7	2.2	15.7	1.9	2.7	10.4	2.4	3.3															
60	36.6	1.5	1.7	24.8	1.7	2.2	17.2	1.9	2.7	11.7	2.3	3.3															
65	39.6	1.5	1.7	27.3	1.7	2.2	18.8	1.9	2.7	12.9	2.3	3.3															
70	42.6	1.5	1.7	29.4	1.7	2.2	20.3	1.9	2.7	14.0	2.2	3.3	9.8	2.8	3.8												
75	45.7	1.5	1.7	31.4	1.7	2.2	21.8	1.9	2.7	15.2	2.2	3.3	11.3	2.7	3.8												
80	48.7	1.5	1.7	33.5	1.7	2.2	23.3	1.9	2.7	16.3	2.2	3.3	12.2	2.6	3.8												
85	51.7	1.5	1.7	35.6	1.6	2.2	24.8	1.9	2.7	17.4	2.2	3.3	13.2	2.5	3.8												
90	54.8	1.5	1.7	37.7	1.6	2.2	26.3	1.9	2.7	18.5	2.2	3.3	14.2	2.5	3.8												
95	57.8	1.5	1.7	39.8	1.6	2.2	27.8	1.9	2.7	19.6	2.2	3.3	15.1	2.5	3.8												
100	60.9	1.5	1.7	41.9	1.6	2.2	29.7	1.9	2.7	20.7	2.2	3.3	16.0	2.5	3.8	11.0	3.2	4.3									
105	63.9	1.5	1.7	44.0	1.6	2.2	31.2	1.9	2.7	21.8	2.2	3.3	16.9	2.5	3.8	12.3	3.0	4.3									
110	66.9	1.5	1.7	46.1	1.6	2.2	32.6	1.9	2.7	22.9	2.2	3.3	17.8	2.4	3.8	13.1	2.9	4.3									
115	70.0	1.5	1.7	48.1	1.6	2.2	34.1	1.9	2.7	24.0	2.1	3.3	18.7	2.4	3.8	13.9	2.9	4.3									
120	73.0	1.5	1.7	50.2	1.6	2.2	35.6	1.9	2.7	25.1	2.1	3.3	19.6	2.4	3.8	14.6	2.9	4.3									
125	76.1	1.5	1.7	52.3	1.6	2.2	37.1	1.9	2.7	26.2	2.1	3.3	20.5	2.4	3.8	15.4	2.8	4.3									
130	79.1	1.5	1.7	54.4	1.6	2.2	38.5	1.9	2.7	27.3	2.1	3.3	21.3	2.4	3.8	16.1	2.8	4.3									
135	82.1	1.5	1.7	56.5	1.6	2.2	40.0	1.9	2.7	28.4	2.1	3.3	22.2	2.4	3.8	16.9	2.8	4.3									
140	85.2	1.5	1.7	58.6	1.6	2.2	41.5	1.9	2.7	29.4	2.1	3.3	23.1	2.4	3.8	17.6	2.8	4.3									
145	88.2	1.5	1.7	60.7	1.6	2.2	43.0	1.9	2.7	30.5	2.1	3.3	24.0	2.4	3.8	18.3	2.8	4.3	12.3	3.7	4.9						
150	91.3	1.5	1.7	62.8	1.6	2.2	44.5	1.9	2.7	31.6	2.1	3.3	24.8	2.4	3.8	19.0	2.7	4.3	13.1	3.5	4.9						

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 0.75 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10	7.0	1.3	1.6																								
15	11.0	1.3	1.6	7.1	1.5	2.1																					
20	14.9	1.3	1.6	9.9	1.4	2.1	6.1	1.9	2.6																		
25	18.9	1.2	1.6	12.7	1.4	2.1	8.6	1.6	2.7																		
30	22.7	1.2	1.6	15.3	1.4	2.1	10.6	1.6	2.6	6.7	2.1	3.2															
35	26.5	1.2	1.6	18.0	1.4	2.1	12.6	1.6	2.7	8.7	1.9	3.2															
40	30.2	1.2	1.6	20.6	1.4	2.1	14.5	1.6	2.7	10.3	1.8	3.2															
45	34.0	1.2	1.6	23.5	1.4	2.1	16.4	1.5	2.7	11.8	1.8	3.2	7.8	2.3	3.8												
50	37.8	1.2	1.6	26.1	1.4	2.1	18.3	1.5	2.7	13.2	1.8	3.2	9.5	2.1	3.8												
55	41.5	1.2	1.6	28.7	1.4	2.1	20.2	1.5	2.7	14.7	1.7	3.2	10.7	2.0	3.8												
60	45.3	1.2	1.6	31.3	1.4	2.1	22.1	1.5	2.7	16.1	1.7	3.2	11.8	2.0	3.8												
65	49.1	1.2	1.6	33.9	1.4	2.1	24.3	1.5	2.6	17.6	1.7	3.2	13.0	2.0	3.8	8.5	2.6	4.4									
70	52.9	1.2	1.6	36.5	1.4	2.1	26.2	1.5	2.6	19.0	1.7	3.2	14.1	2.0	3.8	10.0	2.4	4.3									
75	56.6	1.2	1.6	39.1	1.4	2.1	28.0	1.5	2.6	20.4	1.7	3.2	15.2	2.0	3.8	11.0	2.4	4.4									
80	60.4	1.2	1.6	41.7	1.4	2.1	29.9	1.5	2.6	21.8	1.7	3.2	16.3	1.9	3.8	11.9	2.3	4.4									
85	64.2	1.2	1.6	44.3	1.4	2.1	31.8	1.5	2.6	23.2	1.7	3.2	17.4	1.9	3.8	12.8	2.3	4.4	9.1	2.9	4.8						
90	67.9	1.2	1.6	46.9	1.4	2.1	33.6	1.5	2.6	24.6	1.7	3.2	18.5	1.9	3.8	13.7	2.3	4.4	10.3	2.7	4.8						
95	71.7	1.2	1.6	49.5	1.4	2.1	35.5	1.5	2.6	26.0	1.7	3.2	19.6	1.9	3.8	14.6	2.2	4.4	11.4	2.6	4.8						
100	75.5	1.2	1.6	52.1	1.4	2.1	37.3	1.5	2.6	27.8	1.7	3.2	20.7	1.9	3.8	15.4	2.2	4.4	12.2	2.6	4.8						
105	79.3	1.2	1.6	54.7	1.4	2.1	39.2	1.5	2.6	29.1	1.7	3.2	21.8	1.9	3.8	16.3	2.2	4.4	12.9	2.5	4.8						
110	83.0	1.2	1.6	57.3	1.4	2.1	41.1	1.5	2.6	30.5	1.7	3.2	22.8	1.9	3.8	17.2	2.2	4.4	13.7	2.5	4.8						
115	86.8	1.2	1.6	59.9	1.4	2.1	42.9	1.5	2.6	31.9	1.7	3.2	23.9	1.9	3.8	18.0	2.2	4.4	14.4	2.5	4.8	10.5	3.1	5.3			
120	90.6	1.2	1.6	62.5	1.4	2.1	44.8	1.5	2.7	33.3	1.7	3.2	25.0	1.9	3.8	18.9	2.2	4.4	15.2	2.5	4.8	11.4	3.0	5.3			
125	94.3	1.2	1.6	65.1	1.4	2.1	46.7	1.5	2.7	34.7	1.7	3.2	26.0	1.9	3.8	19.7	2.2	4.4	15.9	2.4	4.8	12.4	2.9	5.3			
130	98.1	1.2	1.6	67.7	1.4	2.1	48.5	1.5	2.7	36.0	1.7	3.2	27.1	1.9	3.8	20.5	2.2	4.4	16.6	2.4	4.8	13.0	2.8	5.3			
135	101.9	1.2	1.6	70.3	1.4	2.1	50.4	1.5	2.7	37.4	1.7	3.2	28.2	1.9	3.8	21.4	2.2	4.4	17.3	2.4	4.8	13.7	2.8	5.3			
140	105.7	1.2	1.6	72.9	1.4	2.1	52.2	1.5	2.7	38.8	1.7	3.2	29.3	1.9	3.8	22.2	2.2	4.4	18.0	2.4	4.9	14.3	2.8	5.3			
145	109.4	1.2	1.6	75.5	1.4	2.1	54.1	1.5	2.7	40.2	1.7	3.2	30.8	1.9	3.7	23.1	2.2	4.4	18.7	2.4	4.9	14.9	2.7	5.3			
150	113.2	1.2	1.6	78.1	1.4	2.1	56.0	1.5	2.7	41.6	1.7	3.2	31.9	1.9	3.7	23.9	2.1	4.4	19.4	2.4	4.9	15.5	2.7	5.3			

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 1.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10	8.2	1.2	1.6	5.2	1.4	2.0																					
15	12.6	1.1	1.6	8.7	1.3	2.1	5.5	1.6	2.6																		
20	17.1	1.1	1.6	11.8	1.2	2.1	8.2	1.4	2.6																		
25	21.4	1.1	1.6	14.9	1.2	2.1	10.5	1.4	2.6	7.3	1.6	3.1															
30	25.7	1.1	1.6	18.0	1.2	2.1	12.8	1.4	2.6	9.1	1.6	3.2															
35	29.9	1.1	1.6	21.2	1.2	2.1	15.0	1.3	2.6	10.9	1.5	3.1	7.8	1.8	3.7												
40	34.2	1.1	1.6	24.3	1.2	2.1	17.3	1.3	2.6	12.6	1.5	3.1	9.2	1.7	3.7												
45	38.5	1.1	1.6	27.3	1.2	2.1	19.5	1.3	2.6	14.3	1.5	3.1	10.6	1.7	3.7	7.2	2.2	4.3									
50	42.7	1.1	1.6	30.3	1.2	2.1	21.9	1.3	2.6	16.0	1.5	3.2	11.9	1.7	3.7	8.8	2.0	4.3									
55	47.0	1.1	1.6	33.3	1.2	2.1	24.1	1.3	2.6	17.7	1.5	3.2	13.3	1.7	3.7	9.9	1.9	4.3									
60	51.3	1.1	1.6	36.3	1.2	2.1	26.3	1.3	2.6	19.3	1.5	3.2	14.6	1.7	3.7	11.0	1.9	4.3									
65	55.5	1.1	1.6	39.4	1.2	2.1	28.5	1.3	2.6	21.0	1.5	3.2	15.9	1.6	3.7	12.1	1.9	4.3	8.0	2.5	4.9						
70	59.8	1.1	1.6	42.4	1.2	2.1	30.7	1.3	2.6	22.7	1.5	3.2	17.1	1.6	3.7	13.2	1.9	4.3	9.5	2.3	4.8						
75	64.1	1.1	1.6	45.4	1.2	2.1	32.9	1.3	2.6	24.6	1.5	3.1	18.5	1.6	3.7	14.2	1.8	4.3	10.4	2.2	4.9						
80	68.3	1.1	1.6	48.4	1.2	2.1	35.0	1.3	2.6	26.2	1.5	3.1	19.8	1.6	3.7	15.2	1.8	4.3	11.3	2.2	4.9						
85	72.6	1.1	1.6	51.5	1.2	2.1	37.2	1.3	2.6	27.9	1.5	3.1	21.0	1.6	3.7	16.3	1.8	4.3	12.1	2.2	4.9	8.8	2.7	5.4			
90	76.9	1.1	1.6	54.5	1.2	2.1	39.4	1.3	2.6	29.5	1.5	3.1	22.3	1.6	3.7	17.3	1.8	4.3	13.0	2.1	4.9	9.8	2.6	5.4			
95	81.1	1.1	1.6	57.5	1.2	2.1	41.6	1.3	2.6	31.1	1.5	3.1	23.6	1.6	3.7	18.3	1.8	4.3	13.8	2.1	4.9	10.9	2.5	5.3			
100	85.4	1.1	1.6	60.5	1.2	2.1	43.8	1.3	2.6	32.7	1.5	3.1	24.9	1.6	3.7	19.3	1.8	4.3	14.6	2.1	4.9	11.6	2.4	5.4			
105	89.7	1.1	1.6	63.6	1.2	2.1	46.0	1.3	2.6	34.4	1.5	3.1	26.5	1.6	3.7	20.3	1.8	4.3	15.4	2.1	4.9	12.4	2.4	5.4	9.7	2.8	5.8
110	94.0	1.1	1.6	66.6	1.2	2.1	48.2	1.3	2.6	36.0	1.5	3.1	27.7	1.6	3.7	21.3	1.8	4.3	16.2	2.1	4.9	13.1	2.4	5.4	10.8	2.6	5.8
115	98.2	1.1	1.6	69.6	1.2	2.1	50.4	1.3	2.6	37.6	1.5	3.1	29.0	1.6	3.7	22.3	1.8	4.3	17.0	2.1	4.9	13.8	2.3	5.4	11.5	2.6	5.8
120	102.5	1.1	1.6	72.6	1.2	2.1	52.5	1.3	2.6	39.3	1.5	3.1	30.2	1.6	3.7	23.3	1.8	4.3	17.9	2.1	4.9	14.5	2.3	5.4	12.2	2.6	5.8
125	106.8	1.1	1.6	75.7	1.2	2.1	54.7	1.3	2.6	40.9	1.5	3.1	31.5	1.6	3.7	24.3	1.8	4.3	18.7	2.1	4.9	15.2	2.3	5.4	12.8	2.5	5.8
130	111.0	1.1	1.6	78.7	1.2	2.1	56.9	1.3	2.6	42.5	1.5	3.1	32.7	1.6	3.7	25.3	1.8	4.3	19.4	2.1	4.9	15.9	2.3	5.4	13.4	2.5	5.8
135	115.3	1.1	1.6	81.7	1.2	2.1	59.1	1.3	2.6	44.2	1.5	3.1	34.0	1.6	3.7	26.3	1.8	4.3	20.2	2.0	4.9	16.6	2.3	5.4	14.1	2.5	5.8
140	119.6	1.1	1.6	84.7	1.2	2.1	61.3	1.3	2.6	45.8	1.5	3.1	35.2	1.6	3.7	27.3	1.8	4.3	21.0	2.0	4.9	17.2	2.3	5.4	14.7	2.5	5.8
145	123.8	1.1	1.6	87.8	1.2	2.1	63.5	1.3	2.6	47.5	1.5	3.1	36.5	1.6	3.7	28.7	1.8	4.3	21.8	2.0	4.9	17.9	2.3	5.4	15.3	2.5	5.8
150	128.1	1.1	1.6	90.8	1.2	2.1	65.7	1.3	2.6	49.1	1.5	3.1	37.8	1.6	3.7	29.7	1.8	4.3	22.6	2.0	4.9	18.6	2.3	5.4	15.9	2.4	5.8

