

Knox County, Ohio **Subdivision Regulations**

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The Knox County
Regional Planning Commission

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Disclaimer

Amendment of these Regulations is an ongoing process. Therefore, contact with the Knox County Regional Planning Commission office is recommended.

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for the addition of future land use
regulation

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STORM WATER MANAGEMENT

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KNOX COUNTY, OHIO**

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CHAPTER 1.

GENERAL PROVISIONS

1.1 - Purpose:

The purpose of these subdivision regulations is to provide for the harmonious development of the County by:

- A. Promoting the public health, safety, and general welfare of Knox County;
- B. Lessening the congestion in the streets and highways;
- C. Furthering the orderly layout and use of land;
- D. Securing safety from fire, panic, and other dangers;
- E. Providing adequate light and air;
- F. Preventing the over-crowding of land;
- G. Avoiding undue concentration of population;
- H. Facilitating adequate provisions for transportation, water, sewerage, schools, parks, playgrounds, and other public requirements; and
- I. Facilitating subdivision of larger tracts into smaller parcels of land.

The provisions of these regulations are made with reasonable consideration, among other things, of the character of the County, with a view of conserving value of the buildings placed upon the land, providing the best possible environment for human habitation, and encouraging the most appropriate use of land throughout the County.

1.2 - Authority:

The authority for the preparation, adoption, and implementation of these regulations by the Knox County Board of Commissioners and by the Knox County Regional Planning Commission is derived from the Ohio Revised Code §711 which enables the two (2) governmental bodies to adopt uniform regulations governing plats and subdivision of land falling within their legal

authority.

1.3 - Name:

The regulations shall be known as the Land Subdivision Regulations for Knox County.

1.4- Interpretation:

The provisions of these regulations shall be held to be minimum requirements for the promotion of health, safety, and the general welfare of the people of Knox County, Ohio.

These regulations are not intended to repeal, abrogate, annul or, in any manner, interfere with any existing laws, covenants or rules. However, where these regulations impose a greater minimum requirement than is required by existing laws, covenants or rules, the provisions of these regulations shall govern.

1.5 - Jurisdiction:

These regulations shall apply to all subdivisions hereinafter made of lands located in the unincorporated area of Knox County.

1.6 - Co-operation:

The Knox County Regional Planning Commission (hereinafter referred to as “KCRPC” and/or “Commission”) may co-operate with any city or village located in Knox County in the review of subdivision plats, occurring in lands adjoining the corporation line of said city or village, or within a reasonable distance of same. The Commission may, as a condition for such co-operation and in order to carry out comprehensive plans more effectively, seek an agreement with any municipal corporation. The terms of the agreement may permit joint review of subdivisions occurring next to the corporation limits of said municipal corporation by the municipal corporation and by the Commission; and, also joint review by the Commission and village of subdivisions occurring within the corporate limits of the municipal corporation.

1.7 - Severability:

Each chapter, and/or each article, and/or each section, and/or each sentence contained in these regulations is declared to be severable and separate, and adoption hereof declares that the invalidity of any shall have no effect on any other.

1.8 - Variances:

Deviations from any of the terms of these regulations may be authorized by the Knox County Regional Planning Commission only in specific cases where unusual topographical and other exceptional conditions may require variance.

1.9 - Zoned Areas:

Whenever a township or part thereof has adopted a zoning plan under the provisions of §519 or §303 of the Ohio Revised Code, all proposed subdivisions shall meet with the requirements of said zoning areas, as well as with the provisions of these regulations.

1.10 - Resubdivision:

Whenever a subdivision which received final approval prior to the effective date of these regulations is resubdivided and the width, lot lines or the area of one (1) or more lots, or the direction and location of any street is altered or modified, the resubdivision shall be submitted to the Commission for approval prior to its recording.

1.11 - Planned Unit Developments:

Where permitted by local zoning provisions, the standards of these regulations may be modified by the Commission in the case of a planned unit development which, in its judgment, provides adequate public spaces and improvements for circulation, recreation, light, air, and service needs of the tract when fully developed and which, also, provides such covenants or other legal provisions as will assure conformity to and achievement of the plan.

CHAPTER 2.

DEFINITIONS

For the purpose of these regulations, the following terms are defined:

“Alley or Service Drive” - means a minor right-of-way, privately or publicly owned, primarily for service access to the back or side of properties, with a minimum width of twenty (20) feet.

“Block” - means a parcel of land bounded or intended to be bounded on all sides by a street or streets.

“Building Line” - means the line within the property defining the required minimum distance between any structure and the adjacent street rightof-way.

“Commission” - means the Knox County Regional Planning Commission.

“County Engineer” - means the County Engineer of Knox County.

“Cul-De-Sac” - means a short street, having one (1) end open to motor traffic and a vehicular turn-around provided on the other end.

“Double Frontage Lot” - means a lot with front and rear street frontage.

“Easement” - means a right-of-way granted for limited use of land for public or quasi-public purpose.

“Floodplain” - means a watercourse and the areas adjoining the watercourse which have been or hereafter may be covered by floodwater.

“Improvements” - means those physical additions and changes to the land that may be necessary to produce useable and desirable lots.

“Lot” - means a parcel of land intended for transfer of ownership, use or improvement, and/or dedication.

“Lot Area” - means the area contained within the property lines of the individual parcels of land as shown on a subdivision plat, excluding space within any street, but including the area of any easement.

“Municipality” - means an incorporated city or village.

“Plat” - means a map of a tract or parcel of land.

“Plat, Preliminary” - means a tentative subdivision plan, in lesser detail than the final plat, indicating the approximate proposed layout of a subdivision as a basis for consideration prior to preparation of the final plat.

“Plat, Final” - means a complete and exact subdivision plan prepared for official recording as required by statute.

“Secretary” - means the Secretary of the Knox County Regional Planning Commission.

“Street” - means a public or private right-of-way designed for the purpose of moving persons and goods or for the provision of access to property. “Street” includes roads, highways, avenues, lanes, courts, pikes, cul-de-sacs, and every other name or designation, which is used to describe a street as defined above. Public recreation trails shall not be considered public or private streets or roads for frontage for the subdivision of land. [Amendment added March 23, 2009]

“Street or Road Frontage” - means the width of a lot or parcel of land measured between the side lot lines and along a line where the lot or parcel of land abuts the right-of-way of a public or private street or road. [Amendment added March 23, 2009]

“Street, Arterial” - means those streets which are used primarily to carry fast to heavy traffic.

“Street, Collector” - means those streets which carry traffic from minor streets to the system of arterial streets and highways, including the principal entrance street of a residential development and streets for circulation within such a development.

“Street, Minor” - means those streets which are primarily for access to the abutting properties.

“Subdivider or Developer” - means a person or his authorized agent for whom the subdivision plans are being or have been made.

“Subdivision” - means either of the following:

- A. The division of any parcel of land shown as a unit or as contiguous units on the last preceding general tax list and duplicate of real and public utility property, into two (2) or more parcels, sites, or lots, any one of which is less than five (5) acres for the purpose, whether immediate or future, of transfer of ownership, provided, however, that the following are exempt:
 - (1) A division or partition of land into parcels of more than five (5) acres not involving any new streets or easements of access;
 - (2) The sale or exchange of parcels between adjoining lot owners, where that sale or exchange does not create additional building sites;
 - (3) If the planning authority adopts a rule in accordance with section 711.133 of the Revised Code that exempts from division (A) of this section any parcel of land that is four (4) acres or more, parcels in the size range delineated in that rule.
- B. The improvement of one (1) or more parcels of land for residential, commercial or industrial structures or groups of structures involving the division or allocation of land for the opening, widening or extension of any public or private street or streets, except private streets serving industrial structures; or involving the division or allocation of land as open spaces for common use by owners, occupants or lease holders or as easements for the extension and maintenance of public or private sewer, water, storm drainage or other similar facilities.

“Surface Drainage Plan” - means a plan showing all present and proposed grades and facilities for storm water drainage. Such drainage plan shall conform to the (Appendix [A]. Knox County Storm Water Management & Sediment Control Regulations).

[Amended March 23, 2009]

CHAPTER 3.

MINOR SUBDIVISION OF LAND

3.1- Rules Governing the Subdivision of Parcels of Land up to Five (5.000) Acres:

A proposed division of a parcel of land may be permitted without a plat, provided all of the following conditions are present:

- A. The property has frontage along an existing public street or road and does not involve the opening, widening or extension of any street or road.
- B. Proposed sanitary facilities are properly tested and documented In accordance with Ohio Administrative Code (OAC) 3701-29 effective January 1, 2015 or as hereafter amended.)
- C. The division does not involve more than five (5) lots, any one (1) of which is less than five (5) acres, after the original tract has been completely subdivided.
- D. A properly certified survey, description and plat of the property is submitted.
- E. Payment of Fee(s). (See Appendix [C].)

If the Commission, acting through its properly authorized representative finds that the proposed division is not contrary to applicable platting, subdivision, zoning, health, sanitary, access management, surface or subsurface drainage regulations or rules governing household sewage disposal systems, it shall approve the proposed division within seven (7) business days of its submission. Upon presentation of a document of conveyance of the parcel, the representative shall stamp the conveyance “*Approved by the Knox County Regional Planning Commission, no plat required*” and the properly authorized representative shall sign and date the instrument of conveyance.

Pursuant to R.C. 711.131(B) as amended by H.B. 166 effective October 17, 2019, this amendment to the Regulations shall become effective, October 28, 2021. The term “original tract” for the purposes of section 3.1 shall mean each tract of land as it existed 5 years prior to the split application date regardless of subsequent change of ownership.

Once the original tract has been divided under Section 3.1 to a maximum of five (5) parcels, further division shall require the platting of all parcels beyond the initial five parcels.

3.2 - Rules governing the division of Parcels of Land between 5.001 Acres and 20.000 Acres:

In addition to the authority contained in Section 3.1 of these Regulations, a proposed division of a parcel of land along an existing public street or road and not involving the opening, widening or extension of any street or road and containing not less than 5.001 acres of land nor more than 20.000 acres of land and meeting the requirements of this Section, may be submitted for subdivision approval without a plat provided that all of the following conditions are found to exist:

- A. The division is not contrary to applicable zoning regulations.
- B. The division complies with Appendix [A] Knox County Storm Water Management & Sediment Control Regulations]. [Amended March 23, 2009]
- C. The division complies with the rules governing household sewage disposal systems including testing and documentation under the Knox County District Board of Health, OAC 3701.29, effective January 1, 2015 or as hereafter amended.
- D. The division is not contrary to County Access Management Regulations.
- E. A properly certified survey, description, and plat of the property is submitted.
- F. Applicable fees are paid. (See Appendix C.)
- G. The lot frontage shall comply with Section 5.5 C of these Regulations and the width to depth ratio shall comply with Section 5.5 F of these Regulations, unless the property is located in a township which imposes lot frontage and/or depth to width ratios through its zoning resolution, in which case it shall comply with the township regulations. (*Amended 8/20/07*)
- H. If the properly authorized representative finds that the proposed division complies with this Section, he/she shall, upon presentation of a conveyance of the parcel, mark it "*Approved by the Knox County Regional Planning Commission, no plat required,*" sign and date the same.
- I. Properly completed applications under this Section shall be approved within the following time frames:
 - 1. Not more than six (6) separate parcels: seven (7) calendar days after submission.
 - 2. Seven (7) to fourteen (14) separate parcels: fourteen (14) calendar days after submission.

3. Fifteen (15) or more separate parcels: twenty-one (21) calendar days after submission.

- J. Subsections A through H shall not apply to parcels of land meeting the size requirements of this Section to be used only for agricultural or personal recreational purposes. Upon presentation of such a parcel, the authorized representative shall, in accordance with the time limits of subsection I, stamp the conveyance *“No approval or plat required under Section R.C. 711.133; for agricultural or personal recreational use only,”* sign and date the same.
- K. Whenever a parcel of land approved under subsection J shall no longer be used only for agricultural or personal recreational purposes, the owner shall promptly apply for approval of the parcel in accordance with subsections A through H in this Section.

CHAPTER 4.

MAJOR SUBDIVISIONS

Subdivisions, as defined in Chapter 2 and which are not eligible for approval under Chapter 3, shall be governed by this Chapter 4.

4.1 - Pre-Sketch Plan Consultation:

Before preparing a Sketch Plan, it is necessary that the subdivider seek the counsel of the Commission's staff to review these Regulations and to obtain information for a Present Conditions Report.

4.2 - Present Conditions Report:

Before preparing a Sketch Plan and no less than five business days before submitting a Sketch Plan, the subdivider shall submit a Present Conditions Report to the Commission's staff. A Present Conditions Report shall describe the following aspects of the land proposed for development in maps and/or in narratives as specified below. The Present Conditions Report shall produce sufficient information to describe the conditions of the property so that physical constraints for development can be understood.

A. Natural Features

1. Existing topography (map)
2. Vegetation (woods, grassed fields, productive farmland, etc.) (map/narrative)
3. Watercourses, drainage patterns, ponding areas, wetlands, ponds, lakes(map)
4. Public wellhead protection areas (map)
5. 100-year flood plain (map)
6. Soil types (map)

B. Existing Infrastructure

1. Names, type of road, condition of road, most recent traffic count of existing roads and streets adjacent to, or crossing, the land proposed for development (narrative)
2. Existing buildings, well and sewage system locations (map)
3. Existing utility easements including gas, electric, water, sewer, telecommunication, cable, etc. (map)
4. Existing rights-of-way including street, access, railroad, etc. (map)
5. Storm sewers and drainage structures, culverts, subsurface drainage systems (map)
6. Cemeteries, historical or archeological sites (map)

C. Surroundings

1. All adjoining parcels (narrative)
2. Current zoning and current use of adjoining parcels (narrative)
3. Distance by road or street to school buildings in district (narrative)
4. Distance by road or street to fire station in district (narrative)
5. Distance by road or street to nearest intersection of a through street (map/narrative)
6. Distance by road or street to nearest intersection with a state or federal highway (map/narrative)
7. Distance along most probable right-of-way to nearest accessible public water line (narrative)
8. Distance along most probable right-of-way to nearest accessible public sewer line (narrative)
9. Off-site areas or watershed affected by potential development (narrative)

D. Other

1. All existing environmental studies of the property (narrative required if any outcome detrimental)
2. Existing plat restrictions or private covenants (narrative)
3. Existing use(s) and zoning of the property (narrative)
4. Documented complaints about dumping or evidence of hazardous materials and/or contamination of soil or groundwater (Please contact Knox County Health Department and OEPA)
5. The character of the surrounding area (approximate the percentages of Agricultural, Residential, Commercial and Manufacturing land uses within a ¼ mile radius for 6 or fewer lots, ½ mile radius for 7-20 lots, and a 1 mile radius for 21 or more lots)
6. Such other information as may be unique to a specific tract of land

4.3 - Sketch Plan:

- A. Sketch plans, based on a Present Conditions Report, of the entire proposed development shall be prepared and discussed with the planning staff prior to committee review. The sketch plan should generally include those items listed in Chapter 5. – Design Standards, including reservations of land for public uses and open spaces.
- B. Sketch plans, based on a Present Conditions Report, of the entire proposed development shall be presented by the subdivider to the planning staff and to one or more review committees.
- C. Sketch plans and recommendations on them from one or more review committees shall be presented to the Commission for formal review and action.

4.4 - Preliminary Plat:

A preliminary plat as described in Subsections 4.4.1 through 4.4.5 shall be required for all subdivisions.

4.4.1. - Submission of Preliminary Plat:

- A. Previous to filing a preliminary plat, the subdivider shall consult with the Commission and/or its staff for advice and assistance and submit plans and data as specified in this Chapter 4.
- B. On reaching conclusions, as recommended in subsection 4.4.1.(A.) above, regarding his/her general purpose and objectives in relation to the design standards as outlined in Chapter 5. Design Standards herein and development objectives, the subdivider shall prepare a preliminary plat, together with improvement plans and other supplemental data as specified in this Chapter 4.
- C. Six (6) copies of the preliminary plat and two (2) copies of other required material shall accompany a written application to the Commission, for consideration at the next regular meeting of the Commission. The preliminary plat shall be filed with the staff not less than fifteen (15) calendar days in advance of such meeting date. The plat shall be considered officially filed after it is examined by the Secretary of the Commission and if it is found to be in full compliance with the provisions of these regulations.

4.4.2. - Review of Preliminary Plat:

- A. The Commission shall, within three (3) days after the filing of the preliminary plat, transmit one (1) copy each to the County Engineer and the Knox County District Board of Health for their study and recommendations. The Commission may transmit copies of the preliminary plat to other area officials if deemed necessary by the Secretary of the Commission for additional study and recommendations.
- B. After receiving a written report from each of the aforementioned officials in 4.4.2.(A.) above, the Commission shall determine whether the preliminary plat shall be approved, approved with modifications, or disapproved.
- C. In the event a written report is not received within twelve (12) days after the transmittal of a plat of a subdivision to the officials in 4.4.2.(A.) above, the Commission may proceed in accordance with these regulations.
- D. The Commission shall approve, approve with conditions or disapprove the preliminary plat within thirty-five (35) business days after same has been officially filed. The Commission's decision shall be in writing and

shall be under the signature of the Secretary of the Commission. The disapproval of a preliminary plat shall state the reasons for the disapproval. A decision of the Commission under this division is preliminary to and separate from the Commission's decision to approve, approve under conditions or refuse to approve a final plat under Section 4.5.2.

4.4.3. - Size and Scale of Preliminary Plat:

- A. The preliminary plat shall be clearly and legibly drawn. The scale of the map shall not be less than one (1) inch equals one (100) hundred feet.
- B. The map of a subdivision containing six (6) acres or less shall be drawn at a scale of one (1) inch equals fifty (50) feet.

4.4.4. - Map Contents:

The preliminary plat shall contain the following information:

- A. Proposed name of the subdivision. The name shall not duplicate, be the same in spelling, or alike in pronunciation with any other recognized or recorded subdivision. However, in case of a subdivision platted by blocks, the subdivider shall be permitted to use the same subdivision name.
- B. Location: distance to the nearest street intersection or plat.
- C. Names and addresses of the subdivider, owner or surveyor.
- D. Scale of the plat, north point, and date.
- E. Boundary lines of the subdivision indicated by a heavy line and the approximate acreage therein.
- F. Location, widths, and names of existing or platted streets, railroad rights-of-way, easements, parks, permanent buildings, military surveys, township lines, section lines, quarter section lines, and lot lines.
- G. Names and addresses of adjacent subdivisions and owners of adjoining parcels or unsubdivided land, deed book, and page number.

- H. USGS topographic maps, enlarged to a scale of one (1) inch equals one hundred (100) feet, will be used to show existing contours unless the County Engineer determines a more detailed topographical survey is needed.
- I. Drainage channels, wooded areas, power transmission poles and lines, and any other significant item should be shown.
- J. Vicinity sketch.

4.4.5. - Other Information:

- A. In addition to the aforementioned requirements, the developer shall submit a statement of the proposed use of lots, stating type of residential buildings with number of proposed dwelling units, type of business or industry, so that the effect of the development on traffic, fire hazards, or congestion of population can be determined; proposed covenants and restrictions; source of water supply; provisions for sewage disposal; drainage and flood control; soil erosion and sedimentation control; if any zoning changes are contemplated; and the proposed plan for the areas, including dimensions.
- B. Test for Individual Sewage Disposal System:
(See Knox County District Board of Health - Regulation 801).

4.5 - Final Plat:

A final plat as described in Sections 4.5.1 through 4.5.6 shall be required for all subdivisions.

4.5.1 - Submission of Final Plat:

- A. General: The final plat shall generally conform to the preliminary plat, and it may constitute only that portion of the approved preliminary plat which the subdivider proposed to record and develop at the time, provided that such portion conforms to all the requirements of these regulations.
- B. Filing: The final plat shall be filed with the Commission not later than twelve (12) months after the date of approval of the preliminary plat, otherwise, it will be considered void unless an extension is requested by

the developer. The request for extension shall be considered by the Commission at its next regular meeting held more than ten (10) days after the request is received. The final plat shall be considered officially filed after it is examined by the Secretary of the Commission and is found to be in full compliance with the formal provisions of these regulations. The final plat shall be filed with the Commission at least ten (10) working days prior to the meeting at which it is to be considered.

4.5.2 - Approval:

After approval of the preliminary plat, the subdivider may proceed to file:

- A. Six copies of the final plat.
- B. A written application for final approval.
- C. Construction plans and profiles of streets and all other construction drawings related to the improvements to be constructed in the subdivision, as required in Appendix [B]. Knox County Engineering and Surveying Standards for Subdivision Development and Appendix [H]. Comprehensive Storm Water Management Plan for Major Subdivisions Knox County, Ohio.
- D. Within five (5) calendar days after submission of a plat for approval under this division, the Commission shall schedule a meeting to consider the plat and shall send a notice by regular mail or by electronic mail to the County Engineer, the Clerk of the Board of Township Trustees of the township in which the plat is located, and the Knox County District Board of Health. The notice shall inform the Engineer, Trustees, and the District Board of Health of the submission of the plat and the date, time, and location of any meeting at which the Commission will consider or act upon the plat. The meeting shall take place within thirty (30) calendar days after submission of the plat, and no meeting shall be held until at least seven (7) calendar days have passed from the date the Commission sent the notice.
- E. The Commission shall also within five (5) calendar days after receipt of the final plat transmit a copy to the following: the County Engineer, the Knox County District Board of Health, and the Chairman of the Board of Township Trustees where the land to be plated is located. The cross sections and all other construction drawings submitted to the Commission shall also be forwarded to the County Engineer

- F. The approval of the Commission, the Commission's conditional approval as described in this section, or the refusal of the Commission to approve shall be endorsed on the plat within thirty (30) calendar days after submission of the plat for approval under this section or within such further time as the applying party may agree to in writing; otherwise, that plat is deemed approved, and the certificate of the Commission as to the date of the submission of the plat for approval under this division and the failure to take action on it within that time shall be sufficient in lieu of the written endorsement or evidence of approval required by this division.
- G. The Commission may grant conditional approval under this section to a plat by requiring a person submitting the plat to alter the plat or any part of it, within a specified period after the end of the thirty (30) calendar days, as a condition for final approval under this section. Once all of the conditions have been met within the specified period, the Commission shall cause its final approval under this division to be endorsed on the plat. No plat shall be recorded until it is endorsed with the Commission's final or unconditional approval under this division.
- H. The ground of refusal of any plat submitted under this section, including citation of or reference to the rule violated by the plat, shall be stated upon the record of the Commission. Within sixty (60) calendar days after the refusal under this section, the person submitting any plat that the Commission refuses to approve under this division may file a petition in the Court of Common Pleas of Knox County, and the proceedings on the petition shall be governed by section 711.09 of the Revised Code as in the case of the refusal of a planning authority to approve a plat. A Board of Township Trustees is not entitled to appeal a decision of the Commission under this division.
- I. The subdivider shall be notified in writing of the final action of the Commission and he/she shall record the final plat in the office of the Recorder of Knox County, Ohio within six (6) months after the date of approval, otherwise the plat shall be considered void. The subdivider shall, immediately upon recording, furnish the Commission with photostats of the recorded plat as may be required.

4.5.3 - Form:

The final plat shall be clearly and legibly drawn, a permanent print of a size, consistent with the Recorder's filing procedures. The map of a subdivision

containing six (6) acres or less shall be drawn at a scale of one (1) inch equals fifty (50) feet. All other subdivision shall be drawn at a scale of one (1) inch equals one hundred (100) feet.

4.5.4 - Map Contents:

The final plat shall contain the following information:

- A. Name of the subdivision and location and graphic, linear scale of the plat, north point, and date. Accurate traverse of subdivision boundary with true angles and distances to an error of closure of one to fifty thousand (1:50,000).
- B. All plat boundaries with length of courses to one - one hundredth feet (1/100) bearings, to half minutes. When required by the County Engineer, all calculations and field notes shall be submitted.
- C. Bearings and distances to the nearest established street lines, military survey, or township lines, section lines, quarter section lines, lot lines, or other recognized permanent monuments, which shall be accurately described on the plat. A true north reference should be considered on the final plat.
- D. Municipal, military survey, or township lines accurately tied to the lines of the subdivision by distances and bearings.
- E. Names of streets within the adjoining plat.
- F. Lengths of all chord and chord bearing radii, internal angles and points of curvature.
- G. All easements for right-of-way provided for public service or utilities, and any limitations of such easements.
- H. All lot numbers and lines with accurate dimensions in feet and hundredths, and with bearings or angles to street and alley or crosswalk way lines.
- I. Accurate outline of any areas to be dedicated for public use with the purpose indicated thereon.
- J. Building setback lines with dimensions.

- K. When lots are located on a curve or when side lot lines are at angles other than ninety degrees (90N), the width at the building lines shall be shown.
- L. Protective covenants shall be submitted and recorded with the final plat.
- M. Certification with seal by a land surveyor, registered with the State of Ohio, that the survey and plat are correct.
- N. Notarized certification by the owner or owners of the adoption of the plat, and the dedication of streets and other public areas.
- O. Certification of the approval of the Commission.
- P. A certificate to provide for the County Recorder.
- Q. A certificate to provide for the County Auditor.
- R. A certificate to provide for the County Engineer.
- S. A certificate for approval by the Board of County Commissioners.
- T. A certificate for approval by the Township Trustees.
- U. A notation "This instrument prepared by:".
- V. Certificate for approval by the Knox County District Board of Health.
- W. Such other certificates of approval by proper authorities.

4.5.5 - Other Information:

A statement by the County Engineer shall be required stating that the improvements have been completed to his satisfaction and according to prescribed standards or that a bond has been posted covering the cost of improvements.

4.5.6 - Recording:

The final plat shall be recorded within six (6) months of final approval by the Commission; otherwise, it will be considered void. A fee shall be paid as

provided in Appendix [G]. Knox County Subdivision - Fee Schedule. [Amended March 23, 2009]

CHAPTER 5.

DESIGN STANDARDS

The following land subdivision regulations, principles, standards and requirements shall be applied by the Knox County Regional Planning Commission in evaluating the proposed subdivision plans submitted for their consideration. These standards are necessary for a well planned community of good quality, with provisions for desirable services and facilities. Further, it is intended by the Commission, that these standards shall be considered minimum requirements necessary to protect the health, safety, morals and welfare of the general public.

5.1 - Street and Highway Standards:

- A. Streets shall be logically related to the topography as to produce useable lots and reasonable grades.
- B. Minor streets shall be so laid out to discourage their use by through traffic. Further, the arrangements of streets shall provide for the continuation or appropriate projection of the streets to serve the adjacent lands whenever topographic conditions and other physical conditions permit.
- C. Where a subdivision abuts or contains an existing or proposed major highway of primary classification, the Commission may require a frontage road, non-access reservation along the rear of the property contiguous to such highway or such other treatment as may be necessary for adequate protection of residential properties and to separate local and through traffic.
- D. Where a subdivision borders on or contains a railroad right-of-way, the Commission may require a street approximately parallel to and on each side of such right-of-way, at a distance suitable for the appropriate use of the intervening land.
- E. Buffer strips or lots intended to restrict access from adjacent private or public areas shall be prohibited.
- F. Streets shall be laid out so as to intersect as near as possible at right angles.

G. Dead-end streets shall be prohibited.

5.2 - Alleys:

- A. Alleys shall be prohibited in residential areas.
- B. Alleys shall be provided in commercial and industrial districts, except that the Commission may waive this requirement where other definite and assured provision is made for service access, such as off-street parking and loading, adequate for the uses proposed.
- C. When permitted in commercial or industrial districts, alleys shall not be less than twenty (20) feet in width.
- D. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn-around facilities at the end, as determined by the Commission.

5.3 - Easements:

- A. In general, utility easements shall be of a minimum, total width of twenty (20) feet, and located at the side or rear of lots when possible.
- B. Where a subdivision is traversed by a water course, acceptable drainage way, channel, or stream, there shall be provided a storm water easement or drainage right-of-way, not less than twenty (20) feet in width, conforming substantially with the lines of such water course.

5.4 - Blocks:

- A. The lengths, widths and shapes of blocks shall be determined by:
 - 1. Provisions for building sites suitable to meet the needs of the type of use contemplated.
 - 2. Zoning regulations pertaining to lot size and dimensions.
 - 3. Needs for convenient access, circulation, control and safety of street traffic.
 - 4. Limitations and opportunities of topography.

5. Block lengths shall not exceed one thousand six hundred (1,600) feet, or be less than six hundred (600) feet in length.
- B. Pedestrian easements or dedications, not less than ten (10) feet in width, shall be required to provide access to playgrounds, schools, shopping centers or other community facilities as determined by the Commission.

5.5 - Lots:

- A. The lot size, width, depth, shape and orientation, and the minimum building lines shall be appropriate for the location of the subdivision and for the type of development and use proposed.
- B. A minimum lot size of forty-three thousand five hundred sixty (43,560) square feet [one (1) acre] shall be provided when neither public water nor sanitary sewers are available. Where public water and/or sanitary sewer is available the lot size may be reduced in accordance with the prevailing rules, regulations and laws of the unincorporated area.
- C. Every lot in a subdivision shall abut on a public or private street for at least fifty (50) feet. All streets whether public or private shall be constructed in accordance with the standards set forth in these regulations. [Amended March 23, 2009]
- D. Whenever possible, side lot lines shall be at right angles to the street lines.
- E. Double frontage shall be avoided except where essential to provide separation of residential development from traffic arteries or to overcome particular topographic and orientation disadvantages.
- F. Excessive depth in relation to the width of lots shall be avoided. A proportion of three (3) feet of depth to one (1) foot of width, measured at the building setback line, will normally be considered maximum, unless a greater proportion shall be approved by the Commission.

5.6 - Building Setback Lines:

Building setback lines shall conform to the requirements of the local zoning regulations. However, where zoning requirements do not apply, said

setback lines shall be approved by the Commission, with a minimum setback of fifty (50) feet from any street right-of-way.

5.7 - Survey Monuments:

- A. A complete survey of a proposed subdivision shall be made by a registered surveyor. The survey shall conform to the surveying standards. (Appendix [B]. The Knox County Engineering and Surveying Standards for Subdivision Development.)
- B. Before the approval of the final plat, permanent reference monuments, made of concrete, shall be located and placed within the subdivision.

5.8 - Street Construction Plan and Profile:

- A. Street construction plans shall conform with the Knox County Engineering and Surveying Standards for Subdivision Development, Appendix [B] and shall be filed with the County Engineer prior to the approval of the final plat.
- B. The plans shall contain the width of the right-of-way, the profile of the existing terrain, the centerline grade, typical cross section, estimated quantities, the size of all drainage structures, the area draining into each structure, and the direction of flow. If the drainage outlet is not located within the subdivision, it shall be shown in the plan.

5.9 - Drainage Systems Requirements:

All drainage structures shall be approved by the County Engineer.

5.10 - Sidewalks:

Where sidewalks are provided or deemed necessary by the Commission, they shall have a minimum width of three (3) feet; be located within the street right-of-way; be constructed of Portland Cement concrete; and, be at least four (4) inches thick, underlain with acceptable granular material at least four (4) inches thick.

