

ARTICLE XXIV
CRYSTAL LAKE WATERSHED OVERLAY DISTRICT
(Adopted August 25, 2021)

SECTION 24.1 PURPOSE

The purpose of this Article is to protect the environmental quality of Crystal Lake, the Crystal Lake shoreline, and the Crystal Lake watershed through appropriate land use and design regulations. The protection of the Crystal Lake Watershed is deemed a public purpose in order to preserve important environmental, historical, residential, recreational, cultural, scenic, and economic attributes of the region.

More specifically, the purpose of this Article is:

- To protect the public health, safety, and welfare;
- To prevent water pollution and warming;
- To prevent erosion and degradation and fragmentation of landscapes;
- To protect fish spawning grounds, aquatic life, bird and other wildlife habitat;
- To protect buildings and lands from accelerated erosion;
- To protect streams, wetlands, groundwater resources, and the water quality of Crystal Lake;
- To conserve natural beauty, open space, native vegetation, and diversity of plants and animals throughout the watershed;
- To ensure that land use and/or development enhances rural character rather than detracts from or ignores the natural topography, resources, amenities, and fragile environment of Crystal Lake and its watershed.

SECTION 24.2 WATERSHED OVERLAY DISTRICT

All areas that are in the Crystal Lake Watershed, according to the Crystal Lake Watershed Overlay Map (Figure 24-1) shall meet all requirements of this Article. All uses allowable in the underlying zoning districts of this Ordinance shall comply with the standards set forth in this Article regulating development and land use in the Crystal Lake Watershed. The requirements of this Article shall be applied in addition to the other applicable regulations or use restrictions for each zoning district and shall be considered as a separate portion of the zoning application.

The Crystal Lake Watershed Overlay Map shall always be on file with the Township Clerk and the Zoning Administrator. Any interpretations of the boundaries of this map shall be the responsibility of the Zoning Administrator, whose decision may be appealed to the Township Board of Appeals.

In cases where a parcel is partially inside and partially outside of the overlay district, only those portions located within the overlay district are required to comply with the regulations of this Article.

Where there is any conflict between the provisions or requirements of this overlay district, and those of any underlying zoning district, the more restrictive provisions apply.

When the proposed land use is a “use by right” in the underlying zoning district, the Planning Commission and Board of Zoning Appeals will diligently engage in a good faith effort to achieve an acceptable site plan.

SECTION 24.3 USES EXCLUDED IN WATERSHED OVERLAY DISTRICT

All uses permitted by right or by special land use permit in the underlying zoning district shall be permitted in the Crystal Lake Watershed Overlay District EXCEPT for the following uses which include but are not limited to:

- A. Confined Feedlots
- B. Slaughterhouses
- C. Gas Stations
- D. Auto Repair Shops
- E. Auto Washes
- F. Oil-change Establishments
- G. Industrial Uses involved in the Manufacturing, Compounding, Processing, or Treating of Products.
- H. Commercial Farming without submitting documentation of Generally Accepted Agricultural Management Practices (GAAMPs) planning and without compliance with Sections 24.7 and 24.8.
- I. Clear Cut Lumbering without submitting a Forest Management Plan (see Section 24.7.C)
- J. Parking Lots (per Article XX [20]) in R-1, R-2 and RP Districts
- K. Expansion of Existing Parking Lots
- L. Fertilizer Storage without Secondary Containers
- M. Salt Storage
- N. Marinas or Boat Repair Shops
- O. Airports or Private Landing Fields
- P. Sand and/or Gravel Pits or Quarries
- Q. Golf Courses or Golf Course Expansions

SECTION 24.4 SETBACKS & DENSITY

Minimum setbacks and density requirements of the underlying zoning district shall be met unless this Article specifically states otherwise. Refer to underlying zoning district for lot dimension requirements. All setbacks are measured along the ground contours.

Crystal Lake Township Zoning Map

Crystal Lake Township
Benzie County, Michigan

Township Supervisor
This is to certify that this is the official zoning map of Crystal Lake Township. Approved and adopted by the Crystal Lake Township Board on

Township Clerk

Zoning Districts

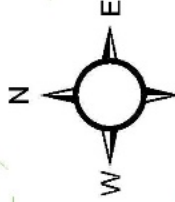
- RP-5 Rural Preservation
- RP-20 Rural Preservation
- RP-2.5 Rural Preservation
- RP-10 Rural Preservation
- R-5 Rec. Residential
- R-4 Multi-Family
- R-3 Rural Residential
- R-2 Single Family Residential
- R-1 Lake Shore Residential
- LI Light Industrial
- CR Comm. Resort
- C-1 Commercial

DRAINAGE DIVIDE
WATERSHED BOUNDARY

DRAINAGE DIVIDE
WATERSHED BOUNDARY

CITY OF
FRANKFORT

FIGURE 24-1 – WATERSHED
OVERLAY BOUNDARIES



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A. Setbacks

1. All principal buildings and permitted uses shall be set back at least one hundred (100) feet from the ordinary high-water mark (OHWM) of Crystal Lake.
2. All accessory buildings and accessory uses shall be set back at least thirty-five (35) feet from the OHWM of Crystal Lake.
3. Within 35 feet of the OHWM of Crystal Lake, no impervious surfaces shall be permitted. See subsequent Section 24.8.

B. Setbacks from Wetlands and Streams

No impervious surfaces shall be permitted within 35 feet of the OHWM of Wetlands and Streams. See subsequent Section 24.8.

C. Density

The permitted density for residential dwellings shall be one dwelling unit per lot/parcel in R-1, R-2, and RP Districts. In the case of development classified as a PRD (Article 16.19), a PUD (Article 17) or a Condominium or Subdivision (Article 18), the density shall be based on the existing slope of the site, the following table, and all other requirements of this Article.

| TABLE 24-1 | |
|----------------------|----------------------------------|
| Existing Slope | Maximum Density |
| Less than 6% | 1.00 unit per acre |
| 6% to less than 12% | 0.75 unit per acre |
| 12% to less than 18% | 0.50 unit per acre |
| 18% or greater | Special Land Use Permit Required |

SECTION 24.5 APPROVAL PROCESS

A. Site Plans

1. All uses permitted by right or by special land use permit (including additions or extensions to such uses or buildings) that are located wholly or partially within the Watershed Overlay District shall be required to obtain site plan approval pursuant to Article XIV (14).

2. No site alteration, including but not limited to grading, excavation, tree and other vegetation removal, filling, demolition or construction of any kind, shall be permitted until a site plan has been approved and a permit has been issued by the Zoning Administrator.

B. Septic Inspection & Maintenance

1. Improperly maintained or installed septic systems are a primary cause of pollution in Michigan's inland lakes. Because these septic systems are near the shoreline, close to the water table, and in very permeable soil, they must all be in perfect working order to protect water quality. Routine inspection and pumping are essential. Vigorous programs of education, leak detection and voluntary remediation are required, and Crystal Lake Township joins with other community groups in supporting these efforts.
2. Any request for a zoning (or land use) permit must include a Septic Evaluation completed by the Benzie-Leelanau District Health Department and submitted to the Zoning Administrator. The Zoning Administrator may waive this requirement if the proposed development would have no effect on the septic system. Any recommended maintenance, repairs, corrective action or replacement must be completed on a timetable agreed to by owner, health department and zoning administrator. In addition, all of the requirements of the Benzie-Leelanau District Department Sanitary Code must be met, according to Section 14.7.3.B.

C. Forestry & Forest Management

Forestry as defined in Section 2.2 under "Forest", "Forestry Use or Forest Operations," "Forest Management," and "Timber Harvesting" located wholly or partially within the Watershed Overlay requires a Temporary Zoning Permit (see Article 14), which will be issued by the Zoning Administrator when:

1. the Zoning Administrator has received a plan for the forestry activity that complies with the Michigan Department of Natural Resources Forestry Best Management Practices for Soil and Water Quality, and;
2. this plan is written by a Forester as defined in Section 2.2 and recognized as such by the Benzie County Conservation District Forester.
3. Pre-approved templates for forestry management plans are available from the Zoning Administrator or on the Township's website. Templates are also available from the American Tree Farm System for Michigan's Family Forest Owners. (www.treefarmssystem.org/michigan)

D. Retaining Walls

1. Shoreline retaining walls (see Section 2.2) are prohibited.
2. No shoreline retaining wall shall be modified, enlarged, replaced or removed without an approved zoning permit from the Zoning Administrator.
3. Shoreline erosion protection such as “rip-rap” or the like shall not be installed without receiving a permit from the Michigan Department of Energy, Great Lakes and Environment (EGLE), and submitting same to the Zoning Administrator. (See Section 22.) In addition, all relevant provisions of this overlay, including but not limited to Section 24.7 DESIGN STANDARD – VEGETATED COVER; Section 24.9 DEVELOPMENT ON SLOPES; Section 24.12 GENERAL DESIGN GUIDELINES; and 24.13 CONSTRUCTION REQUIREMENTS, shall apply.