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 1.25 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	4.1	1.2	1.5																								
10	9.4	1.0	1.5	6.3	1.2	2.0																					
15	14.3	1.0	1.6	9.9	1.1	2.0	6.8	1.3	2.6																		
20	19.4	1.0	1.5	13.4	1.1	2.0	9.5	1.2	2.6	6.7	1.4	3.1															
25	24.2	1.0	1.5	17.0	1.1	2.0	12.1	1.2	2.6	8.8	1.4	3.1	5.9	1.7	3.6												
30	29.0	1.0	1.6	20.4	1.1	2.0	14.6	1.2	2.6	10.7	1.4	3.1	7.8	1.6	3.7												
35	33.8	1.0	1.6	23.8	1.1	2.0	17.1	1.2	2.6	12.7	1.3	3.1	9.4	1.5	3.7	6.5	1.9	4.2									
40	38.6	1.0	1.6	27.1	1.1	2.0	19.8	1.2	2.5	14.6	1.3	3.1	10.9	1.5	3.7	8.1	1.7	4.2									
45	43.5	1.0	1.6	30.5	1.1	2.0	22.3	1.2	2.5	16.5	1.3	3.1	12.5	1.5	3.7	9.4	1.7	4.2									
50	48.3	1.0	1.6	33.9	1.1	2.0	24.8	1.2	2.5	18.3	1.3	3.1	13.9	1.5	3.7	10.6	1.7	4.2	7.7	2.0	4.8						
55	53.1	1.0	1.6	37.3	1.1	2.0	27.2	1.2	2.6	20.5	1.3	3.1	15.4	1.5	3.7	11.8	1.6	4.3	9.0	1.9	4.8						
60	57.9	1.0	1.6	40.7	1.1	2.0	29.7	1.2	2.6	22.3	1.3	3.1	16.9	1.5	3.7	13.0	1.6	4.3	10.1	1.9	4.8						
65	62.8	1.0	1.6	44.1	1.1	2.0	32.2	1.2	2.6	24.2	1.3	3.1	18.3	1.5	3.7	14.2	1.6	4.3	11.1	1.8	4.8	8.0	2.3	5.3			
70	67.6	1.0	1.6	47.5	1.1	2.0	34.6	1.2	2.6	26.0	1.3	3.1	19.8	1.4	3.7	15.4	1.6	4.3	12.0	1.8	4.8	9.3	2.1	5.3			
75	72.4	1.0	1.6	50.8	1.1	2.0	37.1	1.2	2.6	27.9	1.3	3.1	21.2	1.4	3.7	16.5	1.6	4.3	13.0	1.8	4.8	10.1	2.1	5.3			
80	77.2	1.0	1.6	54.2	1.1	2.0	39.6	1.2	2.6	29.7	1.3	3.1	23.0	1.4	3.6	17.7	1.6	4.3	14.0	1.8	4.8	11.0	2.0	5.3			
85	82.1	1.0	1.6	57.6	1.1	2.0	42.0	1.2	2.6	31.6	1.3	3.1	24.4	1.4	3.6	18.8	1.6	4.3	14.9	1.8	4.8	11.8	2.0	5.3			
90	86.9	1.0	1.6	61.0	1.1	2.0	44.5	1.2	2.6	33.5	1.3	3.1	25.8	1.4	3.6	20.0	1.6	4.3	15.9	1.8	4.8	12.6	2.0	5.3	9.1	2.5	5.9
95	91.7	1.0	1.6	64.4	1.1	2.0	47.0	1.2	2.6	35.3	1.3	3.1	27.3	1.4	3.6	21.1	1.6	4.3	16.8	1.8	4.8	13.4	2.0	5.4	10.2	2.4	5.9
100	96.6	1.0	1.6	67.8	1.1	2.0	49.4	1.2	2.6	37.2	1.3	3.1	28.7	1.4	3.6	22.3	1.6	4.3	17.7	1.8	4.8	14.2	2.0	5.4	10.9	2.3	5.9
105	101.4	1.0	1.6	71.2	1.1	2.0	51.9	1.2	2.6	39.0	1.3	3.1	30.1	1.4	3.6	23.4	1.6	4.3	18.7	1.8	4.8	15.0	2.0	5.4	11.6	2.3	5.9
110	106.2	1.0	1.6	74.6	1.1	2.0	54.4	1.2	2.6	40.9	1.3	3.1	31.6	1.4	3.6	24.6	1.6	4.3	19.6	1.7	4.8	15.8	2.0	5.4	12.3	2.3	5.9
115	111.0	1.0	1.6	78.0	1.1	2.0	56.8	1.2	2.6	42.7	1.3	3.1	33.0	1.4	3.6	26.1	1.6	4.2	20.5	1.7	4.8	16.6	1.9	5.4	13.0	2.2	5.9
120	115.9	1.0	1.6	81.3	1.1	2.0	59.3	1.2	2.6	44.6	1.3	3.1	34.4	1.4	3.6	27.2	1.6	4.2	21.5	1.7	4.8	17.3	1.9	5.4	13.6	2.2	5.9
125	120.7	1.0	1.6	84.7	1.1	2.0	61.8	1.2	2.6	46.4	1.3	3.1	35.9	1.4	3.6	28.3	1.6	4.2	22.4	1.7	4.8	18.1	1.9	5.4	14.3	2.2	5.9
130	125.5	1.0	1.6	88.1	1.1	2.0	64.3	1.2	2.6	48.3	1.3	3.1	37.3	1.4	3.7	29.5	1.6	4.2	23.3	1.7	4.8	18.9	1.9	5.4	14.9	2.2	5.9
135	130.3	1.0	1.6	91.5	1.1	2.0	66.7	1.2	2.6	50.2	1.3	3.1	38.7	1.4	3.7	30.6	1.6	4.2	24.2	1.7	4.8	19.6	1.9	5.4	15.6	2.2	5.9
140	135.2	1.0	1.6	94.9	1.1	2.0	69.2	1.2	2.6	52.0	1.3	3.1	40.2	1.4	3.7	31.7	1.6	4.2	25.1	1.7	4.8	20.4	1.9	5.4	16.2	2.2	5.9
145	140.0	1.0	1.6	98.3	1.1	2.0	71.7	1.2	2.6	53.9	1.3	3.1	41.6	1.4	3.7	32.9	1.6	4.2	26.1	1.7	4.8	21.2	1.9	5.4	16.9	2.2	5.9
150	144.8	1.0	1.6	101.7	1.1	2.0	74.1	1.2	2.6	55.7	1.3	3.1	43.0	1.4	3.7	34.0	1.6	4.2	27.0	1.7	4.8	21.9	1.9	5.4	17.5	2.2	5.9