5.11 - Public Sites and Open Spaces:

When a proposed park or other recreation area, school site or other public ground shown in the official Comprehensive Plan for Knox County is located in whole or part within the proposed subdivision, such proposed public

ground or park, if not dedicated to the County or the Board of Education or other agency of the County, shall be reserved by the developer for acquisition by said County, Board of Education, or other agency of County within a period of five (5) years by purchase or other means.

5.12 - Soil Erosion and Sedimentation Control Measures:

All soil and water management measures necessary to prevent excessive soil erosion and sedimentation during and after development will be installed. These measures include, but are not limited to, grassed waterways, lined open channels (concrete or stone), drop structures, storm sewers, debris basins, temporary and permanent seedings, and stockpiling of topsoil for later distribution. (See Appendix [A]. Knox County Urban Sediment Pollution and Water Runoff Control Regulations, and see Appendix [F] Knox County Storm Water Management & Sediment Control Regulations). [Amended March 23, 2009]

5.13 - Floodplains:

If the proposed development is in or near a floodplain, the subdivider shall follow the procedures outlined in Appendix [E]. Knox County, Ohio Flood Damage Prevention Resolution.

5.14 - Sanitary Sewers:

- A. When the proposed subdivision is within an area served by a public sewer system, then, in the judgement of the Commission as based on a sewage feasibility study and accessibility to the subdivision, the subdivider shall provide a complete sanitary sewer system, to be connected to the public sanitary sewer system.
- B. Within an area not having a public system, or within an area having a public sewer system which is not reasonably accessible to the subdivision, the subdivision shall be provided with one (1) of the following methods of sewage disposal:
 - 1. A complete sanitary sewer system to convey the sewage to a treatment plant, to be provided and operated in accordance with the requirements of the Knox County District Board of Health (See Knox County District Board of Health - Regulation 801), Ohio Department of Health and Ohio Environmental Protection Agency.

2. A private sewage disposal system on individual lots as approved by the Knox County District Board of Health (See Knox County District Board of Health - Regulation 801).
- C. Sanitary sewer lines shall be located within the street rights-of-way or easements for utilities.

5.15 - Water:

The subdivision shall be provided with one (1) of the following water systems:

- A. With a complete water main supply system, which shall be connected to a public water system located within the street rights-of-way or easements for utilities.
- B. With a community water system approved by the engineer of the applicable water utility and the Knox County District Board of Health with satisfactory provision for the maintenance thereof.
- C. When a public or community water system is not available, each lot in the subdivision shall be provided with an individual water system in accordance with the minimum standards approved by the Knox County District Board of Health.

5.16 - Storm Drainage System:

All drainage systems and structures shall be approved by the County Engineer.

5.17 - Recommended Improvements:

Although the following improvements are not required, they are recommended as being very valuable to the safety, convenience and attractiveness of a development and a great asset in its appeal to buyers.

- A. Street Trees: Street trees of a deciduous hardwood type of a minimum caliper of one and one-half (1.5) inches shall, when provided, be planted and located as approved by the County Engineer.
- B. Fire Hydrants: Fire hydrants shall be provided as an integral part of any public water supply system.

CHAPTER 6.

REQUIRED IMPROVEMENTS

6.1 - General:

The subdivider shall guarantee the construction of all required improvements in one (1) of the following ways:

- A. The subdivider may construct all improvements. Upon the completion of said improvements and their acceptance by the County Engineer and the Board of County Commissioners, the subdivider may request approval of a subdivision by the Commission. The subdivider shall, prior to constructing the said improvements, seek preliminary approval of the Commission.
- B. The subdivider may furnish a surety bond equal to the estimated cost of construction of all the improvements. An itemized estimate shall be furnished to the County Engineer.
- C. The subdivider may make a cash deposit with the Board of County Commissioners, in an amount equal to the estimated cost of improvement.
- D. The performance bond or cash deposit shall run to Knox County and shall provide that the subdivider, his heirs, successors and assigns, their agents, or servants will comply with all applicable terms, conditions, provisions and requirements. Before said bond is accepted, it shall be approved by the County Engineer and the Board of County Commissioners. Copy of the bond shall be transmitted to the Commission for its record.

6.2 - Extension of Time:

The construction of all improvements for which a surety bond or cash deposit has been provided by the subdivider shall be completed within one (1) year after the subdivision has received final approval. If the subdivider should fail to complete such improvements within the prescribed time, he must show cause why the bond or the cash payment should not be forfeited. The Commission may, if reasonability is shown, grant an extension of time not to exceed six (6) months, at the end of which time, if the improvements still

remain incomplete, the Commission may request the Board of Commissioners to initiate legal action to enforce compliance.

6.3 - Inspections:

During the construction of the subdivision improvement, periodic inspections shall be made by authorized representatives of Knox County. The subdivider shall notify the proper administrative officer when each phase of an improvement is ready for inspection. When acceptable evidence has been received by the Commission that all improvements have been adequately constructed, the Commission may recommend that the surety bond or cash deposit be released. Costs incurred by the County for such inspections shall be paid to the County by the subdivider.

Chapter 7.

ENFORCEMENT, PENALTIES, PUBLIC HEARINGS, AMENDMENTS

7.1 - Enforcement:

The County may institute an injunction or other appropriate action or proceedings to enjoin a violation of these regulations or any provisions of § 711 of the Revised Code.

7.2 - Penalty for Violation:

- A. Any subdivider, owner, agent, surveyor, engineer, or other person, firm or corporation who willfully violates or assists in violating any part of this ordinance or fails to comply with an order issued pursuant hereto, shall forfeit and pay not less than ten dollars (\$10.00) or more than one thousand dollars (\$1000.00) for each violation. Such sum may be recovered with costs in a civil action suit in the Court of Common Pleas of Knox County, Ohio, brought by the legal representative of Knox County, in the name of the County and for the uses thereof.
- B. Each such person shall be deemed guilty of a separate offense for every day during any portion of which any violation of any provision of these regulations, including any physical condition created in violation thereof, continues if it is committed by such person and shall be punished therefore as provided therein.

7.3 - Public Hearings:

The Commission, on its own motion or upon the petition of any citizen or neighboring property owner, prior to acting on a possible violation of this ordinance, may hold a public hearing thereon at such time and place and upon such notice as the Commission may designate. All interested parties shall be entitled to be heard at the hearing.

7.4 - Amendments:

The Commission may, from time to time, revise, modify and amend these regulations by appropriate action, taken in compliance with §711 of the Revised Code.

APPENDIX [A].

KNOX COUNTY STORM WATER MANAGEMENT & SEDIMENT CONTROL REGULATIONS

ARTICLE 1. GENERAL PROVISIONS

1.01[A] - Title:

These regulations shall be cited as the "*Knox County Storm Water Management and Sediment Control Regulations*" and are hereinafter referred as these regulations.

1.02[A] - Statutory Authorization:

These regulations of Knox County are promulgated pursuant to §307.79 of the Ohio Revised Code and thereafter as amended, whereby a Board of County Commissioners may adopt rules for storm water management, to abate soil erosion and water pollution by soil sediment.

1.03[A] - Administration:

The Knox County Soil and Water Conservation District shall administer these regulations. It shall designate a Storm Water Administrator who shall be responsible for determination of compliance with these regulations and shall issue such notices and orders as may be necessary.

1.04[A] - Purpose:

The Knox County Board of Commissioners, hereinafter referred to as "Commissioners", adopts these Storm Water Management and Sediment Control Regulations to establish feasible and economically reasonable standards aimed at achieving a level of management and conservation practices that will abate erosion of the soil and degradation of the Waters of the State of Ohio by soil sediment, caused by non-farm earth-disturbing activities.

These regulations further intend, but are not limited to:

- A. Permit development while keeping downstream flooding, erosion and sedimentation at existing levels.

- B. Reduce damage to receiving streams and drainage systems that may be caused by increases in the quantity and/or rate of water discharged, and impairment of their capacity that may be caused by sedimentation.
- C. Establish a basis for the design of all storm drainage systems that will preserve the rights and options of both the dominant and servient property owners and help assure the long-term adequacy of storm drainage systems.

1.05[A] - Scope:

These regulations shall apply to all earth-disturbing activities performed on unincorporated lands of Knox County, Ohio except those specifically excluded in §307.79 of the Ohio Revised Code as follows:

- A. Farming or silviculture operations or areas regulated by Ohio Agriculture Sedimentation Pollution Abatement Rules 1501:15-5 of the Ohio Administrative Code;
- B. Strip mining operations regulated under §1513.01 of the Ohio Revised Code;
- C. Surface mining operations regulated by §1514.01 of the Ohio Revised Code;
- D. Public highways, transportation and drainage improvements or maintenance thereof undertaken by a government agency or political subdivision provided that its standard sediment control policies have been approved by the Knox County Board of Commissioners, or by the Chief of the ODNR Division of Soil and Water Conservation and that the applicable sediment control policies are no less restrictive than these regulations; and
- E. Refuse disposal sites controlled by other regulations.

1.06[A] - Disclaimer of Liability:

Neither submission of a Plan under the provisions of these regulations, nor compliance with provisions of these regulations, shall relieve any person or other entity from responsibility for damage to any person or property otherwise imposed by law; nor shall it create a duty by the Commissioners or by the Storm Water Administrator to those damaged by soil sediment pollution, flooding, impaired drainage systems and the like.

1.07[A] - Severability:

If any clause, section or provision of these regulations is declared invalid or unconstitutional by a court of competent jurisdiction, validity of the remainder shall not be affected thereby.

1.08[A] - Nuisances:

These regulations shall not be construed as authorizing any person to maintain a private or public nuisance on his property, and compliance with the provisions of these regulations shall not be a defense in any action to abate such a nuisance.

1.09[A] - Responsibility:

Failure of the Storm Water Administrator to observe or recognize hazardous or unacceptable conditions or to recommend corrective measures shall not relieve the owner from the responsibility for the condition or damage resulting therefrom and shall not result in the Commissioners or the Storm Water Administrator, its officers, employees or agents being responsible for any conditions or damage resulting therefrom.

1.10[A] - Effective Date:

These regulations shall become effective on the 31st day after adoption by the Knox County Board of Commissioners.

APPENDIX [A].
KNOX COUNTY STORM WATER MANAGEMENT
&
SEDIMENT CONTROL REGULATIONS

ARTICLE 2. DEFINITIONS

2.01[A] - Interpretation of Terms and Words:

For the purpose of these regulations, certain rules or word usage apply to the text as follows:

- A. Words used in the present tense include the future tense, and the singular includes the plural, unless the context clearly indicates the contrary.
- B. The term *shall* is always mandatory and not discretionary; the word may be permissive. The term *should* is permissive but indicates strong suggestion.
- C. The word or term not interpreted or defined by this article shall be construed according to the rules of grammar and common usage so as to give these regulations their most reasonable application.
- D. In instances where mention is made of the Ohio Revised Code, it means that the actual wording of the current Code is to be used. Any summary or paraphrasing of the Ohio Revised Code that is provided is only as a guide to that which is being referred to in the actual Code.

2.02[A] - Words and Terms Defined:

"Accelerated Water Erosion" - means the wearing away of the land surface by water, occurring at a much more rapid rate than geologic or normal erosion.

"Agricultural Building Facility" - means any structure or impervious area constructed for agricultural purposes, to include pole barns, grain bins, machinery sheds or any other structure which is exempt from the state building code under R.C. 3781.06 (B) (1). Landowners claiming

exemption shall support the exemption by affidavit. [Amended March 23, 2009]

"Appeals Board" - means a group of individuals knowledgeable in matters relating to storm water management and erosion control, representing diverse interests appointed by the County Commissioners to consider appeals to these regulations. This Board shall include one (1) representative of the County Engineer's Office; one (1) representative of the development or building industries; one (1) representative of the Township Association; one (1) representative of the Knox County Regional Planning Commission; and one (1) knowledgeable private citizen.

"Best Management Practice (BMP)" - means techniques used to lessen the environmental impacts of land use. These techniques may involve structures, vegetation, or altering construction operations.

"Channel" - means a natural bed that conveys water; a ditch excavated for the flow of water.

"Critical Storm" - means that rainfall event calculated from the percentage increase in volume of runoff by a proposed development. The critical storm is used to calculate the maximum allowable storm water discharge rate from a developed site as per the chart in Appendix [A]. Article 3. General Requirements for Storm Water Management and Erosion Control, Section 3.16[A] "Storm Water Control Methods" of these regulations.

"Cut" - means an excavation that reduces an existing elevation, as in road or foundation construction.

"Detention Structure" - means a permanent storm water management facility for the temporary storage of runoff, which is designed so as not to create a permanent pool of water.

"Ditch" - means an open channel, either dug or natural, for the purpose of drainage or irrigation with intermittent flow.

"Development Drainage Area" - means any contiguous area being developed that is or will be used or operated as one (1) unit for non-farm commercial, industrial, residential or other non-farm purposes upon which earth-disturbing activities occur.

"Drainage Improvement" - means as defined in the §6131.01(C) of the Ohio Revised Code, and/or conservation works of improvement, developed under Chapters 1511 and 1515 of the Ohio Revised Code.

"Dumping" - means grading, pushing, piling, throwing, unloading or placing.

"Earth-Disturbing Activity" - means any clearing, grading, excavating, filling or other alteration of the earth's surface where natural or man-made ground cover is destroyed, which may result in or contribute to erosion and sediment pollution.

"Earth Material" - means soil, sediment, rock, sand, gravel and organic material or residue associated with or attached to the soil.

"Engineer" - means a Professional Engineer registered in the State of Ohio.

"Erosion" - means the process by which the land surface is worn away by the action of wind, water, ice or gravity.

"Erosion and Sediment Control" - means a system of structural and vegetative measures that minimize soil erosion and offsite sediment pollution.

"Farm" - means land or water devoted to agriculture as defined by §303.01 of the Ohio Revised Code, wherein it states:

"Agriculture: includes farming; ranching; aquaculture; horticulture; viticulture; animal husbandry, including, but not limited to the care and raising of livestock, equine and fur-bearing animals; poultry husbandry and the production of poultry and poultry products; dairy production; the production of field crops, tobacco, fruits, vegetables, nursery stock, ornamental shrubs, ornamental trees, flowers, sod, or mushrooms; timber; pasturage; any combination of the foregoing; the processing, drying, storage, and marketing of agriculture products when those activities are conducted in conjunction with, but are secondary to such husbandry or production."

"Grassed Waterway" - means a broad or shallow natural watercourse or constructed channel, covered with erosion-resistant grasses or similar vegetative cover, used to convey surface water.

"Impervious" - means areas not allowing infiltration of water into the soil such as concrete or asphalt pavement, roofs and highly compacted earthen surfaces.

"Jurisdictional Waters" - means all rivers, streams, lakes, ponds, wetlands, watercourses, drainage systems, and all other bodies or accumulations of surface water, natural or artificial, that are situated wholly or partly within Knox County, or are within its jurisdiction, except those private waters that do not combine or affect a junction with natural surface waters.

"Knox County Standards" - means standards and details for storm water management and stream protection practices include the following:

- A. The standards and details published by the Ohio Department of Natural Resources in the current edition of "Rainwater and Land Development – Ohio's Standards for Storm Water Management Land Development and Urban Stream Protection".
- B. The standards and details that may be published by the Knox County Engineer or the Storm Water Administrator.

"Kokosing Scenic River" - means the designated portion of the Kokosing River and its designated tributaries as defined by Chapter 1517 of the Ohio Revised Code.

"Landslide" - means rapid movement down slope of a mass of soil.

"Larger Common Plan" - means a Plan for the development of two (2) or more contiguous parcels of land under common ownership or control which are intended for current or future development.

"Multi-family Development" - means apartments, condominiums, or other similar buildings containing four (4) or more dwelling units.

"Person" - means any individual, corporation, partnership, joint venture, agency, unincorporated association, municipal corporation, county or state agency, the federal government or any combination thereof.

"Retention Structure" - means a permanent storm water management facility that provides for the storage of runoff by means of a permanent pool of water.

"Runoff" - means the portion of rainfall, melted snow, or irrigation water that flows across the ground surface and is eventually returned to streams.

"Sediment" - means soils or other surface materials that can be transported or deposited by the action of wind, water, ice or gravity as a product of erosion (sedimentation).

"Sediment Basin" - means a barrier or other suitable retention structure built across an area of water flow to intercept runoff and allow transported sediment to settle and be retained, prior to discharge into waters of the State.

"Sediment Pollution" - means degradation of Waters of the State of Ohio by sediment as a result of failure to apply management or conservation practices to abate wind or water soil erosion, specifically in conjunction with earth-disturbing activities on land used or being developed for commercial, industrial, residential or other non-farm purposes.

"Sloughing" - means a slip or downward movement of an extended layer of soil resulting from the undermining action of water or the earth-disturbing activity of man.

"Soil Conservation" - means using the soil within the limits of its physical characteristics and protecting it from the limitations of climate and topography.

"Soil and Water Conservation District" - means as organized under Chapter 1515 of the Ohio Revised Code; referring either to the Soil and Water Conservation District Board, or its designated employee(s), hereinafter referred to as the Knox SWCD.

"Soil Stabilization" - means vegetative or structural cover for controlling erosion including permanent and temporary seed, mulch, sod, pavement, etc.

"Storm Frequency" - means the average period of time within which a storm of a given duration and intensity can be expected to be equaled or exceeded.

"Storm Water Administrator" - means an individual appointed by the Knox SWCD to administer the Knox County Storm Water Management and Sediment Control Regulations.

"Storm Water Conveyance System" - means all storm sewers, channels, streams, ponds, lakes, etc., used for moving concentrated storm water runoff or storing storm water runoff.

"Storm Water Management" - means the practice of safely conveying or temporarily storing and releasing storm water runoff at an allowable rate to minimize erosion and flooding.

"Storm Water Management and Sediment Control Plan" - means an erosion and sediment control strategy or plan, to minimize erosion and prevent off-site sedimentation by containing sediment on-site, or by-passing sediment-laden runoff through a sediment control measure, prepared and approved in accordance with the specific requirements of the Storm Water Administrator and Appendix [A]. Articles 4. Storm Water Management and Sediment Control Permit and 5. Fees, Penalties, and Appeals of these regulations.

"Stream" - means a body of water running or flowing on the earth's surface. Streams appear on USGS maps as a blue line.

"Subsoil" - means that portion of the soil below the topsoil and down to bedrock or parent material.

"Topsoil" - means the upper layer of soil that is usually darker in color and richer in organic matter and nutrients than the subsoil.

"Watercourse" - means a definite channel with bed and banks within which concentrated water flows, either continuously or intermittently, e.g., streams.

"Watershed" - means the total drainage area contributing runoff to a single point.

"Wetland" - means those areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adopted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. An "isolated wetland" is a wetland regulated under §6111.021 - 6111.029 of the Ohio Revised Code.

APPENDIX [A].

KNOX COUNTY STORM WATER MANAGEMENT & SEDIMENT CONTROL REGULATIONS

ARTICLE 3. STORM WATER MANAGEMENT AND SEDIMENT CONTROL REGULATIONS

3.01[A] - General Requirements for Storm Water Management and Erosion Control:

No person shall cause or allow earth-disturbing activities on a development area except in compliance with the criteria established by these regulations as follows:

A. Erosion and Sediment Control (control during construction):

1. When any earth-disturbing activity, including commercial, industrial, or multi-family residential developments, is proposed, which involves more than twenty thousand (20,000) square feet of earth-disturbing activities, or when any such development will result in five thousand (5,000) square feet or more of impervious surface after development is completed, the owner of record shall develop and submit to the Storm Water Administrator a Storm Water Management and Sediment Control Plan, in accordance with the Criteria in paragraph 3.16[A] herein and the requirements set forth in the appropriate sections of Appendix [A]. Article 4. Administrative Provisions. No earth-disturbing activities shall commence prior to the Plan's approval.
2. When any earth-disturbing activity, including a residential dwelling or building on an individual lot, is proposed, which is not part of a larger common plan, and the lot is one (1) acre or less, a SWM/SC Plan is not required. [See OEPA General Permit Part I-B1]. However, the owner of record shall comply with all other General Requirements and provisions of this Article 3. and as outlined in Appendix [A]. Article 4. - Administrative Provisions, Section 4.02[A] "Storm Water Management and Sediment Control for Residential Dwellings on Individual Lots" to prevent sediment pollution from occurring, and shall provide a letter of agreement wherein the owner or developer states that during

construction appropriate erosion and sedimentation control measures will be practiced. No earth-disturbing activities shall commence prior to the review and acceptance of the letter of agreement by the Storm Water Administrator.

3. When any earth-disturbing activity, including a residential dwelling or building on an individual lot, is proposed, which is not a part of a larger common plan, but the lot is greater than one (1) acre, and the amount of earth-disturbing activity is more than twenty thousand (20,000) square feet, the owner of record shall develop and submit to the Storm Water Administrator a Storm Water Management and Sediment Control Plan. This plan shall be in accordance with the criteria in paragraph 3.16[A] and the requirements set forth in Appendix [A]. Article 4. - Administrative Provisions of these regulations. No earth-disturbing activities shall commence prior to the Plan's approval.

B. Storm Water Management (control after construction is completed):

1. For all proposed commercial, industrial building facilities or multifamily developments, including clearing and grubbing, the owner of record shall develop and submit to the Storm Water Administrator a Storm Water Management Plan. This shall be in accordance with the Criteria in paragraph 3.16[A] and the requirements set forth in the appropriate sections of Appendix [A]. Article 4. - Administrative Provisions of these regulations. No earth-disturbing activities shall commence prior to the filing of the Storm Water Management and Sediment Control Plan with the Storm Water Administrator and the Plan's approval.
2. When a proposed commercial, industrial building facility or residential development is "part of a larger common plan of development", the owner of record shall develop and submit a Storm Water Management and Sediment Control Plan.

This shall be in accordance with the requirements of the Knox County Subdivision Regulations, and in conformance with the requirements listed in the appropriate sections of Appendix [A]. Article 4. - Administrative Provisions. No earth-disturbing activities shall commence prior to the filing of the SWM/SC Plan with the Storm Water Administrator and the Plan's approval.

3. When a residential dwelling or building facility on an individual lot is proposed, which is not part of a larger common plan, a SWM/SC

Plan is not required. However, the owner of record shall comply with all other General Requirements and provisions of this Article 3, and Appendix [A]. Article 4. - Administrative Provisions to prevent accelerated storm water runoff from occurring, and shall provide a letter of agreement wherein the owner or developer states that appropriate storm water management and control measures will be practiced. No earth-disturbing activities shall commence prior to the review and acceptance of the letter of agreement by the Storm Water Administrator.

4. When earth-disturbing activities are proposed to take place within one hundred (100) feet of a stream, a wetland, or within an identified flood hazard area, floodways or flood zones, the owner of record shall develop and submit to the Storm Water Administrator a Storm Water Management Plan. This Plan shall be in accordance with the criteria in paragraph 3.16[A] herein and the requirements set forth in the appropriate sections of Appendix [A]. Article 4. Administrative Provisions. No earth-disturbing activities shall commence prior to the filing of the Storm Water Management and Sediment Control Plan with the Storm Water Administrator and the Plan's approval.

3.02[A] - Notification:

The Storm Water Administrator shall be notified forty-eight (48) hours prior to commencement of any earth-disturbing activities for all approved commercial, industrial or residential development, regardless of site acreage. The Storm Water Administrator shall also be notified upon project completion.

3.03[A] - Protection of Adjacent Properties:

Properties adjacent to the site of land disturbance shall be protected from sediment deposition and increased storm water runoff. This includes public lands and waters of the State as well as private property. Protection may be accomplished by preserving a well-vegetated buffer strip around the lower perimeter of the land disturbance or by installing perimeter controls such as sediment barriers, filters or dikes or sediment and detention basins, rain gardens, rain barrels or by a combination of such measures. [Amended November 24, 2008]

3.04[A] - Soil Stabilization:

- A. Permanent soil stabilization shall be installed on denuded areas within seven (7) calendar days after final grade is reached on any portion of the site. Soil stabilization measures include seeding or sodding, mulching and early application of gravel base on areas to be paved. Soil stabilization measures should be selected to be appropriate for the time of year, site conditions and estimated length of use.

A permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that is mature enough to control soil erosion satisfactorily and to survive severe weather conditions. Areas within one hundred twenty (120) feet of designated portions of the Kokosing Scenic River should be planted with native hardwood trees.

- B. Temporary soil stabilization shall be required on any denuded areas that will remain idle (not be re-graded) for longer than thirty (30) days, unless an extension is granted by the Storm Water Administrator. Temporary soil stabilization shall be applied within seven (7) calendar days after rough grading.
- C. Soil stockpiles shall be stabilized or protected with sediment trapping measures to prevent soil loss. Topsoil and sub-soil stockpiles shall be separated. Topsoil shall be re-applied to exposed areas.

3.05[A] - Storm Water Runoff Treatment:

Treatment of storm water runoff requires the use of grassed/vegetated areas or sedimentation basins to remove sediment and/or contaminants. Treatment must occur and sediment and/or contaminants must remain on the development site to comply with paragraph 3.03[A].

- A. Vegetated filter strips, a minimum of fifteen (15) feet in width, can be utilized when sheet or overland flow is planned (storm water is not collected). If at any time it is found that a vegetated filter strip alone is ineffective in stopping sediment movement onto adjacent property, additional perimeter controls shall be provided. Splash-blocks should be used rather than discharging down spout water into a ditch or stream.
- B. Grassed swales can be utilized for treatment if the development site is not conducive to more diffuse overland flow. A minimum ratio of one hundred (100) linear feet of grassed swale per acre of impervious area is required. When possible, swales should be designed to minimize the

velocity of runoff to less than two (2) feet per second from a ten (10)-year, twenty-four (24)-hour storm.

3.06[A] - Sediment Basins/Traps:

Where five (5) acres or more of development area are disturbed in one (1) watershed, storm water runoff from that disturbed area shall pass through a sediment basin or other suitable sediment trapping facility with a minimum capacity of sixty-seven (67) cubic yards of storage per acre of disturbed area.

The Storm Water Administrator shall require sediment basins or traps for smaller disturbed areas where deemed necessary. The sediment basin requirement may be waived, by variance, if the Storm Water Administrator agrees that highly unusual site conditions do not warrant its construction. Unless otherwise designed, sediment basins or traps are temporary and shall be removed following final stabilization of the site.

3.07[A] - Installation of Sediment Controls:

Sediment basins and traps, diversion dikes, sediment barriers and other measures intended to trap sediment on-site shall be constructed as a first step in grading and shall be made functional before upslope land disturbance takes place. Earthen structures such as dams, dikes and diversions shall be seeded and/or mulched within seven (7) calendar days (or as weather conditions permit) after installation is complete so that adequate protection is provided. Slopes found to be eroding excessively shall be provided with additional slope stabilizing measures by the developer until the problem is corrected.

3.08[A] - Storm Water Inlet Protection:

All storm sewer inlets/catch basins that are made operable during construction shall be protected so that sediment-laden water will not enter the conveyance system without first being filtered or otherwise treated to remove sediment. Treatment shall consist of either temporary or permanent measures.

3.09[A] - Cut and Fill Slopes:

Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Consideration should be given to the length and steepness of the slope, the soil type, upslope drainage area, groundwater conditions and other applicable factors. Slopes that are found to be eroding excessively during the first year after construction shall be provided with additional slope stabilizing measures by the developer until the problem is

corrected. The following guidelines are provided to aid in developing an adequate design:

- A. Roughened soil surfaces are generally preferred to smooth surfaces on slopes.
- B. Diversions should be constructed at the top of long steep slopes that have significant drainage areas above the slope. Diversions or terraces may also be used to reduce slope length.
- C. Concentrated storm water should not be allowed to flow down cut or fill slopes unless contained within an adequate channel, flume or slope drain structure.
- D. Wherever a slope face crosses a water seepage plane that endangers the stability of the slope, adequate drainage or other protection should be provided.

3.10[A] - Stabilization of Waterways and Outlets:

All on-site storm water conveyance channels, except roadway ditches, shall be designed and constructed to withstand the expected velocity of flow from a ten (10)-year frequency storm without erosion. Stabilization adequate to prevent erosion shall also be provided at the outlets of all pipes and paved channels. Roadway ditches shall be designed according to the Knox County Subdivision Regulations.

3.11[A] - Working In or Crossing Waterways:

- A. Construction vehicles should be kept out of watercourses to the extent possible. Where in-channel work is necessary, precautions shall be taken to stabilize the work area during construction to minimize erosion. The channel (including bed and banks) shall always be restabilized immediately after in-channel work is completed. U. S. Army Corps of Engineers and/or Ohio Environmental Protection Agency permits may be necessary for in-stream channel projects.
- B. Where a live (wet) watercourse will be crossed by construction vehicles regularly during construction, a Temporary Vehicular Stream Crossing shall be provided.

3.12[A] - Maintenance of Temporary Measures:

All temporary and permanent erosion and sediment control practices shall be maintained and repaired as needed to assure continued performance of their intended function. The developer will be responsible for such maintenance until the final inspection by the Storm Water Administrator. For long-term maintenance, see Appendix [A]. Article 4. - Administrative Provisions, Section 4.04[A], subparagraph B. "Maintenance".

3.13[A] - Disposition of Temporary Measures:

All temporary erosion and sediment control measures shall be disposed of within thirty (30) calendar days after final site stabilization is achieved as determined by the Storm Water Administrator or after the temporary measures are no longer needed, unless otherwise authorized by the Storm Water Administrator. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sediment accumulation.

3.14[A] - Storm Water Management & Sediment Control (SWM/SC) Plan Criteria:

When required by criteria in paragraph 3.01[A], subparagraph A.1., the Storm Water Management and Sediment Control Plan (SWM/SC) must be certified by a Professional Engineer registered in the State of Ohio. All SWM/SC Plans submitted to the Storm Water Administrator, with the exception of those submitted by a public agency, shall be accompanied by a review and filing fee as determined by the fee schedule.

3.15[A] - SWM/SC Plan Review and Filing Fee Schedule:

The Storm Water Management and Sedimentation Control Plan Review and Filing Fee Schedule are separate documents. The current schedule, as adopted by the Knox County Commissioners, should be requested from the Storm Water Administrator or the Knox Regional Planning Commission.

3.16[A] - Storm Water Control Methods:

To provide adequate storm water management and to prevent off-site damage from accelerated storm water runoff from development areas, the increased peak rates and volumes of runoff shall be controlled such that:

- A. The peak discharge rate of runoff from the critical storm and all more frequent storms occurring under post-development conditions does not exceed the peak discharge rate of runoff from a one (1)-year frequency,

twenty-four (24)-hour storm occurring on the same development drainage area under pre-development conditions.