E. Runoff Control

Runoff from any and all impervious surfaces shall be controlled in accordance with Section 22.6. The site plan submitted for approval must address existing control of runoff and runoff control both during and after construction through the use of filtering, retention, and Low Impact Development (LID) systems such as rain gardens or constructed wetlands. See Figure 24-2. Direct discharge of runoff above surface or sub-surface via ditch, pipe, or culvert into the lake, stream, or wetland is prohibited at all times including during and after construction.

F. Non-conforming Conditions

Non-conforming situations (see Section 2.2) created by the adoption of amendments or revisions to Article XXIV (24) shall be adjudicated in accordance with Article XXVIII (28) of this Ordinance subject to the following conditions.

1. Where a structure already exists on a parcel and is wholly or partially within 35 feet of the Lake’s OHWM, that structure, regardless of height shall be considered to be a lawful, non-conforming structure, which cannot be expanded in either footprint or volume.
2. If multiple lots of record are combined and the existing non-conforming structures are removed to allow construction of a new structure, then the new structure shall meet all requirements of the current Ordinances.

How to choose the right location

FIGURE 24-2
RAIN GARDENS

Never plant a rain garden on top of a septic tank, drain field, wellhead, or utilities.

Select a site with few or no trees to avoid disturbing their roots.

At least 10' from a building

Avoid steep slopes and allow for overflow.

Check your local

Area of rain garden (Sq. Ft.) =
Area to be treated (Sq. Ft.) / Depth of Rain Garden (in.)

EXAMPLE
900 Sq. Ft. / 6 in. =
150 Sq. Ft Rain Garden



General Rain Garden Planting Zones

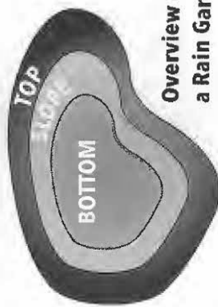
Select plants according to their water needs.

Bottom: For plants that can tolerate wetter conditions.

Slope: For plants that can tolerate occasional standing water.

Top: For plants that prefer drier conditions.

Cross-section of a Rain Garden



Overview of a Rain Garden

SECTION 24.6 DESIGN STANDARDS FOR CONSTRUCTION AND USE OF LAND

The purpose of the design standards of this Article are:

- To slow the rate and volume of stormwater runoff;
- To reduce erosion and sedimentation;
- To protect water quality and recharge groundwater;
- To keep excess nutrients, such as nitrogen and phosphorus and other pollutants from entering lakes and streams;
- To maintain water temperatures at natural levels;
- To preserve fish and wildlife habitat, and;
- To preserve aesthetic and scenic values of the watershed environment.

Any development and/or use of land, including but not limited to new structures; additions or extensions to existing structures (regardless of height); or construction in, or changes to, vegetative cover shall meet the design standards of this Article.

The application prepared by the owner and/or owner's agent shall show, by submitting appropriate calculations and resource inventories, that the proposed development, construction, or land use will preserve predevelopment natural floodwater storage capacity; preserve valuable habitat for Lake and Watershed flora and fauna; preserve water quality and ground water resources; control stormwater runoff velocity and/or volume; and protect any other natural stream, floodplain, and/or wetland function; and is otherwise consistent with the intent of this Article.

In addition, an owner or owner's agent shall meet all requirements of the Township for grading and filling of their property and for stormwater retention, including the environmental provisions of Article XXII (22).

SECTION 24.7 DESIGN STANDARD – VEGETATIVE COVER

The terms "vegetation," and "vegetative cover" as used in this Article shall be defined as all the plant life of an area, taken as a whole, including perennial grasses, legumes, forbs, shrubs, and trees.

A. General Requirements for Vegetative Cover

1. The required area of vegetative cover to remain undisturbed shall be in accordance with the following table and based on the proximity to Crystal Lake, streams, and wetlands and the existing slopes on the site. The Minimum Percent to Remain shall be calculated for each portion of the lot having a similar slope (referred to as a 'slope zone'). Areas having a slope of 18% or greater, rights of way and vegetative buffer zones per Section 24.7.B occurring (wholly or partially) in each slope zone shall be excluded

from the calculation in that slope zone. Areas of undisturbed vegetative cover shall be clearly shown on the proposed site plan. See Figures 24-3.1 and 24-3.2 for an example of how the requirements of the following table are applied.

2. Turf grass or lawns (see Section 2.2) shall not qualify as native or non-invasive vegetative cover required in this Section and shall not be used in the calculation of percentage of vegetative cover in this Section.

| TABLE 24-2 | |
|----------------------|---|
| Existing Slope | Minimum Percent of Lot to Remain in Native and/or Non-Invasive Vegetative Cover |
| Less than 6% | 30% |
| 6% to less than 12% | 40% |
| 12% to less than 18% | 50% |
| 18%+ | Special Land Use Permit Required |

3. Natural vegetative areas shall be located or preserved along lot lines, natural drainage courses, streams, wetlands, and steep slopes.
4. Where existing vegetation is removed in conformance with this Article and such areas are required to be replaced, they shall be replaced with native or non-invasive vegetative cover that is recommended as being effective in infiltrating runoff, preventing erosion, and preserving natural beauty. (Refer to Section 24.14 Resources).
5. In the case of PUDs, PRDs, Condominiums and Subdivision development, each individual lot need not meet the requirements of this Section, provided that the total project does meet the requirements of this Article.

B. Vegetative Buffer Zones

Vegetative Buffer Zones are defined as areas adjacent to Crystal Lake, to streams and wetlands, and to ridgelines, where vegetation is critical to promoting infiltration, preventing erosion and/or controlling runoff. All distances are measured along the ground contours.

1. Vegetation shall remain or begin at the ordinary high-water mark (OHWM) of Crystal Lake, stream, or wetland, and at a ridgeline,

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FIGURE 24-3.2
SLOPE ZONE DETERMINATION & ANALYSIS

| ZONE ON TOPO SURVEY | DETERMINED SLOPE (SEE 24.9) The determination of slope percentages shall be shown on the site plan. There may be different slope percentages in different areas of the lot/parcel, which will determine the amount of vegetative cover removal and/or the area of impervious surface allowed in each of the different areas | VEGETATIVE COVER TO REMAIN (SEE 24.7) The Minimum Percent to Remain shall be calculated for each portion of the lot having a similar slope (referred to as a 'slope zone'). Areas having a slope of 18% or greater, rights of way and vegetative buffer zones per Section 24.7.B occurring (wholly or partially) in each slope zone shall be excluded from the calculation in that slope zone | MAX. ALLOWED IMPERVIOUS SURFACE (SEE 24.8) The area of IMPervious Surface (IMPS) permitted shall be based on distance from the Lake's OHWM and the existing slope zones of the site. Lot coverage shall be defined as the percentage of the lot area (excluding the area of slopes greater than 18%, rights-of-way and vegetative buffer zones per Section 24.7.B) that is uninterrupted by public rights-of-way or slopes greater than 18% and is covered by impervious surface areas, including structures and paving |
|----------------------------|---|---|---|
| ZONE 1 | This area is within 35' of the OHWM (Ordinary High-Water Mark) of Crystal Lake, which is a defined buffer zone | SEE 24.7.B -- Removal of vegetation in an existing vegetative buffer shall be limited to no more than twenty percent (20%) of the length of shoreline of the buffer, provided that removal of this twenty percent (20%) shall not create a clear-cut opening greater than ten feet (10') wide for every fifty feet (50') of shoreline | SEE 24.8.A -- Within 35 feet of the Crystal Lake OHWM, no IMPervious Surfaces (IMPS), regardless of height, shall be permitted. Permeable surfaces shall be constructed per Section 24.8.C. |
| ZONE 2 | Portion of site where slope is approximately 6% Dimension of Zone 2 = 200'w by 110'd Area of Zone 2 = 22,000 sq ft | SEE TABLE 24-2 -- Slope between 6% and 12% requires 40% vegetative cover (8,800 sf) to remain undisturbed unless a lawful, non-conforming situation exists. That is, up to 13,200 sf can be removed. | SEE TABLE 24-3 -- Slope less than 6% allows 30% lot coverage, that is, 6,600 sf of IMPS. Per 24.4 the setback from the Lake's OHWM is 100 feet. However, the area of IMPS (structures, paving, etc.) located between 35 and 75 feet of the lake, shall be limited to a maximum of 150 square feet per 100 linear feet of lake frontage unless a lawful, non-conforming situation exists. SEE FIGURE 24-4. SEE Section 24.5.E for non-conforming situations. |
| ZONE 3 | Portion of site where slope is approximately 12% Dimension of Zone 3 = 200'w by 245'd Area of Zone 3 = 49,000 sq ft | SEE TABLE 24-2 -- Slope between 12% and 18% requires 50% vegetative cover (24,500 sf) to remain undisturbed unless a lawful, non-conforming situation exists. That is, up to 24,500 sf can be removed. | SEE TABLE 24-3 -- Slope between 12% and 18% allows 10% lot coverage, that is, 4,900 sf of IMPS (structures, paving, etc. |
| ZONE 4 | Portion of site where slope is greater than 18% . See 24.9 Dimension of Zone 4 = 200'w by 60'd along the 'fall-line.' Area of Zone 4 = ~12,000 sq ft | SEE TABLE 24-2 -- Slope greater than 18% requires 50% vegetative cover (24,500 sf) to remain undisturbed and also requires the owner to obtain a Special Land Use Permit that may require more than 50% vegetative cover to remain undisturbed. See Section 24.10 | SEE TABLE 24-3 -- Slope greater than 18% allows not more than 10% of IMPS and also requires the owner to obtain a Special Land Use Permit that may further reduce the percentage of IMPS. See Section 24.8.C. and 24.10. |