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 1.50 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	4.9	1.0	1.5																								
10	10.5	0.9	1.5	7.1	1.1	2.0	4.6	1.3	2.5																		
15	16.0	0.9	1.5	10.9	1.0	2.0	7.8	1.1	2.5	5.3	1.4	3.1															
20	21.3	0.9	1.5	14.7	1.0	2.0	10.6	1.1	2.5	7.7	1.3	3.1	5.1	1.6	3.6												
25	26.6	0.9	1.5	18.6	1.0	2.0	13.4	1.1	2.5	9.9	1.2	3.1	7.3	1.4	3.6												
30	31.9	0.9	1.5	22.3	1.0	2.0	16.2	1.1	2.5	12.0	1.2	3.1	9.0	1.4	3.6	6.6	1.6	4.2									
35	37.3	0.9	1.5	26.0	1.0	2.0	19.1	1.1	2.5	14.1	1.2	3.1	10.7	1.4	3.6	8.1	1.5	4.2									
40	42.6	0.9	1.5	29.7	1.0	2.0	21.8	1.1	2.5	16.2	1.2	3.1	12.4	1.3	3.6	9.5	1.5	4.2	6.9	1.8	4.7						
45	47.9	0.9	1.5	33.4	1.0	2.0	24.5	1.1	2.5	18.3	1.2	3.1	14.0	1.3	3.6	10.8	1.5	4.2	8.3	1.7	4.7						
50	53.2	0.9	1.5	37.1	1.0	2.0	27.3	1.1	2.5	20.6	1.2	3.0	15.7	1.3	3.6	12.1	1.5	4.2	9.4	1.7	4.8						
55	58.5	0.9	1.5	40.8	1.0	2.0	30.0	1.1	2.5	22.7	1.2	3.0	17.3	1.3	3.6	13.4	1.5	4.2	10.5	1.6	4.8	8.1	1.9	5.3			
60	63.8	0.9	1.5	44.5	1.0	2.0	32.7	1.1	2.5	24.7	1.2	3.0	18.9	1.3	3.6	14.7	1.4	4.2	11.6	1.6	4.8	9.1	1.9	5.3			
65	69.2	0.9	1.5	48.2	1.0	2.0	35.4	1.1	2.5	26.8	1.2	3.1	20.8	1.3	3.6	16.0	1.4	4.2	12.7	1.6	4.8	10.0	1.8	5.3			
70	74.5	0.9	1.5	51.9	1.0	2.0	38.2	1.1	2.5	28.8	1.2	3.1	22.4	1.3	3.6	17.3	1.4	4.2	13.7	1.6	4.8	10.9	1.8	5.3	8.2	2.2	5.8
75	79.8	0.9	1.5	55.6	1.0	2.0	40.9	1.1	2.5	30.9	1.2	3.1	23.9	1.3	3.6	18.6	1.4	4.2	14.8	1.6	4.8	11.8	1.8	5.3	9.3	2.1	5.8
80	85.1	0.9	1.5	59.4	1.0	2.0	43.6	1.1	2.5	32.9	1.2	3.1	25.5	1.3	3.6	19.9	1.4	4.2	15.8	1.6	4.8	12.7	1.8	5.3	10.1	2.0	5.9
85	90.4	0.9	1.5	63.1	1.0	2.0	46.3	1.1	2.5	35.0	1.2	3.1	27.1	1.3	3.6	21.2	1.4	4.2	16.9	1.6	4.8	13.6	1.8	5.3	10.9	2.0	5.9
90	95.8	0.9	1.5	66.8	1.0	2.0	49.0	1.1	2.5	37.1	1.2	3.1	28.7	1.3	3.6	22.8	1.4	4.1	17.9	1.6	4.8	14.5	1.8	5.3	11.6	2.0	5.9
95	101.1	0.9	1.5	70.5	1.0	2.0	51.8	1.1	2.5	39.1	1.2	3.1	30.3	1.3	3.6	24.0	1.4	4.2	18.9	1.6	4.8	15.3	1.7	5.3	12.4	2.0	5.9
100	106.4	0.9	1.5	74.2	1.0	2.0	54.5	1.1	2.5	41.2	1.2	3.1	31.9	1.3	3.6	25.3	1.4	4.2	20.0	1.6	4.8	16.2	1.7	5.3	13.1	1.9	5.9
105	111.7	0.9	1.5	77.9	1.0	2.0	57.2	1.1	2.5	43.2	1.2	3.1	33.5	1.3	3.6	26.5	1.4	4.2	21.0	1.6	4.8	17.0	1.7	5.3	13.9	1.9	5.9
110	117.0	0.9	1.5	81.6	1.0	2.0	59.9	1.1	2.5	45.3	1.2	3.1	35.1	1.3	3.6	27.8	1.4	4.2	22.0	1.6	4.8	17.9	1.7	5.3	14.6	1.9	5.9
115	122.4	0.9	1.5	85.3	1.0	2.0	62.6	1.1	2.5	47.3	1.2	3.1	36.7	1.3	3.6	29.1	1.4	4.2	23.1	1.6	4.8	18.8	1.7	5.3	15.3	1.9	5.9
120	127.7	0.9	1.5	89.0	1.0	2.0	65.4	1.1	2.5	49.4	1.2	3.1	38.3	1.3	3.6	30.3	1.4	4.2	24.1	1.6	4.8	19.6	1.7	5.3	16.1	1.9	5.9
125	133.0	0.9	1.5	92.7	1.0	2.0	68.1	1.1	2.5	51.4	1.2	3.1	39.9	1.3	3.6	31.6	1.4	4.2	25.4	1.6	4.8	20.5	1.7	5.3	16.8	1.9	5.9
130	138.3	0.9	1.5	96.4	1.0	2.0	70.8	1.1	2.5	53.5	1.2	3.1	41.4	1.3	3.6	32.8	1.4	4.2	26.4	1.6	4.8	21.3	1.7	5.3	17.5	1.9	5.9
135	143.6	0.9	1.5	100.1	1.0	2.0	73.5	1.1	2.5	55.6	1.2	3.1	43.0	1.3	3.6	34.1	1.4	4.2	27.4	1.6	4.8	22.2	1.7	5.3	18.2	1.9	5.9
140	149.0	0.9	1.5	103.9	1.0	2.0	76.3	1.1	2.5	57.6	1.2	3.1	44.6	1.3	3.6	35.3	1.4	4.2	28.5	1.6	4.8	23.0	1.7	5.3	18.9	1.9	5.9
145	154.3	0.9	1.5	107.6	1.0	2.0	79.0	1.1	2.5	59.7	1.2	3.1	46.2	1.3	3.6	36.6	1.4	4.2	29.5	1.6	4.8	23.8	1.7	5.3	19.7	1.9	5.9
150	159.6	0.9	1.5	111.3	1.0	2.0	81.7	1.1	2.5	61.7	1.2	3.1	47.8	1.3	3.6	37.9	1.4	4.2	30.5	1.6	4.8	24.7	1.7	5.3	20.4	1.9	5.9

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 1.75 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	5.4	0.9	1.5																								
10	11.4	0.9	1.5	7.7	1.0	2.0	5.4	1.1	2.5																		
15	17.3	0.9	1.5	11.8	1.0	2.0	8.6	1.1	2.5	6.2	1.2	3.0															
20	23.1	0.9	1.5	16.0	0.9	2.0	11.6	1.0	2.5	8.6	1.2	3.0	6.3	1.3	3.6												
25	28.8	0.9	1.5	20.0	0.9	2.0	14.6	1.0	2.5	10.9	1.1	3.0	8.2	1.3	3.6	5.9	1.5	4.1									
30	34.6	0.9	1.5	24.0	0.9	2.0	17.8	1.0	2.5	13.2	1.1	3.0	10.1	1.2	3.6	7.6	1.4	4.2									
35	40.3	0.9	1.5	28.0	0.9	2.0	20.7	1.0	2.5	15.5	1.1	3.0	11.9	1.2	3.6	9.1	1.4	4.2	6.9	1.6	4.7						
40	46.1	0.9	1.5	32.0	0.9	2.0	23.7	1.0	2.5	18.0	1.1	3.0	13.7	1.2	3.6	10.6	1.4	4.2	8.2	1.6	4.7						
45	51.9	0.9	1.5	36.0	0.9	2.0	26.6	1.0	2.5	20.2	1.1	3.0	15.4	1.2	3.6	12.0	1.3	4.2	9.4	1.5	4.7	7.0	1.8	5.3			
50	57.6	0.9	1.5	40.0	0.9	2.0	29.6	1.0	2.5	22.4	1.1	3.0	17.2	1.2	3.6	13.5	1.3	4.1	10.6	1.5	4.7	8.3	1.7	5.3			
55	63.4	0.9	1.5	44.0	0.9	2.0	32.5	1.0	2.5	24.7	1.1	3.0	19.2	1.2	3.6	14.9	1.3	4.1	11.8	1.5	4.7	9.3	1.7	5.3	6.7	2.1	5.8
60	69.1	0.9	1.5	48.0	0.9	2.0	35.5	1.0	2.5	26.9	1.1	3.0	20.9	1.2	3.6	16.3	1.3	4.1	12.9	1.5	4.7	10.3	1.6	5.3	8.1	1.9	5.8
65	74.9	0.9	1.5	52.0	0.9	2.0	38.4	1.0	2.5	29.2	1.1	3.0	22.7	1.2	3.6	17.7	1.3	4.1	14.1	1.5	4.7	11.3	1.6	5.3	9.0	1.9	5.8
70	80.7	0.9	1.5	56.0	0.9	2.0	41.4	1.0	2.5	31.4	1.1	3.0	24.4	1.2	3.6	19.1	1.3	4.1	15.2	1.5	4.7	12.3	1.6	5.3	9.8	1.8	5.8
75	86.4	0.9	1.5	60.0	0.9	2.0	44.3	1.0	2.5	33.6	1.1	3.0	26.1	1.2	3.6	20.5	1.3	4.1	16.4	1.4	4.7	13.2	1.6	5.3	10.7	1.8	5.8
80	92.2	0.9	1.5	63.9	0.9	2.0	47.3	1.0	2.5	35.9	1.1	3.0	27.9	1.2	3.6	22.2	1.3	4.1	17.5	1.4	4.7	14.2	1.6	5.3	11.5	1.8	5.8
85	97.9	0.9	1.5	67.9	0.9	2.0	50.2	1.0	2.5	38.1	1.1	3.0	29.6	1.2	3.6	23.5	1.3	4.1	18.6	1.4	4.7	15.1	1.6	5.3	12.3	1.8	5.8
90	103.7	0.9	1.5	71.9	0.9	2.0	53.2	1.0	2.5	40.3	1.1	3.0	31.4	1.2	3.6	24.9	1.3	4.1	19.8	1.4	4.7	16.1	1.6	5.3	13.1	1.8	5.8
95	109.5	0.9	1.5	75.9	0.9	2.0	56.1	1.0	2.5	42.6	1.1	3.0	33.1	1.2	3.6	26.3	1.3	4.1	20.9	1.4	4.7	17.0	1.6	5.3	13.9	1.7	5.8
100	115.2	0.9	1.5	79.9	0.9	2.0	59.1	1.0	2.5	44.8	1.1	3.0	34.8	1.2	3.6	27.7	1.3	4.1	22.0	1.4	4.7	17.9	1.6	5.3	14.7	1.7	5.8
105	121.0	0.9	1.5	83.9	0.9	2.0	62.0	1.0	2.5	47.1	1.1	3.0	36.6	1.2	3.6	29.0	1.3	4.1	23.4	1.4	4.7	18.9	1.6	5.3	15.5	1.7	5.8
110	126.8	0.9	1.5	87.9	0.9	2.0	65.0	1.0	2.5	49.3	1.1	3.0	38.3	1.2	3.6	30.4	1.3	4.1	24.5	1.4	4.7	19.8	1.6	5.3	16.3	1.7	5.8
115	132.5	0.9	1.5	91.9	0.9	2.0	67.9	1.0	2.5	51.5	1.1	3.0	40.1	1.2	3.6	31.8	1.3	4.1	25.6	1.4	4.7	20.7	1.6	5.3	17.1	1.7	5.9
120	138.3	0.9	1.5	95.9	0.9	2.0	70.9	1.0	2.5	53.8	1.1	3.0	41.8	1.2	3.6	33.2	1.3	4.1	26.8	1.4	4.7	21.7	1.6	5.3	17.9	1.7	5.9
125	144.0	0.9	1.5	99.9	0.9	2.0	73.8	1.0	2.5	56.0	1.1	3.0	43.5	1.2	3.6	34.6	1.3	4.1	27.9	1.4	4.7	22.6	1.6	5.3	18.7	1.7	5.9
130	149.8	0.9	1.5	103.9	0.9	2.0	76.8	1.0	2.5	58.3	1.1	3.0	45.3	1.2	3.6	35.9	1.3	4.1	29.0	1.4	4.7	23.5	1.6	5.3	19.4	1.7	5.9
135	155.6	0.9	1.5	107.9	0.9	2.0	79.7	1.0	2.5	60.5	1.1	3.0	47.0	1.2	3.6	37.3	1.3	4.1	30.1	1.4	4.7	24.5	1.6	5.3	20.2	1.7	5.9
140	161.3	0.9	1.5	111.9	0.9	2.0	82.7	1.0	2.5	62.7	1.1	3.0	48.8	1.2	3.6	38.7	1.3	4.1	31.2	1.4	4.7	25.7	1.6	5.3	21.0	1.7	5.9
145	167.1	0.9	1.5	115.9	0.9	2.0	85.6	1.0	2.5	65.0	1.1	3.0	50.5	1.2	3.6	40.1	1.3	4.1	32.3	1.4	4.7	26.6	1.6	5.3	21.8	1.7	5.9
150	172.8	0.9	1.5	119.9	0.9	2.0	88.6	1.0	2.5	67.2	1.1	3.0	52.2	1.2	3.6	41.5	1.3	4.1	33.4	1.4	4.7	27.5	1.6	5.3	22.6	1.7	5.9