- B. Storms of less frequent occurrence (longer return periods) than the critical storm up to the one hundred (100)-year storm have peak runoff discharge rates no greater than the peak runoff rates from equivalent size storms under pre-development conditions. Consideration of the one (1)-, two (2)-, five (5)-, ten (10)-, twenty-five (25)-, fifty (50)-, and one hundred (100)-year storms will be considered adequate for designing and developing methods to meet this standard.
- C. The critical storm for a specific development drainage area is determined as follows:
1. Use the Natural Resources Conservation Service (NRCS) TR-55, Urban Hydrology for Small Watersheds, to determine the total volume (acre-feet) of runoff from a one (1)-year, twenty-four (24)hour storm occurring on the development drainage area before and after development.
 2. From the volumes determined in paragraph 3.16[A], subparagraph 1.C. above, determine the percent increase in volume of runoff due to development and using this percentage, select the twenty-four (24)-hour critical storm from the following table:

If the percentage of increase in volume of runoff is:		
Equal to or greater than:	Less than:	<u>The critical storm will be:</u>
---	10	1 year
10	20	2 year
20	50	5 year
50	100	10 year
100	250	25 year
250	500	50 year
500	---	100 year

(For example, if the percent increase between the pre-development and post-development runoff volume for a one (1)-year storm is thirty-five percent (35%), the critical storm is a five (5)-year storm. The peak discharge rate of runoff for all storms up to this frequency shall be controlled so as not to exceed the peak discharge rate from the one (1)-year frequency storm under predevelopment conditions in the development drainage area. The post-development runoff from all less frequent storms need only be controlled to meet the pre-development peak discharge rate for each of those same storms.)

D. Methods for controlling increases in the rate and volume of storm water runoff may include, but are not limited to, the following:

1. Retarding flow velocities by increasing friction. (For example, using grass-lined road ditches, rather than paved street gutters where practical, and discharging roof water to vegetated areas, or grass and rock-lined drainage channels.)
2. Grading and construction of terraces or diversions to slow runoff by diffusion, or use of grade control structures, such as check dams, to provide a level of control in flow paths and/or existing drainage ways.
3. Induced infiltration of increased storm water runoff into the soil where practical. (For example, constructing special infiltration areas where soils are suitable, retaining topsoil for all areas to be re-vegetated, or providing good infiltration areas with proper emergency overflow facilities.)
4. Provisions for detention and retention of storm water, with properly designed retention basins being preferred. (For example, utilizing permanent ponds and lakes as storm water basins that provide multiple use areas for storm water detention, recreation, wildlife, fire protection and aesthetics. Constructed wetlands, dry detention basins or subsurface storage areas are other options.)

APPENDIX [A].

KNOX COUNTY STORM WATER MANAGEMENT & SEDIMENT CONTROL REGULATIONS ARTICLE 4. ADMINISTRATIVE PROVISIONS

4.01[A] - Storm Water Management and Sediment Control Permit:

4.01.1[A] - Applications:

For the purpose of administering these regulations, all soil-disturbing projects meeting the requirements of Appendix [A], Article 3. Storm Water Management and Sediment Control Regulations of these regulations shall have a Storm Water Management and Sediment Control Permit. The owner, developer, builder, or contractor, or an authorized representative, shall apply for a Storm Water Management and Sediment Control Permit, as directed below:

- A. For soil-disturbing projects related to or involving building construction, as defined by the Zoning Regulations of the Township in which the project is located or the Ohio Revised Code, shall apply to the Knox County Regional Planning Commission for the required Storm Water Management and Sediment Control Permit.
- B. For all other soil-disturbing activities, including but not limited to site grading, grubbing and land clearing, but not involving building construction, as defined above, shall apply to the Knox County Regional Planning Commission for the required Storm Water Management and Sediment Control Permit.
- C. Unless otherwise exempt by these regulations, no building permit shall be issued, and no soil-disturbing activities shall begin until a project Storm Water Management and Sediment Control Permit has been issued.
- D. Permit applications shall be on a form directed by these regulations and available through the Knox County Regional Planning Commission.

- E. Government Agencies are not exempt from the permit requirements of these regulations.

4.01.2[A] - Permit Processing:

- A. Storm Water Management and Sediment Control Permit applications for projects involving building construction shall be completed and filed with the permit fee at the Knox County Regional Planning Commission. The application shall then be forwarded to the Storm Water Administrator within five (5) working days. The Storm Water Administrator shall review the permit application making comment on any necessary corrections to the Plan and advise the applicant of the results of the review, within five (5) working days. When all conditions are met, a Storm Water Management and Sediment Control Permit will be issued.
- B. Consultation with the County Engineer and concurrence with the review shall be obtained, when the proposed project affects public roads, or public property within Knox County. Consultation shall be arranged by the Storm Water Administrator.
- C. Storm Water Management and Sediment Control Permits shall be granted, conditional upon one (1) of the following categories:
 - 1. Approved - Without Further Action: Permit is granted without further action (Letter of no interest).
 - 2. Approved - Silt Control Agreement Required: Permit is granted, conditional upon a written agreement between the Storm Water Administrator and the Owner/Representative to control silt and storm water run-off, during construction.
 - 3. Approved - Silt Control Plan Required: Permit is granted, conditional upon the submission of a temporary silt control plan.
 - 4. Approved - Storm Water Management Plan Required: Permit is granted, conditional upon the submission and approval of a storm water management and/or a permanent silt control plan.
 - 5. Permit Denied: Permit is denied. Reason for denial to be provided.

4.01.3[A] - Temporary Sediment Control Plans:

- A. A temporary silt control plan shall be required for projects when, in the opinion of the Storm Water Administrator or the County Engineer, both of the following conditions exist:
 - 1. The project presents a significant risk of damage from uncontrolled silt run-off to adjacent properties, natural watercourses, the public roads, or other public property; and
 - 2. A permanent Storm Water Management Plan is not required.
- B. When required by the terms of the Storm Water Management and Sediment Control Permit, the temporary silt control plan shall be submitted to the Storm Water Administrator, for review and approval.
- C. For small projects, or projects where silt run-off can be reasonably contained within the project site and without further control measures, a silt control agreement may be executed between the Storm Water Administrator and the Owner/Representative, in lieu of a silt control plan.

4.02[A] – Storm Water Management and Sediment Control for Residential Dwelling on Individual Lots:

A. Residential Dwellings on Individual Lots:

In compliance with Appendix [A], Article 3. Storm Water Management and Sediment Control Regulations, Section 3.01[A] "General Requirements for Storm Water Management and Erosion Control", paragraph A.2., a SWM/SC Plan is not required. However, copies of State and Federal permits, if any, may be submitted to the Storm Water Administrator, to demonstrate compliance with any applicable Ohio EPA and U.S. Army Corps of Engineers' regulations. Local zoning, however, may require development of an Erosion Control Plan. For this type information, please contact the Township's Zoning Inspector.

B. Residential Dwellings on Individual Lots in Subdivisions with Approved Storm Water Management Plans:

Residential lots in approved subdivisions do not require a SWM/SC Plan unless the construction plan proposes to modify the previously approved storm water management system or directly affects a public waterway.

C. Standards for Residential Dwellings on Individual Lots:

In lieu of a formal Storm Water Management and Sediment Control Plan, the following standards will apply to development or construction on single unit residential lots:

1. Pre-existing vegetation shall be retained on idle portions of the building lot for as long as construction operations allow;
2. Clearing shall be done so only active work areas are bare;
3. Temporary seed (annual rye, oats, etc.) and/or mulch shall be applied to areas that are bare and not actively being worked;
4. Soil stockpiles shall be stabilized or protected with sediment trapping measures to prevent soil loss;
5. Silt fences shall control sheet flow runoff from building lots. Silt fences shall not be constructed in pre-existing natural drainage courses or areas of concentrated flow;
6. Other sediment control such as inlet protection and sediment traps shall be used as needed to control runoff;
7. Construction vehicle access shall be limited to one (1) route to the greatest extent possible. The access shall be gravel or crushed rock applied to the driveway area;
8. Mud tracked into the street or sediment settled around inlets or in roadside gutters or ditches shall be removed daily or as needed to prevent accumulating;
9. Sediment on streets shall be removed by shoveling and scraping. It shall not be washed off paved surfaces or into storm drains; and
10. Overland runoff is the preferred approach for down spout drainage on the site.
11. When the natural flow path of stormwater runoff travels within fifty (50) feet of an existing structure or future downstream building sites before entering an existing

stormwater conveyance system, runoff water from newly constructed impervious surfaces shall be captured and released at pre-developed rates.

Note:

Section 4.02. C.11 shall be accomplished using practices designed to capture all storms up to the 10-year 24-hour storm. These practices, which may include any or all of the following or other practices that are shown to meet the stated requirements, shall be followed as long as impervious surfaces resulting from development remain on the property:

- Rain Barrels - A container designed to capture water runoff from roof systems to be released at a reduced rate or used for gardening or irrigation purposes.
- Rain Garden - A system designed to capture stormwater runoff from impervious surfaces and to release the water through infiltration into the soil, while using a variety of vegetation to absorb excess moisture.
- Individual lot detention system - A structural or non-structural system designed to capture stormwater runoff from an individual developed lot, store the water, and release the water at or below the pre-developed water runoff rate. Sample plans and engineering specifications are available from Knox Soil and Water Conservation District.

Guidance and/or assistance in developing an individual lot stormwater system, and/or on maintaining such a system to meet continually the requirement of 4.02. C. 11 above, can be obtained through the Knox Soil and Water Conservation District and must be approved by the Stormwater Administrator. Where no other option can be implemented, the Stormwater Administrator may approve a mechanism to direct runoff to the nearest stormwater conveyance system. [Amended November 24, 2008]

4.03[A] - Storm Water Management and Sediment Control Plans - General Requirements:

In compliance with Appendix [A], Article 3. Storm Water Management and Sediment Control Regulations, Section 3.01[A] "General Requirements for Storm Water Management and Erosion Control", paragraph A.1., a Storm

Water Management and Sediment Control Plan shall be submitted to the Storm Water Administrator for review, and shall consist of:

- A. A brief narrative section, including storm water run-off calculations;
- B. Construction plan sheets, containing drainage, erosion/sediment control measures, and any other details that may be useful to the contractor;
and
- C. A one (1)-page summary.

It is recommended that more BMP information be incorporated into construction drawings, details, and in general notes to contractors, as follows:

A. Narrative Section shall include the following:

- 1. Project Description: Briefly describe the nature and types of land-disturbing activity. Note, specifically, those items not selfevident from the plan drawings.
- 2. Existing Site Conditions: To include topography, vegetation, and on-site drainage, consistent with information in TR-55, or other acceptable storm water model calculations, for both predevelopment and post-development run-off.
- 3. Critical Areas: Describe the BMP - required to protect areas that have a high potential for serious erosion problems, such as stream crossings, steep slopes, etc. Other areas requiring special consideration include: adjacent properties, nearby streams, downstream ponds, and roadways that might be affected by construction site run-off.
- 4. Storm water run-off: Include estimations and calculations for both pre-development and post-development peak discharge, using the TR-55 method. Include critical storm determinations and demonstrate how the run-off from upper watershed areas has been considered in these calculations. (There is no requirement to detain water from off the property.)
- 5. Provisions for long-term maintenance of permanent storm water facilities: A Deed restriction may be necessary, to notify responsible parties of the correct maintenance procedures,

including scheduled sediment removal, etc. A copy of the Deed restriction should be included on the title page of the construction plans.

6. Names and addresses: The Professional Engineer responsible and in charge of the plan, the property owner, and the operator having responsibility for the overall development area.
7. Areas of Jurisdictional Waters: If applicable to the site, a copy of any U.S. Army Corps of Engineers permits must be submitted showing project approval, along with any restrictions that apply to site activities.
8. Ohio EPA Notice of Intent: If applicable to the site, a copy of the NOI, or NPDES permit number issued for the project. Contact the OEPA for additional information, and/or for permit applications.

B. Site Construction Plans, Drawings, and Details:

1. Vicinity map indicating the site, in relation to the surrounding area.
2. Construction plan sheets with a maximum scale of one inch equals two hundred feet (1" = 200') overall, and one inch equals fifty feet (1" = 50') for those areas of concentrated earth-moving activity. Existing topography, using two (2) foot intervals, over the development area. Specifically, include location of springs, lakes, wetlands, etc., within two hundred (200) feet of site.
3. Grading plan, showing limits of clearing and grading, areas of excavation, or other earth-disturbing activity, and final contours. Soil types, and relevant boundaries, shall also be included on this sheet.
4. Existing and proposed drainage patterns, including watershed lines, sub-areas, direction(s) of flow, and watershed acreage.
5. Location of BMP and storm water control structures to be used. Include details and directions for installation in the contractor's notes. All detention and retention structures should be drawn to scale, showing the area contributing to the drainage.

6. Construction sequence for contractor shall include an estimated time frame as required for the following phases of site development:
 - i. Initial clearing and grubbing, using phasing technique, in order to leave more undisturbed vegetation.
 - ii. Installation of BMP, whether temporary and/or permanent, with all of the perimeter controls installed within seven (7) calendar days of clearing and grubbing.
 - iii. Remaining phases of clearing and grubbing.
 - iv. Excavating sediment traps, and/or sediment retention basins.
 - v. Road grading, and all other excavation work.
 - vi. Installation of utilities.
 - vii. Final grading, paving, landscaping (permanent cover), soil stabilization.
 - viii. Removal of temporary erosion control measures.
7. Special notes for contractor on critical erosion areas, along with specific BMP's, are required.
8. Specify stabilization, using seeding mixtures and rates, lime and fertilizer application rates, type and quantity of mulching, for both temporary and permanent vegetation control measures. Make sure that rates comply with Knox County Standards for Storm Water Management, or you may reference ODOT Item 659 on construction plans, details, or general notes. (See also: ODOT Item 207 and the Knox County Standards for Storm Water Management.)
9. Submit a maintenance schedule, along with persons responsible for the inspection and repair of erosion and sediment control measures, until all construction has been completed.
10. Location and elevation of proposed structures shall be indicated in all commercial developments.
11. Detail drawings, indicating structural practices that will be used, especially ones not referenced in the Knox County Standards.

12. Permanent storm water control facilities will require detailed drawings, and their specific location, and shall appear on approved construction plans. Deed restrictions should include references to this information, and shall remain on file with the County Recorder. Developers shall provide as-built plan data, to document the condition of the facility, prior to final inspection of any new development.
13. Certification of a Professional Engineer - Certification required by a registered Professional Engineer in the State of Ohio.
14. Specific Contractor Notes - Two notes, in particular, should be placed on the plan, to meet NPDES requirements: Sediment ponds, and perimeter sediment controls, shall be implemented as the first step of grading, and installed within seven (7) calendar days from the start of grubbing. These measures shall continue to function until all disturbed areas are re-stabilized. Observe, also, disturbed areas that will remain not worked for a period of thirty (30) calendar days, or longer, unless an extension is granted by the Storm Water Administrator, shall be stabilized with seeding and mulching, or by other appropriate means, as soon as possible, but not to exceed seven (7) calendar days after earth-moving activity ceases.
15. Review and Filing Fee - The submitted SWM/SC Plan will not receive a final review and approval from the Storm Water Administrator, until the appropriate fees have been paid by the developer.

C. Suggested Step by Step Procedures - As May Be Required by the Storm Water Administrator:

Step 1 - Data Collection:

- a. Topography
- b. Drainage
- c. Soils
- d. Ground Cover
- e. Adjacent Areas
- f. Requirements

Step 2 - Data Analysis:

- a. Topography - slope gradients, lengths
- b. Drainage - existing drainage patterns
- c. Soil-erodibility, permeability
- d. Ground Cover - trees, grassy areas, unique vegetation
- e. Adjacent Areas - streams, roads, buildings, ponds, wetlands, etc.

Step 3 - Site Plan Development:

- a. Develop Site Plan, by:
 - 1. Fitting development to surrounding terrain
 - 2. Locating construction in the least critical areas
 - 3. Minimizing paved areas, and maximizing green/common space
 - 4. Utilizing natural drainage systems
- b. Calculate Run-off Discharge Rates/Volumes and Sediment Storage:
 - 1. Incorporate into the calculations any decrease in storm water storage capacity resulting from sediment accumulation during construction.

Step 4 - Plan for Erosion and Sediment Control:

- a. Determine limits of clearing and grading
- b. Divide the site into drainage areas
- c. Select erosion and sediment control practices for each of the following drainage areas:
 - 1. Vegetation
 - 2. Structures
 - 3. Management measures, i.e., construction phasing

Step 5 - Prepare Storm Water Management and/or Sediment Control Plans:

- a. Narrative - keep brief and include storm water run-off calculations for planned and future use
- b. Site Plan - include all pertinent details and notes for use by contractor
- c. Review Fee - must be submitted, prior to plan approval by SW Manager

PLEASE NOTE: In unusual circumstances the Storm Water Administrator may waive specific requirements for plan detail or time frames, or he/she may require additional information, to show that the work will conform to the basic requirements of these regulations. Any waiver or need for additional information shall be properly documented.

4.04[A] - Storm Water Management and Sediment Control Plan - For Commercial and Industrial Sites:

4.04.1[A] - General Requirements:

- A. Commercial or industrial development, except where excluded by the Ohio Revised Code, which is part of a larger, approved common plan of development will be required to submit a Storm Water Management Plan if one (1) or more of the following conditions exist:
 - 1. The proposed improvement is of a character significantly different from the development included in the previously approved Storm Water Management Plan; and/or
 - 2. The proposed improvement modifies the previously approved Storm Water Management Plan by changing the nature of the storm water collection or discharge, or by modifying the retention/detention volume.
- B. Projects which propose an addition to an existing commercial or industrial site except where excluded by the Ohio Revised Code, will be required to submit a Storm Water Management Plan if the impervious area is increased by more than five thousand (5,000) square feet.
- C. All other commercial or industrial developments, except where excluded by the Ohio Revised Code, including commercial building sites, will be required to submit a Storm Water Management Plan in accordance with paragraph 3.01[A], subparagraph A herein.

4.04.2[A] - Maintenance:

When permanent storm water management facilities are required, the developer shall provide the Storm Water Administrator a copy of an Inspection & Maintenance Agreement, to be binding on all subsequent owners of land served by these facilities. Such agreements, or restrictions, shall: designate

the party or parties who are to be responsible for the long-term maintenance; prohibit unauthorized alterations to the facility; and be recorded on the Deed.

This restriction must also provide access to the facility, at any reasonable time, for an inspection by the Storm Water Administrator, in order to document the condition of the facility. This provision must be satisfied, to obtain approval of the SWM/SC Plan.

The location, dimensions, and bearing of such facilities shall be incorporated into the final plat, prior to approval by the Knox County Regional Planning Commission, and reference shall be made thereon as to the individual(s) or entity responsible for the long-term maintenance.

Permanent storm water facilities must be installed and made functional, prior to acceptance by the Knox County Board of Commissioners, and approval of the assessment schedule. An as-built plan must be completed by qualified personnel and submitted to the Storm Water Administrator, prior to the start of the Knox County Engineer's scheduled inspection period.

As an alternative, the owner, or responsible party(s), may petition the Board of County Commissioners for the permanent maintenance of all storm water control structures and/or facilities, when the area of benefit involves two (2), or more, property owners, as prescribed in the Ohio Drainage Law, Chapters 6131 or 1515 of the Ohio Revised Code. The County may require that structures and facilities be designed, so that maintenance costs can be kept to a minimum.

4.05[A] - Storm Water Management and Sediment Control Plan - For Multifamily Dwelling Sites:

4.05.1[A] - General Requirements:

For the purpose of these regulations, multi-family dwelling sites shall be divided into two (2) classes: a.) Single owner sites, and b.) Condominium sites. Planned Unit Developments shall be considered as condominium sites.

4.05.2[A] - Single Owner Sites:

In addition to a Storm Water Management Plan, the owners of a multifamily dwelling, when required by the Storm Water Administrator, shall file with the County a Maintenance Plan outlining the steps, procedures and responsibilities for the maintenance of any permanent storm water management facility required for the project.

4.05.3[A] - Condominium Sites and Planned Unit Developments:

The Developer/Builder of condominium multi-family home sites or planned unit developments must comply with the requirements of paragraph 4.06[A] herein for subdivisions.

4.06[A] - Storm Water Management and Sediment Control Plan - For Subdivisions:

4.06.1[A] - General Requirements:

The construction plans for subdivisions constructed under the Subdivision Regulations for Knox County shall contain a comprehensive plan for the control of storm water and sediment run-off, during construction and post-construction control of storm water. These plans shall be included in the general construction plans for the subdivision and shall contain details and specifications for the installation of both temporary and permanent facilities.

Storm water management and sediment control plans for all subdivision projects must be reviewed by the Storm Water Administrator, prior to submission to the Knox County Regional Planning Commission for final approval.

For the purposes of administration, maintenance, repair, and replacement, all permanent storm water management facilities in major subdivisions shall be considered Public Watercourses, in accordance with the terms and conditions of paragraph 4.06.3[A] herein and the Storm Water Agreement.

4.06.2[A] - Storm Water Management Plan:

Storm Water Management and Sediment Control Plans for subdivisions shall conform to the general requirements of paragraph 4.03[A] herein.

Included in the overall subdivision planning, will be provisions for access by public agencies to the storm water management facilities, for purposes of management, repair, and/or replacement.

No modifications to the Storm Water Management Plan shall be made, without the approval of the Storm Water Administrator.

4.06.3[A] - Storm Water Agreement:

The developer/owner of each major subdivision constructed in Knox County shall submit to the County, through the County Engineer, an agreement to construct all necessary storm water management facilities, and to provide for their future maintenance, by assessment to all lots (benefitting properties) that lie within the subdivision.

This agreement shall be on a form approved by the County Prosecutor, and signed by all persons having a vested interest in the subdivision.

4.06.4[A] - Maintenance Fund:

Upon completion of the work, or when suitable surety is established in accordance with the Knox County Subdivision Regulations, the County Engineer will request a hearing before the Board of Commissioners, to establish procedures and assessments for the maintenance of the storm water management facilities within the development.

Maintenance assessments will begin the year after acceptance of the subdivision, based upon an assessment schedule prepared by the County Engineer, and approved by the Board of Commissioners. All maintenance assessments will be paid into a Ditch Maintenance Fund (§6137 of the Ohio Revised Code) that is established for the sole benefit of the subdivision in question.

Annual inspections, as well as all necessary maintenance work, shall be performed by/or under supervision of the County Engineer. All expenditures from the Maintenance Fund shall be approved by the Board of Commissioners, as recommended by the County Engineer.

4.06.5[A] - Maintenance Fund Characteristics and Calculations:

The maintenance funds are derived from an annual assessment levied against all benefitting owners of lots within the subdivision, and are accumulated until they are needed to perform maintenance, repair or replacement as the facilities age. The amount of the maintenance fund is based on the original construction cost of the storm water facilities in the subdivision. The maintenance fund may never have an unencumbered balance of more than twenty percent (20%) of the cost of original improvement, as adjusted to current costs. Once the fund has reached the twenty percent (20%) maximum, assessments will abate until such time as monies are withdrawn from the fund to maintain, repair or replace some element of the storm water management system. The annual assessment is determined by dividing the maximum maintenance fund balance by six (6) years. The entire maintenance

fund amount is apportioned to the lots within the subdivision on a fair and equitable formula in order to establish the appropriate amount to be assessed to each property.

Upon special request, the rate of assessment may be partially abated over the initial five (5)-year period following subdivision approval. This abatement is to allow developers time to sell individual lots without creating an undue strain on cash flow during the early phases of development. Beginning with the fifth (5th) year of the schedule, the assessment is collected at the full rate. Generally, using this assessment schedule where payments in the first five (5) years are partially abated, it requires between nine (9) and ten (10) years to reach its maximum balance, provided no monies have been withdrawn. Requests for abatement must be presented to the Knox County Regional Planning Commission for consideration and dispensation as follows:

Year	Typical Storm Water Maintenance Fund Assessment Schedule	Special Abated Storm Water Maintenance Fund Assessment Schedule
Year 1	100% of Total Annual Assessment	5% of Total Annual Assessment
Year 2	100% of Total Annual Assessment	10% of Total annual Assessment
Year 3	100% of Total Annual Assessment	25% of Total annual Assessment
Year 4	100% of Total Annual Assessment	50% of Total annual Assessment
Year 5	100% of Total Annual Assessment	100% of Total Annual Assessment
Year 6	100% of Total Annual Assessment	100% of Total Annual Assessment
Year 7-10		100% of Total Annual Assessment

4.07[A] - Storm Water Administrator Plan Review:

The Storm Water Management and Sediment Control (SWM/SC) Plan shall be submitted to the Storm Water Administrator, after acceptance of the preliminary plan by the Knox County Regional Planning Commission, along with the concurrent submittal of construction drawings to the Knox County Engineer. Approval of the SWM/SC Plan shall be a condition, precedent to final plat approval by the Knox County Regional Planning Commission. No

earth-disturbing activities shall commence, until the final plat has been approved by the Knox County Planning Commission.

Within fifteen (15) days of receipt of a SWM/SC Plan, the Storm Water Administrator shall convey to the owner, or his appointed representative, the plan's status as to its compliance or non-compliance. A ruling of noncompliance shall include specific plan deficiencies, as well as the procedures for filing a revised plan.

At the time a revised plan is submitted, a new fifteen (15)-day period begins. All approved plans shall remain valid for two (2) years from date of approval.

4.08[A] - Inspection and Compliance:

If, in the opinion of the Storm Water Administrator, immediate and irreparable damage will occur, because of a violation, he/she may approach the Commissioners for their consideration, without delay.

If the Commissioners determine that a violation does exist, and seeks recourse, in writing, through the County Prosecuting Attorney, the Prosecuting Attorney shall seek an injunction, or some other appropriate relief, in order to abate excessive erosion, or sedimentation, and thereby secure compliance with these regulations (refer to §307.79 of the Ohio Revised Code). In granting relief, the court may order construction of sediment control improvements, or the implementation of other control measures.

A final inspection will then be made, to determine if the criteria of these regulations have been satisfied. A timely final report shall be sent to the Commissioners relevant to the status of compliance, or non-compliance.

4.09[A] - Variance:

The duly appointed Appeals Board may grant a variance to these regulations whenever an owner, or his appointed representative, can show evidence that a hardship exists, whereby, compliance with these regulations is not appropriate, based upon the following:

- A. That exceptional and/or unusual topographic or other physical conditions exist that are peculiar to the particular parcel of land.
- B. That the peculiar conditions, noted in paragraph 4.09[A], subparagraph A. above, did not result from any previous action by the owner.

- C. That such a literal interpretation of these regulations would deprive the owner of rights that are enjoyed by other property owners.

PLEASE NOTE: Adverse economic conditions shall not be considered a valid reason, or hardship, for a variance request to be granted. No variances will be granted, where activities occur that would defeat the purpose of these regulations. Requests for a variance should be submitted to the Storm Water Administrator, stating the specific variances being sought, and including sufficient data to justify the granting of such variances.

4.10[A] - Performance Guarantees:

- A. Any person submitting an application for a Storm Water Management and Sediment Control Plan under paragraphs 4.02[A], 4.04[A] or 4.05[A] herein of these regulations shall submit, as a condition of its approval, a performance bond in an amount equal to one hundred percent (100%) of the estimated construction costs of the improvements to guarantee that they will be constructed in accordance with the plan and these regulations. The bond shall be issued by an insurance company or surety company licensed to do business in the State of Ohio (or other surety who submits evidence of assets equal to or in excess of the amount of the bond). The amount of the bond shall be approved by the County Engineer and the form of the bond by the County Prosecuting Attorney.
- B. In lieu of the performance bond required by paragraph 4.10[A], subparagraph A. above, the applicant may submit an irrevocable letter of credit equal to one hundred percent (100%) of the estimated construction cost drawn on a commercial or savings bank or savings association authorized to do business in the State of Ohio, which agrees to honor the requests for payment by the Knox County Commissioners as beneficiary upon submission of documentary evidence that the improvements have not been constructed in accordance with the plan and these regulations. The amount of the letter of credit shall be approved by the County Engineer and the form of the letter of credit shall be approved by the County Prosecuting Attorney.

APPENDIX [A].

KNOX COUNTY STORM WATER MANAGEMENT & SEDIMENT CONTROL REGULATIONS ARTICLE 5. FEES, PENALTIES & APPEALS

5.01[A] - Fees:

The Storm Water Management and Sedimentation Control Plan Review and Filing Fee Schedule are separate documents. The current schedule, as adopted by the Knox County Commissioners, should be requested from the Knox Regional Planning Commission.

Plan review fees and inspection fees for subdivisions and planned unit developments are included in the fee schedule prescribed by the Knox County Subdivision Regulations.

5.02[A] - Penalties:

5.02.1[A] - For Violation of Section 4.01[A]; Failure to Obtain a Storm Water Management Permit:

- A. First Offense - Warning letter providing ten (10) days to obtain a permit.
- B. Second Offense – Warning letter providing ten (10) days to obtain a permit and a fine of one hundred dollars (\$100.00).
- C. Subsequent Offenses – Warning letter providing ten (10) days to obtain a permit and a fine of up to five hundred dollars (\$500.00).
- D. In any case, the Storm Water Administrator may issue a stop-work order if a building is involved.

5.02.2[A] - For Violation of Section 4.07[A]; Failure to Provide a Storm Water Management Plan:

- A. First Offense - Notice of Violation including orders to stop work until the plan is approved, and requiring immediate remediation of

earthdisturbing activities. Remediation shall take place as soon as possible, weather permitting.

- B. If violator fails to begin appropriate action, the matter will then be referred for legal action, which shall include a fine of up to five hundred dollars (\$500.00).

5.02.3[A] - For Modification of an Existing Storm Water Management Facility or Public Watercourse, Without Prior Approval of the Storm Water Administrator:

- A. First Offense – Notice of violation with orders to take corrective action including the imposition of the provisions of Section 5.02.5[A] and a fine of one hundred dollars (\$100.00).
- B. Second or Subsequent Offenses - Notice of violation with orders to take corrective action including the imposition of the provisions of 5.02.5[A] and a fine of up to five hundred dollars (\$500.00).

5.02.4[A] - Any Person Who Fails to Maintain a Temporary Silt Control Facility, as Agreed Upon or as Shown in the Plans, Shall be Fined as Follows:

- A. First Offense – Warning letter – Ordering an immediate stop of all work and remediation as soon as possible, weather permitting.
- B. Second or Subsequent Offenses – Warning letter - Indicating that the matter is being turned over to legal counsel and a fine of up to five hundred dollars (\$500.00).

5.02.5[A] - In Addition to the Fines Imposed in Paragraph 5.02.3[A] Above, the Owner/Developer/Builder allowing the Discharge of Silt-Bearing Water Shall Perform the Following:

- A. Correct the offending condition within twenty-four (24) hours, by repairing, rebuilding, or by augmenting the prevention measures intended to control storm water and carry it from the project site, AND
- B. In the case of damage to private property, the Owner/Developer/Builder shall make arrangements with the owner whose property has been damaged, to correct the offending condition to the satisfaction of the owner or the Storm Water Administrator. Written confirmation, listing the corrective measures to be taken, must be provided to the Storm Water Administrator, OR

- C. In the case of damage to public property, such as: roads, ditches, utilities, or any other property that is owned by the State, County, Township, or Municipality, it is required that the Owner/Developer/Builder remove, or otherwise clean up the offending material, to the full satisfaction of the public authority.

Should the Owner/Developer/Builder of Projects, causing damage to private or public property by the uncontrolled discharge of silt and/or storm water, fail to correct the problem as soon as possible, weather permitting, as directed by the storm water administrator, corrective action will be taken by the governing public authority with all costs being assessed to the permit holder.

5.03[A] - Actions by the Board of Commissioners:

The Board of County Commissioners may order removal of any obstruction to a public watercourse, including public storm water management facilities, in accordance with the requirements of §6151.14 of the Ohio Revised Code.