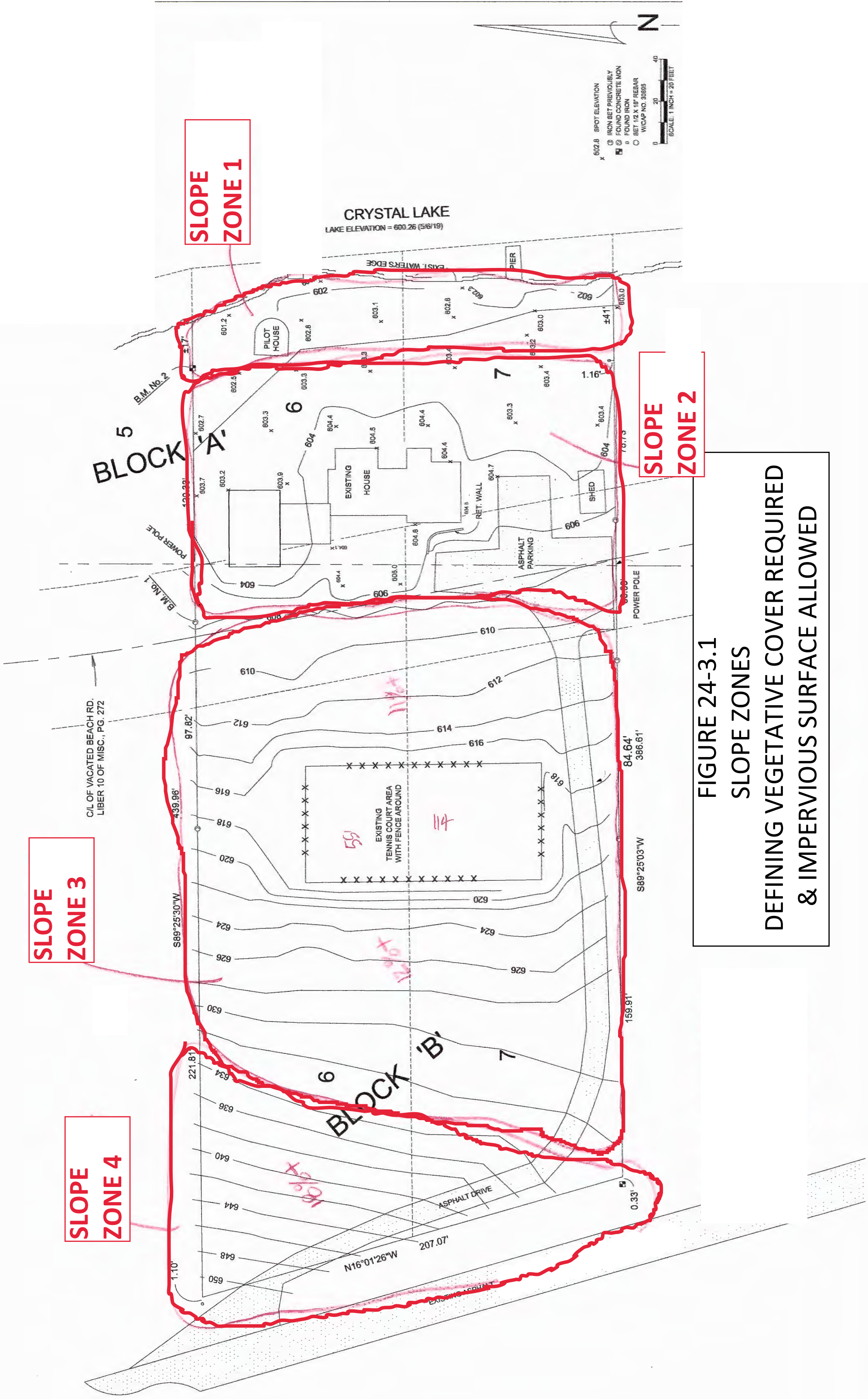


FIGURE 24-3.1
SLOPE ZONES
DEFINING VEGETATIVE COVER REQUIRED
& IMPERVIOUS SURFACE ALLOWED

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and extend a minimum distance of 35 feet, measured horizontally on a line perpendicular to the shoreline, water course or ridgeline.

- a. Existing soil and organic matter shall not be altered or disturbed within the natural vegetative buffer.
 - b. Existing vegetated areas that are located along lot lines, natural drainage courses, streams, wetlands, ridgelines, and slopes shall be maintained.
 - c. Turf grass areas are not considered vegetative buffer.
2. All existing vegetation located within thirty-five (35) feet of the ordinary high-water mark of Crystal Lake, shall be preserved as a vegetative buffer in accordance with this Section.
- a. Removal of vegetation in an existing vegetative buffer shall be limited to no more than twenty percent (20%) of the length of shoreline of the buffer, provided that removal of this twenty percent (20%) shall not create a clear-cut opening greater than ten feet (10') wide for every fifty feet (50') of shoreline.
 - b. For lots greater than fifty feet (50') wide, the clear-cut opening so created shall be restricted to ten feet (10') or less for any single opening. Multiple openings shall not be contiguous.
3. All existing vegetation located within thirty-five (35') feet on either side of any stream, wetland or ridgeline shall be maintained as a vegetative buffer in accordance with this Section.
- a. Removal of vegetation in the natural vegetative buffer shall be limited to no more than twenty-five (25) percent of the length of this buffer, provided that cutting of this twenty-five (25) percent shall not create a clear-cut opening greater than twenty-five (25) feet wide for every one hundred (100) feet of ridgeline. Multiple openings shall not be contiguous.

C. Tree Maintenance & Management

Woodlands provide for public safety through the prevention of erosion, siltation, and flooding. They are critical to a healthy watershed, even if not next to a lake, stream, or wetland. Woodlands control stormwater by reducing runoff velocity and quantity, by filtering pollutants before they enter waterways, by absorbing rainfall and snow melt, and by recharging aquifers thereby protecting and improving water quality, which is

tremendously important to the health and welfare of the communities near Crystal Lake, Betsie River and Lake Michigan.

1. Forestry

Any forestry, timber harvesting or land clearing activity in any forest (as defined by Section 2.2) located within the Crystal Lake Watershed Overlay District shall be subject to submitting a Best Practices plan and obtaining a permit as required by Section 24.5.C. In addition to the requirements of Section 24.5.C, the cutting and removing of trees in the watershed shall be restricted by Section 22.5 which covers "Removal of Vegetative Cover" in environmentally sensitive areas of Crystal Lake Township.

2. Tree Removal for Construction

- a. Removal of trees during construction or expansion of new or existing structures shall be restricted to the building footprint, decks, patios, septic fields, driveways, walkways, etc. shown on the approved site plan. See Section 24.5.
- b. Areas of trees and vegetation removed for temporary parking and/or storage of materials, equipment, etc. shall be shown on the approved site plan and must be included in the calculation for the Percent of Vegetation to Remain on the parcel per the text and table in Section 24.7.A.

3. Tree Management / Maintenance by Property Owner (non-commercial)

- a. Tree topping in the Overlay District is prohibited unless the Zoning Administrator has received a plan prepared by a Certified Arborist, Registered Landscape Architect, Forester, or Landscape Design Professional who maintains an active certification from the Michigan Natural Shoreline Professional Training and Certification Program (see Section 2.2, Definitions).
- b. A property owner may, without a permit, remove up to five (5) trees whose diameter measures between 6" and 12" at a height of 4.5' above the ground, provided that the trees removed represent no more than 30% of the total number of trees on the property. In addition, any tree removal by property owner is subject to all restrictions in this Overlay, including but not limited to: provisions for removal of vegetation on existing slopes; preservation of existing vegetation in vegetative buffer zones; and lot coverage requirements on existing slopes.
- c. Any tree removal more extensive than described in Section 24.7.C.3.b., preceding, requires an Administrative Waiver that will be issued by the Zoning Administrator (see Section 14) after the Zoning Administrator has received a plan for the

additional tree removal prepared by a Certified Arborist, Registered Landscape Architect, Forester, or Landscape Design Professional (see Section 2.2, Definitions) This plan shall conform to the environmental purposes and meet all requirements of this overlay ordinance and the provisions of Section 22.5. Pre-approved templates for such tree removal plans are available from the Zoning Administrator or on the Township's website.

- d. Property owners who encounter insect infestation or trees suspected of being diseased shall contact a Certified Arborist, Registered Landscape Architect, Forester, or Landscape Design Professional (see Section 2.2, Definitions) for proper diagnosis and planning for treatment or removal. The property owner shall supply a copy of this consultant's report to the Zoning Administrator prior to removing any trees.
- e. Exceptions to the requirements in Section 24.7.C.3.b and 24.7.C.3.c. are:
 - 1). Actions made necessary by an emergency, such as a tornado, windstorm, flood, freeze, or other disaster, in order to prevent injury or damage to persons or property or to restore order;
 - 2). Repair or maintenance work performed by public utilities necessitating the trimming or cutting of trees;
 - 3). Removal of dead trees.