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 2.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	5.9	0.9	1.5																								
10	12.4	0.8	1.5	8.1	0.9	2.0	5.9	1.0	2.5																		
15	18.5	0.8	1.5	12.3	0.9	2.0	9.3	1.0	2.5	6.8	1.1	3.0	4.7	1.4	3.5												
20	24.7	0.8	1.5	16.7	0.9	2.0	12.5	1.0	2.5	9.4	1.1	3.0	7.0	1.2	3.6	4.7	1.5	4.1									
25	30.8	0.8	1.5	20.8	0.9	2.0	15.9	1.0	2.4	11.8	1.1	3.0	9.0	1.2	3.5	6.8	1.3	4.1									
30	37.0	0.8	1.5	25.0	0.9	2.0	19.0	1.0	2.5	14.3	1.1	3.0	11.0	1.2	3.5	8.5	1.3	4.1	6.4	1.5	4.7						
35	43.2	0.8	1.5	29.1	0.9	2.0	22.2	1.0	2.5	16.9	1.0	3.0	12.9	1.1	3.5	10.1	1.3	4.1	7.8	1.4	4.7						
40	49.3	0.8	1.5	33.3	0.9	2.0	25.3	1.0	2.5	19.3	1.0	3.0	14.8	1.1	3.5	11.6	1.3	4.1	9.1	1.4	4.7	7.1	1.6	5.2			
45	55.5	0.8	1.5	37.4	0.9	2.0	28.5	1.0	2.5	21.7	1.0	3.0	16.7	1.1	3.5	13.1	1.3	4.1	10.4	1.4	4.7	8.2	1.6	5.2			
50	61.7	0.8	1.5	41.6	0.9	2.0	31.7	1.0	2.5	24.1	1.0	3.0	18.8	1.1	3.5	14.7	1.2	4.1	11.7	1.4	4.7	9.3	1.5	5.3	7.1	1.8	5.8
55	67.8	0.8	1.5	45.7	0.9	2.0	34.8	1.0	2.5	26.5	1.0	3.0	20.7	1.1	3.5	16.2	1.2	4.1	12.9	1.4	4.7	10.4	1.5	5.3	8.2	1.7	5.8
60	74.0	0.8	1.5	49.9	0.9	2.0	38.0	1.0	2.5	28.9	1.0	3.0	22.6	1.1	3.5	17.7	1.2	4.1	14.1	1.4	4.7	11.4	1.5	5.3	9.2	1.7	5.8
65	80.2	0.8	1.5	54.0	0.9	2.0	41.1	1.0	2.5	31.4	1.0	3.0	24.5	1.1	3.5	19.5	1.2	4.1	15.4	1.3	4.7	12.4	1.5	5.3	10.1	1.7	5.8
70	86.3	0.8	1.5	58.2	0.9	2.0	44.3	1.0	2.5	33.8	1.0	3.0	26.3	1.1	3.5	21.0	1.2	4.1	16.6	1.3	4.7	13.5	1.5	5.3	11.0	1.6	5.8
75	92.5	0.8	1.5	62.3	0.9	2.0	47.5	1.0	2.5	36.2	1.0	3.0	28.2	1.1	3.5	22.4	1.2	4.1	17.8	1.3	4.7	14.5	1.5	5.3	11.8	1.6	5.8
80	98.7	0.8	1.5	66.5	0.9	2.0	50.6	1.0	2.5	38.6	1.0	3.0	30.1	1.1	3.5	23.9	1.2	4.1	19.0	1.3	4.7	15.5	1.5	5.3	12.7	1.6	5.8
85	104.8	0.8	1.5	70.6	0.9	2.0	53.8	1.0	2.5	41.0	1.0	3.0	32.0	1.1	3.5	25.4	1.2	4.1	20.3	1.3	4.7	16.5	1.5	5.3	13.6	1.6	5.8
90	111.0	0.8	1.5	74.8	0.9	2.0	57.0	1.0	2.5	43.4	1.0	3.0	33.8	1.1	3.5	26.9	1.2	4.1	21.8	1.3	4.6	17.5	1.5	5.3	14.4	1.6	5.8
95	117.2	0.8	1.5	78.9	0.9	2.0	60.1	1.0	2.5	45.8	1.0	3.0	35.7	1.1	3.5	28.4	1.2	4.1	23.0	1.3	4.6	18.6	1.5	5.3	15.3	1.6	5.8
100	123.3	0.8	1.5	83.1	0.9	2.0	63.3	1.0	2.5	48.2	1.0	3.0	37.6	1.1	3.5	29.9	1.2	4.1	24.2	1.3	4.6	19.6	1.5	5.3	16.2	1.6	5.8
105	129.5	0.8	1.5	87.3	0.9	2.0	66.4	1.0	2.5	50.6	1.0	3.0	39.5	1.1	3.5	31.4	1.2	4.1	25.4	1.3	4.6	20.6	1.5	5.3	17.0	1.6	5.8
110	135.7	0.8	1.5	91.4	0.9	2.0	69.6	1.0	2.5	53.0	1.0	3.0	41.3	1.1	3.5	32.9	1.2	4.1	26.6	1.3	4.7	21.6	1.4	5.3	17.9	1.6	5.8
115	141.8	0.8	1.5	95.6	0.9	2.0	72.8	1.0	2.5	55.4	1.0	3.0	43.2	1.1	3.5	34.4	1.2	4.1	27.9	1.3	4.7	22.6	1.4	5.3	18.7	1.6	5.8
120	148.0	0.8	1.5	99.7	0.9	2.0	75.9	1.0	2.5	57.9	1.0	3.0	45.1	1.1	3.5	35.9	1.2	4.1	29.1	1.3	4.7	23.9	1.4	5.2	19.5	1.6	5.8
125	154.1	0.8	1.5	103.9	0.9	2.0	79.1	1.0	2.5	60.3	1.0	3.0	47.0	1.1	3.5	37.4	1.2	4.1	30.3	1.3	4.7	24.8	1.4	5.2	20.4	1.6	5.8
130	160.3	0.8	1.5	108.0	0.9	2.0	82.3	1.0	2.5	62.7	1.0	3.0	48.8	1.1	3.5	38.9	1.2	4.1	31.5	1.3	4.7	25.8	1.4	5.3	21.2	1.6	5.8
135	166.5	0.8	1.5	112.2	0.9	2.0	85.4	1.0	2.5	65.1	1.0	3.0	50.7	1.1	3.5	40.3	1.2	4.1	32.7	1.3	4.7	26.8	1.4	5.3	22.1	1.6	5.8
140	172.6	0.8	1.5	116.3	0.9	2.0	88.6	1.0	2.5	67.5	1.0	3.0	52.6	1.1	3.5	41.8	1.2	4.1	33.9	1.3	4.7	27.8	1.4	5.3	22.9	1.6	5.8
145	178.8	0.8	1.5	120.5	0.9	2.0	91.8	1.0	2.5	69.9	1.0	3.0	54.5	1.1	3.5	43.3	1.2	4.1	35.1	1.3	4.7	28.8	1.4	5.3	23.7	1.6	5.8
150	185.0	0.8	1.5	124.6	0.9	2.0	94.9	1.0	2.5	72.3	1.0	3.0	56.4	1.1	3.5	44.8	1.2	4.1	36.3	1.3	4.7	29.8	1.4	5.3	24.6	1.6	5.8

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 3.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	7.4	0.7	1.4	4.9	0.8	1.9	3.2	1.0	2.3																		
10	15.1	0.7	1.4	10.2	0.8	1.9	7.6	0.8	2.4	5.7	0.9	2.9	4.0	1.1	3.4												
15	22.6	0.7	1.4	15.6	0.8	1.9	11.5	0.8	2.4	8.8	0.9	2.9	6.7	1.0	3.4	5.1	1.1	4.0									
20	30.1	0.7	1.4	20.7	0.8	1.9	15.5	0.8	2.4	11.8	0.9	2.9	9.2	0.9	3.4	7.2	1.0	4.0	5.5	1.2	4.6						
25	37.6	0.7	1.4	25.9	0.8	1.9	19.4	0.8	2.4	15.0	0.9	2.9	11.6	0.9	3.4	9.2	1.0	4.0	7.2	1.1	4.6	5.6	1.3	5.1			
30	45.1	0.7	1.4	31.1	0.8	1.9	23.3	0.8	2.4	18.0	0.9	2.9	14.0	0.9	3.4	11.1	1.0	4.0	8.9	1.1	4.6	7.1	1.2	5.2	5.3	1.5	5.7
35	52.7	0.7	1.4	36.2	0.8	1.9	27.1	0.8	2.4	21.0	0.9	2.9	16.5	0.9	3.4	13.0	1.0	4.0	10.5	1.1	4.6	8.4	1.2	5.2	6.7	1.4	5.7
40	60.2	0.7	1.4	41.4	0.8	1.9	31.0	0.8	2.4	24.0	0.9	2.9	18.9	0.9	3.4	14.9	1.0	4.0	12.0	1.1	4.6	9.8	1.2	5.2	7.9	1.3	5.7
45	67.7	0.7	1.4	46.6	0.8	1.9	34.9	0.8	2.4	27.0	0.9	2.9	21.2	0.9	3.4	17.0	1.0	4.0	13.6	1.1	4.6	11.1	1.2	5.2	9.1	1.3	5.7
50	75.2	0.7	1.4	51.8	0.8	1.9	38.8	0.8	2.4	29.9	0.9	2.9	23.6	0.9	3.4	18.9	1.0	4.0	15.2	1.1	4.6	12.4	1.2	5.2	10.2	1.3	5.7
55	82.8	0.7	1.4	56.9	0.8	1.9	42.6	0.8	2.4	32.9	0.9	2.9	25.9	0.9	3.4	20.8	1.0	4.0	16.7	1.1	4.6	13.7	1.2	5.2	11.3	1.3	5.7
60	90.3	0.7	1.4	62.1	0.8	1.9	46.5	0.8	2.4	35.9	0.9	2.9	28.3	0.9	3.4	22.7	1.0	4.0	18.5	1.1	4.5	14.9	1.2	5.2	12.4	1.3	5.7
65	97.8	0.7	1.4	67.3	0.8	1.9	50.4	0.8	2.4	38.9	0.9	2.9	30.6	0.9	3.4	24.6	1.0	4.0	20.0	1.1	4.5	16.2	1.2	5.2	13.5	1.3	5.7
70	105.3	0.7	1.4	72.4	0.8	1.9	54.3	0.8	2.4	41.9	0.9	2.9	33.0	0.9	3.4	26.4	1.0	4.0	21.5	1.1	4.5	17.5	1.2	5.2	14.5	1.3	5.7
75	112.8	0.7	1.4	77.6	0.8	1.9	58.1	0.8	2.4	44.9	0.9	2.9	35.3	0.9	3.4	28.3	1.0	4.0	23.1	1.1	4.5	19.1	1.2	5.1	15.6	1.3	5.7
80	120.4	0.7	1.4	82.8	0.8	1.9	62.0	0.8	2.4	47.9	0.9	2.9	37.7	0.9	3.4	30.2	1.0	4.0	24.6	1.1	4.5	20.3	1.2	5.1	16.7	1.3	5.7
85	127.9	0.7	1.4	88.0	0.8	1.9	65.9	0.8	2.4	50.9	0.9	2.9	40.1	0.9	3.4	32.1	1.0	4.0	26.1	1.1	4.5	21.6	1.2	5.1	17.8	1.2	5.7
90	135.4	0.7	1.4	93.1	0.8	1.9	69.8	0.8	2.4	53.9	0.9	2.9	42.4	0.9	3.4	34.0	1.0	4.0	27.7	1.1	4.5	22.9	1.2	5.1	18.9	1.2	5.7
95	142.9	0.7	1.4	98.3	0.8	1.9	73.6	0.8	2.4	56.9	0.9	2.9	44.8	0.9	3.4	35.9	1.0	4.0	29.2	1.1	4.5	24.1	1.2	5.1	20.2	1.2	5.7
100	150.5	0.7	1.4	103.5	0.8	1.9	77.5	0.8	2.4	59.9	0.9	2.9	47.1	0.9	3.4	37.8	1.0	4.0	30.7	1.1	4.5	25.4	1.2	5.1	21.2	1.2	5.7
105	158.0	0.7	1.4	108.7	0.8	1.9	81.4	0.8	2.4	62.8	0.9	2.9	49.5	0.9	3.4	39.6	1.0	4.0	32.3	1.1	4.5	26.7	1.2	5.1	22.3	1.2	5.7
110	165.5	0.7	1.4	113.8	0.8	1.9	85.3	0.8	2.4	65.8	0.9	2.9	51.8	0.9	3.4	41.5	1.0	4.0	33.8	1.1	4.6	27.9	1.2	5.1	23.3	1.2	5.7
115	173.0	0.7	1.4	119.0	0.8	1.9	89.1	0.8	2.4	68.8	0.9	2.9	54.2	0.9	3.4	43.4	1.0	4.0	35.4	1.1	4.6	29.2	1.2	5.1	24.4	1.2	5.7
120	180.5	0.7	1.4	124.2	0.8	1.9	93.0	0.8	2.4	71.8	0.9	2.9	56.5	0.9	3.4	45.3	1.0	4.0	36.9	1.1	4.6	30.5	1.2	5.1	25.5	1.2	5.7
125	188.1	0.7	1.4	129.4	0.8	1.9	96.9	0.8	2.4	74.8	0.9	2.9	58.9	0.9	3.4	47.2	1.0	4.0	38.4	1.1	4.6	31.7	1.2	5.1	26.5	1.2	5.7
130	195.6	0.7	1.4	134.5	0.8	1.9	100.8	0.8	2.4	77.8	0.9	2.9	61.2	0.9	3.4	49.1	1.0	4.0	40.0	1.1	4.6	33.0	1.2	5.1	27.6	1.2	5.7
135	203.1	0.7	1.4	139.7	0.8	1.9	104.6	0.8	2.4	80.8	0.9	2.9	63.6	0.9	3.4	51.0	1.0	4.0	41.5	1.1	4.6	34.3	1.2	5.1	28.6	1.2	5.7
140	210.6	0.7	1.4	144.9	0.8	1.9	108.5	0.8	2.4	83.8	0.9	2.9	66.0	0.9	3.4	52.8	1.0	4.0	43.0	1.1	4.6	35.6	1.2	5.1	29.7	1.2	5.7
145	218.2	0.7	1.4	150.1	0.8	1.9	112.4	0.8	2.4	86.8	0.9	2.9	68.3	0.9	3.4	54.7	1.0	4.0	44.6	1.1	4.6	36.8	1.2	5.1	30.7	1.2	5.7
150	225.7	0.7	1.4	155.2	0.8	1.9	116.3	0.8	2.4	89.8	0.9	2.9	70.7	0.9	3.4	56.6	1.0	4.0	46.1	1.1	4.6	38.1	1.2	5.1	31.8	1.2	5.7