The cost of removal of such obstructions shall be paid as follows:

- A. Obstructions considered acts of nature or due to normal deterioration of the storm water facility shall be paid from the maintenance fund for the watercourse in question.
- B. Obstructions in watercourses without maintenance funds shall be the responsibility of the property owner.
- C. Obstructions placed and caused to exist by the property owner shall be removed by the County with the cost paid from the general fund of the County. The amount so paid, along with a fifty percent (50%) penalty shall be assessed against the owner(s) of the property.

The owner of property on which obstructions to a watercourse exist, as mentioned in paragraph 5.03[A], subparagraph C. above, shall be given thirty (30) days notice to remove said obstruction to the watercourse.

5.04[A] - Appeals:

Any person, who is aggrieved by any order, requirement, determination, or other action relative to these regulations, may appeal to the County Commissioners' duly appointed Appeals Board and ultimately the Court of Common Pleas.

An appeal to any regulatory action brought against person/persons by the Storm Water Administrator must be filed within thirty (30) days of the date of receipt, in the office of the Knox County Regional Planning Commission at 117 East High Street, Suite 221, Mount Vernon, Ohio 43050. Application for Appeal must be made on a form provided by the Regional Planning Commission and must be accompanied by any applicable fees as established by the Board of County Commissioners.

Applications for Appeal that are duly received by the Regional Planning Commission with applicable fees paid, shall receive a hearing by the Appeals Board within 30 days of receipt by the Planning Commission.

A verbatim record of the hearing shall be made with all testimony taken under oath. The applicant shall have the right to present witnesses and evidence and to cross-examine witnesses that testify adversely to his/her position.

The Appeals Board shall render its decision within thirty (30) days of the conclusion of the Appeals hearing.

Appeals to decisions of the Board of Appeals for Storm Water Management shall be in accordance with the Ohio Revised Code Chapter 2506. (Amended 9/2011)

APPENDIX [B].

THE KNOX COUNTY ENGINEERING AND SURVEYING
STANDARDS
FOR SUBDIVISION DEVELOPMENT

ARTICLE 1.

GENERAL CONSIDERATION

1.01[B] - Purpose:

- A. The purpose of these rules, guidelines, and standards as adopted by the Knox County Board of Commissioners, hereinafter referred to as the “Board of County Commissioners”, is to provide engineering and surveying standards for subdivision development in Knox County, Ohio, and to define the minimum requirements for surveying, engineering, construction, and erosion and sedimentation control as applied to land development.
- B. There shall be no variance from these rules, guidelines, and standards without the written consent of the Board of County Commissioners, based on the recommendations of the Knox County Engineer.

1.02[B] - Title:

These rules, guidelines and standards shall be known as and may be cited and referred to as “THE KNOX COUNTY ENGINEERING AND SURVEYING STANDARDS FOR SUBDIVISION DEVELOPMENT”, and shall hereinafter be referred to as these “Standards”.

1.03[B] - Authority:

The County Commissions are authorized to adopt general rules and regulations setting standards and requiring and securing the construction of improvements shown on the plats and plans within their jurisdiction by virtue of §711 of the Ohio Revised Code.

1.04[B] - Jurisdiction:

These Standards shall be applicable to all subdivisions hereinafter made of land within the unincorporated areas of Knox County.

1.05[B] - Interpretation of Text:

In the interpretation and application of the provisions of these Standards, they shall be held to be minimum requirements. It is not intended by these Standards to interfere with, or abrogate or annul any easement, covenant, or other agreement between parties unless they violate these Standards. When two (2) specific provisions of these Standards conflict with each other, or when a provision of these Standards conflicts with any other lawfully adopted rule, regulation, standard, ordinance, or resolution, the most restrictive, or that imposing the higher standard shall apply.

1.06[B] - Administration:

These Standards shall be administered by the Knox County Engineer, hereinafter referred to as the "County Engineer", for the County Commissioners.

1.07[B] - Adoption:

These Standards shall become effective after:

- A. The necessary public hearings;
- B. Adoption by the County Commissioners, and
- C. Certification by the Knox County Recorder in accordance with §711.101 of the Ohio Revised Code.

1.08[B] - Amendments:

These Standards may be amended in accordance with the same procedure as stated in Section 1.07[B] of these Standards.

1.09[B] - Separability:

The invalidation of any clause, sentence, paragraph, or section of these Standards by a Court of competent jurisdiction shall not effect the validity of the remainder of these Standards, either in whole or in part.

1.10[B] - Interpretation of Terms:

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

- A. The word “person” includes a firm, association, organization, partnership, trust, company, or corporation as well as an individual.
- B. The word “shall” is a mandatory requirement, the word “may” is a permissive requirement and the word “should” is a preferred requirement.
- C. The present tense includes the future tense, the singular number includes the plural, and the plural number includes the singular.

1.11[B] - Definitions:

As used herein:

“A.D.T.” - means average daily traffic.

“County” - means Knox County, State of Ohio.

“County Commissioners” - means the Board of Knox County Commissioners, or its designated representative.

“County Engineer” - means the Knox County Engineer, or his designated representative.

“County Water and Sewer Superintendent” - means the Knox County Water and Sewer Superintendent or his designated representative.

“Developer” - (See “Subdivider”).

“Easement” - means a grant by the property owner for the use of a strip of land by the public, a corporation or another person for specific purposes.

“O.D.N.R.” - means the Ohio Department of Natural Resources.

“O.D.O.T.” - means the Ohio Department of Transportation.

“O.R.C.” - means the Ohio Revised Code.

“Performance Bond” - means an agreement by a Subdivider with Knox County for the amount of the estimated construction cost guaranteeing the completion of physical improvements according to the plans and specifications within the time prescribed by the Subdivider’s agreement.

“Planning Commission” - means the Knox County Regional Planning Commission, or its designated representative.

“Professional Engineer” - means a registered engineer, authorized to practice professional engineering by the Ohio State Board of Registration, as specified under §4733 (Adm. Code) Ohio Revised Code.

“Professional Surveyor” - means a registered surveyor, authorized to practice professional surveying by the Ohio State Board of Registration, as specified under §4733 (Adm. Code) Ohio Revised Code.

“Public Utility” - means any firm, corporation, governmental agency, or board having a Public Utility Commission permit to furnish to the public, under regulations, electricity, gas, sewer, telephone, transportation, water, or other similar public services.

“Street, Public” - means a right-of-way, dedicated to public use, which provides vehicular and pedestrian access to adjacent properties.

“Subdivider” - means any individual, developer, firm, association, syndicate, partnership, corporation, trust, or any other legal entity commencing proceedings under these Standards to effect a subdivision of land hereunder for himself or for another.

“Variance” - means a modification of the strict terms of the relevant standards where such modification will not be contrary to public interest and where owing to conditions peculiar to the subject property and not the result of the action of the applicant and a literal enforcement of the Standards would result in unnecessary and undue hardship. Said variance shall be granted by the County Commissioners upon recommendation by the County Engineer.

1.12[B] - Review:

Any requests for a review of the text of these standards shall be made in writing to the County Commissioners with the reason for the review being so stated. Any such request will be reviewed by the County Commissioners and if they feel it is necessary, they will conduct a public hearing.

APPENDIX [B].

ARTICLE 2.

CONSTRUCTION PROCEDURE AND MATERIALS

2.01[B] - Construction Procedure and Materials:

- A. The subdivider shall design and construct improvements not less than the standards outlined in these regulations. The work shall be done under Knox County supervision and shall be completed within the time fixed or agreed upon by the Knox County Board of Commissioners.
- B. It is the responsibility of the developer and his engineer to investigate local conditions that may require additional improvements.

2.02[B] - Pre-Construction Meeting:

A pre-construction meeting with the Knox County Engineer is required. The subdivider and his contractor shall be present at the meeting.

2.03[B] - Materials:

All work and materials shall conform to the Ohio Department of Transportation, Construction and Material Specifications as amended to date, and to the Standards and Specifications of Knox County, Ohio. Ohio Department of Transportation Standards are acceptable and may be required at the discretion of the County Engineer.

2.04[B] - Street Subgrade:

- A. The subgrade shall be free of sod, vegetative or organic matter, soft clay, and other objectionable materials for a depth of at least two (2) feet below the finished surface. The subgrade shall be properly rolled, shaped, and compacted, and shall be subject to the approval of the Knox County Engineer.
- B. The presence of groundwater may necessitate the use of subdrains, and poor subgrade material may require the use of subbase material.

2.05[B] - Inspections:

- A. Inspections during the installation of improvements may be made by an approved independent testing laboratory, or the design consulting engineer, to ensure conformity with the approved plans and specifications as required by these regulations. The items that may require inspection are as follows:
1. Storm drainage and sanitary sewers improvements and appurtenances.
 2. 304 or 301 base thickness and tack coat (by measurement of cores, or other accepted means).
 3. 448 - Type 1, 2 asphaltic concrete thickness (by measurement, cores or other accepted means).
 4. Utility excavation, granular backfill.
 5. Monument and lot corner pin placement, (verification).
- B. If during construction or within the maintenance period, deficiencies occur in design, workmanship, or materials, the Knox County Board of Commissioners reserves the right to require additional improvements.

2.06[B] - Testing:

- A. To ensure compliance with the construction and material specifications, testing may be required to be performed by an approved independent testing laboratory. The following items “may” be tested to ensure compliance:
1. Subgrade compaction one hundred percent (100%).
 2. 304 or 301 base material.
 3. 448 asphaltic concrete material.
 4. Curb/gutter and sidewalk [cylinders every fifty (50) yards].
- B. Inspection and test reports, if requested by the County Engineer, shall be in writing with copies to the County Engineer's Office. The reports shall clearly identify the subdivision name, the location of applicable test areas, and street names.

2.07[B] - Responsibility:

The work shall be under the control and supervision of the subdivider until final acceptance is given by the Knox County Engineer.

2.08[B] - Final Inspection:

Upon completion of all the improvements the subdivider shall request, in writing, a final inspection by the Knox County Engineer and/or Knox County Sanitary Engineer as required under §711.091 of the Ohio Revised Code.

APPENDIX [B].

ARTICLE 3.

SUBMISSION OF PLANS

3.01[B] - Plans and Profiles:

- A. Complete plans and profiles, signed and approved by a registered engineer, shall be made for all new streets and other improvements to be constructed in any subdivision subject to these regulations. Three (3) sets of prints of the plans and profiles and estimated quantities shall be filed with the Secretary to the Knox County Regional Planning Commission, who shall forward two (2) sets to the Knox County Engineer.
- B. The plan and profile shall be on twenty-two inch by thirty-six inch (22" x 36") plan profile sheets, or a size approved by the Knox County Engineer and/or a size approved by the Knox County Sanitary Engineer. Plans and profiles shall show all necessary data in sufficient detail for the complete construction of all work and improvements to be made in the plat.
- C. All grade elevations shall be based on United States Geological Survey data.
- D. More specifically, all plans and profiles shall show and include the following items:

<u>GENERAL</u>	
<u>Plan</u>	<u>Profile</u>
1. Show all proposed lots, streets, curbs, etc.	1. Existing centerline and proposed top of curb profiles.
2. Existing pavements, headwalls, piers, etc.	2. Centerline stations.

<u>GENERAL CONTINUED</u>	
<u>Plan</u>	<u>Profile</u>
3. Typical street and curb sections	3. Curb elevations at minimum fifty (50) foot stations
4. Construction notes	4. Label proposed centerline and top of curb profile
5. Structural details	5. Profile of sewers and utilities in easements through lots
6. North arrow (preferably up or to the right)	6. Stations and centerline elevations of intersecting streets
7. Street names	7. Label "curb elevations intersecting streets"
8. Centerline stations (south to north and west to east) where possible)	8. Insert title box in lower right corner
9. Easements for utilities and storm drainage	
10. Pavement and right-of-way widths	
11. Lot numbers and dimensions	
12. Curb radius at intersections (if not covered in notes)	

<u>GENERAL</u>	
<u>Plan</u>	<u>Profile</u>
13. Curve data; station of PC, PT, PCC	
14. Sheet reference	
15. Plat section lines (boundary lines); show stations	
16. Dimension utility locations. Location and/or statement of adequate outlet for storm sewer as approved by the Knox County Engineer	

<u>STORM SEWER</u>	
<u>Plan</u>	<u>Profile</u>
1. Show proposed storm sewers, manholes, laterals, catch basins, headwalls, etc.	1. Show length of span, size, grade and class of pipe
2. Label each span (length and pipe size)	2. Label storm water manholes, junction boxes, etc. and show centerline of streets and stations for each.
3. Station low points of grade and manholes	3. Show invert elevations of all pipe at manholes, headwalls, junction boxes, etc., except laterals to catch basins
	4. Show elevation on top of manhole or catch basin, when not in paved street or when in vertical curved portion of street

3.02[B] - Approval of Plans:

- A. Construction drawings are to be approved, signed and dated by the Knox County Engineer. If a minimum of twenty-five percent (25%) of the bonded amount of construction has not taken place within a period of one (1) year from his plan approval date, the approval shall be void and re-approval shall be required.
- B. Construction drawings shall be approved prior to the approval of a final plat.

APPENDIX [B].

ARTICLE 4.

INSTALLATION/BONDING OF IMPROVEMENTS

4.01[B] - Bond for Installation of Improvements:

- A. In order that Knox County has the assurance that the construction and installation of improvements will be completed, the subdivider shall enter into one (1) of the following agreements:
1. To construct all improvements directly affecting the subdivision, as required by the Knox County Board of Commissioners, prior to the approval of a final plat; or
 2. In lieu of the completion of the improvements, to execute a performance bond or surety bond, certified check, escrow account, letter of credit or other means of security with the Knox County Board of Commissioners equal to the cost of construction of the uncompleted improvements, plus thirty percent (30%) of such uncompleted improvements as shown on plans, and based on an estimate approved by the Knox County Engineer.
- B. The following improvements shall be installed, constructed or bonded: earthwork, landscape restoration, new streets, improvements to existing streets, sidewalks and other walkways/bicycle paths, storm water drainage facilities, monuments and lot corner pins, facilities, and waste water facilities.

4.02[B] - Conditions:

- A. The security shall run to Knox County for a period not to exceed two (2) years, as determined by the Knox County Engineer from date of execution, and shall provide that the subdivider, his heirs, successors or assigns, their agents or servants, will comply with all applicable terms, conditions, provisions and requirements of these regulations, and will faithfully perform and complete the work of constructing and installing such facilities or improvements in accordance with such laws and regulations. Sidewalks may be bonded separately and for a period of up to three (3) years or until such time as eighty percent (80%) of the development in the subdivision is completed.

- B. Before said security is accepted, it shall be approved by the proper administrative officials.
- C. Whenever a cash deposit is made, the same shall be made to the County Treasurer of Knox County.
- D. Preceding the acceptance of the developer's security, an itemized list of materials and their cost shall be submitted to the Knox County Engineer. Construction cost estimates shall reflect realistic and current bid prices.

4.03[B] - Completion of Work:

As required improvements are completed, approved, and accepted, the Knox County Board of County Commissioners may, with the concurrence of the Knox County Engineer, reduce the amount of the security.

4.04[B] - Maintenance Bond:

Upon acceptable completion of installation of the required improvements, the subdivider shall execute a maintenance bond or certified check, escrow account, letter of credit or other means of security with the Board of County Commissioners equaling ten percent (10%) of the cost of construction. At the end of the two (2)-year maintenance period, the Knox County Engineer shall issue a letter to the Board of County Commissioners, and such letter shall be sufficient evidence for the release of the security by Knox County.

4.05[B] - Acceptance:

When the proper administrative officials, following final inspection of a subdivision, certify to the Knox County Board of Commissioners, that all improvements have been constructed in accordance with County specifications, the Knox County Board of Commissioners may proceed to accept the facilities for which the security was posted.

4.06[B] - Failure to Comply:

Whenever public improvements have not been constructed in accordance with the agreement, and with specifications as established, the Knox County Board of Commissioners may exercise its rights of foreclosure under the security agreement.

APPENDIX [B].

ARTICLE 5.

SUBDIVISION DESIGN STANDARDS

5.01[B] - General:

The regulations in Sections 5.01[B] through 5.12[B], inclusive, shall control the manner in which streets, lots, and other elements of a subdivision are arranged on the land. These design controls shall help ensure convenient and safe streets, creation of useable lots, provisions of space for public utilities, and reservation of land for recreational and other public purposes. The planning of attractive and functional neighborhoods shall be promoted, minimizing the undesirable features of unplanned, haphazard growth.

5.02[B] - Conformity to Development Plans and Zoning:

The arrangement, character, width, and location of all thoroughfares or extensions thereof shall conform with the Comprehensive Plan and Thoroughfare Plan. Thoroughfares not contained in the aforementioned plan shall conform to the recommendation of the KCRPC based upon the design standards set forth in Sections 5.02[B] to 5.12[B], inclusive. In addition, no final plat of land within the areas in which an existing zoning resolution is in effect shall be approved unless it conforms with such resolution.

5.03[B] - Suitability of Land:

If the KCRPC finds that land proposed to be subdivided is unsuitable for subdivision development due to flooding, poor drainage, topography, inadequate water supply and/or inadequate waste water treatment facilities, schools, transportation facilities, or other such conditions which may be detrimental to public health and safety; and, if from investigations conducted by the public agencies concerned, it is determined that in the best interest of the public the land should not be developed for the subdivision proposed, the KCRPC shall not approve the land for said purpose unless adequate methods are advanced by the subdivider for solving the problems that will be created by the development of the land.

5.04[B] - Street Design:

The arrangement, character, width, grade, construction, and location of all streets shall conform to the Thoroughfare Plan, or subsequent amendments thereto in effect at the time of approval of the final plat for a subdivision, and shall be considered in relation to existing and planned streets, topographical conditions, public convenience and safety, and the proposed uses of the land to be served by such streets. The street pattern shall discourage through traffic in the interior of a subdivision. The subdivider shall provide within the boundaries of the subdivision plat the necessary right-of-way for widening, continuance, or alignment of such streets in conformity with the Official Thoroughfare Plan.

5.05[B] - Street Classification:

Each street in a subdivision shall be classified and designed according to the following classification.

<u>STREET TYPE</u>	<u>FUNCTION/ DESCRIPTION</u>	<u>ADT (Range)</u>
Cul-de-sac	A street that has a single means of access and that terminates in a vehicular turn-around. Cul-de-sacs should be encouraged where feasible to the extent that they provide low traffic volumes and neighborhood identity . Lengths of cul-de-sacs are limited to minimize backup time for large service vehicles unable to use the turn-around, to minimize mistaking cul-de-sacs with connecting streets, and to discourage speeding.	Under 250
Minor	Local residential streets are the lowest order streets providing access to residential lots and carrying only the traffic generated by adjoining residential land uses. Residential subdivisions should be developed so that the maximum number of housing units have frontage on local residential and cul-de-sac streets.	200 - 1,000

<u>STREET TYPE</u>	<u>FUNCTION/ DESCRIPTION</u>	<u>ADT (Range)</u>
Collectors	Collectors distribute traffic between lower order residential streets and higher order arterials. Their purpose is primarily to promote free traffic flow, and direct access for adjoining lots should be limited where possible. Collectors should not be used for on-street parking, and may provide linkages to adjoining developments to improve circulation. Typically, existing County roads will be classified as collectors, and a new collector will be required when a residential subdivision reaches one hundred fifty (150) dwelling units, or an equivalent traffic generation.	1,000 - 3,000
Arterial	Arterials are major thoroughfares designed to carry traffic between municipalities and other activity centers and to provide connections with major state and interstate roadways. Typically, existing state routes will be classified as arterial.	Over 3,000

5.06[B] - Street Design Standards for Minor, Cul-de-sac, and Collector Streets:

The design and improvement standards contained herein are minimums for minor, cul-de-sac, and collector street types in residential subdivisions. All such streets shall be designed and constructed in accordance with standards as specified in Exhibit "1." - Street Design Standards (Appendix [B]. Article 5. Subdivision Design Standards). Cul-de-sacs shall be required whenever a street is intended to be permanently dead ended.

5.07[B] - Arterial Street Design Standards:

The design and improvement standards contained herein are minimums for all arterial streets. All such streets shall be designed and constructed in accordance with the standards as specified in Exhibit "1." - Street Design Standards (Appendix [B]. Article 5. - Subdivision Design Standards).

5.08[B] - Horizontal Alignment:

When there is an angle of deflection of more than ten degrees (10N) between two (2) centerline tangent sections of street, a curve of required radius shall connect them. Between reverse curves, a minimum tangent shall be introduced as indicated in Exhibit "1." - Street Design Standards (Appendix [B]. Article 5. - Subdivision Design Standards).

5.09[B] - Vertical Alignment:

Vertical alignment requirements for street types and intersections are as specified in Exhibit "1." - Street Design Standards (Appendix [B]. Article 5. Subdivision Design Standards). All changes in grades shall be connected by vertical curves of a minimum length in feet equal to thirty (30) times the algebraic difference in the rate of change of grade expressed in feet per one hundred (100) feet. Longer vertical curves shall be used when needed for sight distances as determined by the Knox County Engineer.

5.10[B] - Intersection Design Standards:

- A. The design and improvement standards for intersections are minimums for all street intersections in subdivisions. All such intersections shall be designed and constructed in accordance with the standards as specified in Exhibit "1." - Street Design Standards (Appendix [B], Article 5. Subdivision Design Standards).
- B. Multiple intersections involving junctions of more than two (2) streets shall be avoided.
- C. Four (4)-way intersections of local streets should be avoided and three (3)-way or T-intersections should be encouraged whenever possible.

5.11[B] - Special Street Types:

The following requirements shall apply to special street types:

- A. Permanent dead-end streets shall not be permitted. Temporary dead-end streets shall be permitted only as part of a continuing street plan. Where a street is temporarily dead-ended at a property line, a temporary turnaround may be required.
- B. Dedication of new half-streets shall not be permitted. Where a dedicated or platted half-street exists adjacent to the tract being subdivided, the other half shall be platted.

- C. Where a subdivision abuts or contains an existing or proposed arterial street [eighty (80) feet wide up to one hundred twenty (120) feet wide] right-of-way width), the KCRPC may require marginal access streets, reverse frontage with screen planting contained in a non-access reservation along the rear property line or other such treatment as may be necessary for adequate protection of residential properties and to afford separation of through and local traffic. There shall be no direct vehicular access from residential lots to such arterial streets or highways.
- D. Alleys shall not be approved in residential subdivisions except where justified by extreme conditions. Alleys may be required in commercial or industrial districts if other provisions cannot be made for adequate service access. The minimum widths for alleys shall be twenty (20) feet for the right-of-way and eighteen (18) feet for the pavement width.

5.12[B] - Streets for Commercial Subdivisions:

Streets serving business developments and accessory parking areas shall be planned to connect with arterial streets so as not to generate traffic on lower order streets. The intersections of driveways from parking areas with arterial or collector streets shall be located so as to cause the least possible interference with traffic movement on the streets and shall be located not less than two hundred (200) feet from each other. The KCRPC may require a marginal, access street to provide maximum safety and convenience.

5.13[B] - Streets for Industrial Subdivisions:

Public streets in areas to be developed as industrial subdivisions shall be designed as collector streets. Collector streets for industrial subdivisions shall be planned to serve industrial areas exclusively and shall connect with other collector or arterial streets so that no industrial traffic will be directed into local streets. The intersections of service streets from parking areas with arterial or collector streets shall not be less than one hundred (100) feet from the intersection of the arterial or collector street with any other street. Location of curb cuts shall be approved by the KCRPC. Design and construction standards relating to required pavement thickness and base, right-of-way width, or geometrics may be increased by the KCRPC upon the recommendation by the Knox County Engineer, depending upon the nature of the development and characteristics of expected traffic or average daily traffic (ADT).

APPENDIX [B].

ARTICLE 5. SUBDIVISION DESIGN STANDARDS

Exhibit "1." - STREET DESIGN STANDARDS

(Tables I, II, III, & IV as follows)

<p style="text-align: center;"><u>TABLE I.</u> <u>STREET DESIGN STANDARDS FOR</u> <u>MINOR, COLLECTOR, AND CUL-DE-SAC STREETS</u></p>	
<u>DESIGN ELEMENT</u>	<u>DIMENSIONS</u>
Right-of-way (feet) Curb & Gutter Uncurbed	60 feet* 60 feet*
Pavement Width (feet): Curb & Gutter	32 feet (curb face to curb face, consisting of two 10' lanes & one 9' parking lane & two 1.5' gutters)
Pavement Width (feet): Uncurbed	20 feet (two 10' lanes)
Sidewalk Width (when required)	4 feet
Minimum Stopping Sight Distance (25 mph design speed)	150 feet
Maximum Grade	10%
Minimum Radius of Centerline in feet	150 feet
Maximum Cul-de-sac Length	600 feet
Minimum Cul-de-sac Bulb Radius (right-of-way)	75 feet
Minimum Cul-de-sac Bulb Radius (pavement)	55 feet uncurbed 55 feet curbed

TABLE I.
STREET DESIGN STANDARDS FOR
MINOR, COLLECTOR, AND CUL-DE-SAC STREETS

<u>DESIGN ELEMENT</u>	<u>DIMENSIONS</u>
Maximum grade within fifty (50) feet of an intersection	5%
Minimum grade	0.5%
Minimum tangent length between reverse curves	50 feet
Minimum curb radii	25 feet
* A utility easement ten (10) feet in width may be required along each side of the street rightof-way.	
<p><u>NOTE:</u> Hillside lots with grades of more than fifteen percent (15%) are subject to exceptions. The necessity of guard rail, seeding, backfill, or other special provisions shall be determined by the Knox County Engineer.</p>	

TABLE II.
STREET DESIGN STANDARDS FOR ARTERIAL
STREETS

<u>DESIGN ELEMENT</u>	<u>DIMENSIONS</u>
Right-of-Way (feet)	80 feet
Pavement Width (feet) Curb and Gutter	36 feet (curb face to curb face) (2 - 18' lanes)
Sidewalk Width (when required)	4 feet
Minimum Stopping Sight Distance	200 feet
Maximum Grade	7%
Minimum Radius of Centerline	575 feet
Maximum grade within fifty (50) feet of an intersection	3%
Minimum grade	0.5%
Minimum tangent length between reversing curves	250 feet
Minimum curb radii	35 feet
NOTE: Hillside lots with grades of more than fifteen (15%) are subject to exceptions. The necessity of guard rail, seeding, backfill, or other special provisions shall be determined by the Knox County Engineer.	

TABLE III.
INTERSECTION DESIGN STANDARDS

<u>DESIGN ELEMENT</u>	<u>STANDARDS</u>	
Maximum Approach speed	25 mph	
Minimum Angle of Intersection	75 degrees and street shall remain in the angle of intersection for at least 100 feet beyond the point of intersection.	
Minimum Centerline Offset of Adjacent Intersections a. Minor - Minor b. Minor - Collector c. Minor - Arterial d. Collector - Arterial	175 feet 250 feet 300 feet 1,320 feet	
Minimum Intersections Stopping Sight Distance	<u>SPEED</u> 55 MPH 50 MPH 45 MPH 40 MPH 35 MPH 30 MPH 25 MPH	<u>MIN. SSD.</u> 400 feet 350 feet 315 feet 275 feet 240 feet 200 feet 200 feet

TABLE IV.
PAVEMENT DESIGN GUIDE
TYPICAL SECTION: PAVEMENT DESIGN

MINOR, CUL-DE-SAC, COLLECTOR

A. <u>BASE:</u>	<p>A. <u>Preferred:</u> Five (5) inches of Item 301 Bituminous Aggregate Base</p> <p>1.A. <u>Alternate:</u> Eight (8) inches of Item 304 Aggregate Base - Compacted</p>
B. <u>PAVEMENT ITEMS:</u>	<ol style="list-style-type: none"> 1. 2. <u>Prime Coat</u> - Item 408, 0.5 gallons per square yard <u>Tack Coat</u> - Item 407, 0.05 gallons per square yard applied to Item 301 Bituminous Aggregate Base and to Item 448 - Type 2 Intermediate Course Asphaltic Concrete. For 1.A. above, applied only to Item 448 Type 2 3. <u>Intermediate Course</u> - Two and threequarters (2.75) inch of Item 448-Type 2 Asphaltic Concrete 4. <u>Final Course</u> - One and one-quarter (1.25) inch of Item 448-Type 1 Asphaltic Concrete
<u>ARTERIAL</u>	
A. <u>BASE:</u>	<ol style="list-style-type: none"> 1. 2. Four (4) inches of Item 304 Aggregate Base Compacted <u>Prime Coat</u> - Item 408, 0.5 gallons per square yard 3. Six (6) inches of Item 301 Bituminous Aggregate Base
B. <u>PAVEMENT ITEMS:</u>	<ol style="list-style-type: none"> 1. 2. <u>Tack Coat</u> - Item 407, 0.05 gallons per square yard <u>Intermediate Course</u> - Four (4) inches of Item 448-Type 2 Asphaltic Concrete 3. <u>Final Course</u> - Two (2) inches of Item 448-Type 1 Asphaltic Concrete

APPENDIX [B].

ARTICLE 6.

REQUIREMENTS FOR CONSTRUCTION OF IMPROVEMENTS

6.01[B] - Guarantee for Installation of Improvements:

All improvements required herein shall be constructed prior to the granting of the final plat approval by the KCRPC; or the subdivider shall furnish the County Commissioners with a surety bond or certified check for the amount of the estimated construction cost for the ultimate installation and initial maintenance of the improvements. The description of the bonding process is in Appendix [B]. Article 4. - Installation/Bonding of Improvements.

6.02[B] - Construction Procedure and Materials:

The subdivider shall design and construct improvements not less than the standards outlined in these regulations. The minimum requirements for materials shall be in accordance with the standards of the current volume of "*Construction and Materials Specifications*" of the State of Ohio Department of Transportation, and the current requirements of the Ohio Department of Health or Ohio Environmental Protection Agency.

6.03[B] - Monuments, Markers, and Pins:

Permanent markers shall be set according to the provisions of §711.03 of the Ohio Revised Code. The developer shall direct the surveyor to place and set at least four (4) permanent markers in each plat of ten (10) lots or less and in plats having more than ten (10) lots as many additional permanent markers as the surveyor deems necessary to properly control his original survey. In addition, at least one (1) monument box assembly shall be set on the centerline of any new street created for any subdivision or addition, and the surveyor shall place additional permanent markers in accordance with §711.03 of the Ohio Revised Code, or with the approval of the Knox County Engineer. When all or part of a subdivision is located within a federally designated floodplain, the developer shall direct and cause the surveyor to place and set at least one (1) benchmark tied to U.S.G.S. elevation data.

6.04[B] - Streets:

A. After the surface of the sub-grade has been prepared, shaped and compacted to the approximate cross section grade and before any pavement, base, or sub-base material is placed thereon, it shall be inspected by the Knox County Engineer. When notice of approval is received by the subdivider or contractor, he may proceed with the application of the base course provided that such application is inspected by the Knox County Engineer while same is being accomplished.

B. Street grading shall be graded, surfaced, and improved to the grades and dimensions shown on plans, profiles, and cross sections submitted by the subdivider and approved by the Knox County Engineer.