SECTION 24.8 DESIGN STANDARD – IMPERVIOUS SURFACES

A. Lot Coverage

The area of impervious surface permitted shall be based on distance from the Crystal Lake OHWM, streams, and wetlands, and the existing slope zones of the site. Lot coverages are calculated considering only those portions of a lot that are uninterrupted by rights-of-way and/or slopes 18% or greater. For those uninterrupted portions, lot coverage is calculated as the area covered by impervious surfaces (see Section 2.2) compared to the area of the uninterrupted portion of the lot from which the areas of easements, slopes 18% or greater and/or vegetative buffers (see Section 24.7.B) have been deducted.

- 1. Within 35 feet of the Crystal Lake OHWM, streams, and wetlands, no impervious surfaces, regardless of height, shall be permitted. Impervious surface area of structures, paving, etc. established between 35 and 75 feet of the lake, stream or wetland shall be limited to a maximum of 150 square feet per 100 linear feet of lake

frontage. Maximum height of structures between 35 and 75 feet of the lake, stream, or wetland shall be 12 feet. See Figure 24-4

2. The maximum lot coverage varies depending on distance from the lake, stream or wetland (see Section 24.7.A.1 and 24.8.A) and the slope of the land on the lot/parcel. Maximum lot coverage shall be in accordance with the following table 24-3:

| TABLE 24-3 | |
|----------------------|----------------------------------|
| Existing Slope | Lot Coverage |
| Less than 12% | 30% |
| 12% to less than 18% | 20% |
| 18%+ | Special Land Use Permit Required |

See Figures 24-3.1 and 24-3.2 for an example of how the requirements of this table are applied.

3. In the case of PUDs, PRDs, and Condominiums, each individual lot need not meet the requirements of Sections 24.7 and 24.8, provided that the total project does meet the requirements of Sections 24.7 and 24.8.

B. Existing Impervious Surfaces

For impervious surfaces that were lawfully placed when constructed but that do not comply with the impervious surface standards of Section 24.8.A, preceding, the property owner may do either of the following:

1. Maintain and repair existing impervious surfaces without increasing their area; or
2. Replace existing impervious surfaces with permeable or pervious surfaces that meet applicable setbacks and the standards of Section 24.8. Refer to Section 24.14, Resources, for information on permeable surface designs.

C. Permeable or Pervious Surfaces

1. To qualify as a permeable or pervious surface, the prepared subbase shall be similar to that shown in Figures 24-5, 24-6.1 and 24-6.2; and,
2. The prepared subbase must undergo a four (4) hour percolation test, observed by the Zoning Administrator or his designee, showing a percolation rate equal to adjacent, undisturbed soils.

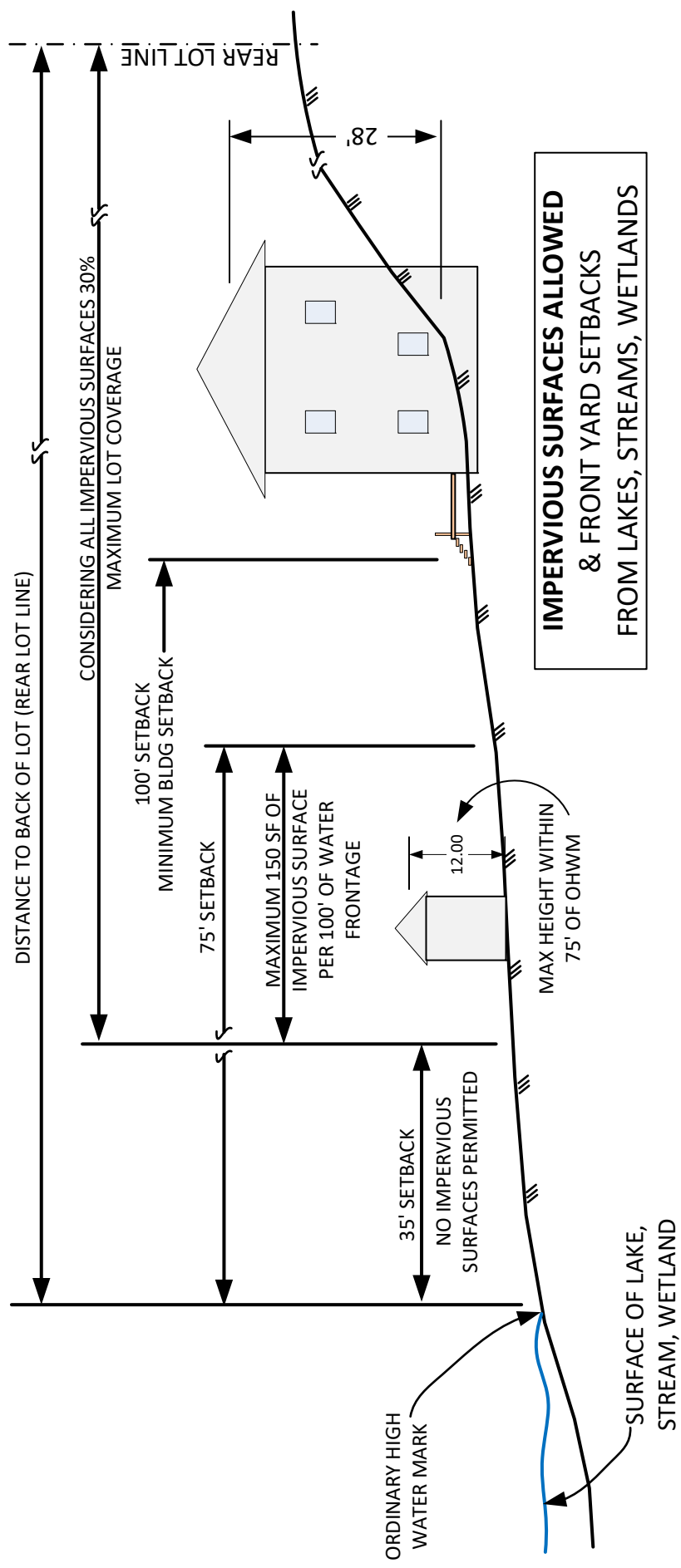
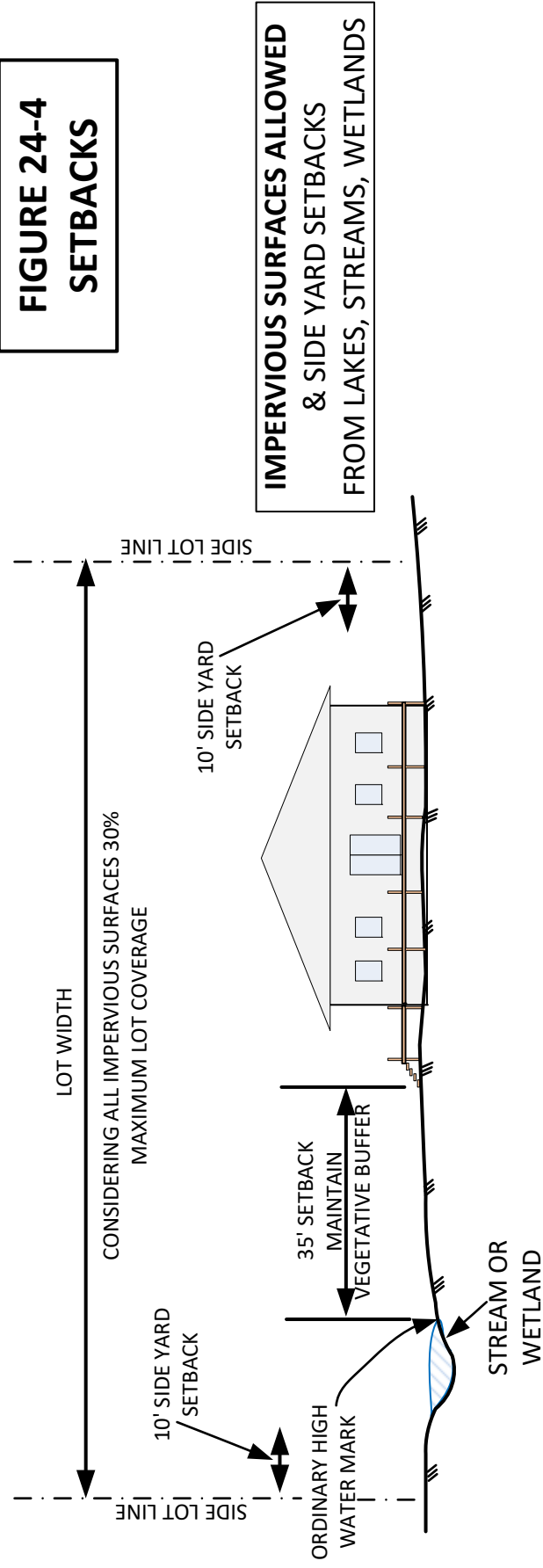


FIGURE 24-4 SETBACKS



PERMEABLE INSTALLATIONS

Similar to the non-permeable paver systems structural component, permeable paver installations offer secondary purpose for capturing and detaining rainwater. Common uses can range from sidewalk and plaza areas, to heavy-duty parking lots and roadways and include various base depths as shown in the two details below.