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 4.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	8.5	0.6	1.4	5.9	0.7	1.8	4.1	0.8	2.3																		
10	17.2	0.6	1.4	12.1	0.7	1.8	8.8	0.7	2.3	6.7	0.8	2.8	5.2	0.9	3.3	3.8	1.0	3.9									
15	25.8	0.6	1.4	18.1	0.7	1.8	13.4	0.7	2.3	10.3	0.8	2.8	8.1	0.8	3.4	6.4	0.9	3.9	4.9	1.0	4.5						
20	34.4	0.6	1.4	24.2	0.7	1.8	17.8	0.7	2.3	13.9	0.8	2.8	10.9	0.8	3.4	8.7	0.9	3.9	6.9	1.0	4.5	5.5	1.1	5.0			
25	43.0	0.6	1.4	30.2	0.7	1.9	22.3	0.7	2.3	17.4	0.8	2.8	13.8	0.8	3.3	10.9	0.9	3.9	8.8	1.0	4.5	7.1	1.0	5.1	5.7	1.2	5.6
30	51.6	0.6	1.4	36.3	0.7	1.9	26.7	0.7	2.3	20.8	0.8	2.8	16.5	0.8	3.3	13.2	0.9	3.9	10.7	0.9	4.5	8.7	1.0	5.1	7.1	1.1	5.6
35	60.2	0.6	1.4	42.3	0.7	1.9	31.1	0.7	2.3	24.3	0.8	2.8	19.3	0.8	3.4	15.6	0.9	3.9	12.5	0.9	4.5	10.3	1.0	5.0	8.4	1.1	5.6
40	68.8	0.6	1.4	48.3	0.7	1.9	35.6	0.7	2.3	27.8	0.8	2.8	22.0	0.8	3.4	17.8	0.9	3.9	14.4	0.9	4.5	11.8	1.0	5.0	9.8	1.1	5.7
45	77.4	0.6	1.4	54.4	0.7	1.9	40.0	0.7	2.4	31.2	0.8	2.8	24.8	0.8	3.4	20.0	0.9	3.9	16.4	0.9	4.4	13.3	1.0	5.0	11.1	1.1	5.7
50	86.0	0.6	1.4	60.4	0.7	1.9	44.5	0.7	2.4	34.7	0.8	2.8	27.5	0.8	3.4	22.2	0.9	3.9	18.2	0.9	4.4	14.9	1.0	5.0	12.3	1.1	5.7
55	94.6	0.6	1.4	66.5	0.7	1.9	48.9	0.7	2.4	38.2	0.8	2.8	30.3	0.8	3.4	24.4	0.9	3.9	20.0	0.9	4.4	16.6	1.0	5.0	13.6	1.1	5.7
60	103.2	0.6	1.4	72.5	0.7	1.9	53.4	0.7	2.4	41.7	0.8	2.8	33.0	0.8	3.4	26.6	0.9	3.9	21.8	0.9	4.5	18.1	1.0	5.0	14.9	1.1	5.7
65	111.8	0.6	1.4	78.5	0.7	1.9	57.8	0.7	2.4	45.1	0.8	2.8	35.8	0.8	3.4	28.9	0.9	3.9	23.6	0.9	4.5	19.6	1.0	5.0	16.2	1.1	5.7
70	120.4	0.6	1.4	84.6	0.7	1.9	62.3	0.7	2.4	48.6	0.8	2.8	38.6	0.8	3.4	31.1	0.9	3.9	25.4	0.9	4.5	21.1	1.0	5.0	17.7	1.1	5.6
75	129.0	0.6	1.4	90.6	0.7	1.9	66.7	0.7	2.4	52.1	0.8	2.8	41.3	0.8	3.4	33.3	0.9	3.9	27.2	0.9	4.5	22.6	1.0	5.0	19.0	1.1	5.6
80	137.6	0.6	1.4	96.7	0.7	1.9	71.2	0.7	2.4	55.5	0.8	2.8	44.1	0.8	3.4	35.5	0.9	3.9	29.1	0.9	4.5	24.1	1.0	5.0	20.2	1.1	5.6
85	146.2	0.6	1.4	102.7	0.7	1.9	75.6	0.7	2.4	59.0	0.8	2.8	46.8	0.8	3.4	37.7	0.9	3.9	30.9	0.9	4.5	25.6	1.0	5.0	21.5	1.1	5.6
90	154.8	0.6	1.4	108.7	0.7	1.9	80.0	0.7	2.4	62.5	0.8	2.8	49.6	0.8	3.4	39.9	0.9	3.9	32.7	0.9	4.5	27.1	1.0	5.0	22.8	1.1	5.6
95	163.4	0.6	1.4	114.8	0.7	1.9	84.5	0.7	2.4	65.9	0.8	2.8	52.3	0.8	3.4	42.2	0.9	3.9	34.5	0.9	4.5	28.6	1.0	5.0	24.0	1.1	5.6
100	172.0	0.6	1.4	120.8	0.7	1.9	88.9	0.7	2.4	69.4	0.8	2.8	55.1	0.8	3.4	44.4	0.9	3.9	36.3	0.9	4.5	30.1	1.0	5.0	25.3	1.1	5.6
105	180.6	0.6	1.4	126.9	0.7	1.9	93.4	0.7	2.4	72.9	0.8	2.8	57.8	0.8	3.4	46.6	0.9	3.9	38.1	0.9	4.5	31.6	1.0	5.0	26.5	1.1	5.6
110	189.2	0.6	1.4	132.9	0.7	1.9	97.8	0.7	2.4	76.3	0.8	2.8	60.6	0.8	3.4	48.8	0.9	3.9	39.9	0.9	4.5	33.1	1.0	5.0	27.8	1.1	5.6
115	197.8	0.6	1.4	138.9	0.7	1.9	102.3	0.7	2.4	79.8	0.8	2.8	63.3	0.8	3.4	51.0	0.9	3.9	41.7	0.9	4.5	34.6	1.0	5.0	29.0	1.1	5.6
120	206.4	0.6	1.4	145.0	0.7	1.9	106.7	0.7	2.4	83.3	0.8	2.8	66.1	0.8	3.4	53.3	0.9	3.9	43.6	0.9	4.5	36.1	1.0	5.0	30.2	1.1	5.7
125	215.0	0.6	1.4	151.0	0.7	1.9	111.2	0.7	2.4	86.8	0.8	2.8	68.8	0.8	3.4	55.5	0.9	3.9	45.4	0.9	4.5	37.6	1.0	5.0	31.5	1.1	5.7
130	223.7	0.6	1.4	157.1	0.7	1.9	115.6	0.7	2.4	90.2	0.8	2.8	71.6	0.8	3.4	57.7	0.9	3.9	47.2	0.9	4.5	39.1	1.0	5.0	32.7	1.1	5.7
135	232.3	0.6	1.4	163.1	0.7	1.9	120.1	0.7	2.4	93.7	0.8	2.8	74.3	0.8	3.4	59.9	0.9	3.9	49.0	0.9	4.5	40.6	1.0	5.0	34.0	1.1	5.7
140	240.9	0.6	1.4	169.1	0.7	1.9	124.5	0.7	2.4	97.2	0.8	2.8	77.1	0.8	3.4	62.1	0.9	3.9	50.8	0.9	4.5	42.1	1.0	5.0	35.2	1.1	5.7
145	249.5	0.6	1.4	175.2	0.7	1.9	129.0	0.7	2.4	100.6	0.8	2.8	79.8	0.8	3.4	64.3	0.9	3.9	52.6	0.9	4.5	43.6	1.0	5.0	36.5	1.1	5.7
150	258.1	0.6	1.4	181.2	0.7	1.9	133.4	0.7	2.4	104.1	0.8	2.8	82.6	0.8	3.4	66.6	0.9	3.9	54.4	0.9	4.5	45.1	1.0	5.0	37.8	1.1	5.7