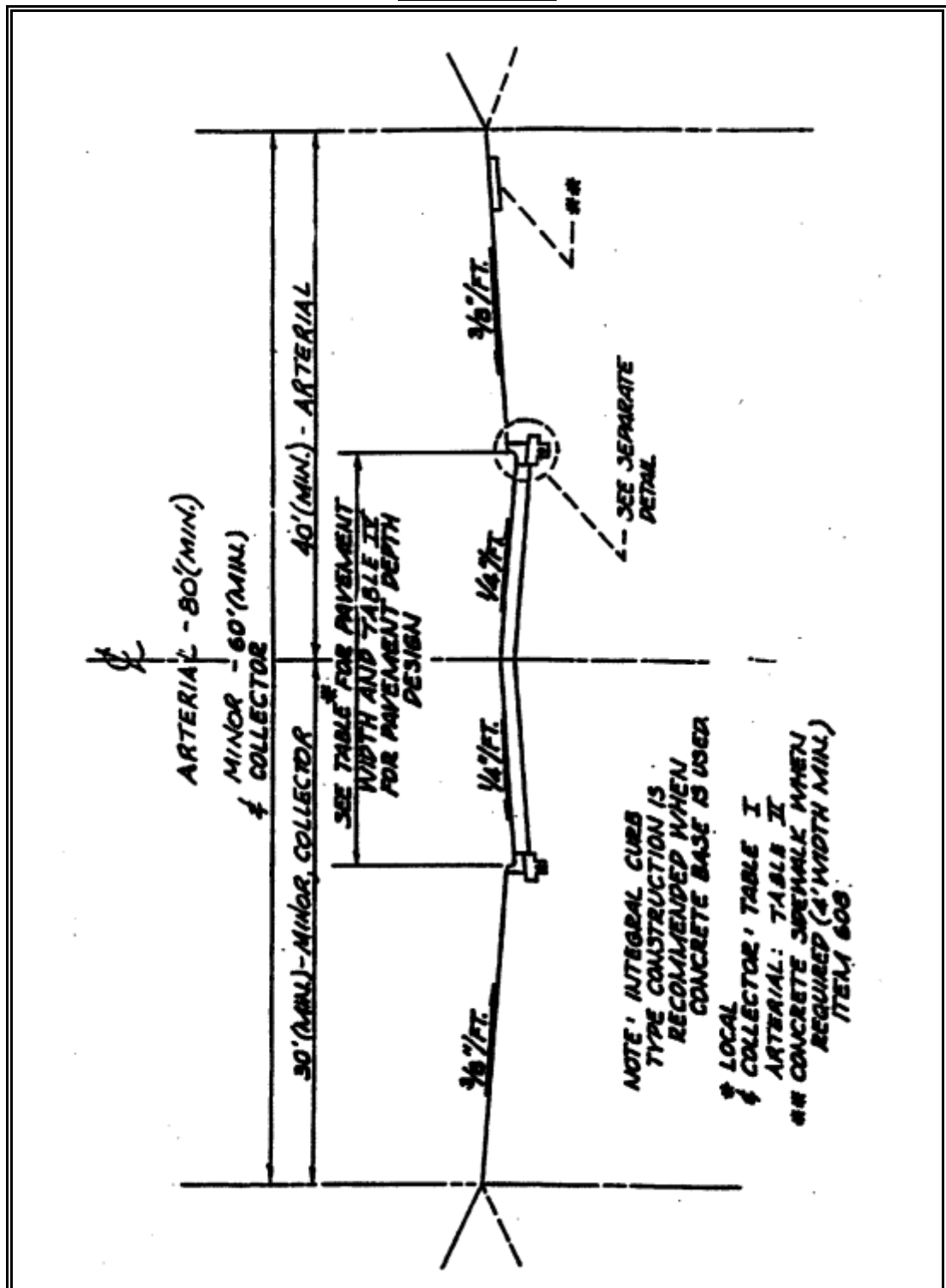
APPENDIX [B].

STANDARD DRAWINGS

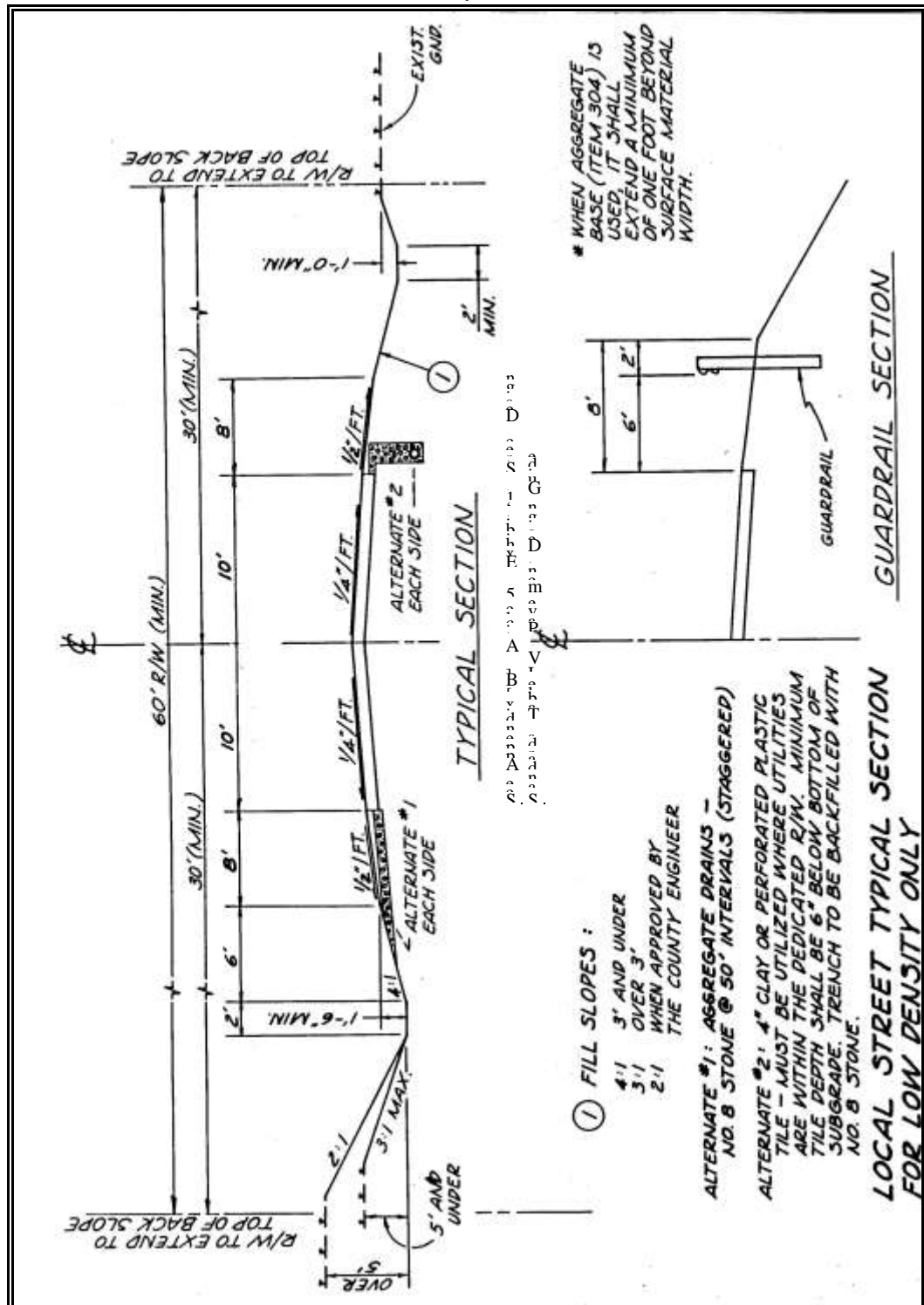
(DESIGN STANDARDS) Index

Street With Curb and Gutter Typical Section.....	B-25
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STREET WITH CURB & GUTTER TYPICAL SECTION

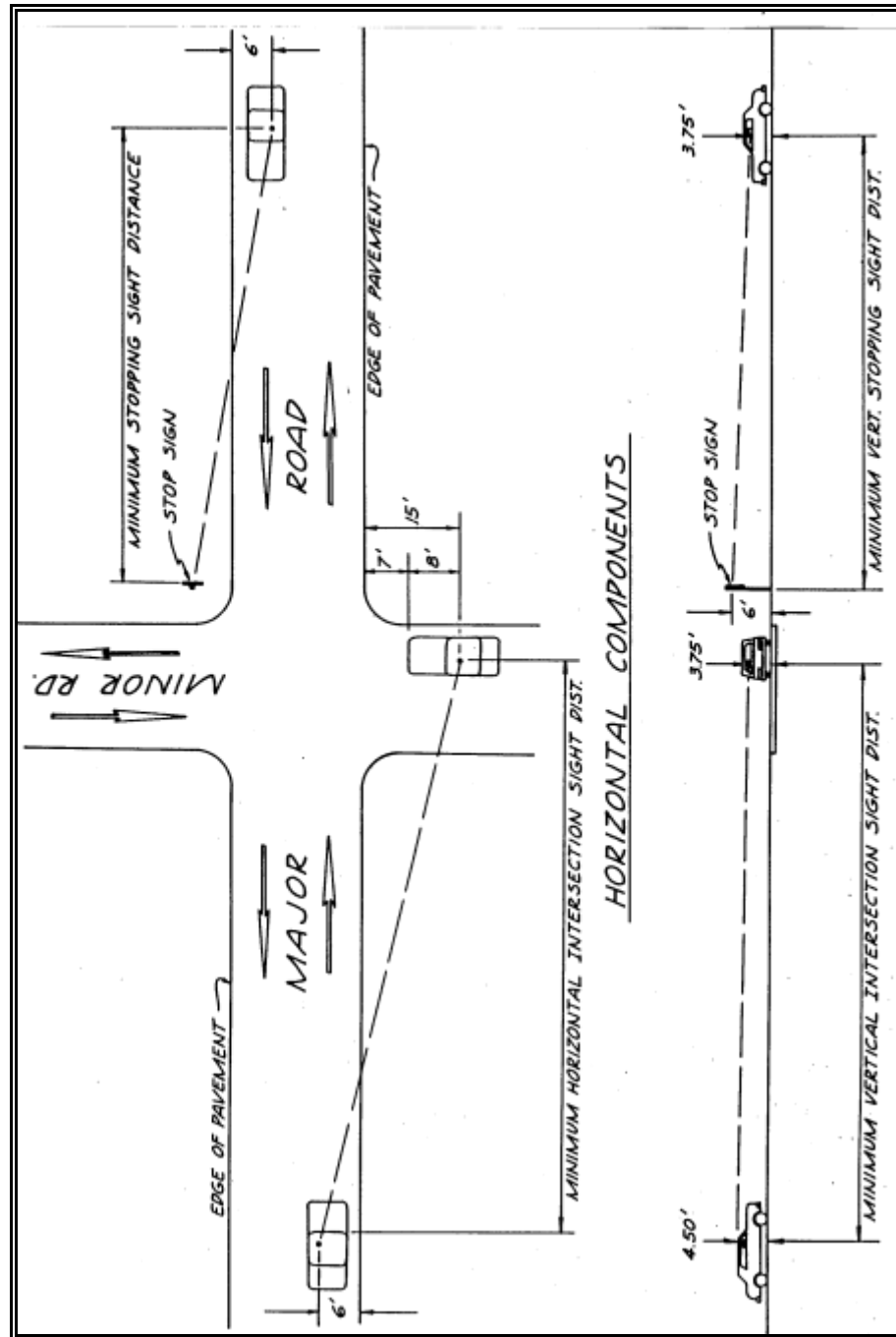


MINOR/COLLECTOR STREET TYPICAL SECTION LOW/MEDIUM DENSITY

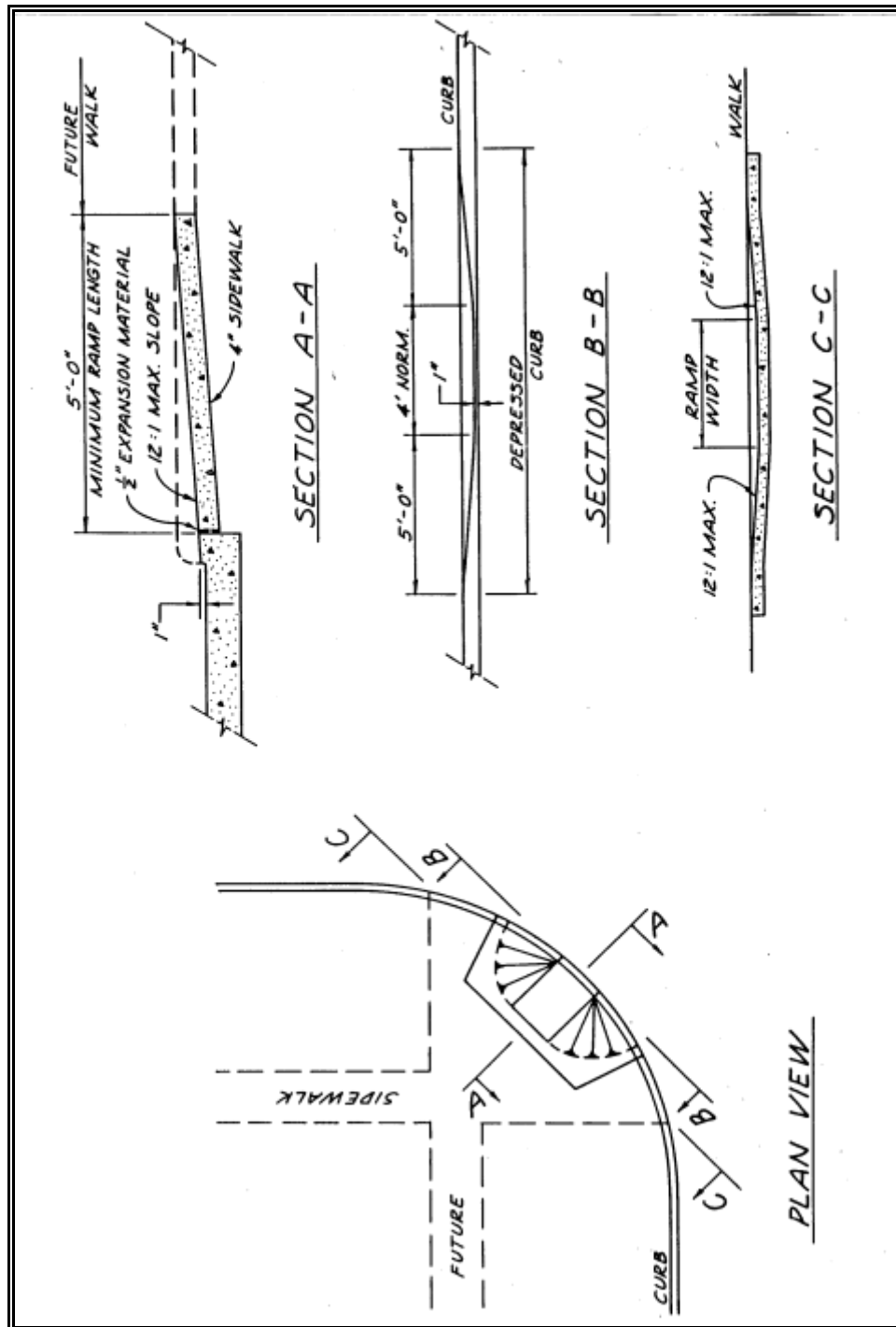


INTERSECTION SIGHT DISTANCE REQUIREMENTS

VERTICAL COMPONENTS

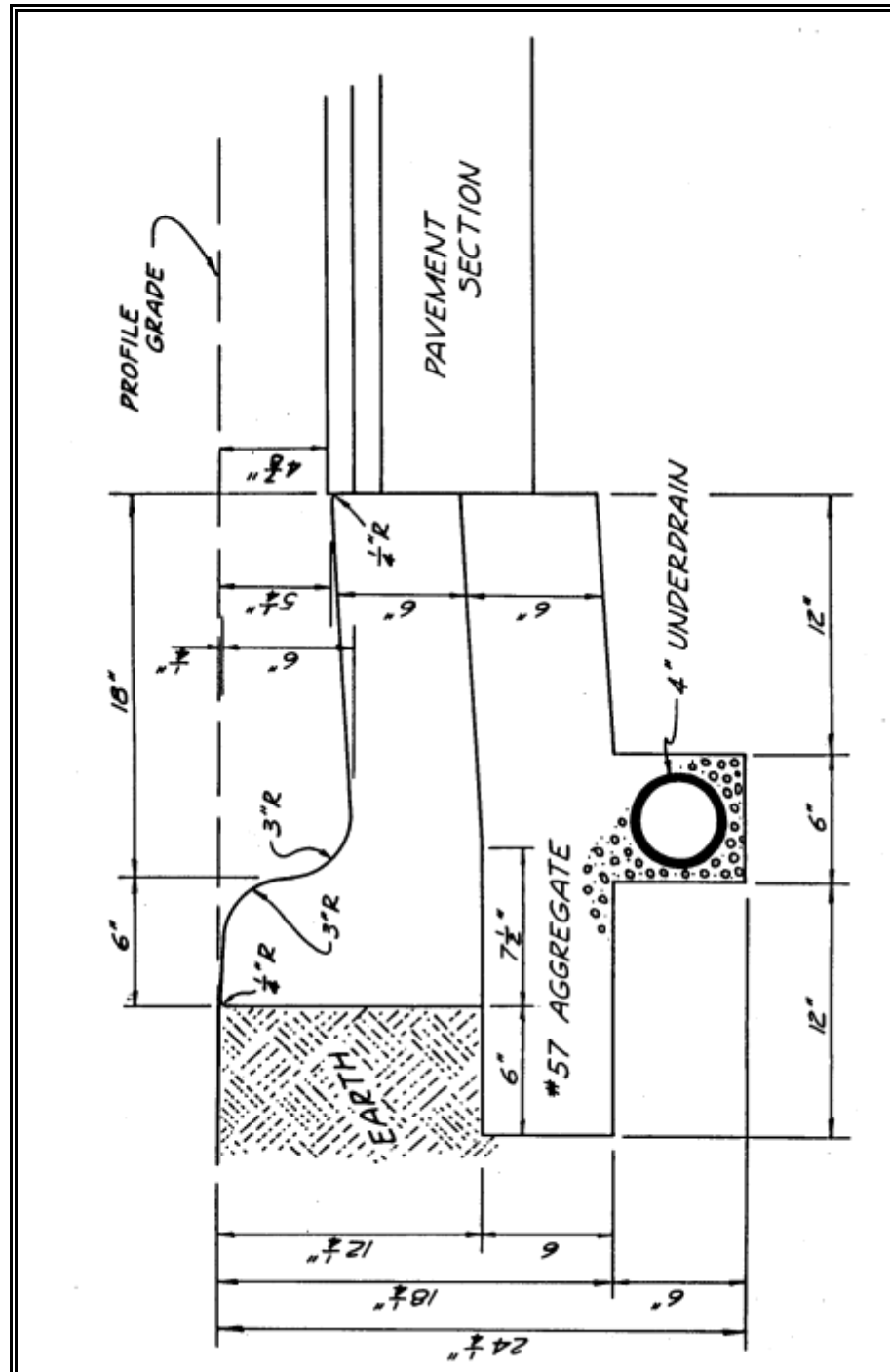


CURB RAMP DETAIL



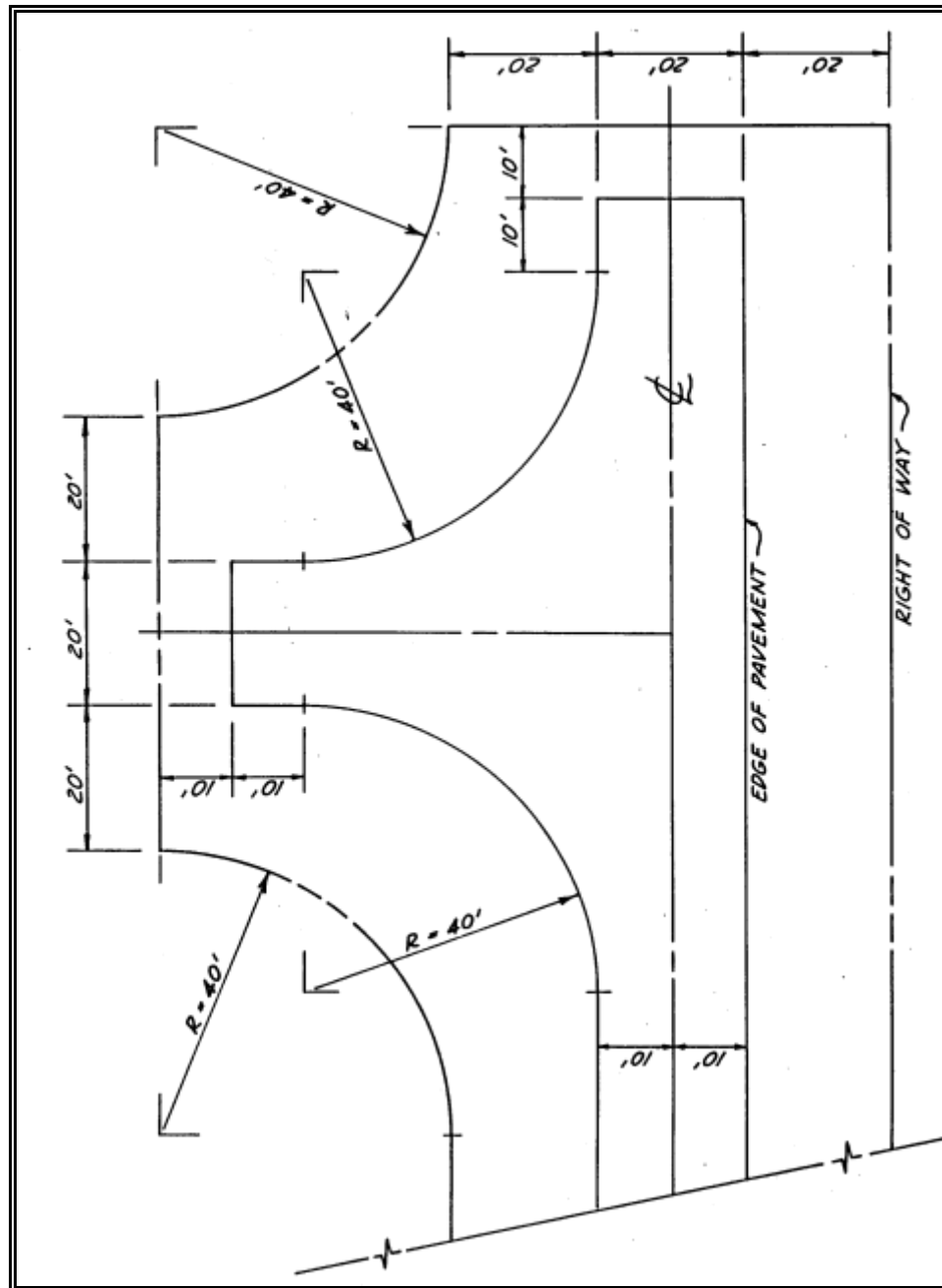
CONCRETE COMBINED CURB & GUTTER

NOTE: Class 'C' concrete, 6 1/2 Bag Mix,
7% to 9% Air Entertainment



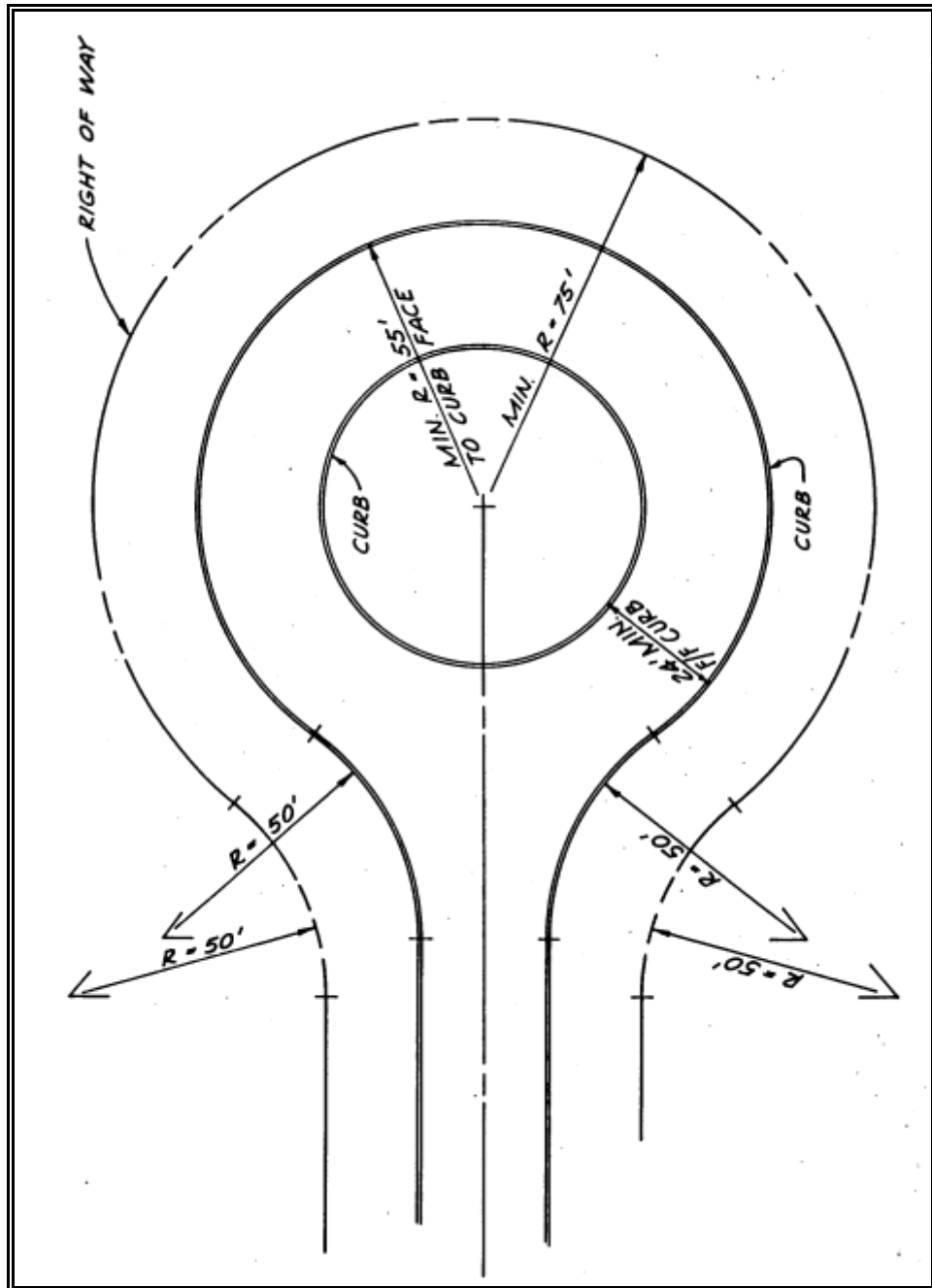
TEMPORARY "T" TYPE TURN-AROUND

NOTE: "T" Type Turnaround Drainage Ditches Shall be Similar to Normal Road Ditch Sections.



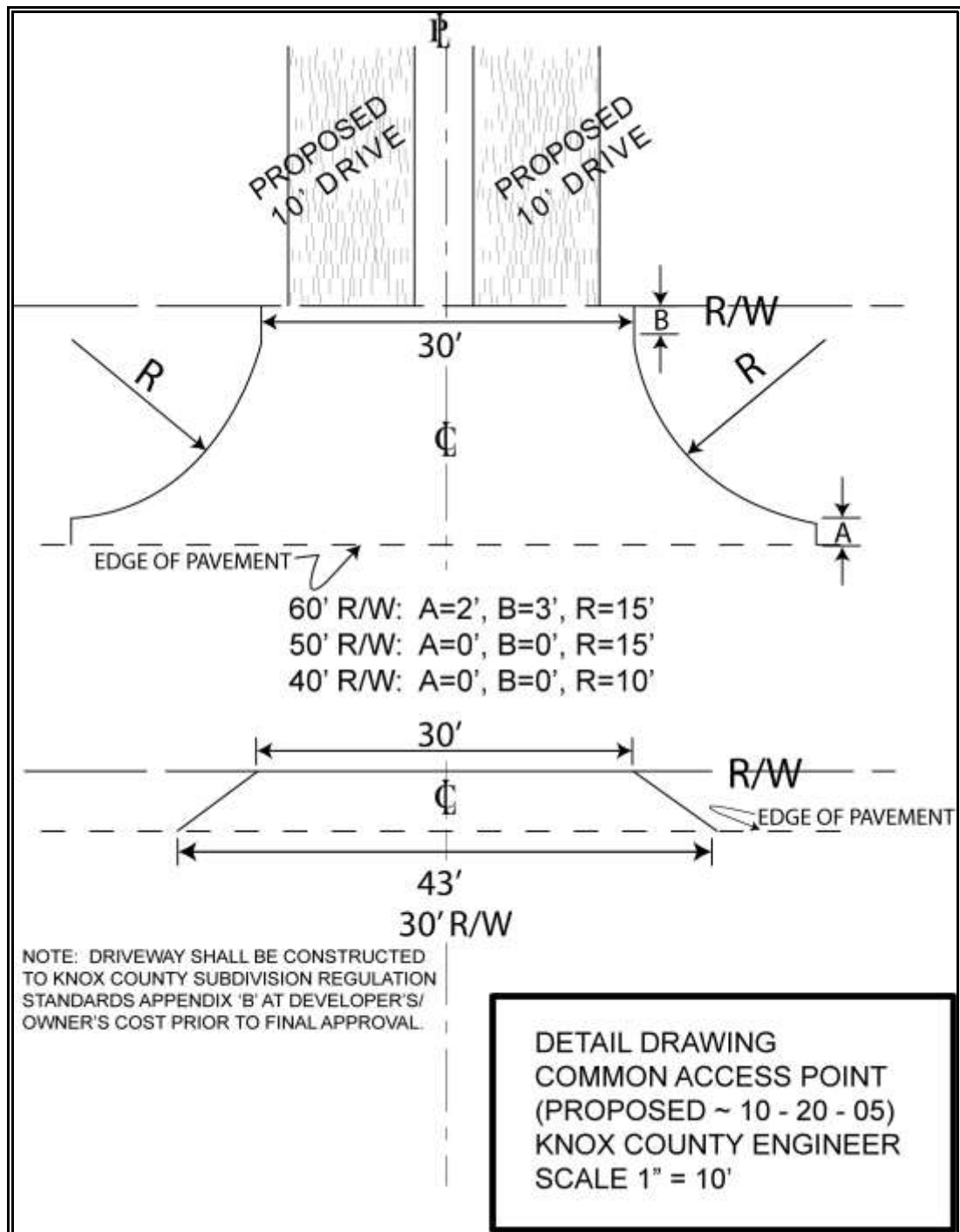
CURB STREET CUL-DE-SAC WITH/WITHOUT ISLAND

NOTE: Use Pavement Min. R and Right-of-way; Min. R for street without curb cul-de-sac



Detail Drawing Common Access Point*

*Added by amendment 8/20/07



APPENDIX [B].