PERMEABLE ON OPEN GRADED AGGREGATE - LIGHT DUTY

This cross-section is an example of a light-duty pedestrian sidewalk application.

. Specific installation details will vary based on site conditions.

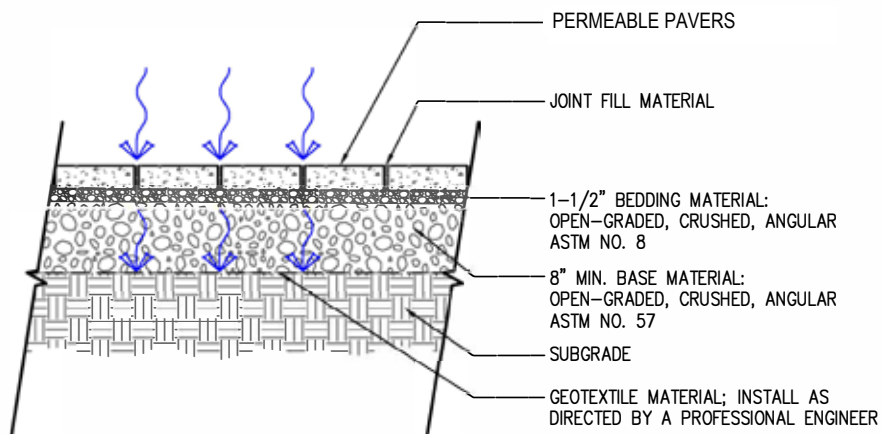
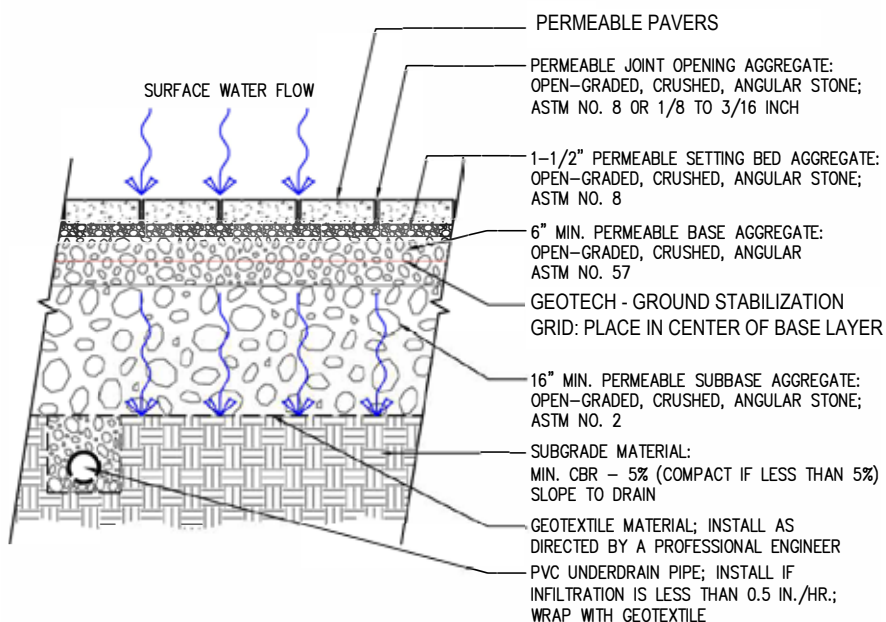


FIGURE 24-5

PERMEABLE ON OPEN GRADED AGGREGATE - HEAVY-DUTY

Heavy-duty permeable applications require additional base support as illustrated below. This cross section is only an example.

Specific installation details will vary based on site conditions.



SECTION 24.9 DESIGN STANDARD – DEVELOPMENT ON SLOPES

A. Steep Slopes

Development on slopes greater than eighteen percent (18%) is prohibited without a Special Land Use Permit.

B. Determination of Slope

1. The determination of slope percentages shall be shown on the site plan presented for approval by the property owner. The site plan shall include calculations and/or cross-sections showing how slope percentages are calculated. There may be different slope percentages in different areas of the lot/parcel, which will determine the amount of vegetative cover removal and/or the area of impervious surface allowed in each of the different areas. See example illustration in Figures 24-3.1 and 24-3.2.
 - a. In the event slope percentages are not shown on the site plan, the Zoning Administrator shall use the Slope Map to determine percentages of slope for the lot/parcel. The Slope Map shall always be on file with the Township Clerk and the Zoning Administrator.
 - b. The Zoning Administrator shall make the best possible determination using the scale of the map and shall record his or her determination on a site plan that is made available by the property owner. In cases where there is more than one slope category on a lot or proposed development, the Zoning Administrator shall indicate these areas on the site plan.
- 2.. If the property owner disagrees with the slope determination made by the Zoning Administrator, he or she may request a review of the determination by the Planning Commission during the site plan review process.
 - a. In making its case, the property owner shall present a topographic map, or a survey of the property prepared and sealed by a licensed surveyor or licensed civil engineer or a licensed architect.
 - b. Based on the evidence presented by the Zoning Administrator and the property owner, the Planning Commission shall make a slope determination and shall record its decision on the proposed site plan.

SECTION 24.10 REQUIREMENTS FOR SPECIAL LAND USE PERMIT

There are two reasons for Special Land Use Permits (SLUP) in the Watershed Overlay area: first is because the underlying zoning district specifies that certain

land uses require a SLUP; and second is because whatever is being developed is on a slope of 18% or greater. Circumstances could be such that both conditions are true.

If a Special Land Use Permit is required by other sections of the Ordinance or by Article 24 itself, the SLUP prepared by the owner and/or owner's agent shall show, by submitting appropriate calculations and resource inventories, how the proposed development, construction, or land use will preserve rural character of land; preserve valuable flora and fauna habitat; address water quality and natural floodwater storage capacity; control stormwater runoff velocity and/or volume; and protect any other natural stream, floodplain, and/or wetland function; and is consistent with the intent of this Article.

The following criteria shall be used by the Zoning Administrator and/or Planning Commission to determine if a Special Land Use Permit should be granted.

- A. The property owner has demonstrated their attempts to comply with the ordinances and that no other reasonable or prudent alternatives exist.
- B. The property owner has demonstrated that reason for the Special Land Use application is not created by the action of the applicant.
- C. The property owner has provided a site plan that details all the information required by this Article, the underlying zoning district and Article 14, Part 4, including the requirements of Table 14.21.2.2.
 - 1. The Zoning Administrator will prepare a written report addressing the property owner's compliance with each requirement of this Article, Article 14, Part 4, and each item of Table 14.21.2.2.
 - 2. The site plan shall show slope zones as defined in Section 24.9 of this Article. See Figures 24-3.1 and 24-3.2.
 - 3. The site plan shall show contouring and landscaping, including protected vegetation zones during construction and final landscaping after construction.
- D. The Section 24.4, Table 24-1 limit allowing no more than 0.50 units per acre in the area where the slope is 18% or greater is maintained or the number of units per acre is further reduced as the slopes become steeper.
- E. The Section 24.7, Table 24-2 limit allowing no more than 50% of existing vegetative cover to be removed in the area where the slope is 18% or greater is maintained or the percentage of vegetative cover allowed to be removed is further reduced as the slopes become steeper.
- F. The property owner has demonstrated how the vegetative cover on 'downslope areas' will be preserved or improved.
 - 1. The 'downslope areas' are the land on the slope descending from the area being developed and/or a ridgeline and/or the crest of a hill.

2. The Zoning Administrator and/or Planning Commission may require, as a condition of approval, that the property owner provide an affidavit, (filed with the property deed) describing how the 'downslope areas' will be maintained over time.
- G. The owner has provided a Forest Management Plan, if applicable.
 - H. The Section 24.8, Table 24-3 limit allowing impervious surfaces to cover no more than 20% of the area where the slope is 18% or greater is maintained or the percentage of impervious surface is further reduced as the slopes become steeper.
 - I. Engineered runoff control: the site plan shall show designs and calculations confirming that the peak rate of stormwater runoff after development will not exceed the peak rate of stormwater runoff that has occurred prior to the proposed development stamped by a registered professional engineer.
 1. The owner has employed Low Impact Development Designs for handling runoff and improving water filtration.
 2. The site plan shall show how surface runoff during construction will be controlled and contained on the property.
 3. The site plan shall show how surface runoff will be controlled and contained on the property after construction
 4. That the development will not create excessive soil erosion or sedimentation and that it will not impair the quality of water discharged from the site.
 - J. The owner has provided a Shoreline Stewardship Plan for riparian buffers at the Lake, streams, or wetlands.
 - K. The property owner has demonstrated that, in granting their application for a Special Land Use Permit, their project will not cause a substantial adverse effect upon property values in the immediate vicinity, or in the district in which the property of the applicant is located.