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 5.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	9.5	0.6	1.4	6.7	0.6	1.8	4.7	0.7	2.3	3.5	0.8	2.8															
10	19.0	0.6	1.4	13.7	0.6	1.8	9.7	0.7	2.3	7.6	0.7	2.8	6.0	0.8	3.3	4.7	0.8	3.8	3.4	1.0	4.4						
15	28.5	0.6	1.4	20.5	0.6	1.8	14.8	0.7	2.3	11.7	0.7	2.8	9.2	0.7	3.3	7.3	0.8	3.8	5.9	0.9	4.4	4.7	1.0	5.0			
20	38.0	0.6	1.4	27.3	0.6	1.8	19.7	0.7	2.3	15.5	0.7	2.8	12.4	0.7	3.3	9.9	0.8	3.8	8.0	0.9	4.4	6.5	0.9	4.9	5.3	1.0	5.5
25	47.5	0.6	1.4	34.1	0.6	1.8	24.6	0.7	2.3	19.4	0.7	2.8	15.5	0.7	3.3	12.6	0.8	3.8	10.1	0.8	4.4	8.3	0.9	5.0	6.8	1.0	5.6
30	57.0	0.6	1.4	40.9	0.6	1.8	29.5	0.7	2.3	23.3	0.7	2.8	18.6	0.7	3.3	15.1	0.8	3.8	12.2	0.8	4.4	10.1	0.9	5.0	8.3	1.0	5.6
35	66.5	0.6	1.4	47.7	0.6	1.8	34.4	0.7	2.3	27.2	0.7	2.8	21.7	0.7	3.3	17.6	0.8	3.8	14.5	0.8	4.4	11.8	0.9	5.0	9.8	1.0	5.6
40	76.0	0.6	1.4	54.6	0.6	1.8	39.4	0.7	2.3	31.0	0.7	2.8	24.8	0.7	3.3	20.1	0.8	3.8	16.5	0.8	4.4	13.6	0.9	5.0	11.3	1.0	5.5
45	85.5	0.6	1.4	61.4	0.6	1.8	44.3	0.7	2.3	34.9	0.7	2.8	27.9	0.7	3.3	22.6	0.8	3.8	18.6	0.8	4.4	15.5	0.9	4.9	12.8	1.0	5.5
50	95.0	0.6	1.4	68.2	0.6	1.8	49.2	0.7	2.3	38.8	0.7	2.8	31.0	0.7	3.3	25.1	0.8	3.8	20.6	0.8	4.4	17.2	0.9	4.9	14.3	1.0	5.5
55	104.6	0.6	1.4	75.0	0.6	1.8	54.1	0.7	2.3	42.7	0.7	2.8	34.1	0.7	3.3	27.6	0.8	3.8	22.7	0.8	4.4	18.9	0.9	4.9	15.9	0.9	5.5
60	114.1	0.6	1.4	81.8	0.6	1.8	59.0	0.7	2.3	46.6	0.7	2.8	37.2	0.7	3.3	30.1	0.8	3.8	24.7	0.8	4.4	20.6	0.9	4.9	17.3	0.9	5.5
65	123.6	0.6	1.4	88.6	0.6	1.8	63.9	0.7	2.3	50.4	0.7	2.8	40.3	0.7	3.3	32.6	0.8	3.8	26.8	0.8	4.4	22.3	0.9	4.9	18.8	0.9	5.5
70	133.1	0.6	1.4	95.5	0.6	1.8	68.9	0.7	2.3	54.3	0.7	2.8	43.4	0.7	3.3	35.1	0.8	3.8	28.9	0.8	4.4	24.0	0.9	4.9	20.2	0.9	5.5
75	142.6	0.6	1.4	102.3	0.6	1.8	73.8	0.7	2.3	58.2	0.7	2.8	46.5	0.7	3.3	37.7	0.8	3.8	30.9	0.8	4.4	25.7	0.9	4.9	21.6	0.9	5.5
80	152.1	0.6	1.4	109.1	0.6	1.8	78.7	0.7	2.3	62.1	0.7	2.8	49.6	0.7	3.3	40.2	0.8	3.8	33.0	0.8	4.4	27.4	0.9	4.9	23.1	0.9	5.5
85	161.6	0.6	1.4	115.9	0.6	1.8	83.6	0.7	2.3	65.9	0.7	2.8	52.7	0.7	3.3	42.7	0.8	3.8	35.0	0.8	4.4	29.1	0.9	5.0	24.5	0.9	5.5
90	171.1	0.6	1.4	122.7	0.6	1.8	88.5	0.7	2.3	69.8	0.7	2.8	55.8	0.7	3.3	45.2	0.8	3.8	37.1	0.8	4.4	30.9	0.9	5.0	26.0	0.9	5.5
95	180.6	0.6	1.4	129.6	0.6	1.8	93.4	0.7	2.3	73.7	0.7	2.8	58.9	0.7	3.3	47.7	0.8	3.8	39.2	0.8	4.4	32.6	0.9	5.0	27.4	0.9	5.5
100	190.1	0.6	1.4	136.4	0.6	1.8	98.4	0.7	2.3	77.6	0.7	2.8	62.0	0.7	3.3	50.2	0.8	3.8	41.2	0.8	4.4	34.3	0.9	5.0	28.8	0.9	5.5
105	199.6	0.6	1.4	143.2	0.6	1.8	103.3	0.7	2.3	81.5	0.7	2.8	65.1	0.7	3.3	52.7	0.8	3.8	43.3	0.8	4.4	36.0	0.9	5.0	30.3	0.9	5.5
110	209.1	0.6	1.4	150.0	0.6	1.8	108.2	0.7	2.3	85.3	0.7	2.8	68.2	0.7	3.3	55.2	0.8	3.8	45.3	0.8	4.4	37.7	0.9	5.0	31.7	0.9	5.5
115	218.6	0.6	1.4	156.8	0.6	1.8	113.1	0.7	2.3	89.2	0.7	2.8	71.3	0.7	3.3	57.7	0.8	3.8	47.4	0.8	4.4	39.4	0.9	5.0	33.2	0.9	5.5
120	228.1	0.6	1.4	163.6	0.6	1.8	118.0	0.7	2.3	93.1	0.7	2.8	74.3	0.7	3.3	60.2	0.8	3.8	49.5	0.8	4.4	41.1	0.9	5.0	34.6	0.9	5.5
125	237.6	0.6	1.4	170.5	0.6	1.8	123.0	0.7	2.3	97.0	0.7	2.8	77.4	0.7	3.3	62.7	0.8	3.8	51.5	0.8	4.4	42.8	0.9	5.0	36.0	0.9	5.5
130	247.1	0.6	1.4	177.3	0.6	1.8	127.9	0.7	2.3	100.8	0.7	2.8	80.5	0.7	3.3	65.2	0.8	3.8	53.6	0.8	4.4	44.6	0.9	5.0	37.5	0.9	5.5
135	256.6	0.6	1.4	184.1	0.6	1.8	132.8	0.7	2.3	104.7	0.7	2.8	83.6	0.7	3.3	67.8	0.8	3.8	55.6	0.8	4.4	46.3	0.9	5.0	38.9	0.9	5.5
140	266.1	0.6	1.4	190.9	0.6	1.8	137.7	0.7	2.3	108.6	0.7	2.8	86.7	0.7	3.3	70.3	0.8	3.8	57.7	0.8	4.4	48.0	0.9	5.0	40.4	0.9	5.5
145	275.6	0.6	1.4	197.7	0.6	1.8	142.6	0.7	2.3	112.5	0.7	2.8	89.8	0.7	3.3	72.8	0.8	3.8	59.8	0.8	4.4	49.7	0.9	5.0	41.8	0.9	5.5
150	285.1	0.6	1.4	204.6	0.6	1.8	147.5	0.7	2.3	116.4	0.7	2.8	92.9	0.7	3.3	75.3	0.8	3.8	61.8	0.8	4.4	51.4	0.9	5.0	43.2	0.9	5.5

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 6.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	10.6	0.5	1.3	7.3	0.6	1.8	5.3	0.6	2.3	4.0	0.7	2.8	2.9	0.8	3.2													
10	21.1	0.5	1.3	14.7	0.6	1.8	10.9	0.6	2.3	8.4	0.7	2.8	6.6	0.7	3.2	5.3	0.8	3.8	4.2	0.8	4.3						
15	31.6	0.5	1.3	22.1	0.6	1.8	16.3	0.6	2.3	12.7	0.6	2.7	10.1	0.7	3.3	8.2	0.7	3.8	6.6	0.8	4.3	5.4	0.9	4.9	4.3	1.0	5.5
20	42.1	0.5	1.3	29.5	0.6	1.8	21.7	0.6	2.3	17.0	0.6	2.7	13.6	0.7	3.2	11.1	0.7	3.7	9.0	0.8	4.3	7.4	0.8	4.9	6.1	0.9	5.5
25	52.7	0.5	1.3	36.8	0.6	1.8	27.1	0.6	2.3	21.2	0.6	2.8	17.0	0.7	3.2	13.9	0.7	3.8	11.3	0.8	4.3	9.3	0.8	4.9	7.8	0.9	5.5
30	63.2	0.5	1.3	44.2	0.6	1.8	32.5	0.6	2.3	25.4	0.6	2.8	20.4	0.7	3.2	16.6	0.7	3.8	13.7	0.8	4.3	11.3	0.8	4.9	9.4	0.9	5.5
35	73.7	0.5	1.3	51.6	0.6	1.8	38.0	0.6	2.3	29.7	0.6	2.8	23.8	0.7	3.2	19.4	0.7	3.8	16.0	0.8	4.3	13.4	0.8	4.9	11.1	0.9	5.5
40	84.2	0.5	1.3	58.9	0.6	1.8	43.4	0.6	2.3	33.9	0.6	2.8	27.2	0.7	3.3	22.2	0.7	3.8	18.3	0.8	4.3	15.3	0.8	4.9	12.7	0.9	5.5
45	94.8	0.5	1.3	66.3	0.6	1.8	48.8	0.6	2.3	38.2	0.6	2.8	30.7	0.7	3.3	24.9	0.7	3.8	20.6	0.8	4.3	17.2	0.8	4.9	14.5	0.9	5.4
50	105.3	0.5	1.3	73.6	0.6	1.8	54.2	0.6	2.3	42.4	0.6	2.8	34.1	0.7	3.3	27.7	0.7	3.8	22.8	0.8	4.3	19.1	0.8	4.9	16.1	0.9	5.4
55	115.8	0.5	1.3	81.0	0.6	1.8	59.7	0.6	2.3	46.6	0.6	2.8	37.5	0.7	3.3	30.5	0.7	3.8	25.1	0.8	4.3	21.0	0.8	4.9	17.7	0.9	5.4
60	126.4	0.5	1.3	88.4	0.6	1.8	65.1	0.6	2.3	50.9	0.6	2.8	40.9	0.7	3.3	33.3	0.7	3.8	27.4	0.8	4.3	22.9	0.8	4.9	19.3	0.9	5.4
65	136.9	0.5	1.3	95.7	0.6	1.8	70.5	0.6	2.3	55.1	0.6	2.8	44.3	0.7	3.3	36.0	0.7	3.8	29.7	0.8	4.3	24.8	0.8	4.9	20.9	0.9	5.4
70	147.4	0.5	1.3	103.1	0.6	1.8	75.9	0.6	2.3	59.3	0.6	2.8	47.7	0.7	3.3	38.8	0.7	3.8	32.0	0.8	4.3	26.7	0.8	4.9	22.5	0.9	5.4
75	158.0	0.5	1.3	110.5	0.6	1.8	81.3	0.6	2.3	63.6	0.6	2.8	51.1	0.7	3.3	41.6	0.7	3.8	34.3	0.8	4.3	28.6	0.8	4.9	24.1	0.9	5.4
80	168.5	0.5	1.3	117.8	0.6	1.8	86.8	0.6	2.3	67.8	0.6	2.8	54.5	0.7	3.3	44.3	0.7	3.8	36.5	0.8	4.3	30.5	0.8	4.9	25.7	0.9	5.5
85	179.0	0.5	1.3	125.2	0.6	1.8	92.2	0.6	2.3	72.0	0.6	2.8	57.9	0.7	3.3	47.1	0.7	3.8	38.8	0.8	4.3	32.4	0.8	4.9	27.3	0.9	5.5
90	189.6	0.5	1.3	132.6	0.6	1.8	97.6	0.6	2.3	76.3	0.6	2.8	61.3	0.7	3.3	49.9	0.7	3.8	41.1	0.8	4.3	34.3	0.8	4.9	28.9	0.9	5.5
95	200.1	0.5	1.3	139.9	0.6	1.8	103.0	0.6	2.3	80.5	0.6	2.8	64.7	0.7	3.3	52.6	0.7	3.8	43.4	0.8	4.3	36.2	0.8	4.9	30.5	0.9	5.5
100	210.6	0.5	1.3	147.3	0.6	1.8	108.5	0.6	2.3	84.8	0.6	2.8	68.1	0.7	3.3	55.4	0.7	3.8	45.7	0.8	4.3	38.1	0.8	4.9	32.1	0.9	5.5
105	221.1	0.5	1.3	154.6	0.6	1.8	113.9	0.6	2.3	89.0	0.6	2.8	71.5	0.7	3.3	58.2	0.7	3.8	47.9	0.8	4.3	40.0	0.8	4.9	33.7	0.9	5.5
110	231.7	0.5	1.3	162.0	0.6	1.8	119.3	0.6	2.3	93.2	0.6	2.8	74.9	0.7	3.3	60.9	0.7	3.8	50.2	0.8	4.3	41.9	0.8	4.9	35.3	0.9	5.5
115	242.2	0.5	1.3	169.4	0.6	1.8	124.7	0.6	2.3	97.5	0.6	2.8	78.3	0.7	3.3	63.7	0.7	3.8	52.5	0.8	4.3	43.8	0.8	4.9	36.9	0.9	5.5
120	252.7	0.5	1.3	176.7	0.6	1.8	130.2	0.6	2.3	101.7	0.6	2.8	81.7	0.7	3.3	66.5	0.7	3.8	54.8	0.8	4.3	45.7	0.8	4.9	38.5	0.9	5.5
125	263.3	0.5	1.3	184.1	0.6	1.8	135.6	0.6	2.3	106.0	0.6	2.8	85.1	0.7	3.3	69.3	0.7	3.8	57.1	0.8	4.3	47.6	0.8	4.9	40.1	0.9	5.5
130	273.8	0.5	1.3	191.5	0.6	1.8	141.0	0.6	2.3	110.2	0.6	2.8	88.5	0.7	3.3	72.0	0.7	3.8	59.4	0.8	4.3	49.5	0.8	4.9	41.7	0.9	5.5
135	284.3	0.5	1.3	198.8	0.6	1.8	146.4	0.6	2.3	114.4	0.6	2.8	91.9	0.7	3.3	74.8	0.7	3.8	61.6	0.8	4.3	51.4	0.8	4.9	43.3	0.9	5.5
140	294.9	0.5	1.3	206.2	0.6	1.8	151.8	0.6	2.3	118.7	0.6	2.8	95.3	0.7	3.3	77.6	0.7	3.8	63.9	0.8	4.3	53.3	0.8	4.9	44.9	0.9	5.5
145	305.4	0.5	1.3	213.6	0.6	1.8	157.3	0.6	2.3	122.9	0.6	2.8	98.7	0.7	3.3	80.3	0.7	3.8	66.2	0.8	4.3	55.2	0.8	4.9	46.5	0.9	5.5
150	315.9	0.5	1.3	220.9	0.6	1.8	162.7	0.6	2.3	127.1	0.6	2.8	102.1	0.7	3.3	83.1	0.7	3.8	68.5	0.8	4.3	57.1	0.8	4.9	48.1	0.9	5.5