ARTICLE 7.

SURVEYING STANDARDS

7.01[B] - Purpose:

These standards are intended to define the minimum requirements for the practice of surveying within Knox County. They include standards and accuracies that are acceptable for property surveys, and also the preparation of survey plats and subdivision plats and the information to be indicated thereon.

7.02[B] - General Standards:

- A. Property surveying activities conducted within the County shall be performed by or under the direction and close supervision of a Professional Surveyor.
- B. A Professional Surveyor who specializes in property surveying operates in a quasi-judicial capacity as an informal agent of the court. He must analyze boundary evidence based upon common law principles related to monumentation, measurements, land descriptions and other forms of evidence. He must search the records for all pertinent deed writings, survey records, and court records and relate these records to evidence he finds on the ground. He seeks and takes the testimony of everyone who has knowledge of the problem at hand. He evaluates all the evidence he can gather from the record, the ground, and from testimony, and makes his own decision. He marks his decision on the ground by durable, exclusively identifiable monuments and accessories. He assumes the responsibility for his work by showing all the pertinent data such as records, evidence, reasoning, and old and new monuments on a plat which he signs, dates, seals, and publicly records. His plat is an edited, accurately scaled, dimensioned, pictorial representation of his original notes and records research in sufficient detail that the retracement surveyor or reviewing lawyer need have no further resource to his original notes. A Professional Surveyor must be impartial and should make his decisions in such a way that they will be upheld by the court, if tried.
- C. Surveying encompasses the science and art of determining relative positions of points above, on or beneath the surface of the earth, or

establishing such points. In the various phases of all categories of surveying practice, the Professional Surveyor incorporates the use of judgment. Judgment should not be uneducated guessing or uninformed opinion, but rather the professional level of judgment which is well considered, based on experience, and exercised only after understanding the theoretical concepts.

- D. When surveys of any type are conducted for the purpose of designing and preparing plans and maps for improvements, which require approval by Knox County, such surveys shall be performed only by or under the direction of an individual who has a thorough knowledge of surveying science and practice in that particular area, with emphasis on the complexities of survey measurements and their analysis.

7.03[B] - Definitions:

As used herein:

“Photogrammetry” - means the science of making measurements on photographs. Terrestrial photogrammetry applies to the measurement of photographs that are taken from a ground station, the position of which usually is known or can be readily determined. Aerial photogrammetry applies to the measurement of photographs taken from the air and includes all operations, processes, and products involving the use of aerial photographs. Among these are included the measurement of horizontal distances, the determination of elevations, the compilation of planimetric and topographic maps, the preparation of mosaics and orthophotos, and the interpretation and analysis of aerial photographs.

“Plat, Subdivision” - means a map of a subdivision of land, prepared in accordance with state plat statutes and the Knox County Subdivision Regulations.

“Plat, Survey” - means a graphical description drawn to scale showing all essential data pertaining to the boundaries and subdivisions of a tract of land.

“Professional Surveyor” - means a registered surveyor, authorized to practice professional surveying by the Ohio State Board of Registration, as specified under §4733 (Adm. Code) Ohio Revised Code.

“Property Surveying” - means that branch of surveying which involves “the art and science of: (1) reestablishing cadastral surveys and land boundaries

based on documents of record and historical evidence; (2) planning, designing and establishing property boundaries; and (3) certifying

surveys as required by statute or local ordinance such as subdivision plats, registered land surveys, judicial surveys and space delineation.” (Knowledge of both the weight-of-authority and statute law relative to the establishment of boundaries by both written and unwritten methods is imperative.)

“Subdivision” - means

- A. The division of any parcel of land shown as a unit or as contiguous units on the last preceding tax roll, into two (2) or more parcels, sites, or lots, any one (1) of which is less than five (5) acres for the purpose, whether immediate or future, of transfer of ownership, provided, however, that the division or partition of land into parcels of more than five (5) acres not involving any new streets or easements of access, and the sale or exchange of parcels between adjoining lot owners, where such sale or exchange does not create additional building sites, shall be exempted; or
- B. The improvement of one (1) or more parcels of land for residential, commercial or industrial structures or groups of structures involving the division or allocation of land for the opening, widening or extension of any street or streets, except private streets serving industrial structures; the division or allocation of land as open spaces for common use by owners, occupants or lease holders or as easements for the extension and maintenance of public sewer, water, storm drainage or other public facilities. (§711.001 of the Ohio Revised Code).

“Surveying Practice” - means any professional service which requires the application of special knowledge of the principles of mathematics, the related physical and applied sciences, and the relevant requirements of law for the adequate performance of the art of surveying [included are all major categories of surveying practice, e.g., property, topographic, hydrographic, engineering, geologic, photogrammetric, environmental (remote sensing), and soil surveying, etc.].

7.04[B] - Property Surveying - means

- A. All research, investigation, monumentation, measurement specifications, plats of survey, descriptions, and subdivision plats shall conform to the

Minimum Standards for Boundary Surveys in the State of Ohio, §4733 37 (Adm. Code) Ohio Revised Code. (See Exhibit "2." - '703' Property Surveying Appendix [B]. Article 7. - Surveying Standards). These standards are intended to be a minimum requirement and where the surveying profession dictates a higher level of standards, in one (1) or several areas, the practitioner is encouraged to follow those particular standards of the profession.

- B. Measurements shall be designed and executed with control over uncertainty through use of well designed specifications.
- C. When a written and/or graphical description is prepared for the purpose of conveying a permanent easement (e.g., for utilities, right-of-way, etc.), said description shall include sufficient and adequate legal and technical wording so that the easement can be definitely located and defined in relation to the actual property corners and/or the centerline survey control points involved. For this purpose, whenever the said corners or control points are determined to be obliterated or lost or if they are to be called for in a description, they shall be established and monumented in accordance with the minimum standards as referred to above in paragraphs 7.04[B]A. and 7.04[B]B.

7.05[B] - Plat and Plan Requirements:

- A. All final copies of required plats, plans and maps which are submitted for record shall: (1) be neatly and legibly drawn or printed so that several successive reproductions shall be reasonably legible; (2) conform to the microfilm standards in paragraph 7.05[B].B.; and (3) conform to the following minimum requirements (Note: Also refer to paragraph 7.03[B] above for additional plat requirements):

- 1. Plat Form and Size:

- a. Subdivision (Final) Plats: shall be clearly and legibly drawn in black drafting (India) ink on tracing cloth, polyester film (Mylar), or equivalent reproducible material. Maximum sheet size shall be twenty-four inch by thirty-six inch (24" by 36"). The plat must meet all applicable requirements of §711 of the Ohio Revised Code and conform to the intent of the approved preliminary plan. It may constitute only that portion of the preliminary plan which the subdivider proposes to develop and record at that particular time, provided that such portion conforms with all other

requirements. (For recording and distribution of copies of subdivision plats, refer to the current Knox County Subdivision Regulations.)

- b. Survey Plats: the minimum size shall be eight and one-half inch by eleven inch (8.5" by 11") and the maximum sheet size shall be twenty-four inch by thirty-six inch (24" by 36"), unless otherwise approved by the County Engineer. The plat, depending upon its size, shall be filed [See Appendix [B]. Article 7. Surveying Standards, Exhibit "2." "703 Property Surveying"] with the proper office as follows:
 - i. Eight and one-half inch by fourteen inch (8.5" by 14") or less: a copy of the original plat shall be filed with the written conveyance in the office of the County Recorder. (The submitted copy will be returned to the designated party.)
 - ii. Larger than eight and one-half inch by fourteen inch (8.5" by 14"): a permanent photo positive or high quality "Xerox" type copy of the original shall be filed in the tax map room in the County Courthouse Annex.

NOTE: A copy of a scaled plat must accompany all new land descriptions of existing tract(s) or parcel(s) (including descriptions not based on a new survey), which are submitted to the tax map room for approval for transfer.

2. Plat Content:

- a. Name of the owner(s) of the land being surveyed and the adjacent landowners and/or subdivisions and Deed Book Volume and page(s) or Plat Book Volume and page(s) thereof.
- b. The road numbers, names and right-of-way widths of all public roads in unplatted territories and all public streets in platted areas.
- c. The perimeter of the parcel must be accurately located relative to a monumented major control point (e.g., the intersection of: the lines of the public land surveys of the

United States, farm lot lines, centerlines of recorded public roads or streets, lot lines within municipalities, etc.).

- d. If the tract(s) or lot(s), as surveyed, fall within two (2) or more existing parcels, as currently shown on the County Auditor's Tax Duplicate, or within two (2) or more general areas (e.g., quarter-townships, sections within quarter-townships, farm lots, Virginia Military Surveys, city lots, etc.), then the plat and/or written description shall include the areas broken down accordingly.
- e. When a division of any parcel of land into two (2) or more parcels is created, the plat shall graphically show the relationship of the newly created parcel(s) to the parent parcel and shall show the acreage and the recording reference of the parent parcel.

[The following subparagraphs f. through l.ix. shall apply to Subdivision (Final) Plats only]:

- f. Proposed name of the subdivision which shall not duplicate or approximate the name of any other subdivision in Knox County.
- g. Location and purpose of all easements for rights-of-way provided for public services or utilities, and the limitations of such easements.
- h. Accurate outline and indicated purpose of any area to be dedicated or temporarily reserved for public use.
- i. Each lot or site indicated by a an assigned lot number, assigned by the subdivider.
- j. Protective covenants and restrictions shall be shown on the plat or may be recorded as a part thereof by separate instrument, provided reference thereto is indicated on the plat.
- k. The plat shall: (1) be certified by a Professional Surveyor; (2) be acknowledged by the owner before an officer authorized to take the acknowledgment of deeds, which officer shall certify his official act on the plat; and (3) contain a dedication, by

the owner, of the road(s) and/or street(s) and other public areas. (§711.04 of the Ohio Revised Code).

1. Approval of plat with endorsement in writing of each of the following local government agencies, if having jurisdiction over the lands being platted:
 - i. The Board of County Commissioners.
 - ii. The Knox County District Board of Health.
 - iii. The County Sanitary Engineer, if applicable.
 - iv. The Knox County Regional Planning Commission, in unincorporated areas, and/or
 - v. The City Planning Commission, provided the City has exercised jurisdiction over the lands outside its corporate limits as provided for by §711.09 of the Ohio Revised Code.
 - vi. Zoning Board, if applicable.
 - vii. The County Engineer, in unincorporated areas.
 - viii. Transfer statement by the County Auditor showing the date that transfer of the property has been made.
 - ix. Recording statement by the County Recorder with date and time that the plat was filed for record, Plat Book Volume and page(s), recording fee, file number and signature.
3. Final Engineering and Construction Plan:

After all of the proposed improvements have been made and are complete, the Subdivider shall submit for record an updated “as-built” plan to the County Engineer. In addition to the requirements of these Standards, the information and data obtained for and presented on the “as-built” plan should conform to the as-built survey specifications currently accepted by the surveying

profession. This plan shall be a permanent photo positive copy of the “final engineering and construction plan”.

B. Microfilm Standards (For final record size copies):

1. The minimum letter size shall not be less than two/thirty-seconds of an inch (2/32") [three/thirty-seconds of an inch (3/32") is preferred].
2. Lettering within lined areas, such as a quantity box, shall at no time come in contact with any of these lines.
3. Letters shall be properly spaced so that a crowded condition does not exist.
4. A line width of seven thousandths inches (0.007), the equivalent of “4 x 0” (Rapidograph pen size) is minimum and can only be used for dimension lines, cross-hatching and the index map.
5. All other lines and lettering shall be a minimum width of one thousandths (0.001) inches, which is equivalent to “3 x 0” Rapidograph.
6. All lines shall be of uniform weight and density.
7. The minimum distance between two (2) or more adjacent lines shall be one thirty-second inch (1/32"), even though an out-ofscale condition might exist.
8. Cross-hatching shall be in one (1) direction only.
9. No shading or coloring shall be allowed.
10. Drawing background shall be light and uniform in color and the lines and lettering shall be dark and opaque. This will provide the optimum contrast needed.
11. All lines and lettering shall be on the face of the drawing material.

7.06[B] - Engineering and Topographic Surveying:

A. Master Benchmark Standards:

1. Definitions (As Used Herein):

- a. “Master Benchmark” - means a vertical control monument which is durable, easily identifiable, and permanently located within the development area in a position which affords the highest possible protection from disturbance. At least one (1) “master benchmark” shall be established for each development area. Temporary benchmarks of a lesser nature and with elevations derived from the “master benchmark” may be used for control within the development area.
- b. “Source Benchmark” - means an existing, permanently established and undisturbed monument with a known elevation which is related to the "North American Vertical Datum of 1988" (NAVD 88) with a high level of certainty.
- c. “Development Area” - means the area of land included within each individual subdivision (or phase of subdivision) as submitted for review and approval.

2. Minimum Requirements:

- a. The elevation of each “master benchmark” shall be determined and established by measurements designed and executed with control over uncertainty through use of well designed specifications.
- b. The following shall be shown on the “final subdivision plat” and on all required engineering plans:
 - i. The location, description and elevation of the “master benchmark(s)” within the subject development area and the “source benchmark(s),” and
 - ii. The total expected error, and its respective “source benchmark(s)” based on actual design or sound judgment.

B. Topographic Standards¹:

1. The elevation of ninety percent (90%) of all identifiable points shall be in error not more than one-half (0.5) contour interval.
2. No point shall be in error more than a full contour interval.

C. 'As-built' Surveys:

These are surveys to determine positions of structures as actually constructed. "As-built" surveys are required to check the contractor's work, assure that the structures will function according to design, and provide a record of locations of structures for maintenance and other subsequent design purposes. In addition to the requirements of these Standards, the information and data obtained for and presented on the "as-built" plan should conform to the "as-built" survey specifications currently accepted by the surveying profession.

7.07[B] - Exception (Platting):

A proposed division of a parcel of land along an existing public street, which involves no more than five (5) lots after the original tract has been completely subdivided, may be submitted to the proper authority for approval without a Subdivision Plat. The proposal must include a "sketch," which shall conform to the minimum requirements for a "Plat of Survey," §4733-37-05 (Adm. Code) of the Ohio Revised Code. [See Exhibit "2." - '703' Property Surveying (Appendix [B], Article 7.)], based on an actual property survey, and such other information as is pertinent to determine that such proposed division is not contrary to the applicable platting, subdividing, or zoning regulations. The Subdivider (and/or his consultant) is encouraged to meet with the properly designated representative or committee (whichever applies) of the Knox County Regional Planning Commission, prior to developing any property surveys or legal descriptions of the proposed division, to discuss the procedures involved and become familiar with any regulations pertaining to the property and the proposed action. Approval of the proposal must be granted prior to stamping a conveyance of said parcel(s). The conveyance must conform to the intent of the approved proposal and contain any requirements or restrictions as specified by the approving authority. (See §711.131 of the Ohio Revised Code and the Knox County Subdivision Regulations.)

¹ U.S. Department of Agriculture, Soil Conservation Service, Engineering Field Manual, Chapter 1, Table 1-1, Pg. 1-2.

APPENDIX [B].

ARTICLE 7. - SURVEYING STANDARDS

Exhibit "2." "703 - PROPERTY SURVEYING"

The following is referred to as item "703 - PROPERTY SURVEYING" of this Article. (Underlining and emphasis added.)

§4733-37 (Adm. Code) Ohio Revised Code
Minimum Standards for Boundary Surveys
in the State of Ohio (Effective May 1, 1980)

4733-37-01[B] - Preamble:

These standards are intended to be the basis for all surveys relating to the establishment or retracement of property boundaries in the State of Ohio. Abridgments of one (1) or more provisions herein shall be clearly indicated on plats and/or legal descriptions and reports. Where local or other prescribed regulations exist which are more restrictive than these standards, the survey shall conform to all local and state regulatory standards. When a client desires only a portion of his property surveyed, and this portion can be clearly isolated from the remainder of the property without affecting the interests of adjoining owners, these standards shall apply to the survey of only the desired portion.

4733-37-02[B] - Research and Investigation:

- A. When the deed description of the subject property and the deed descriptions of adjoining properties do not resolve the unique locations of the corners and lines of the property being surveyed, the surveyor shall consult other sources of information in order to assemble the best possible set of written evidence of every corner and line of the property being surveyed. These sources include, but are not limited to: records of previous surveys, deed descriptions of adjacent properties, records of adjacent highways, railroads and public utility lines, and also include subdivision plats, tax maps, topographic maps, aerial photographs, and other sources as may be appropriate.
- B. After all necessary written documents have been analyzed, the survey shall be based on a field investigation of the property. The surveyor

shall: make a thorough search for physical monuments, analyze evidence of occupation and confer with the owner(s) of the property being surveyed. In addition, the surveyor shall, when necessary confer with the owner(s) of the adjoining property and take statements.

4733-37-03[B] - Monumentation:

- A. When necessary, in accordance with the accepted surveying practice and legal requirements, the surveyor shall set boundary monuments so that, upon completion of the survey, each corner of the property and each referenced control station will be physically monumented.
- B. When it is impossible or impracticable to set a boundary monument on a corner, the surveyor shall set a reference monument, similar in character to the boundary monument and preferably along one (1) of the property lines which intersects at that corner. When such a reference monument is used, it shall be clearly identified as a reference monument on the plat of the property and in any new deed description which may be written for the property.
- C. Every boundary monument and/or reference set by the surveyor shall, when practicable:
 - 1. Be composed of a durable material.
 - 2. Have a minimum length of thirty (30) inches.
 - 3. Have a minimum cross-section area of material of two-tenths (0.2) square inches.
 - 4. Be identified with a durable marker bearing the surveyor's Ohio registration number and/or name or company name.
 - 5. Be detectable with conventional instruments for finding ferrous or magnetic objects.
- D. When a case arises, due to physical obstructions such as pavements, large rocks, large roots, utility cables, etc., so that neither a boundary monument nor a reference monument can be conveniently or practicably set in accordance with paragraph 4733-37-03[B]C. of this rule, then alternative monumentation, which is essential as durable and

identifiable (e.g., chiselled "X" in concrete, drill hole, etc.) shall be established for the particular situation.

4733-37-04[B] - Measurement Specifications:

All measurements shall be made in accordance with the following specifications:

- A. The surveyor shall keep his equipment in such repair and adjustment as to conform to the requirements stipulated by the Director of Agriculture in §1327.46 to §1327.99 of the Ohio Revised Code. The specifications, tolerances, and regulations published in the "*National Bureau of Standards Handbook 44*" shall be the specifications, tolerances and regulations for commercial weighing and measuring devices of the state.
- B. Every measurement of distance shall be made either directly or indirectly in such a manner that the linear error in the distance between any two (2) points (not necessarily adjacent points) shall not exceed the reported distance divided by five thousand (5,000) [allowable linear error = reported distance divided by five thousand (5,000)] and every angular measurement shall be made in such a manner that the allowable (directional) error, in radians, shall not exceed the allowable linear error divided by the reported distance [allowable (directional) error = allowable linear error divided by reported distance]. When the reported distance is less than one hundred (100) feet, the linear error shall not exceed two hundredths (0.02) feet. The reported distance is the distance established by the survey.
- C. In all new deed descriptions and plats of survey, the lengths and directions of the lines shall be specified so that the mathematical error in closure of the property boundary does not exceed two-hundredths (0.02) feet in latitude and two-hundredths (0.02) feet in departure.

4733-37-05[B] - Plat of Survey:

- A. The surveyor shall prepare a scale drawing of every survey in which he retraces previously established property lines and establishes new boundaries.
- B. A copy of this drawing shall be given to the client. When required, another copy shall be filed with the proper agency.
- C. The surveyor shall include the following details:

1. A title such that the general location of the survey can be identified.
2. A north arrow with a clear statement as to the basis of the reference direction used.
3. The control station(s) or line cited in the deed description and the relationship of the property to this control.
4. A notation at each corner of the property stating that the boundary monument specified in the deed description was found, or that a boundary monument was set. In addition, there shall be a statement describing the material, size, position and condition of every monument found and/or set.
5. A general notation describing the evidence of occupation that may be found along every boundary line and/or occupation line.
6. The length and direction of each line as specified in the deed description of the property or as determined in the actual survey, if this differs from what is stated in the deed description by more than the tolerance specified in paragraph (B) of rule 4733-37-04 of the Administrative Code.
7. A citation of pertinent documents and sources of data used as a basis for carrying out the work.
8. The written and graphical scale of the drawing.
9. The date of the survey.
10. The surveyor's printed name and Ohio registration number, signature and seal (in a form which may clearly reproduce on any copies which may be made of the original drawing).

4733-37-06[B] - Descriptions:

- A. When a surveyor is called upon to prepare a new description, either to replace an existing description which is inadequate or to create a new piece of property, said description shall include the following items:
 1. Sufficient caption so that the property can be adequately identified.

2. A relationship between the property in question and clearly defined control station(s).
 3. The basis of the bearings.
 4. A citation to the public record of the appropriate prior deed(s).
 5. The surveyor's name, Ohio registration number and date of writing and/or survey.
- B. A metes and bounds description shall include, in addition to paragraph 4733-37-06[B].A. of this rule:
1. A description of the boundary monument used as the initial point of the description.
 2. A series of calls for successive lines bounding the parcel, each of which specifies:
 - a. The intent in regards to adjoiners or other existing features.
 - b. The direction of the line relative to the direction of the basis of bearing.
 - c. The length of the line.
 - d. A description of the boundary monument (or reference monument) and whether found or set to identify the end of the particular line.
 - e. Sufficient mathematical data shall be given for each curved line so that the curve can be reproduced without ambiguity.
 - f. The reported boundary data shall meet the closure requirements of paragraph (C) of rule 4733-37-04 of the Administrative Code.
 3. The area of the parcel.
- C. Descriptions other than the metes and bounds form shall include sufficient and adequate legal and technical wording so that the property can be definitely located and defined.

D. A statement shall appear indicating that either:

- * the description was made in accordance with a recent survey and the date thereof, or
- * the description was based on a previous survey, of a certain date, and date of description, or
- * the description was not based on a survey.

E. When the surveyor knows a new description is to be used for a fee transfer, the surveyor shall base the description on a current or updated survey of the property.

4733-37-07[B] - Subdivision Plats:

When a subdivision is created from a piece of property, or several adjoining pieces, the surveyor shall prepare a scale drawing showing all of the details in rule 4733-37-05 of the Administrative Code. In addition, the drawing will show all of the details of each new lot, street, easement, etc., including the length and direction of each new line. Sufficient mathematical data shall be given for each curved line so that the curve can be reproduced without ambiguity.

APPENDIX [C].

KNOX COUNTY SUBDIVISION
SCHEDULE OF FEES

ADMINISTRATIVE FEES

Minor Subdivision (Lot Split)	\$ 50.00 per lot
Major Subdivision: 1. Sketch Plan Conference (Required) 2. Preliminary Plan Review 3. Final Plat Review	\$100.00 (non-refundable) \$ 50.00 per proposed lot (nonrefundable) \$ 50.00 per lot (non-refundable)
Variance Request	\$200.00 (non-refundable)
Exempted Lot Split (transfer between adjoining property owners)	\$ 25.00 per split
All Other Lots	\$ 50.00 per lot

(Other fees and charges shall be in accordance with the orders and
directions of the County Engineer and/or Board of County
Commissioners.)

APPENDIX [D].

Special Flood Hazard Area Criteria

This Appendix is repealed by Commissioner
Resolution 2021-434

Effective June 13, 2021

APPENDIX [E].

KNOX COUNTY, FLOOD DAMAGE REDUCTION RESOLUTION

ARTICLE 1. STATUTORY AUTHORIZATION, FINDINGS OF FACT, PURPOSE & OBJECTIVES

1.01[E] - Statutory Authorization:

This resolution is adopted pursuant to authorization contained in §307.37 and §307.85 of the Ohio Revised Code. This resolution adopts regulations for areas of special flood hazard that are necessary for participation in the National Flood Insurance Program. Therefore, the Board of Commissioners of Knox County does hereby resolve as follows:

1.02[E] - Findings of Fact:

Knox County, Ohio, has special flood hazard areas that are subject to periodic inundation which may result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base. Additionally, structures that are inadequately elevated, floodproofed, or otherwise protected from flood damage also contribute to the flood loss. In order to minimize the threat of such damages and to achieve the purposes hereinafter set forth, these regulations are adopted.

1.03[E] - Statement of Purpose:

It is the purpose of these regulations to promote the public health, safety and general welfare, and to:

- A. Protect human life and health;
- B. Minimize expenditure of public money for costly flood control projects;
- C. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- D. Minimize prolonged business interruptions;
- E. Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, roads and bridges located in areas of special flood hazard;

- F. Help maintain a stable tax base by providing for the proper use and development of areas of special flood hazard so as to protect property and minimize future flood blight areas;
- G. Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions;
- H. Minimize the impact of development on adjacent properties within and near flood prone areas;
- I. Ensure that the flood storage and conveyance functions of the floodplain are maintained;
- J. Minimize the impact of development on the natural, beneficial values of the floodplain;
- K. Prevent floodplain uses that are either hazardous or environmentally incompatible; and
- L. Meet community participation requirements of the National Flood Insurance Program.

1.04[E] - Methods of Reducing Flood Loss:

In order to accomplish its purposes, these regulations include methods and provisions for:

- A. Restricting or prohibiting uses which are dangerous to health, safety, and property due to water hazards, or which result in damaging increases in flood heights or velocities;
- B. Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- C. Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;
- D. Controlling filling, grading, dredging, excavating, and other development which may increase flood damage; and,
- E. Preventing or regulating the construction of flood barriers, which will unnaturally divert flood waters or which may increase flood hazards in other areas.

1.05[E] - Lands to Which These Regulations Apply:

These regulations shall apply to all areas of special flood hazard within the jurisdiction of Knox County, Ohio, as identified in Section 1.06[E] below,

including any additional areas of special flood hazard annexed by Knox County, Ohio.

1.06[E] - Basis for Establishing the Areas of Special Flood Hazard:

For the purposes of these regulations, the following studies and/or maps are adopted:

- A. *Flood Insurance Study Knox County, Ohio and Incorporated Areas and Flood Insurance Rate Map Knox County, Ohio and Incorporated Areas* both effective July 7, 2009. Floodways designated on these maps and/or other studies produced prior to July 20, 2006 do not meet the standards set herein. [Amended May 14, 2009] See Section 4.9 [E] -Assurance of Flood Carrying Capacity.
- B. Other studies and/or maps, which may be relied upon for establishment of the flood protection elevation, or delineation of the one hundred (100)year floodplain, floodways or other areas of special flood hazard.
- C. Any hydrologic and hydraulic engineering analysis authored by a Registered Professional Engineer, registered in the State of Ohio, which has been approved by Knox County, Ohio, as required by Appendix [E]. Article 4. Use and Development Standards for Flood Hazard Reduction, Section 4.03[E] "Subdivisions and Large Scale Developments."

Any revisions to the aforementioned maps and/or studies are hereby adopted by reference and declared to be a part of these regulations. Such maps and/or studies are on file at the Office of the Knox County Regional Planning Commission, 117 East High Street, Suite 221, Mount Vernon, Ohio.

1.07[E] - Abrogation and Greater Restrictions:

These regulations are not intended to repeal any existing resolutions including subdivision regulations, zoning or building codes. In the event of a conflict between these regulations and any other ordinance(s) [resolution(s)], the more restrictive shall be followed. These regulations shall not intend to impair any deed restriction covenant or easement but the land subject to such interests shall also be governed by the regulations.

1.08[E] - Interpretation:

In the interpretation and application of these regulations, all provisions shall be:

- A. Considered as minimum requirements;
- B. Liberally construed in favor of the governing body; and,
- C. Deemed neither to limit nor repeal any other powers granted under state statutes. Where a provision of these regulations may be in conflict with a state

or Federal law, such state or Federal law shall take precedence over these regulations.

1.09[E] - Warning and Disclaimer of Liability:

The degree of flood protection required by these regulations is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by manmade or natural causes. These regulations do not imply that land outside the areas of special flood hazard or uses permitted within such areas will be free from flooding or flood damage. These regulations shall not create liability on the part of Knox County, Ohio, any officer or employee thereof, or the Federal Emergency Management Agency, for any flood damage that results from reliance on these regulations or any administrative decision lawfully made thereunder.

1.10[E] - Severability:

Should any section or provision of these regulations be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of the regulations as a whole, or any part thereof, other than the part so declared to be unconstitutional or invalid.

APPENDIX [E].

KNOX COUNTY, FLOOD DAMAGE REDUCTION RESOLUTION

ARTICLE 2. DEFINITIONS

Unless specifically defined below, words or phrases used in these regulations shall be interpreted so as to give them the meaning they have in common usage and to give these regulations the most reasonable application.

"Accessory Structure" - means a structure on the same lot with, and of a nature customarily incidental and subordinate to, the principal structure.

"Appeal" - means a request for review of the floodplain administrator's interpretation of any provision of these regulations or a request for a variance.

"Base Flood" - means the flood having a one percent (1%) chance of being equaled or exceeded in any given year. The base flood may also be referred to as the one percent (1%) chance annual flood or one hundred (100)-year flood.

"Base One Hundred (100)-Year Flood Elevation (BFE)" - means the water surface elevation of the base flood in relation to a specified datum, usually the National Geodetic Vertical Datum of 1929 or the North American Vertical Datum of 1988, and usually expressed in Feet Mean Sea Level (MSL). In Zone AO areas, the base flood elevation is the natural grade elevation plus the depth number [from one (1) to three (3) feet].

"Basement" - means any area of the building having its floor subgrade (below ground level) on all sides.

"Compensatory Flood Storage Area" - means a permanent excavation that is equal to the amount of flood water storage lost due to any volume of fill added to the floodplain and that functions in a manner hydrologically similarly to the area being filled.

"Critical Development" - means development that is vital to the community's public health and safety, is essential to the orderly functioning of a community, stores or produces highly volatile, toxic or water-reactive materials, or houses occupants that may be insufficiently mobile to avoid loss of life or injury. Examples of critical development include, but are not limited to, jails, hospitals, schools, fire stations, nursing homes,

wastewater treatment facilities, water plants, and gas/oil/propane storage facilities.

"Development" - means any manmade change to improved or unimproved real estate, including but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

"Enclosure Below the Lowest Floor" - see "Lowest Floor" contained in this section.

"Executive Order 11988 (Floodplain Management)" - means the order issued by President Carter in 1977; this order requires that no federally assisted activities be conducted in or have the potential to affect identified special flood hazard areas, unless there is no practicable alternative.

"Federal Emergency Management Agency (FEMA)" - means the agency with the overall responsibility for administering the National Flood Insurance Program.

"Fill" - Fill is both a verb and a noun:

- A. As a verb, "Fill" - means to add, to deposit, or to place earthen material by artificial means at one time, or over time, within the special flood hazard area so as to increase the elevation of the land therein.
- B. As a noun, "Fill" - means the material so added, placed, or deposited within the special flood hazard area, including, but not limited to, sand, gravel, soil, woody debris, broken concrete, asphalt, and garbage.

"Flood or Flooding" - means a general and temporary condition of partial or complete inundation of normally dry land areas from:

- A. The overflow of inland or tidal waters, and/or
- B. The unusual and rapid accumulation or runoff of surface waters from any source.