SECTION 24.11 DESIGN STANDARD – DEVELOPMENT ON RIDGELINES

Ridgelines shall be defined as visually prominent strips or crests of land. Ridgelines include the highest points of elevation in the watershed and separate one drainage basin from another. (see Section 2.2). Ridgelines shall be as shown on the Slope Map, which shall always be on file with the Township Clerk and the Zoning Administrator.

- A. The precise delineation of a ridgelines shall be determined by the Zoning Administrator at the time a zoning permit application is received based on any combination of the following criteria.
 - 1. Ridgelines that are located at the top of slopes 18% or greater facing Crystal Lake.
 - 2. Ridgelines that are at the top of slopes that create valleys that drain directly into Crystal Lake.
 - 3. Ridgelines that are part of an area of significant ecological, historical, or cultural importance, such as those that connect park or trail systems.
 - 4. Ridgelines that have visual dominance as characterized by a silhouetting appearance against the sky.
 - 5. Ridgelines are a significant natural backdrop feature.
 - 6. Ridgelines that have a visual dominance due to proximity and view from existing major corridors.
 - 7. Ridgelines that surround or visually dominate the surrounding valley landscape either through their size in relation to the hillside or terrain of which they are a part.
- B. All principal buildings and accessory structures shall be set back at least fifty feet (50') from ridgelines measured along ground contours.
- C. All principal use structures or accessory buildings or structures located within one hundred (100) feet of a ridgeline (measured along ground contours) shall not exceed eighteen (18) feet in height. See Figure 24.4.
- D. All existing vegetation located within thirty-five (35) feet on either side of the ridgeline (measured along ground contours) shall be maintained as a vegetative buffer in accordance with Section 24.7.B.
- E. A building setback from the ridgeline may be waived by the Zoning Administrator if any of the following conditions exist:
 - 1. There are no other reasonable or prudent alternatives to achieve the required fifty (50)-foot setback.
 - 2. There would be significant environmental consequences if the fifty (50)-foot setback were enforced.
 - 3. The structure in question is not located within a special or unique viewing area or view shed within the Crystal Lake Overlay District.

SECTION 24.12 DESIGN STANDARD – PRIVATE ROADS & DRIVEWAYS

All private roads and driveways located in the Watershed Overlay District shall meet the requirements of Section 3.22 and this Section.

- A. Private roads shall not be located within thirty-five (35) feet of Crystal Lake or within ten (10) feet of a wetland, stream, or ridgeline. If a road must be located within thirty-five feet (35') of a wetland, stream or ridgeline, the road surface shall be permeable as required by Section 24.8. Distances are measured along ground contours.
- B. Private roads and driveways in hilly terrain shall be located along natural contours of the land in order to minimize cutting, filling, and erosion and shall be shown on site plans.

SECTION 24.13 GENERAL DESIGN GUIDELINES

For any development, construction, improvement, or alteration of land use, including removal or clearing of vegetative cover in the Watershed Overlay District, the following general design guidelines shall be followed:

- A. Vegetation shall be maintained. If an owner, on his site plan, proposes that the removal of vegetation is necessary, reestablishment of like-type native or non-invasive plant material suitable to the habitat shall be required. The percent of vegetative cover and/or vegetative buffers per Section 24.7.A and 24.8.A must be restored.
- B. Existing mature trees (i.e., six inches or larger diameter at a height of 4.5') that the owner wishes to remain shall be located on the site plan and incorporated into the project design. See Section 24.13.H.
- C. Natural drainage courses shall be protected from grading activity.
- D. Obvious surface water and known groundwater flow patterns shall not be interrupted.
- E. Slopes created by the grading of the site shall not exceed a slope ratio of one (1) foot of vertical slope to three (3) feet of horizontal distance.
- F. Buildings shall be clustered as much as possible to retain open space, surrounding tree cover, other vegetative cover and to minimize changes in topography.
- G. Screening along roadways shall make maximum use of berming and landscaping but shall not interfere with sight distances. (Refer to Article XXII [22]).
- H. The site plan submitted for approval must address control of runoff both during and after construction using filtering, retention, and Low Impact Development (LID) systems such as rain gardens or constructed wetlands. Direct discharge via ditch, pipe, or culvert of runoff into the lake, stream or wetland is prohibited.

SECTION 24.14 CONSTRUCTION REQUIREMENTS

For any development, construction, improvement, or alteration of land use, including removal or clearing of vegetative cover in the Watershed Overlay District, the following construction requirements shall be followed:

- A. Owner and/or owner's agent must obtain an Erosion, Sedimentation, and Stormwater Control permit and submit to the Zoning Administrator prior to removing vegetative cover, moving earth or beginning construction.
- B. The smallest practical area of land shall be exposed at any time during development.
- C. When land is exposed during development, the exposure shall be kept to the shortest practical period of time and, if possible, shall be scheduled during seasons of minimum precipitation.
- D. Whenever feasible, existing native and non-invasive vegetation shall be retained and protected. Topsoil should be preserved whenever possible.
 - 1. Any vegetation required to remain on the property must be maintained and protected by a barrier of orange tape and signs that clearly prohibit disturbance.
 - a. This barrier must be maintained until construction is complete.
 - b. If the owner shows on the site plan that no construction activities will take place within dripline of vegetation that is required to be protected, then the protective barrier will not be required in that location.
- E. The owner and/or owner's agent must show on site plan how trees will be protected during construction and/or how trees will be relocated, if relocations are necessary.
 - 1. A protective barrier (See Figures 24-8.1 and 24-8.2) is required for all trees that are to remain on the site, and shall, at minimum, be comprised of orange vinyl snow fence not less than 4 feet in height, with stakes no less than 8 feet apart, and placed at the perimeter of the drip line of all trees to be protected from construction activity. The barrier must be maintained until construction is complete. If the owner shows on the site plan that no construction activities will take place within 50 feet of the CRZ (critical root zone) of trees that are to remain on site, then a protective barrier will not be required in that location.
 - 2. For relocating trees, the root ball must be approximately ten (10) to twelve (12) inches in diameter for every inch of the tree's diameter. Adequate drainage and backfill shall be necessary to complete the relocation. Root protection during construction is essential in saving

mature trees (i.e., six inches or larger diameter at a height of 4.5'. Recommended techniques include:

- (a) using a geotextile aeration mat to allow structures to have adequate ventilation, while protecting the roots from excessive compaction, and;
- (b) steel-reinforced concrete paving patterned with voids filled with gravel or grass that allow drainage, while protecting the tree from root compaction in highly trafficked areas.

F. The following minimum requirements shall be used to prevent or minimize soil compaction that may occur during construction due to excavation, stockpiling materials, equipment traffic, and equipment parking:

- 1. Septic system areas shall be protected from soil compaction in accordance with Health Department regulations and recommendations.
- 2. Parking, storing equipment and/or storing construction materials in areas designated for storm water runoff during or after construction is prohibited.
- 3. Parking areas shall be limited to the extent possible and marked with signage during construction. The Zoning Administrator will approve the number of designated parking spots in accordance with the size of the property and the layout of the construction.
- 4. Erosion from topsoil stockpiling and fill material storage areas shall be maintained and controlled by encircling such storage areas with erosion control/silt fencing.
- 5. When topsoil is reapplied to disturbed areas, it should be "bonded" with the subsoil. This can be done by spreading a thin layer of topsoil (2-3 inches), tilling it into the subsoil and then reapplying the remaining topsoil.

G. When developing a property that includes a wetland and/or stream, owner and/or owner's agent shall not:

- 1. Deposit or permit the placing of fill material in a wetland or stream;
- 2. Dredge, remove or permit the removal of soil or minerals from a wetland or stream;
- 3. Perform construction or maintain any activity or development in a wetland or stream;
- 4. Divert surface waters into a wetland or stream.

H. Where inadequate vegetation exists, temporary or permanent native or non-invasive vegetation shall be established.

I. All exposed slopes and graded areas shall be landscaped with biodegradable mats, ground cover, shrubs, and trees as soon as possible.

- J. The permanent final vegetation and all structures shall be installed as soon as practical.
- K. The Zoning Administrator or designee may inspect the property at any time during construction to determine if any element of the site plan as submitted and approved, or any requirements of this ordinance, are not being adhered to. Failure to comply with approved site plans may result in citations and fines.
- L. If the Zoning Administrator determines that vegetation protections and soil compaction requirements have not been met at any time during construction, he or she may require post construction soil percolation tests to be performed by a qualified testing firm, followed by rehabilitation as necessary to reverse the effects of soil compaction in protected areas.

SECTION 24.15 RESOURCES

The following list of suggested resources is current as of the adoption date of this ordinance and is not meant to be a comprehensive list. This list shall be reviewed and may be updated from time-to-time by the Zoning Administrator without formal amendment of these Ordinances. For more or updated resources, contact the Michigan State University Extension for the Benzie County area.