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 8.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	12.0	0.5	1.3	8.5	0.5	1.7	6.2	0.5	2.2	4.6	0.6	2.7	3.7	0.6	3.2	2.9	0.7	3.6									
10	24.1	0.5	1.3	16.9	0.5	1.7	12.6	0.5	2.2	9.6	0.6	2.7	7.8	0.6	3.2	6.3	0.6	3.7	5.1	0.7	4.2	4.2	0.8	4.8	3.2	0.9	5.3
15	36.1	0.5	1.3	25.3	0.5	1.7	18.9	0.5	2.2	14.4	0.6	2.7	11.8	0.6	3.2	9.7	0.6	3.7	7.9	0.7	4.2	6.5	0.7	4.8	5.4	0.8	5.3
20	48.1	0.5	1.3	33.8	0.5	1.7	25.2	0.5	2.2	19.2	0.6	2.7	15.8	0.6	3.2	12.9	0.6	3.7	10.7	0.7	4.2	8.8	0.7	4.8	7.4	0.8	5.3
25	60.1	0.5	1.3	42.2	0.5	1.7	31.5	0.5	2.2	24.0	0.6	2.7	19.7	0.6	3.2	16.2	0.6	3.7	13.4	0.7	4.2	11.2	0.7	4.7	9.3	0.8	5.3
30	72.1	0.5	1.3	50.6	0.5	1.7	37.8	0.5	2.2	28.8	0.6	2.7	23.6	0.6	3.2	19.4	0.6	3.7	16.1	0.7	4.2	13.5	0.7	4.8	11.3	0.7	5.3
35	84.1	0.5	1.3	59.1	0.5	1.7	44.1	0.5	2.2	33.6	0.6	2.7	27.6	0.6	3.2	22.6	0.6	3.7	18.7	0.7	4.2	15.7	0.7	4.8	13.3	0.7	5.3
40	96.2	0.5	1.3	67.5	0.5	1.7	50.4	0.5	2.2	38.4	0.6	2.7	31.5	0.6	3.2	25.8	0.6	3.7	21.4	0.7	4.2	17.9	0.7	4.8	15.2	0.7	5.3
45	108.2	0.5	1.3	76.0	0.5	1.7	56.7	0.5	2.2	43.2	0.6	2.7	35.4	0.6	3.2	29.0	0.6	3.7	24.1	0.7	4.2	20.2	0.7	4.8	17.1	0.7	5.3
50	120.2	0.5	1.3	84.4	0.5	1.7	63.0	0.5	2.2	48.0	0.6	2.7	39.4	0.6	3.2	32.3	0.6	3.7	26.8	0.7	4.2	22.4	0.7	4.8	19.0	0.7	5.3
55	132.2	0.5	1.3	92.8	0.5	1.7	69.3	0.5	2.2	52.8	0.6	2.7	43.3	0.6	3.2	35.5	0.6	3.7	29.4	0.7	4.2	24.7	0.7	4.8	20.9	0.7	5.3
60	144.2	0.5	1.3	101.3	0.5	1.7	75.6	0.5	2.2	57.6	0.6	2.7	47.2	0.6	3.2	38.7	0.6	3.7	32.1	0.7	4.2	26.9	0.7	4.8	22.8	0.7	5.3
65	156.3	0.5	1.3	109.7	0.5	1.7	81.8	0.5	2.2	62.4	0.6	2.7	51.2	0.6	3.2	41.9	0.6	3.7	34.8	0.7	4.2	29.1	0.7	4.8	24.7	0.7	5.3
70	168.3	0.5	1.3	118.2	0.5	1.7	88.1	0.5	2.2	67.2	0.6	2.7	55.1	0.6	3.2	45.2	0.6	3.7	37.5	0.7	4.2	31.4	0.7	4.8	26.6	0.7	5.3
75	180.3	0.5	1.3	126.6	0.5	1.7	94.4	0.5	2.2	72.0	0.6	2.7	59.0	0.6	3.2	48.4	0.6	3.7	40.1	0.7	4.2	33.6	0.7	4.8	28.5	0.7	5.3
80	192.3	0.5	1.3	135.0	0.5	1.7	100.7	0.5	2.2	76.8	0.6	2.7	63.0	0.6	3.2	51.6	0.6	3.7	42.8	0.7	4.2	35.9	0.7	4.8	30.3	0.7	5.3
85	204.3	0.5	1.3	143.5	0.5	1.7	107.0	0.5	2.2	81.6	0.6	2.7	66.9	0.6	3.2	54.9	0.6	3.7	45.5	0.7	4.2	38.1	0.7	4.8	32.2	0.7	5.3
90	216.4	0.5	1.3	151.9	0.5	1.7	113.3	0.5	2.2	86.4	0.6	2.7	70.8	0.6	3.2	58.1	0.6	3.7	48.1	0.7	4.2	40.3	0.7	4.8	34.1	0.7	5.3
95	228.4	0.5	1.3	160.3	0.5	1.7	119.6	0.5	2.2	91.2	0.6	2.7	74.8	0.6	3.2	61.3	0.6	3.7	50.8	0.7	4.2	42.6	0.7	4.8	36.0	0.7	5.3
100	240.4	0.5	1.3	168.8	0.5	1.7	125.9	0.5	2.2	96.0	0.6	2.7	78.7	0.6	3.2	64.5	0.6	3.7	53.5	0.7	4.2	44.8	0.7	4.8	37.9	0.7	5.3
105	252.4	0.5	1.3	177.2	0.5	1.7	132.2	0.5	2.2	100.8	0.6	2.7	82.6	0.6	3.2	67.8	0.6	3.7	56.2	0.7	4.2	47.1	0.7	4.8	39.8	0.7	5.3
110	264.4	0.5	1.3	185.7	0.5	1.7	138.5	0.5	2.2	105.6	0.6	2.7	86.6	0.6	3.2	71.0	0.6	3.7	58.8	0.7	4.2	49.3	0.7	4.8	41.7	0.7	5.3
115	276.5	0.5	1.3	194.1	0.5	1.7	144.8	0.5	2.2	110.4	0.6	2.7	90.5	0.6	3.2	74.2	0.6	3.7	61.5	0.7	4.2	51.5	0.7	4.8	43.6	0.7	5.3
120	288.5	0.5	1.3	202.5	0.5	1.7	151.1	0.5	2.2	115.2	0.6	2.7	94.4	0.6	3.2	77.4	0.6	3.7	64.2	0.7	4.2	53.8	0.7	4.8	45.5	0.7	5.3
125	300.5	0.5	1.3	211.0	0.5	1.7	157.4	0.5	2.2	120.0	0.6	2.7	98.4	0.6	3.2	80.7	0.6	3.7	66.9	0.7	4.2	56.0	0.7	4.8	47.4	0.7	5.3
130	312.5	0.5	1.3	219.4	0.5	1.7	163.7	0.5	2.2	124.8	0.6	2.7	102.3	0.6	3.2	83.9	0.6	3.7	69.5	0.7	4.2	58.3	0.7	4.8	49.3	0.7	5.3
135	324.5	0.5	1.3	227.9	0.5	1.7	170.0	0.5	2.2	129.6	0.6	2.7	106.2	0.6	3.2	87.1	0.6	3.7	72.2	0.7	4.2	60.5	0.7	4.8	51.2	0.7	5.3
140	336.6	0.5	1.3	236.3	0.5	1.7	176.3	0.5	2.2	134.4	0.6	2.7	110.2	0.6	3.2	90.3	0.6	3.7	74.9	0.7	4.2	62.7	0.7	4.8	53.1	0.7	5.3
145	348.6	0.5	1.3	244.7	0.5	1.7	182.6	0.5	2.2	139.2	0.6	2.7	114.1	0.6	3.2	93.6	0.6	3.7	77.6	0.7	4.2	65.0	0.7	4.8	55.0	0.7	5.3
150	360.6	0.5	1.3	253.2	0.5	1.7	188.9	0.5	2.2	144.0	0.6	2.7	118.0	0.6	3.2	96.8	0.6	3.7	80.2	0.7	4.2	67.2	0.7	4.8	56.9	0.7	5.3