"Flood Hazard Boundary Map (FHBM)" - means the initial map, produced by the Federal Emergency Management Agency, or U.S. Department of Housing and Urban Development, for a community depicting approximate special flood hazard areas.

"Flood Insurance Rate Map (FIRM)" - means an official map on which the Federal Emergency Management Agency or the U.S. Department of Housing and Urban Development has delineated the areas of special flood hazard.

"Flood Insurance Risk Zones" - means the Zone designations on FHBM's and FIRM's that indicate the magnitude of the flood hazard in specific areas of a community. Following are the zone definitions:

Zone A:

Special flood hazard areas inundated by the one hundred (100)year flood; base flood elevations are not determined.

Zones A1-30 and Zone AE:

Special flood hazard areas inundated by the one hundred (100)year flood; base flood elevations are determined.

Zone AO:

Special flood hazard areas inundated by the one hundred (100)year flood; with flood depths of one (1) to three (3) feet (usually sheet flow on sloping terrain); average depths are determined.

Zone AH:

Special flood hazard areas inundated by the one hundred (100)year flood; flood depths of one (1) to three (3) feet (usually areas of ponding); base flood elevations are determined.

Zone A99:

Special flood hazard areas inundated by the one hundred (100)year flood to be protected from the one hundred (100)-year flood by a Federal flood protection system under construction; no base flood elevations are determined.

Zone B and Zone X (shaded):

Areas of five hundred (500)-year flood; areas subject to the one hundred (100)-year flood with average depths of less than one (1) foot or with contributing drainage area less than one (1) square mile; and areas protected by levees from the base flood.

Zone C and Zone X (unshaded):

Areas determined to be outside the five hundred (500)-year floodplain.

"Flood Insurance Study (FIS)" - means the official report in which the Federal Emergency Management Agency or the U.S. Department of Housing and Urban Development has provided flood profiles, floodway boundaries (sometimes shown on Flood Boundary and Floodway Maps), and the water surface elevations of the base flood.

"Flood Protection Elevation (FPE)" - means the base flood elevation plus two (2) feet of freeboard. In areas where no base flood elevations exist from any

authoritative source, the flood protection elevation can be historical flood elevations, or base flood elevations determined and/or approved by the floodplain administrator.

"Floodway" - means the channel of a river or other watercourse and the adjacent land areas that have been reserved in order to pass the base flood discharge. A floodway is typically determined through a hydraulic and hydrologic engineering analysis such that the cumulative increase in the water surface elevation of the base flood discharge is no more than a designated height. In no case shall the designated height be more than one-tenth of one (0.1) foot at any point within the community.

The floodway is an extremely hazardous area, and is usually characterized by any of the following: Moderate to high velocity flood waters, high potential for debris and projectile impacts, and moderate to high erosion forces.

"Freeboard" - means a factor of safety usually expressed in feet above a flood level for the purposes of floodplain management. Freeboard tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, obstructed bridge openings, debris and ice jams, and the hydrologic effect of urbanization in a watershed.

"Historic Structure" - means any structure that is:

- A. Listed individually in the National Register of Historic Places (a listing maintained by the U.S. Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listings on the National Register;
- B. Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district; or
- C. Individually listed on the State of Ohio's inventory of historic places maintained by the Ohio Historic Preservation Office.

"Hydrologic and Hydraulic Engineering Analysis" - means an analysis performed by a Registered Professional Engineer, registered in the State of Ohio, in accordance with standard engineering practices as accepted by FEMA, used to determine flood elevations and/or floodway boundaries.

"Letter of Map Change (LOMC)" - means an official FEMA determination, by letter, to amend or revise effective Flood Insurance Rate Maps, Flood

Boundary and Floodway Maps, and Flood Insurance Studies. LOMC's are broken down into the following categories:

"Letter of Map Amendment (LOMA)" - means a revision based on technical data showing that a property was incorrectly included in a designated special flood hazard area. A LOMA amends the current effective Flood Insurance Rate Map and establishes that a specific property is not located in a special flood hazard area.

"Letter of Map Revision (LOMR)" - means a revision based on technical data that, usually due to manmade changes, shows changes to flood zones, flood elevations, floodplain and floodway delineations, and planimetric features. One common type of LOMR, a LOMR-F, is a determination concerning whether a structure or parcel has been elevated by fill above the base flood elevation and is, therefore, excluded from the special flood hazard area.

"Conditional Letter of Map Revision (CLOMR)" - means a formal review and comment by FEMA as to whether a proposed project complies with the minimum National Flood Insurance Program floodplain management criteria. A CLOMR does not amend or revise effective Flood Insurance Rate Maps, Flood Boundary and Floodway Maps, or Flood Insurance Studies.

"Hazardous, Flammable or Explosive" - means those items or classes of items listed in the *Emergency Response Guidebook*, produced by the U. S. Department of Transportation, R&SPA (2004, or the most recent subsequent edition or replacement thereof).

"Lowest Floor" - means the lowest floor of the lowest enclosed area (including basement) of a structure. This definition excludes an "enclosure below the lowest floor" which is an unfinished or flood resistant enclosure usable solely for parking of vehicles, building access or storage, in an area other than a basement area, provided that such enclosure is built in accordance with the applicable design requirements specified in these regulations for enclosures below the lowest floor.

"Manufactured Home" - means a structure, transportable in one (1) or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. The term "manufactured home" does not include a "recreational vehicle". For the purposes of these regulations, a manufactured home includes manufactured homes and mobile homes as defined in Chapter 3733 of the Ohio Revised Code.

"Manufactured Home Park" - means as specified in §3701-27-01 of the Ohio Administrative Code, any tract of land upon which three (3) or more manufactured homes, used for habitation are parked, either free of charge or for revenue purposes, and includes any roadway, building,

structure, vehicle, or enclosure used or intended for use as part of the facilities of the park. A tract of land that is subdivided and the individual lots are not for rent or rented, but are for sale or sold for the purpose of installation of manufactured homes on the lots, is not a manufactured home park, even though three (3) or more manufactured homes are parked thereon, if the roadways are dedicated to the local government authority.

"Material or Equipment" - For the purposes of these Regulations, "material" includes, but is not limited to, the following items or classes of items: stacked firewood, logs, lumber, wooden pallets, utility poles, plastic pipe of all types, unsecured metal or plastic tanks of all types, skidded or non-skidded portable structures; and "equipment" includes, but is not limited to, the following items or classes of items: airplanes, passenger automobiles and light trucks, golf carts, recreational vehicles, mobile or modular or manufactured homes (when not residential structures fully compliant with federal or state mandates), semi-tractor trailers or other primarily empty vessel-like structures, snowmobiles, and watercraft of all types.

"National Flood Insurance Program (NFIP)" - means a Federal program enabling property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods. Participation in the NFIP is based on an agreement between local communities and the Federal government, whereby, if a community will adopt and enforce floodplain management regulations to reduce future flood risks to all development in special flood hazard areas, the Federal government will make flood insurance available within the community as a financial protection against flood loss.

"New Construction" - means structures for which the "start of construction" commenced on or after the initial effective date of Knox County, Ohio, Flood Insurance Rate Map, July 19, 1982, and includes any subsequent improvements to such structures.

"Person" - means the inclusion of any individual or group of individuals, corporation, partnership, association, or any other entity, including state and local governments and agencies. An agency is further defined in §111.15 of the Ohio Revised Code as any governmental entity of the state and includes, but is not limited to, any board, department, division, commission, bureau, society, council, institution, state college or university, community college district, technical college district, or state community college. "Agency" does not include the general assembly, the controlling board, the adjutant general's department, or any court.

"Recreational Vehicle" - means a vehicle which is:

- A. Built on a single chassis;
- B. Four hundred (400) square feet or less when measured at the largest horizontal projection;
- C. Designed to be self-propelled or permanently towable by a light duty truck; and
- D. Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

"Registered Professional Architect" - means a person registered to engage in the practice of architecture under the provisions of §4703.01 to §4703.19 of the Ohio Revised Code.

"Registered Professional Engineer" - means a person registered as a professional engineer under Chapter 4733 of the Ohio Revised Code.

"Registered Professional Surveyor" - means a person registered as a professional surveyor under Chapter 4733 of the Ohio Revised Code.

"Special Flood Hazard Area" - also known as "Areas of Special Flood Hazard" means the land in the floodplain subject to a one percent (1.0%) or greater chance of flooding in any given year. Special flood hazard areas are designated by the Federal Emergency Management Agency on Flood Insurance Rate Maps, Flood Insurance Studies, Flood Boundary and Floodway Maps and Flood Hazard Boundary Maps as Zones A, AE, AH, AO, A1-30, and A99. Special flood hazard areas may also refer to areas that are flood prone and designated from other Federal, state or local sources of data including, but not limited to, historical flood information reflecting high water marks, previous flood inundation areas, and flood prone soils associated with a watercourse.

"Start of Construction" - means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement, or other improvement was within one hundred eighty (180) days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of roads and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure.

For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of a building.

"Storage" - means either of the following:

- A. The placement, deposition, or stocking of any amount of the items or classes of items listed in the *Emergency Response Guidebook*, produced by the U.S. Department of Transportation, R&SPA (2004, or the most recent subsequent edition or replacement thereof) for any length of time in a warehouse, cache, stockpile, store yard, depot or similar area.
- B. The placement, deposition, or stocking of materials or equipment in a warehouse, cache, stockpile, store yard or similar area.

"Structure" - means a walled and roofed building, manufactured home, or gas or liquid storage tank that is principally above ground.

"Substantial Damage" - means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed fifty percent (50%) of the market value of the structure before the damage occurred. Substantial damage also means flood-related damage sustained by a structure on two (2) separate occasions during a ten (10)-year period for which the cost of repairs at the time of each such flood event, on the average, equals or exceeds twenty-five percent (25%) of the market value of the structure before the damage occurred.

"Substantial Improvement" - means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds fifty percent (50%) of the market value of the structure before the "start of construction" of the improvement. When the combined total of all previous improvements or repairs made during the life of the structure equals or exceeds fifty percent (50%) of a structure's market value, that structure is considered a substantial improvement. This term includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include:

- A. Any improvement to a structure, which is considered "new construction";
- B. Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified prior to the application for a development permit by the local code enforcement official and

which are the minimum necessary to assure safe living conditions;
or

- C. Any alteration of an "historic structure," provided that the alteration will not preclude the structure's continued designation as an "historic structure".

"Variance" - means a grant of relief from the standards of these regulations consistent with the variance conditions herein.

"Violation" - means the failure of a structure or other development to be fully compliant with these regulations.

APPENDIX [E].

KNOX COUNTY, FLOOD DAMAGE REDUCTION RESOLUTION

ARTICLE 3. ADMINISTRATION

3.01[E] - Designation of the Floodplain Administrator:

The Secretary of the Knox County Regional Planning Commission is hereby appointed to administer and implement these regulations and is referred to herein as the Floodplain Administrator.

3.02[E] - Duties and Responsibilities of the Floodplain Administrator:

The duties and responsibilities of the Floodplain Administrator shall include, but are not limited to the following:

- A. Evaluate applications for permits to develop in special flood hazard areas.
- B. Interpret floodplain boundaries and provide flood hazard and flood protection elevation information.
- C. Issue permits to develop in special flood hazard areas when the provisions of these regulations have been met, or refuse to issue the same in the event of non-compliance.
- D. Inspect buildings and lands to determine whether any violations of these regulations have been committed.
- E. Make and permanently keep all records for public inspection necessary for the administration of these regulations including Flood Insurance Rate Maps, Letters of Map Amendment and Revision, records of issuance and denial of permits to develop in special flood hazard areas, determinations of whether development is in or out of special flood hazard areas for the purpose of issuing floodplain development permits, elevation certificates, variances, and records of enforcement actions taken for violations of these regulations.
- F. Enforce the provisions of these regulations.
- G. Provide information, testimony, or other evidence as needed during variance hearings.
- H. Coordinate map maintenance activities and FEMA follow-up.

- I. Conduct substantial damage determinations to determine whether existing structures, damaged from any source and in special flood hazard areas identified by FEMA, must meet the development standards of these regulations.

3.03[E] - Floodplain Development Permits:

It shall be unlawful for any person to begin construction or other development activity including, but not limited to, filling; grading; construction; alteration, remodeling, or expanding any structure; or alteration of any watercourse wholly within, partially within or in contact with any identified special flood hazard area, as established in Appendix [E]. Article 1. - Statutory Authorization, Findings of Fact, Purpose and Objectives, Section 1.06[E] "Basis for Establishing the Areas of Special Flood Hazard", until a floodplain development permit is obtained from the Floodplain Administrator. Such floodplain development permit shall show that the proposed development activity is in conformity with the provisions of these regulations. No such permit shall be issued by the Floodplain Administrator, until the requirements of these regulations have been met.

3.04[E] - Application Required:

An application for a floodplain development permit shall be required for all development activities located wholly within, partially within, or in contact with an identified special flood hazard area. Such application shall be made by the owner of the property or his/her authorized agent, herein referred to as the applicant, prior to the actual commencement of such construction on a form furnished for that purpose. Where it is unclear whether a development site is in a special flood hazard area, the Floodplain Administrator may require an application for a floodplain development permit to determine the development's location. Such applications shall include, but not be limited to the following:

- A. Site plans drawn to scale showing the nature, location, dimensions, and topography of the area in question; the location of existing or proposed structures, fill, storage of materials, drainage facilities, and the location of the foregoing;
- B. Elevation of the existing, natural ground where structures are proposed;
- C. Elevation of the lowest floor, including basement, of all proposed structures;
- D. Such other material and information as may be requested by the Floodplain Administrator to determine conformance with and provide enforcement of these regulations;
- E. Technical analyses conducted by an appropriate design professional registered in the State of Ohio and submitted with an application for a floodplain development permit when applicable:

1. Floodproofing certification for non-residential flood-proofed structure as required in Appendix [E]. Article 4. - Use and Development Standards for Flood Hazard Reduction, Section 4.05[E] "Nonresidential Structures";
2. Certification that fully enclosed areas below the lowest floor of a structure not meeting the design requirements of Appendix [E]. Article 4. - Use and Development Standards for Flood Hazard Reduction, Section 4.04[E] "Residential Structures", Subsection (E) are designed to automatically equalize hydrostatic flood forces;
3. Description of any watercourse alteration or relocation demonstrating that the flood carrying capacity of the watercourse will not be diminished, and maintenance assurances as required in Appendix [E]. Article 4. - Use and Development Standards for Flood Hazard Reduction, Section 4.09[E] "Assurance of Flood Carrying Capacity", Subsection (C) "Alterations of a Watercourse";
4. A hydrologic and hydraulic analysis demonstrating that the cumulative effect of proposed development, when combined with all other existing and anticipated development will not increase the water surface elevation of the base flood by more than one tenth of one (0.1) foot in special flood hazard areas where the Federal Emergency Management Agency has provided base flood elevations but no floodway as required by Appendix [E]. Article 4. - Use and Development Standards for Flood Hazard Reduction, Section 09[E] "Assurance of Flood Carrying Capacity", Subsection (B) "Development in Riverine Areas With Base Flood Elevations but No Floodways".
5. A hydrologic and hydraulic engineering analysis showing impact of any development on flood heights in an identified floodway as required by Appendix [E]. Article 4. - Use and Development Standards for Flood Hazard Reduction, Section 4.09[E] "Assurance of Flood Carrying Capacity", Subsection (A) "Development in Floodways";
6. Generation of base flood elevation(s) for subdivision and large-scale developments as required by Appendix [E]. Article 4. - Use and Development Standards for Flood Hazard Reduction, Section 4.03[E] "Subdivisions and Large Developments"; and/or
7. Volumetric calculations demonstrating compensatory storage have been provided as required by Appendix [E]. Article 4. - Use and Development Standards for Flood Hazard Reduction, Section 4.11[E] "Fill."

- F. A floodplain development permit application fee set by the schedule of fees adopted by the Board of County Commissioners of Knox County, Ohio.

3.05[E] - Review and Approval of a Floodplain Development Permit Application:

A. Review:

1. After receipt of a complete application, the Floodplain Administrator shall review the application to ensure that the standards of these regulations have been met. No floodplain development permit application shall be reviewed until all information required in Section 3.04[E] "Application Required" herein has been received by the Floodplain Administrator.
2. The Floodplain Administrator shall review all floodplain development permit applications to assure that all necessary permits have been received from those Federal, state or local governmental agencies from which prior approval is required. The applicant shall be responsible for obtaining such permits as required including permits issued by the U.S. Army Corps of Engineers under §10 of the Rivers and Harbors Act and §404 of the Clean Water Act, and the Ohio Environmental Protection Agency under §401 of the Clean Water Act.

B. Approval:

Within thirty (30) days after the receipt of a complete application, the Floodplain Administrator shall either approve or disapprove the application. If an application is approved, a floodplain development permit shall be issued. All floodplain development permits shall be conditional upon the commencement of work within one (1) year. A floodplain development permit shall expire one (1) year after issuance unless the permitted activity has been substantially begun and is thereafter pursued to completion.

3.06[E] - Inspections:

The Floodplain Administrator shall make periodic inspections at appropriate times throughout the period of construction in order to monitor compliance with permit conditions.

3.07[E] - Post-Construction Certifications Required:

The following as-built certifications are required after a floodplain development permit has been issued:

- A. For new or substantially improved residential structures, or nonresidential structures that have been elevated, the applicant shall

have a *Federal Emergency Management Agency Elevation Certificate* completed by a Registered Professional Surveyor to record as-built elevation data. For elevated structures in Zone A and Zone AO areas without a base flood elevation, the elevation certificate may be completed by the property owner or owner's representative.

- B. For all development activities subject to the standards of Section 3.10[E] "Map Maintenance Activities", Subsection (A) "Requirement to Submit New Technical Data" herein, a Letter of Map Revision.

3.08[E] - Revoking a Floodplain Development Permit:

A floodplain development permit shall be revocable, if among other things, the actual development activity does not conform to the terms of the application and permit granted thereon. In the event of the revocation of a permit, an appeal may be taken to the Variance Board in accordance with Appendix [E]. Article 5. - Appeals and Variances of these regulations.

3.09[E] - Exemption from Filing a Development Permit:

An application for a floodplain development permit shall not be required for:

- A. Maintenance work such as roofing, painting, and basement sealing, or for small nonstructural development activities (except for filling and grading) valued at less than five thousand dollars (\$5,000);
- B. Development activities in an existing or proposed manufactured home park. Such activities are under the authority of the Ohio Department of Health and subject to the flood damage reduction provisions of §3701 of the Ohio Administrative Code;
- C. Major utility facilities permitted by the Ohio Power Siting Board under Chapter 4906 of the Ohio Revised Code;
- D. Hazardous waste disposal facilities permitted by the Hazardous Waste Siting Board under Chapter 3734 of the Ohio Revised Code; and/or
- E. Development activities undertaken by a federal agency and which are subject to Federal Executive Order 11988 – Floodplain Management.

Any proposed action exempt from filing for a floodplain development permit is also exempt from the standards of these regulations.

3.10[E] - Map Maintenance Activities:

To meet National Flood Insurance Program minimum requirements to have flood data reviewed and approved by FEMA, and to ensure that the flood maps, studies and other data identified in Appendix [E]. Article 1. - Statutory Authorization, Findings of Fact, Purpose and Objectives, Section 1.06[E] "Basis

for Establishing the Areas of Special Flood Hazard" accurately represent flooding conditions in Knox County, Ohio, so appropriate floodplain management criteria are based on current data, the following map maintenance activities are identified:

A. Requirement to Submit New Technical Data:

1. For all development proposals that impact floodway delineations or base flood elevations, the community shall ensure that technical data reflecting such changes be submitted to FEMA within six (6) months of the date such information becomes available. These development proposals include:
 - a. Floodway encroachments that increase or decrease base flood elevations or alter floodway boundaries;
 - b. Fill sites to be used for the placement of proposed structures where the applicant desires to remove the site from the special flood hazard area;
 - c. Alteration of watercourses that result in a relocation or elimination of the special flood hazard area, including the placement of culverts; and
 - d. Subdivision or large scale development proposals requiring the establishment of base flood elevations in accordance with Appendix [E]. Article 4. - Use and Development Standards for Flood Hazard Reduction, Section 4.03[E] "Subdivisions and Large Developments".
2. It is the responsibility of the applicant to have technical data, required in accordance with this Section 3.10[E], Subsection (A), prepared in a format required for a Conditional Letter of Map Revision or Letter of Map Revision, and submitted to FEMA. Submittal and processing fees for these map revisions shall be the responsibility of the applicant;
3. The Floodplain Administrator shall require a Conditional Letter of Map Revision prior to the issuance of a floodplain development permit for:
 - a. Proposed floodway encroachments that increase the base flood elevation; and
 - b. Proposed development which increases the base flood elevation by more than one tenth of one (0.1) foot in areas where FEMA has provided base flood elevations but no floodway.

4. Floodplain development permits issued by the Floodplain Administrator shall be conditioned upon the applicant obtaining a Letter of Map Revision from FEMA for any development proposal subject to this Section 3.10[E], Subsection (A), Subparagraph (1).

B. Right to Submit New Technical Data:

The Floodplain Administrator may request changes to any of the information shown on an effective map that does not impact floodplain or floodway delineations or base flood elevations, such as labeling or planimetric details. Such a submission shall include appropriate supporting documentation made in writing by the President of the Board of Commissioners of Knox County, Ohio, and may be submitted at any time.

C. Annexation/Detachment:

Upon occurrence, the Floodplain Administrator shall notify FEMA in writing whenever the boundaries of Knox County, Ohio, have been modified by annexation or the community has assumed authority over an area, or no longer has authority to adopt and enforce floodplain management regulations for a particular area. In order that the Knox County, Ohio, Flood Insurance Rate Map accurately represents the boundaries of Knox County, Ohio, include within such notification a copy of a map of Knox County, Ohio, suitable for reproduction, clearly showing the new corporate limits or the new area for which Knox County, Ohio, has assumed or relinquished floodplain management regulatory authority.

3.11[E] - Data Use and Flood Map Interpretation:

The following guidelines shall apply to the use and interpretation of maps and other data showing areas of special flood hazard:

- A. In areas where FEMA has not identified special flood hazard areas, or in FEMA identified special flood hazard areas where base flood elevation and floodway data have not been identified, the Floodplain Administrator shall review and reasonably utilize any other flood hazard data available from a federal, state, or other source;
- B. Base flood elevations and floodway boundaries produced on FEMA flood maps and studies shall take precedence over base flood elevations and floodway boundaries by any other source that reflect a reduced floodway width and/or lower base flood elevations. Other sources of data, showing increased base flood elevations and/or larger floodway areas than are shown on FEMA flood maps and studies, shall be reasonably used by the Floodplain Administrator;

- C. When Preliminary Flood Insurance Rate Maps and/or Flood Insurance Study have been provided by FEMA:
 - 1. Upon the issuance of a Letter of Final Determination by FEMA, the preliminary flood hazard data shall be used and replace all previously existing flood hazard data provided from FEMA for the purposes of administering these regulations;
 - 2. Prior to the issuance of a Letter of Final Determination by FEMA, the use of preliminary flood hazard data shall only be required where no base flood elevations and/or floodway areas exist or where the preliminary base flood elevations or floodway areas exceed the base flood elevations and/or floodway widths in existing flood hazard data provided from FEMA. Such preliminary data may be subject to change and/or appeal to FEMA;
- D. The Floodplain Administrator shall make interpretations, where needed, as to the exact location of the flood boundaries and areas of special flood hazard. A person contesting the determination of the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in Appendix [E]. Article 5. - Appeals and Variances; and/or
- E. Where a map boundary showing an area of special flood hazard and field elevations disagree, the base flood elevations or flood protection elevations (as found on an elevation profile, floodway data table, established high water marks, etc.) shall prevail.

3.12[E] - Substantial Damage Determinations:

Damages to structures may result from a variety of causes including tornado, wind, heavy snow, flood, fire, etc. After such a damage event, the Floodplain Administrator shall:

- A. Determine whether damaged structures are located in special flood hazard areas;
- B. Conduct substantial damage determinations for damaged structures located in special flood hazard areas; and
- C. Make reasonable attempt to notify owners of substantially damaged structures of the need to obtain a floodplain development permit prior to repair, rehabilitation, or reconstruction.

Additionally, the Floodplain Administrator may implement other measures to assist with the substantial damage determination and subsequent repair process. These measures include issuing press releases, public service announcements, and other public information materials related to the floodplain development permits and repair of damaged structures; coordinating

with other Federal, state, and local agencies to assist with substantial damage determinations; providing owners of damaged structures materials and other information related to the proper repair of damaged structures in special flood hazard areas; and assist owners of substantially damaged structures with Increased Cost of Compliance insurance claims.

APPENDIX [E].

KNOX COUNTY, FLOOD DAMAGE REDUCTION RESOLUTION

ARTICLE 4. USE AND DEVELOPMENT STANDARDS FOR FLOOD HAZARD REDUCTION

The following use and development standards apply to development wholly within, partially within, or in contact with any special flood hazard area as established in Appendix [E]. Article 1. Statutory Authorization, Findings of Fact, Purpose and Objectives, Section 1.06[E] "Basis for Establishing the Areas of Special Flood Hazard" or Article 3. Administration, Section 3.11[E] "Data Use and Flood Map Interpretation", Subparagraph (A):

4.01[E] - Use Regulations:

A. Permitted Uses:

All uses not otherwise prohibited in this section or any other applicable land use regulation adopted by the Board of County Commissioners of Knox County, Ohio, are allowed provided they meet the provisions of these regulations;

B. Prohibited Uses:

1. Private water supply systems in all special flood hazard areas identified by FEMA, permitted under Chapter 3701 of the Ohio Revised Code;
2. Infectious waste treatment facilities in all special flood hazard areas, permitted under Chapter 3734 of the Ohio Revised Code;
3. Critical developments in all special flood hazard areas;
4. Storage or processing of materials that are hazardous, flammable, or explosive in the identified special flood hazard area [See definitions under "storage" and "hazardous, flammable or explosive materials."];
5. Storage of material or equipment that, in time of flooding, could become buoyant and pose an obstruction to flow in identified floodway areas [See definitions under "storage" and "material or equipment"]; and/or

6. New construction of any residential or nonresidential structure in floodway areas.

4.02[E] - Water and Wastewater Systems:

The following standards apply to all water supply, sanitary sewerage and waste disposal systems not otherwise regulated by the Ohio Revised Code:

- A. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems;
- B. New and replacement sanitary sewerage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters; and,
- C. On-site waste disposal systems shall be located to avoid impairment to or contamination from them during flooding.

4.03[E] - Subdivisions and Large Developments:

- A. All subdivision proposals shall be consistent with the need to minimize flood damage and are subject to all applicable standards in these regulations;
- B. All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage;
- C. All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and
- D. In all areas of special flood hazard where base flood elevation data are not available, the applicant shall provide a hydrologic and hydraulic engineering analysis that generates base flood elevations for all major (platted) subdivision proposals and other proposed developments at least one and one-half (1 1/2) acres in size.
- E. The applicant shall comply with the requirement to submit technical data to FEMA in Appendix [E]. Article 3. - Administration, Section 3.10[E] "Map Maintenance Activities", Subsection (A) Subparagraph(1)(d) when a hydrologic and hydraulic analysis is completed that generates base flood elevations as required by this Section 4.03[E], Subsection (D) herein.
- F. All preliminary plans for platted subdivisions shall identify the flood hazard areas and the elevation of the base flood.
- G. All final subdivision plats will provide the boundary of the special flood hazard area, the floodway boundary, and base flood elevations.

- H. In platted subdivisions, all proposed lots or parcels that will be future building sites shall have a minimum buildable area outside the natural (non-filled) one hundred (100)-year flood level elevation. The buildable area shall be large enough to accommodate any primary structure and associated structures such as sheds, barns, swimming pools, detached garages, on-site sewage disposal systems, and water supply wells, if applicable.
- I. Approval shall not be given for roads within a subdivision, which would be subject to flooding. All road surfaces must be located at or above the base flood elevation.

4.04[E] - Residential Structures:

- A. New construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. Where a structure, including its foundation members, is elevated on fill to or above the base flood elevation, the requirements for anchoring {Section 4.04[E], Subsection (A) herein} and construction materials resistant to flood damage {Section 4.04[E], Subsection (B) herein} must be satisfied.
- B. New construction and substantial improvements shall be constructed with methods and materials resistant to flood damage.
- C. New construction and substantial improvements shall be constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or elevated so as to prevent water from entering or accumulating within the components during conditions of flooding.
- D. New construction and substantial improvement of any residential structure, including manufactured homes, shall have the lowest floor, including basement, elevated to or above the flood protection elevation.
 - 1. Where flood protection elevation data are not available, the structure shall have the lowest floor, including basement, elevated at least two (2) feet above the highest adjacent natural grade.
 - 2. Support structures and other foundation members shall be certified by a Registered Professional Engineer or architect and designed in accordance with ASCE 24, Flood Resistant Design and Construction.
- E. New construction and substantial improvements, including manufactured homes, that do not have basements and that are elevated to the flood protection elevation using pilings, columns, posts, or solid foundation perimeter walls with openings sufficient to allow unimpeded

movement of flood waters may have an enclosure below the lowest floor provided the enclosure meets the following standards:

1. Be used only for the parking of vehicles, building access, or storage; and
 2. Be designed and certified by a Registered Professional Engineer or architect to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters; or
 3. Have a minimum of two (2) openings on different walls having a total net area not less than one (1) square inch for every square foot of enclosed area, and the bottom of all such openings being no higher than one (1) foot above grade. The openings may be equipped with screens, louvers, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.
- F. Manufactured homes shall be affixed to a permanent foundation and anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors.
- G. Repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as an historic structure and is the minimum necessary to preserve the historic character and design of the structure shall be exempt from the development standards of this Section 4.04[E] herein.
- H. Each new residential site shall have direct access to a walkway, driveway, or roadway whose surface elevation is not less than the flood protection elevation and such escape route shall lead directly out of the floodplain area.
- I. In any Zone AO, new construction and substantial improvement shall have adequate drainage paths around structures on slopes to guide floodwaters around and away from the structure.

4.05[E] - Nonresidential Structures:

- A. New construction and substantial improvement of any commercial, industrial or other nonresidential structure shall meet the requirements of Section 4.04[E], Subsections (A) through (C), (E) through (G), and (I) herein.
- B. New construction and substantial improvement of any commercial, industrial or other non-residential structure shall either have the lowest

floor, including basement, elevated to or above the level of the flood protection elevation; or, together with attendant utility and sanitary facilities, shall meet all of the following standards:

1. Be dry floodproofed so that the structure is watertight with walls substantially impermeable to the passage of water to the level of the flood protection elevation;
 2. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and,
 3. Be certified by a Registered Professional Engineer or architect, through the use of a *Federal Emergency Management Floodproofing Certificate*, that the design and methods of construction are in accordance with this Section 4.05[E], Subsection (B), Subparagraphs (1) and (2) herein.
- C. Where flood protection elevation data are not available, the structure shall have the lowest floor, including the basement, elevated at least two (2) feet above the highest adjacent, natural grade.
- D. Each new nonresidential site shall have direct access to a walkway, driveway, or roadway whose surface elevation is not less than the flood protection elevation and such escape route shall lead directly out of the floodplain area.