- A. General Information & Organizations to Contact for Guidance
 - 1. Benzie Conservation District Programs and Services
<https://www.benziecd.org/programs--services.html>
 - 2. Crystal Lake & Watershed Association
<http://crystallakewatershed.org/>
 - 3. Michigan Natural Shoreline Partnership
<http://www.mishorelinepartnership.org/>
Includes listing of Michigan Certified Natural Shoreline Professionals at:
<http://www.mishorelinepartnership.org/find-a-shoreline-contractor.html>
- B. Native Plant Specific Resource
Plant It Wild
<http://plantitwild.net/>
- C. Permeable Surface Resources
See Figures 24-5, 24-6.1, 24-6.2 and 24-7

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Nine components of a highly **Successful** **Permeable Pavement**

FIGURE 24-6.1

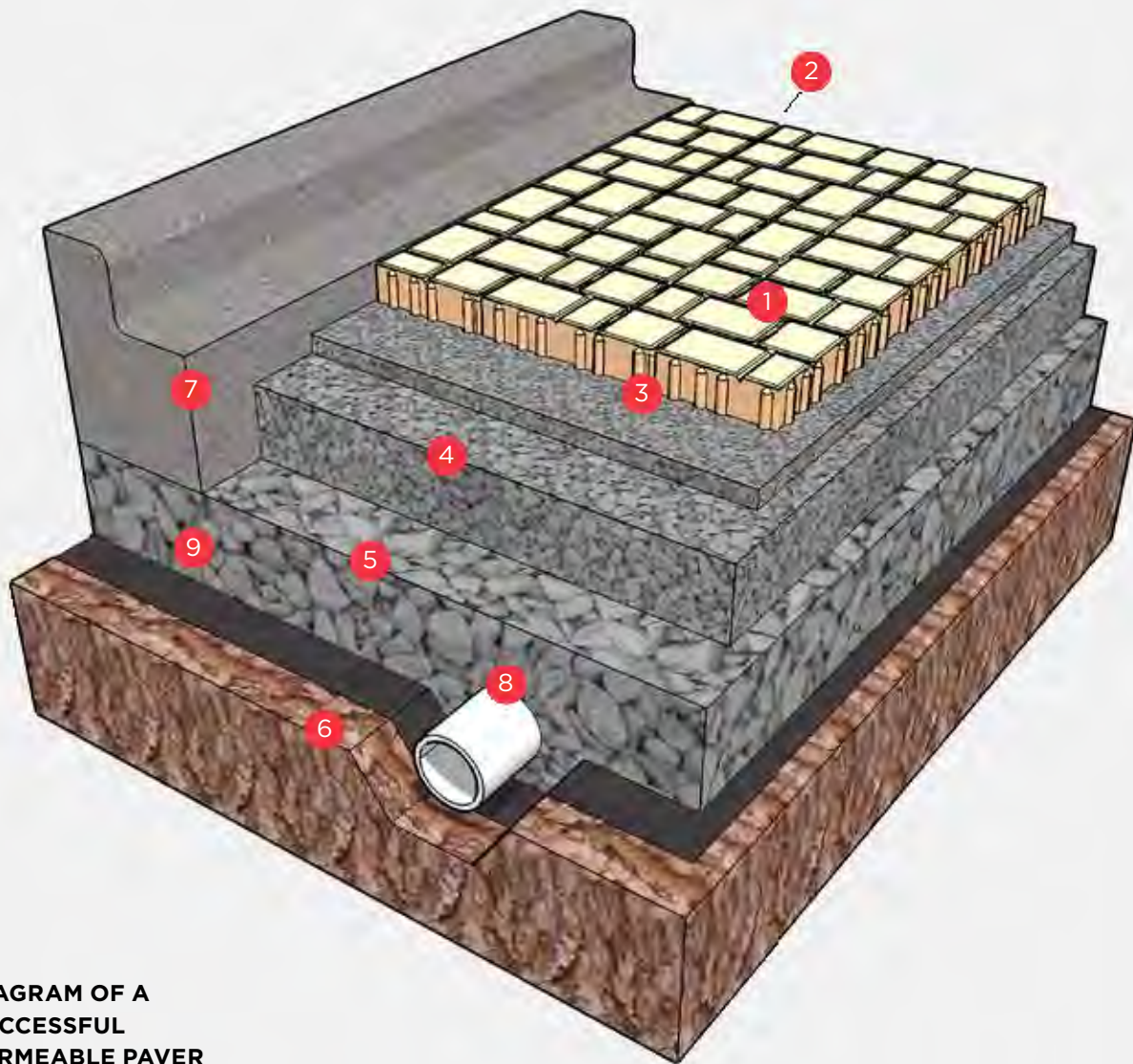


DIAGRAM OF A
SUCCESSFUL
PERMEABLE PAVER
INSTALLATION

1 | Unilock Permeable Interlocking Concrete Paver

With various aesthetically pleasing colors and textures, creative choices are not compromised by function. Permeable Interlocking Concrete Pavers (PICPs) are the most durable of any porous pavement material. Unilock's minimum 8,500 psi (57 MPa), high-strength, no-slump concrete allows water to infiltrate between paver units instead of through the material. The joint sizes vary between paver options, ranging from 0.25" (6 mm) to 0.5" (13 mm), which meet the Americans with Disabilities Act specifications for permeable pavement, and allows a minimum of 100" (2,540 mm) per hour of surface infiltration.

2 | Joint Aggregate - ASTM No. 8 OR 9

As the initial filtering layer, the 0.25" (6 mm) crushed, angular, chip stone captures approximately 80 percent of debris in the first 1" (25 mm) to 2" (51 mm). The secondary function of the joint aggregate is to increase the positive interlock between the paver units, which is essential to the structural stability of the PICPs. The joint aggregate must always remain filled to the lip of the PICP units to reduce unnecessary clogging.

3 | Setting Bed Aggregate - ASTM No. 8

Using the 0.25" (6 mm) crushed, angular, chip stone, instead of sand, provides a smooth leveling course for placing pavers and additional structural interlocking of the PICPs. Unlike sand, the setting bed aggregate allows for rapid water infiltration with over 500" (12,700 mm) per hour through the 40 percent void-space. Sand must be avoided as a setting bed in a PICP application.

4 | Base Aggregate - ASTM No. 57

When subsoil conditions are conducive to supporting the ASTM No. 57 (12.5-25mm) crushed, angular, open-graded base material without migration, it can be used without ASTM No. 2 (50-63mm) subbase aggregate. Minimum thickness must be designed to sufficiently support anticipated loads, as well as accommodate stormwater detention in the 40 percent void space of the material. The ASTM No. 57 base aggregate, with a minimum thickness of 4" (102 mm), serves as a transition material between the ASTM No. 8 (2-10mm) setting bed and the ASTM No. 2 subbase aggregate. The infiltration rate of the ASTM No. 57 is over 500" (12,700 mm) per hour.

5 | Subbase Aggregate - ASTM No. 2

Subsoil conditions will dictate the necessity of this larger ASTM No. 2 (50-63mm), crushed, angular, open-graded subbase aggregate thickness. Installation of such material will provide increased structural stability on sites with poor soil conditions. A minimum thickness of 8" (203 mm) is required for effective performance. Subbase aggregate thickness must be designed to sufficiently support anticipated loads. As an added feature, the ASTM No. 2 subbase aggregate temporarily detains stormwater runoff in the 40 percent void-space of the material. The ASTM No. 2 also has an infiltration rate of over 500" (12,700 mm) per hour.

6 | Subgrade

Existing soil materials will determine the performance capabilities of the PICP system. Pre-construction soil analysis, including percolation, California Bearing Ratio and penetrometer measurements (blow counts), are mandatory for proper design. Subsoils with less than 0.5" (13 mm) per hour of infiltration may require underdrainage, scarification and potentially amendments. Subsoils with greater than 0.5" (13 mm) per hour are considered highly permeable. Subsoil compaction can cause a detrimental reduction in permeability and can be eliminated.

7 | Edge Restraint

PICP containment is vitally important to the success of interlocking properties. Lack or failure of an edge restraint will negatively impact the integrity of the pavement surface. For all vehicular PICP applications, an edge restraint, such as a concrete curb, is required. For non-vehicular and pedestrian areas, a plastic edging is sufficient when properly anchored into the subbase.

8 | Underdrain

In PICP systems, the underdrain pipe is based on several factors, such as the permeability of the subsoil, detention requirements, and stormwater release rate of the site. With highly permeable subsoils over 0.5" (13 mm) per hour, the underdrain pipe could be eliminated. Underdrain pipe size is inconsequential, provided the flow rate is greater than the release rate.

9 | Mechanical Base Stabilization

Subsoil characteristics will determine the need for base stabilization. Specifically designed geogrid style systems, such as DriveGrid™ system, can be placed between the subsoil and ASTM No. 57 (12.5-25mm) base aggregate or ASTM No. 2 (50-63mm) and subbase. DriveGrid is not required between aggregate material layers. The base stabilization must be determined by soil conditions specific to each project. Drivegrid should be considered for any weaker subsoils.