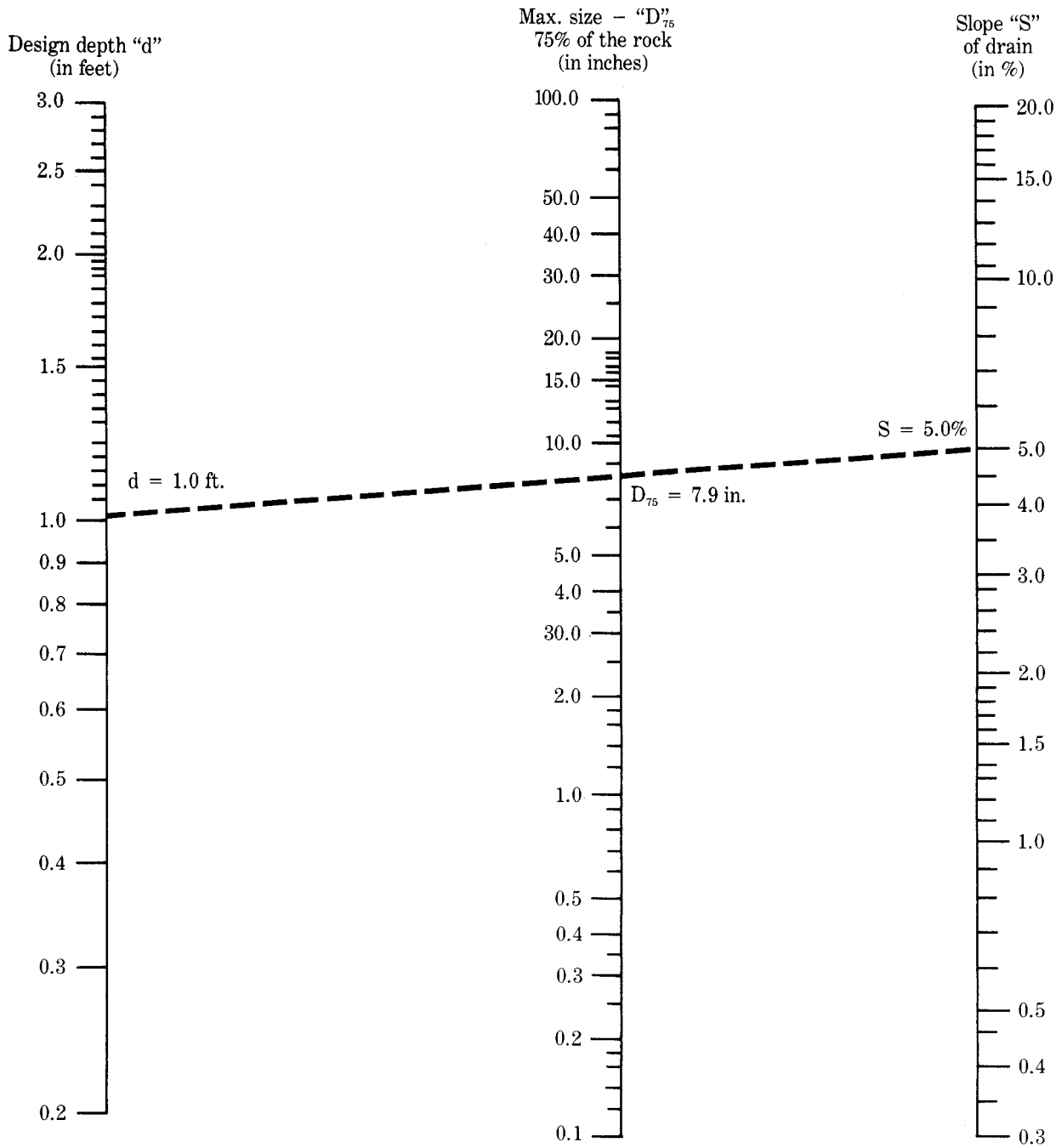
EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")

V1 FOR RETARDANCE "D". TOP WIDTH (T), DEPTH' (D) AND V2 FOR RETARDANCE "C"

GRADE 10.00 PERCENT

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	13.3	0.4	1.3	9.4	0.5	1.7	6.8	0.5	2.2	5.3	0.5	2.6	4.1	0.6	3.2	3.4	0.6	3.6	2.6	0.7	4.1						
10	26.6	0.4	1.3	18.7	0.5	1.7	13.8	0.5	2.2	10.9	0.5	2.6	8.5	0.6	3.2	7.1	0.6	3.6	5.9	0.6	4.1	4.9	0.7	4.7	4.0	0.7	5.3
15	39.9	0.4	1.3	28.0	0.5	1.7	20.7	0.5	2.2	16.3	0.5	2.6	12.8	0.6	3.2	10.9	0.6	3.6	9.0	0.6	4.1	7.5	0.6	4.7	6.3	0.7	5.2
20	53.2	0.4	1.3	37.4	0.5	1.7	27.6	0.5	2.2	21.7	0.5	2.7	17.0	0.6	3.2	14.5	0.6	3.6	12.1	0.6	4.1	10.2	0.6	4.6	8.5	0.7	5.2
25	66.5	0.4	1.3	46.7	0.5	1.7	34.5	0.5	2.2	27.1	0.5	2.7	21.3	0.6	3.2	18.1	0.6	3.6	15.1	0.6	4.1	12.7	0.6	4.7	10.8	0.7	5.2
30	79.8	0.4	1.3	56.1	0.5	1.7	41.4	0.5	2.2	32.5	0.5	2.7	25.5	0.6	3.2	21.7	0.6	3.6	18.1	0.6	4.1	15.2	0.6	4.7	12.9	0.7	5.2
35	93.1	0.4	1.3	65.4	0.5	1.7	48.3	0.5	2.2	37.9	0.5	2.7	29.8	0.6	3.2	25.3	0.6	3.6	21.1	0.6	4.1	17.8	0.6	4.7	15.1	0.7	5.2
40	106.4	0.4	1.3	74.7	0.5	1.7	55.2	0.5	2.2	43.3	0.5	2.7	34.0	0.6	3.2	29.0	0.6	3.6	24.1	0.6	4.1	20.3	0.6	4.7	17.2	0.7	5.2
45	119.7	0.4	1.3	84.1	0.5	1.7	62.1	0.5	2.2	48.8	0.5	2.7	38.3	0.6	3.2	32.6	0.6	3.6	27.2	0.6	4.1	22.8	0.6	4.7	19.4	0.7	5.2
50	133.0	0.4	1.3	93.4	0.5	1.7	69.0	0.5	2.2	54.2	0.5	2.7	42.5	0.6	3.2	36.2	0.6	3.6	30.2	0.6	4.1	25.4	0.6	4.7	21.5	0.7	5.2
55	146.3	0.4	1.3	102.8	0.5	1.7	75.9	0.5	2.2	59.6	0.5	2.7	46.8	0.6	3.2	39.8	0.6	3.6	33.2	0.6	4.1	27.9	0.6	4.7	23.7	0.7	5.2
60	159.6	0.4	1.3	112.1	0.5	1.7	82.8	0.5	2.2	65.0	0.5	2.7	51.0	0.6	3.2	43.4	0.6	3.6	36.2	0.6	4.1	30.5	0.6	4.7	25.9	0.7	5.2
65	172.9	0.4	1.3	121.4	0.5	1.7	89.7	0.5	2.2	70.4	0.5	2.7	55.3	0.6	3.2	47.1	0.6	3.6	39.2	0.6	4.1	33.0	0.6	4.7	28.0	0.7	5.2
70	186.2	0.4	1.3	130.8	0.5	1.7	96.6	0.5	2.2	75.8	0.5	2.7	59.5	0.6	3.2	50.7	0.6	3.6	42.2	0.6	4.1	35.5	0.6	4.7	30.2	0.7	5.2
75	199.5	0.4	1.3	140.1	0.5	1.7	103.5	0.5	2.2	81.2	0.5	2.7	63.8	0.6	3.2	54.3	0.6	3.6	45.2	0.6	4.1	38.1	0.6	4.7	32.3	0.7	5.2
80	212.8	0.4	1.3	149.5	0.5	1.7	110.5	0.5	2.2	86.7	0.5	2.7	68.0	0.6	3.2	57.9	0.6	3.6	48.3	0.6	4.1	40.6	0.6	4.7	34.5	0.7	5.2
85	226.1	0.4	1.3	158.8	0.5	1.7	117.4	0.5	2.2	92.1	0.5	2.7	72.3	0.6	3.2	61.5	0.6	3.6	51.3	0.6	4.1	43.1	0.6	4.7	36.6	0.7	5.2
90	239.4	0.4	1.3	168.1	0.5	1.7	124.3	0.5	2.2	97.5	0.5	2.7	76.5	0.6	3.2	65.2	0.6	3.6	54.3	0.6	4.1	45.7	0.6	4.7	38.8	0.7	5.2
95	252.7	0.4	1.3	177.5	0.5	1.7	131.2	0.5	2.2	102.9	0.5	2.7	80.8	0.6	3.2	68.8	0.6	3.6	57.3	0.6	4.1	48.2	0.6	4.7	40.9	0.7	5.2
100	266.0	0.4	1.3	186.8	0.5	1.7	138.1	0.5	2.2	108.3	0.5	2.7	85.0	0.6	3.2	72.4	0.6	3.6	60.3	0.6	4.1	50.7	0.6	4.7	43.1	0.7	5.2
105	279.3	0.4	1.3	196.2	0.5	1.7	145.0	0.5	2.2	113.7	0.5	2.7	89.3	0.6	3.2	76.0	0.6	3.6	63.3	0.6	4.1	53.3	0.6	4.7	45.2	0.7	5.2
110	292.6	0.4	1.3	205.5	0.5	1.7	151.9	0.5	2.2	119.2	0.5	2.7	93.5	0.6	3.2	79.6	0.6	3.6	66.4	0.6	4.1	55.8	0.6	4.7	47.4	0.7	5.2
115	305.9	0.4	1.3	214.9	0.5	1.7	158.8	0.5	2.2	124.6	0.5	2.7	97.8	0.6	3.2	83.3	0.6	3.6	69.4	0.6	4.1	58.3	0.6	4.7	49.5	0.7	5.3
120	319.2	0.4	1.3	224.2	0.5	1.7	165.7	0.5	2.2	130.0	0.5	2.7	102.0	0.6	3.2	86.9	0.6	3.6	72.4	0.6	4.1	60.9	0.6	4.7	51.7	0.7	5.3
125	332.5	0.4	1.3	233.5	0.5	1.7	172.6	0.5	2.2	135.4	0.5	2.7	106.3	0.6	3.2	90.5	0.6	3.6	75.4	0.6	4.1	63.4	0.6	4.7	53.8	0.7	5.3
130	345.8	0.4	1.3	242.9	0.5	1.7	179.5	0.5	2.2	140.8	0.5	2.7	110.5	0.6	3.2	94.1	0.6	3.6	78.4	0.6	4.1	66.0	0.6	4.7	56.0	0.7	5.3
135	359.1	0.4	1.3	252.2	0.5	1.7	186.4	0.5	2.2	146.2	0.5	2.7	114.8	0.6	3.2	97.7	0.6	3.6	81.4	0.6	4.1	68.5	0.6	4.7	58.1	0.7	5.3
140	372.4	0.4	1.3	261.6	0.5	1.7	193.3	0.5	2.2	151.7	0.5	2.7	119.0	0.6	3.2	101.3	0.6	3.6	84.4	0.6	4.1	71.0	0.6	4.7	60.3	0.7	5.3
145	385.7	0.4	1.3	270.9	0.5	1.7	200.2	0.5	2.2	157.1	0.5	2.7	123.3	0.6	3.2	105.0	0.6	3.6	87.5	0.6	4.1	73.6	0.6	4.7	62.5	0.7	5.3
150	399.0	0.4	1.3	280.2	0.5	1.7	207.1	0.5	2.2	162.5	0.5	2.7	127.5	0.6	3.2	108.6	0.6	3.6	90.5	0.6	4.1	76.1	0.6	4.7	64.6	0.7	5.3

EXHIBIT 7-5 PARABOLIC WATERWAY DESIGN
(RETARDANCE "D" AND "C")



Example: "d" – 1.0 foot "S" – 5%
Place straight edge at "d" value in Design Depth column and at "S" value in "Slope" column. Read rock size in middle column, 7.9 inches; round to 8 inches.

For Design:
25% of the rock by volume should be in sizes of 8 inches or slightly larger. The remaining 75% or less should be of well-graded material, smaller than 8 inches, including sufficient sands and gravels to fill the voids between the larger rock.

Exhibit 7-6.—Determination of rock size for stone center waterway.

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