FIGURE 24-7

Designer/Reviewer Checklist for Pervious Pavement with Infiltration Bed

Type of pervious pavement(s) proposed: _____

Source of mix design or material source: _____

| ITEM | YES | NO | N/A | NOTES |
|--|-----|----|-----|-------|
| Appropriate application of pervious pavement (e.g., use, traffic loading, slopes)? | | | | |
| Was the Soil Infiltration Testing Protocol followed? | | | | |
| Appropriate areas of the site evaluated? | | | | |
| Infiltration rates measured? | | | | |
| Was the Infiltration BMP followed? | | | | |
| Two-foot minimum separation between the bed bottom and bedrock/SHWT? | | | | |
| Soil permeability acceptable? | | | | |
| If not, appropriate underdrain provided? | | | | |
| Adequate separations from wells, structures, etc.? | | | | |
| Natural, uncompacted soils? | | | | |
| Level infiltration area (bed bottom)? | | | | |
| Excavation in pervious pavement areas minimized? | | | | |
| Hotspots/pretreatment considered? | | | | |
| Loading ratio below 5:1? | | | | |
| Storage depth limited to two feet? | | | | |
| Drawdown time less than 48 hours? | | | | |
| Positive overflow from system? | | | | |
| Erosion and Sedimentation control? | | | | |
| Feasible construction process and sequence? | | | | |
| Geotextile specified? | | | | |
| Clean, washed, open-graded aggregate specified? | | | | |
| Properly designed/specified pervious pavement surface? | | | | |
| Maintenance accounted for and plan provided? | | | | |
| Signage provided? | | | | |

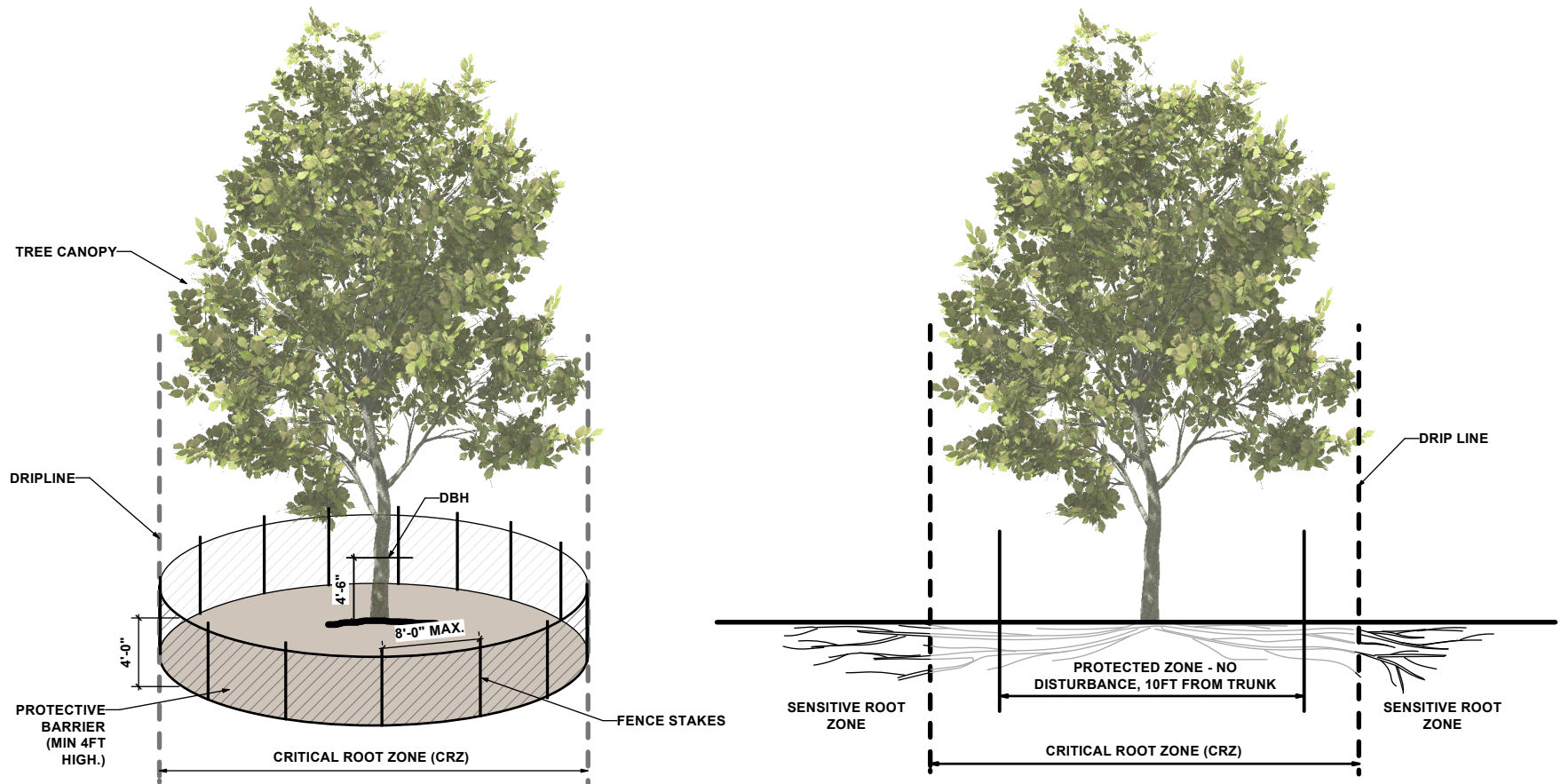


FIGURE 24-8.1
CRITICAL ROOT ZONE AND TREE PROTECTION
FENCE DIAGRAM

NOTES:

1. IF NECESSARY TO CUT ROOTS, USE SHARP, CLEAN TOOLS SUCH AS SAWS OR HAND TOOLS. DO NOT USE TRENCHERS, BULLDOZERS, BACKHOES OR OTHER EXCAVATORS.
2. COVER EXPOSED ROOTS AS QUICKLY AS POSSIBLE OR WITHIN ONE HOUR, BACKFILL WITH TOPSOIL FROM ONSITE OR COVER WITH WET BURLAP.
3. WATER THE TREE WITHIN 24 HOURS.

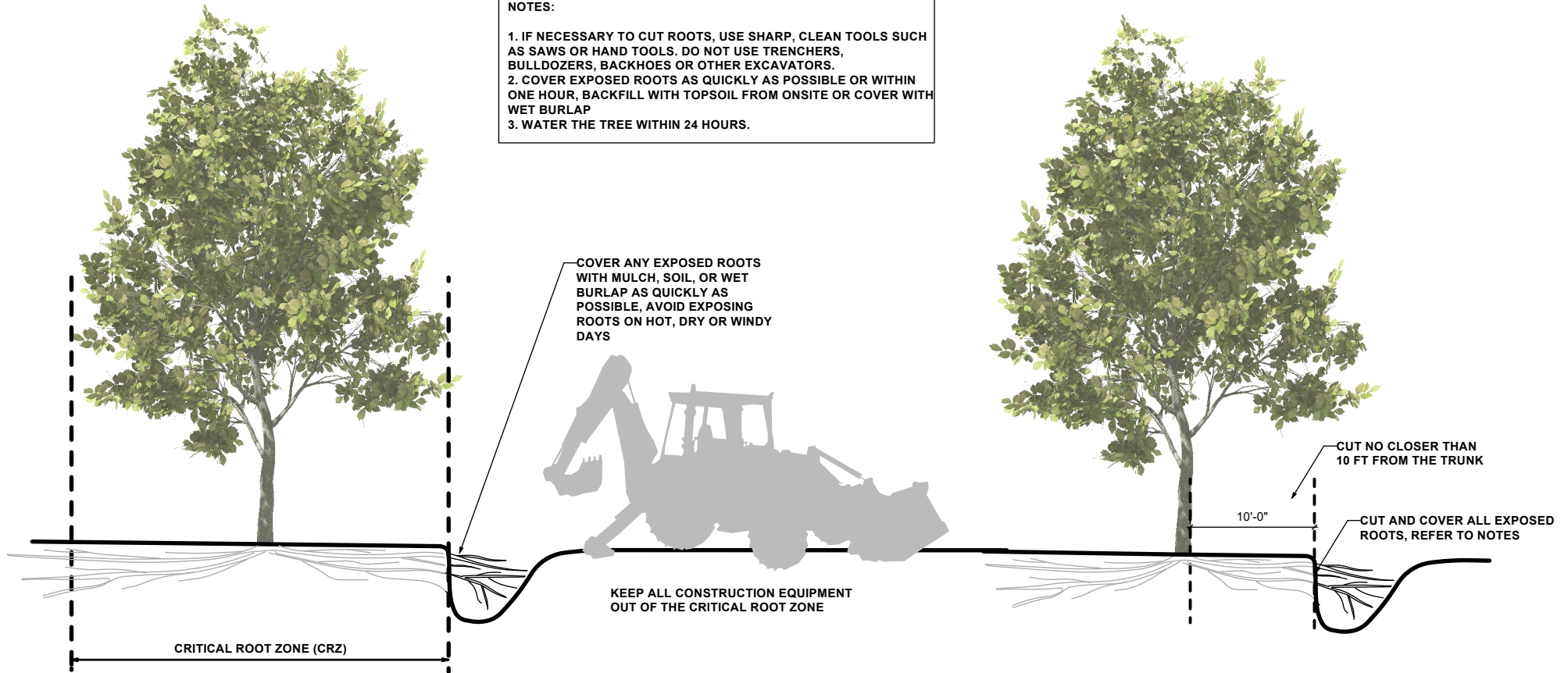


FIGURE 24-8.2
ROOT PROTECTION & CUTTING DIAGRAM