4.06[E] - Accessory Structures:

Relief to the elevation or dry floodproofing standards may be granted for accessory structures containing no more than six hundred (600) square feet. Such structures must meet the following standards:

- A. They shall not be used for human habitation;
- B. They shall be constructed of flood resistant materials;
- C. They shall be constructed and placed on the lot to offer the minimum resistance to the flow of floodwaters;
- D. They shall be firmly anchored to prevent flotation;
- E. Service facilities such as electrical and heating equipment shall be elevated or floodproofed to or above the level of the flood protection elevation; and
- F. They shall meet the opening requirements of Section 4.04[E], Subsection (E), Subparagraph (3) herein.

4.07[E] - Recreational Vehicles:

Recreational vehicles must meet at least one (1) of the following standards:

- A. They shall not be located on sites in special flood hazard areas for more than one hundred eighty (180) days, or
- B. They must be fully licensed and ready for highway use, or
- C. They must meet all standards of Section 4.04[E] herein.

4.08[E] - Above Ground Gas or Liquid Storage Tanks:

All above-ground gas or liquid storage tanks shall be anchored to prevent flotation or lateral movement resulting from hydrodynamic and hydrostatic loads.

4.09[E] - Assurance of Flood Carrying Capacity:

Pursuant to the purpose and methods of reducing flood damage stated in these regulations, the following additional standards are adopted to assure that the reduction of the flood carrying capacity of watercourses is minimized:

A. Development in Riverine Areas with Base Flood Elevations:

- 1. In Riverine special flood hazard areas identified by FEMA where base flood elevation data are provided, the cumulative effect of any proposed development, when combined with all other existing and anticipated development, shall not increase the base flood elevation more than one tenth of one (0.1) foot at any point. Prior to issuance of a floodplain development permit, the applicant must submit a hydrologic and hydraulic analysis, conducted by a Registered Professional Engineer, that delineates a floodway based on the one tenth of one (0.1) foot cumulative rise allowed. The floodway shall be delineated based on an equal degree of conveyance reduction on each side of the channel when physically possible.
- 2. In areas where a floodway has been delineated based on one tenth of one (0.1) foot rise and previously approved by Knox County, the previously approved floodway may be used.

B. Development in Floodways (re-delineated with one tenth of one (0.1) foot standard):

In floodway areas, delineated in accordance with 4.9 A and as approved by Knox County, development shall cause no increase in flood levels during the occurrence of the base flood discharge. Prior to issuance of a floodplain development permit, the applicant must submit a hydrologic and hydraulic analysis, conducted by a Registered Professional Engineer, demonstrating that the proposed development would not result in any increase in the base flood elevation.

C. Alterations of a Watercourse:

For the purpose of these regulations, a watercourse is altered when any change occurs within its banks. The extent of the banks shall be established by a field determination of the "bankfull stage." The field determination of "bankfull stage" shall be based on methods presented in Chapter 7 of the *USDA Forest Service General Technical Report RM-245, Stream Channel Reference Sites: An Illustrated Guide to Field Technique* or other applicable publication available from a Federal, state, or other authoritative source. For all proposed developments that alter a watercourse, the following standards apply:

1. The bankfull flood carrying capacity of the altered or relocated portion of the watercourse shall not be diminished. Prior to the issuance of a floodplain development permit, the applicant must submit a description of the extent to which any watercourse will be altered or relocated as a result of the proposed development, and certification by a Registered Professional Engineer that the bankfull flood carrying capacity of the watercourse will not be diminished.
2. Adjacent communities, the U.S. Army Corps of Engineers, and the Ohio Department of Natural Resources, Division of Water, must be notified prior to any alteration or relocation of a watercourse. Evidence of such notification must be submitted to the Federal Emergency Management Agency.
3. The applicant shall be responsible for providing the necessary maintenance for the altered or relocated portion of said watercourse so that the flood carrying capacity will not be diminished. The Floodplain Administrator may require the permit holder to enter into an agreement with Knox County, Ohio, specifying the maintenance responsibilities. If an agreement is required, it shall be made a condition of the floodplain development permit.
4. The applicant shall meet the requirements to submit technical data in Appendix [E]. Article 3. - Administration, Section 3.10[E] "Map Maintenance Activities", Subparagraph (A), Subsection (1)(c) when an alteration of a watercourse results in the relocation or elimination of the special flood hazard area, including the placement of culverts.

4.10[E] - Storage of Materials:

Storage of material or equipment not otherwise prohibited in Section 4.01[E], Subparagraph (B) herein shall be firmly anchored to prevent flotation.

4.11 [E] - Fill:

The following standards apply to all activities involving fill in special flood hazard areas:

- A. Fill within the special flood hazard area shall be clean granular or earthen material.
- B. Fill sites, upon which structures will be constructed or placed, must be compacted to ninety-five percent (95%) of the maximum density obtainable with the Standard Proctor Test method or an acceptable equivalent method.
- C. Fill slopes shall not be steeper than one (1) foot vertical to two (2) feet (1:2) horizontal.
- D. Adequate protection against erosion and scour must be provided for fill slopes.
 - 1. When the expected velocities during the occurrence of the base flood are five (5) feet per second or greater, armoring with stone or rock protection shall be provided.
 - 2. When the expected velocities during the base flood are less than five (5) feet per second, protection of the slopes shall be provided with vegetative cover.
- E. Fill shall result in no net loss of natural floodplain storage below the Flood Protection Elevation. The volume of the loss of floodwater storage due to filling in the special flood hazard area shall be offset by providing an equal volume of permanent compensatory flood storage capacity by excavation or other measures at or adjacent to the development site. Areas for Compensatory Flood Storage must be:
 - 1. Open to the Floodplain Administrator for inspection.
 - 2. Permanently tied to the property, which may include more than one parcel, receiving the fill and must be repaired or replaced by the owner of the property, if silted in or otherwise compromised.
 - 3. Above the water table; i.e., the storage area cannot hold water other than in times of flooding, and
 - 4. In the same drainage system.
 - 5. Adjacent to the area being filled.
 - 6. Must allow for free flow of flood waters into and out of the area.

APPENDIX [E].
KNOX COUNTY, FLOOD DAMAGE
REDUCTION RESOLUTION

ARTICLE 5. APPEALS AND VARIANCES

5.01[E] - Appeals Board Established:

The elected officers (Chairman, Vice Chairman and Treasurer) of the Knox County Regional Planning Commission, the Knox County Engineer and the Administrator of the Knox Soil and Water Conservation District are hereby designated as the Appeals Board. Records of the Appeals Board shall be kept and filed in the Office of the Knox County Regional Planning Commission, 117 East High Road, Room 221, Mount Vernon, Ohio, 43050.

5.02[E] - Powers and Duties:

- A. The Appeals Board shall hear and decide appeals where it is alleged there is an error in any order, requirement, decision or determination made by the Floodplain Administrator in the administration or enforcement of these regulations.
- B. Authorize variances in accordance with Section 5.04[E] herein of these regulations.

5.03[E] - Appeals:

Any person affected by any notice and order, or other official action of the Floodplain Administrator may request and shall be granted a hearing on the matter before the Appeals Board provided that such person shall file, within seven (7) calendar days of the date of such notice and order, or other official action, a brief statement of the grounds for such hearing or for the mitigation of any item appearing on any order of the Floodplain Administrator's decision. Such appeal shall be in writing, signed by the applicant, and be filed with the Floodplain Administrator. Upon receipt of the appeal, the Floodplain Administrator shall transmit said notice and all pertinent information on which the Floodplain Administrator's decision was made to the Appeals Board.

Upon receipt of the notice of appeal, the Appeals Board shall fix a reasonable time for the appeal, give notice in writing to parties in interest, and decide the appeal within a reasonable time after it is submitted.

5.04[E] - Variances:

Any person believing that the use and development standards of these regulations would result in unnecessary hardship may file an application for a variance. The Appeals Board shall have the power to authorize, in specific

cases, such variances from the standards of these regulations, not inconsistent with Federal regulations, as will not be contrary to the public interest where, owing to special conditions of the lot or parcel, a literal enforcement of the provisions of these regulations would result in unnecessary hardship.

A. Application for a Variance:

1. Any owner, or agent thereof, of property for which a variance is sought shall make an application for a variance by filing it with the Floodplain Administrator, who upon receipt of the variance shall transmit it to the Appeals Board.
2. Such application at a minimum shall contain the following information:
 - a. Name, address, and telephone number of the applicant;
 - b. Legal description of the property;
 - c. Parcel map;
 - d. Description of the existing use;
 - e. Description of the proposed use;
 - f. Location of the floodplain;
 - g. Description of the variance sought; and
 - h. Reason for the variance request.
3. All applications for a variance shall be accompanied by a variance application fee set in the schedule of fees adopted by the Board of County Commissioners of Knox County, Ohio.

B. Notice for Public Hearing:

The Appeals Board shall schedule and hold a public hearing within thirty (30) days after the receipt of an application for a variance from the Floodplain Administrator. Prior to the hearing, a notice of such hearing shall be given in one (1) or more newspapers of general circulation in the community at least ten (10) days before the date of the hearing.

C. Public Hearing:

At such hearing the applicant shall present such statements and evidence as the Appeals Board requires. In considering such variance applications, the Appeals Board shall consider and make findings of fact on all evaluations, all relevant factors, standards specified in other sections of these regulations and the following factors:

1. The danger that materials may be swept onto other lands to the injury of others.
2. The danger to life and property due to flooding or erosion damage.
3. The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner.
4. The importance of the services provided by the proposed facility to the community.
5. The availability of alternative locations for the proposed use which are not subject to flooding or erosion damage.
6. The necessity to the facility of a waterfront location, where applicable.
7. The compatibility of the proposed use with existing and anticipated development.
8. The relationship of the proposed use to the comprehensive plan and floodplain management program for that area.
9. The safety of access to the property in times of flood for ordinary and emergency vehicles.
10. The expected heights, velocity, duration, rate of rise, and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site.
11. The costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water systems, and roads and bridges.

Variances shall only be issued upon:

1. A showing of good and sufficient cause.
2. A determination that failure to grant the variance would result in exceptional hardship due to the physical characteristics of the property. Increased cost or inconvenience of meeting the requirements of these regulations do not constitute an exceptional hardship to the applicant.
3. A determination that the granting of a variance will not result in increased flood heights beyond that which is allowed in these regulations; additional threats to public safety; extraordinary public expense, nuisances, fraud on or victimization of the public, or conflict with existing local laws.

4. A determination that the structure or other development is protected by methods to minimize flood damages.
5. A determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.

Upon consideration of the above factors and the purposes of these regulations, the Appeals Board may attach such conditions to the granting of variances as it deems necessary to further the purposes of these regulations. D. Other Conditions for Variances:

1. Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result.
2. Generally, variances may be issued for new construction and substantial improvements to be erected on a lot of one-half (1/2) acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing items in this Section 5.04[E], Subparagraph (C), Subsections (1) through (11) herein have been fully considered. As the lot size increases beyond one-half (1/2) acre, the technical justification required for issuing the variance increases.
3. Any applicant to whom a variance is granted shall be given written notice that the structure will be permitted to be built with a lowest floor elevation below the base flood elevation and the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.

5.05[E] - Procedure at Hearings:

- A. All testimony shall be given under oath.
- B. A complete record of the proceedings shall be kept, except confidential deliberations of the Appeals Board, but including all documents presented and a verbatim record of the testimony of all witnesses.
- C. The applicant shall proceed first to present evidence and testimony in support of the appeal or variance.
- D. The administrator may present evidence or testimony in opposition to the appeal or variance.
- E. All witnesses shall be subject to cross-examination by the adverse party or their counsel.

- F. Evidence that is not admitted may be proffered and shall become part of the record for appeal.
- G. The Appeals Board shall issue subpoenas upon written request for the attendance of witnesses. A reasonable deposit to cover the cost of issuance and service shall be collected in advance.
- H. The Appeals Board shall prepare conclusions of fact supporting its decision. The decision may be announced at the conclusion of the hearing and thereafter issued in writing or the decision may be issued in writing within a reasonable time after the hearing.

5.06[E] - Appeal to the Court:

Those aggrieved by the decision of the Appeals Board may appeal such decision to the Knox County, Ohio, Court of Common Pleas, as provided in Chapter 2506 of the Ohio Revised Code.

APPENDIX [E].

KNOX COUNTY, FLOOD DAMAGE REDUCTION RESOLUTION

ARTICLE 6. ENFORCEMENT

6.01[E] - Compliance Required:

- A. No structure or land shall hereafter be located, erected, constructed, reconstructed, repaired, extended, converted, enlarged or altered without full compliance with the terms of these regulations and all other applicable regulations which apply to uses within the jurisdiction of these regulations, unless specifically exempted from filing for a development permit as stated in Appendix [E]. Article 3. - Administration, Section 3.09[E] "Exemption from Filing a Development Permit."
- B. Failure to obtain a floodplain development permit shall be a violation of these regulations and shall be punishable in accordance with Section 6.03[E] herein.
- C. Floodplain development permits issued on the basis of plans and applications approved by the Floodplain Administrator authorize only the use and arrangement set forth in such approved plans and applications or amendments thereto. Use, arrangement, or construction contrary to that authorized shall be deemed a violation of these regulations and punishable in accordance with Section 6.03[E] herein.

6.02[E] - Notice of Violation:

Whenever the Floodplain Administrator determines that there has been a violation of any provision of these regulations, he shall give notice of such violation to the person responsible therefor and order compliance with these regulations as hereinafter provided. Such notice and order shall:

- A. Be put in writing on an appropriate form;
- B. Include a list of violations, referring to the section or sections of these regulations that have been violated, and order remedial action which, if taken, will affect compliance with the provisions of these regulations;
- C. Specify a reasonable time for corrective measures;
- D. Advise the owner, operator, or occupant of the right to appeal;

- E. Be served on the owner, occupant, or agent in person. However, this notice and order shall be deemed to be properly served upon the owner, occupant, or agent if a copy thereof is sent by registered or certified mail to the person's last known mailing address, residence, or place of business, and/or a copy is posted in a conspicuous place in or on the dwelling affected.

6.03[E] - Violations and Penalties:

Violation of the provisions of these regulations or failure to comply with any of its requirements shall be deemed to be a strict liability offense. Any person who violates these regulations or fails to comply with any of its requirements shall upon conviction thereof be fined not more than three hundred (\$300.00).

Each day such violation continues shall be considered a separate offense. Nothing herein contained shall prevent Knox County, Ohio, from taking such other lawful action as is necessary to prevent or remedy any violation. Knox County, Ohio, shall prosecute any violation of these regulations in accordance with the penalties stated herein.

APPENDIX [E].

KNOX COUNTY, FLOOD DAMAGE
REDUCTION RESOLUTION

ARTICLE 7. ADOPTION

This Resolution (595 A-2006) shall take effect on the thirty-first day following the date of its adoption. The "Knox County Flood Damage Reduction Resolution" adopted on January 20, 2005 is hereby repealed.

Adopted by the Board of County Commissioners on this 20th day of July, 2006.

Roll Call Vote:

Mr. McLarnan, Aye.

Mr. Stockberger, Aye.

Mr. Wise, Aye.

Attest: Rochelle R. Shackle, Clerk/Administrator

CERTIFICATION OF PUBLIC NOTICES

In accordance with §307.37 and §307.39 of the Ohio Revised Code, public hearings were held on the 17th day of July, 2006, and the 20th day of July, 2006, at regular meetings of the Board of County Commissioners. Notice of these hearings was published once a week for two weeks immediately preceding the hearings in the *Mount Vernon News* on Monday, July 3, 2006 and Monday, July 10, 2006; Thursday, July 6, 2006 and Thursday, July 13, 2006.

A notice of adoption and availability was published within ten days after adoption in the *Mount Vernon News* on Friday, July 28 and Saturday, July 29, 2006.

CERTIFIED BY: Randy Pore, Flood Plain Administrator

DATE: August 21, 2006.

APPENDIX [F].

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the addition of future land use regulation

APPENDIX [G].

SEDIMENT AND EROSION CONTROL

&

STORM WATER MANAGEMENT

SCHEDULE OF FEES

<u>Lot/Acreage Size</u>	<u>Description</u>	<u>Fee</u>
Commercial Sites*	Up to 1.5 acres disturbed Per acre beyond 1.5 disturbed	\$300.00 \$200.00
Subdivisions*	Fee per lot regardless of number	\$100.00
Multi-Family Residential*	Fee per housing unit e.g., 2-unit condo = \$200	\$100.00
Individual Residential Lot	Lot not part of larger common Plan	\$50.00
Churches/Nonprofits 501	Lot not part of a larger common plan	No Charge
Additions to existing structures of three hundred (300) square feet or less are exempt from the permitting and fee process.		
*Inspection fee of two and one half percent (2.5%) of one hundred percent (100%) of the approved estimated cost of the required storm water improvements shall be added to the permit fee at the time of application		

APPENDIX [H].

COMPREHENSIVE STORM WATER
MANAGEMENT PLAN
FOR MAJOR SUBDIVISIONS
KNOX COUNTY, OHIO

GLOSSARY OF TERMS

The following is a compilation of words commonly used in this and other storm water management-related documents.

"Channel" - means a natural stream that conveys water, or a ditch or channel excavated for the flow of water.

"Concentrated Storm Water Runoff" - means the surface runoff which converges and flows primarily through water conveyance features such as swales, gullies, waterways, channels or storm sewers and which exceeds the maximum specified flow rates of filters or perimeter controls intended to control sheet flow.

"Conservation" - means the wise use and management of natural resources.

"Control Device" - means an element of a discharge structure which allows the gradual release of water under controlled conditions. This is sometimes referred to as the bleed-down mechanism, or "bleeder."

"Control Elevation" - means the lowest elevation at which water can be released through the control device.

"County" - means the County of Knox acting through its various departments and authorized agents, such agents acting separately within the scope of particular duties assigned to them.

"County Engineer" - means the Engineer of the County of Knox or his authorized agents or assistants.

"Cut and Fill Slopes" - means a portion of land surface or area from which soil material is excavated and/or filled forming a slope or embankment.

- "Denuded Area" - means a portion of land surface on which the vegetation or other soil stabilization features have been removed, destroyed, or covered and which may result in or contribute to erosion and sedimentation.
- "Detention" - means the delay of storm runoff prior to discharge into receiving waters.
- "Detention Facility" - means a reservoir, formed from soil or other material, to temporarily contain excess storm water runoff and release it at a regulated rate into a receiving watercourse. These facilities are normally dry and therefore, are commonly referred to as "dry ponds."
- "Detention Volume" - means the volume of open surface storage behind the discharge structure between the overflow elevation and control elevation.
- "Development Area" - means any contiguous area owned by one (1) person or operated as one (1) development unit and used or being developed for commercial, industrial, residential, or other non-farm purposes upon which earth-disturbing activities are planned or underway.
- "Discharge Structure" - means a structural device made of concrete, metal, or other similarly durable material through which water is discharged from a project to the receiving water.
- "District" - means the Knox Soil and Water Conservation District.
- "Ditch" - means an excavation, either man-made or natural, for the purpose of drainage or irrigation with intermittent flow.
- "Drainageway" - means an area of concentrated water flow other than a river, stream, ditch, or grassed waterway.
- "Dumping" - means the grading, pushing, piling, throwing, unloading, or placing of soil.
- "Earth-Disturbing Activity" - means any grading, excavating, filling or other alteration of the earth's surface, where natural or man-made cover is destroyed.
- "Earth Material" - means the soil, sediment, rock, sand, gravel, and organic material or residue associated with or attached to the soil.

- "Easement" - means the authorization by a property owner for the use by another person or agency, for a specified purpose, of a designated portion of his property.
- "Elevation" - means the height in feet above mean sea level according to National Geodetic Vertical Datum (NGVD).
- "Erosion" - means the process by which the land surface is worn away by the action of water, wind, ice, or gravity.
- "Erosion and Sediment Control Practices" - means the conservation measures used to control sedimentation or other pollution and includes structural practices, vegetative practices, and management techniques.
- "Flood Plain" - means a normally dry land area adjacent to stream channels that is susceptible to being inundated by overbank stream flows.
- "Frequency Storm" - means a rainfall or other storm event of a magnitude with a specified average recurrence interval and is calculated with Soil Conservation Service Type II twenty-four (24) hour curves or depth duration frequency curves.
- "Grading" - means the earth-disturbing activity such as excavation, stripping, cutting, filling, stockpiling, or any combination thereof.
- "Grassed Waterway" - means a broad or shallow natural water course or constructed channel covered with erosion-resistant grasses or similar vegetative cover, and used to conduct surface water.
- "Grubbing" - means removing, clearing or scalping material such as roots, stumps, or sod.
- "Impervious" - means the land surfaces which do not allow, or minimally allow, the penetration of water; included as examples are building roofs, normal concrete and asphalt pavements, and some fine-grained soils such as clays.
- "Intensity and Duration" - means the intensity of the rate of rainfall (described in layman's terms as "how hard it is raining") and the length of time of rainfall. The intensity is described by measuring the depth of rainfall over some period of time, usually one (1) hour.

- "Landslide" - means the rapid mass movement of soil and rock material downhill under the influence of gravity in which the movement of the soil mass occurs along an interior surface of sliding.
- "Local Storm Water Management" - means the design and construction of a facility(s) necessary to control storm water runoff within or adjacent to a development area.
- "ODNR" - means the Ohio Department of Natural Resources.
- "Outfall" - means an area where water flows from a structure such as a conduit, storm sewer, improved channel or drain, and the area immediately beyond the structure, which is impacted by the velocity of flow in the structure.
- "Overflow Elevation" - means the design elevation of a discharge structure at which, or below which, water is contained behind the structure, except for that which leaks or bleeds out through a control device down to the control elevation.
- "Overland Flow Detention" - means the time that elapses from the instant a rain starts until runoff reaches a defined channel. This time is affected by many factors such as the nature of the surface, slope, and length of land from the watershed boundary line to channel.
- "Person" - means any individual, corporation, partnership, joint venture, agency, unincorporated association, municipal corporation, township, county, state agency, the federal government, or any combination thereof.
- "Post-Development Runoff" - means the rate of storm water runoff from a watershed or development area based on modified runoff characteristics due to land use changes.
- "Pre-Development Runoff" - means the rate of storm water runoff from a watershed or development area based on existing runoff characteristics.
- "Professional Engineer" - means a person qualified to practice the profession of engineering and registered with the State Board of Registration for Professional Engineers and Surveyors of the State of Ohio.
- "Project Site" - means the area of land used and any contiguous (abutting) area owned by one (1) person or operated initially as one (1) unit upon

which construction and/or earth-disturbing activities are planned or are underway.

"Rate of Storm Water Runoff" - means an instantaneous measurement of water flow expressed in a unit of volume per unit of time, also referred to as "Discharge" (i.e., cubic feet per second [cfs]; gallons per minute [gpm]).

"Regional Storm Water Management" - means the design and construction of a facility(s) necessary to control storm water runoff from more than one (1) development area.

"Retention Facility" - means a reservoir, formed from soil or other material, to contain excess storm water for release at a regulated rate while maintaining a minimum pool of water. This facility is often associated with water-related recreational or aesthetic uses and is commonly termed a "wet pond."

"Runoff Characteristics" - means the surface components of any watershed or development area which affect the rate, amount, and direction of storm water runoff.

"SCS" - means the Soil Conservation Service now known as the Natural Resource Conservation Service (NRCS).

"Sediment" - means the solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by wind, water, gravity or ice, and has come to rest on the earth's surface above or below sea level.

"Sediment Basin" - means a settling pond meeting or exceeding the design specifications of a temporary sediment basin as defined in Rainwater and

Land Development: Ohio's Standards for Stormwater Management, Land Development and Urban Stream Protection. (ODNR 1996) as in the glossary section under "sediment basin."

"Sediment Control" - means the limiting of sediment transport by controlling erosion or detaining sediment-laden water to allow sediment to settle out.

"Sediment Pollution" - means the failure to use management or conservation practices to control wind or water erosion of the soil and to minimize the degradation of water resources by soil sediment in conjunction with land grading, excavating, filling, or other soil-disturbing activities on land used or being developed for commercial, industrial, residential, or other non-farm purposes.

"Sensitive Area" - means an area or water resource as delineated by the approving authority prior to plan approval, that requires special management because of its susceptibility to sediment pollution or because of its importance to the well-being of the surrounding communities, region, or the state and includes:

- A. Ponds, wetlands or small lakes with less than five (5) acres of surface area;
- B. Drainage areas of a local or state designated scenic river.

"Settling Pond" - means a runoff detention structure, such as a sediment basin or sediment trap which detains sediment-laden runoff, allowing sediment to settle out.

"Sheet Flow" - means the water runoff in a thin, uniform layer or rill which is of small enough quantity to be treated by sediment barriers.

"Silviculture" - means the theory and practice of controlling forest establishment, composition, and growth.

"Sloughing" - means a slip or downward movement of an extended layer of soil resulting from the undermining action of water or the earth-disturbing activity of man.

"Soil" - means the unconsolidated erodible earth material consisting of minerals and/or organics.

"Soil Loss" - means the soil relocated on or removed from a given site by the force of erosion and the redeposit of that soil at another site on land or in a body of water.

"Soil Stabilization" - means the vegetative or structural soil cover controlling erosion, and includes permanent and temporary seed, mulch, sod, pavement, etc.

- "Storm Frequency" - means the average time within which a storm of a given duration and intensity can be expected to be equaled or exceeded.
- "Storm Water Conveyance System" - means all storm sewers, channels, streams, ponds, lakes, etc., used for conveying concentrated storm water runoff or storing storm water runoff.
- "Storm Water Management Plan" - means the required set of representations/ drawings or other documents submitted by a land developer to a governmental entity according to the provisions of the governmental entity's storm water management program.
- "Storm Water Management Practices" - means any or a combination of a number of constructed physical features or techniques incorporated into the planning, design, and construction of a project to retain, detain, convey or control storm water runoff in accordance with current acceptable engineering practices.
- "Storm Water Management Program" - means the adopted regulations establishing the policies, purposes, criteria, and the means to administer and implement storm water and soil erosion control practices.
- "Storm Water Runoff" - means that portion of the rain or snow melt that flows off the land surface.
- "Stream" - means a body of water running or flowing on the earth's surface or the channel in which such flow occurs. Flow may be seasonally intermittent.
- "Topsoil" - means the surface and upper surface soils, which typically are darker, colored, fertile soil materials, ordinarily rich in organic matter or humus debris.
- "Unstable Soil" - means a portion of the land surface which is prone to slipping, sloughing, or landslides.
- "Volume of Storm Water Runoff" - means the quantity of water normally measured analytically in inches, cubic feet, or acre-feet.
- "Watercourse" - means the natural or improved channel which continuously or periodically conveys moving water and/or forms a link to or between

bodies of water. It has a definite bed and banks which confine the flow of water. Watercourses may be streams, rivers, major ditches or canals.

"Water Management Areas" - means the areas to be utilized for the conveyance or storage of storm water or environmental preservation.

"Water Resources" - means all streams, lakes, ponds, wetlands, watercourses, waterways, drainage systems, and all other bodies or accumulations of surface water, natural or artificial, which are situated wholly or partly within, or border upon, this state, or are within its jurisdiction, except those private waters which do not combine or effect a junction with natural surface waters.

"Watershed" - means the topographically defined area drained by a river/stream or other body of water such that all outflow is discharged through a single watercourse.

"Watershed Plan" - means a master plan, identifying through hydrologic and other analysis, the existing and future watershed problems relating to flooding, erosion, and sedimentation caused by land use changes, and recommending alternative control and management options.

"Wetlands" - means areas that are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.

APPENDIX [H].

ARTICLE 1.

GENERAL REQUIREMENTS

1.1[H] - Introduction:

These regulations for developing major subdivisions within Knox County shall conform with the *Knox County Storm Water Management and Sediment Control Regulations*, dated December 15, 2003, effective January 22, 2004, and as amended to date. The following are intended to offer guidelines for compliance with and to complement those regulations for situations involving a larger common plan (minor subdivisions); commercial/industrial development; redevelopment or expansion; earth-disturbance of more than twenty thousand square feet (20,000); and major subdivisions.

1.2[H] - Purpose:

Storm water runoff regulations and standards have been developed for the purpose of managing non-farm, earth-disturbing activities in order to control runoff so as to reduce or prevent flooding, soil erosion, sedimentation, and degradation of water quality.

1.3[H] - Runoff Control Criteria:

If the volume and/or the peak rate of runoff from an area after development will be greater than the volume and/or the peak rate of runoff from the same area before development, corrective action will be required. The peak rate of runoff from the twenty-five (25)-year frequency, twenty-four (24)hour storm and more frequent storms occurring on the development area shall be reduced to the peak rate of runoff from a one (1)-year frequency, twenty-four (24)-hour storm occurring on the same area under pre-development conditions. The fifty (50)-year and one hundred (100)-year storm shall have peak runoff rates no greater than the peak runoff rates from equivalent size storms under pre-development conditions.

1.4[H] - Drainage Systems:

Storm drainage and management systems are constructed to contend with an increase in runoff as land is developed. A typical drainage system has

two (2) separate and distinct components: the primary and the secondary systems. The secondary system serves as the initial drainage system. This system consists of storm sewers, swales, small ditches, gutters, and various inlets and catch basins that collect and convey runoff to an impoundment or discharge area. When the secondary system's capacity is exceeded or is impeded, the excess flows over land, causing damage. The following articles contain criteria for secondary drainage systems.

The primary system serves as the flood control system, which includes natural streams, channels, large pipes, planned conveyance routes, storm water facilities, ponds, and lakes. Planned conveyance routes may include: streets, property line drainage easements, and other water-carrying routes. The purpose of the primary drainage system is to accommodate the runoff that exceeds the secondary system. The design storm frequency for the primary system is the one hundred (100)-year frequency, twenty-four (24)-hour storm duration.

The primary and secondary drainage systems should be planned and designed concurrently. In previous years, the only planned portion of a drainage system has been storm sewers. When the sewer capacity is exceeded, floodwaters create their own flood routes, often through yards, homes, and businesses.

The following discussion presents only a limited look at the design criteria for the components of the secondary drainage system. It is important to refer to the specific chapters and articles of this document for a narrative and detailed discussion of each type of system.

1.5[H] - General Procedure for Planning and Designing Drainage Systems:

The following list is offered as a general procedure for planning and designing a drainage system. Additional details on the elements of this list may be found in the following sections of this document. Users are cautioned that unique site conditions may require additional steps beyond this general procedure:

- A. Identify and list all applicable federal, state, and local regulations and criteria that will affect the design.
- B. Compile background and existing data including soil types, rainfall characteristics, historical flood information, water quality data,

groundwater conditions, locations of wetlands, and prior studies in the area.

- C. Identify probable future development within the basin. Off-site areas that drain onto the site, as well as the site itself, must be included.
- D. Identify natural drainage-ways through the site.
- E. Identify location of outfalls for the project; include their capacity and downstream constraints.
- F. Delineate drainage areas.
- G. Develop a preliminary system layout by roughly defining the primary and secondary flow routes.
- H. Calculate the associated runoff for both the primary and secondary drainage systems.
- I. Define grades and alignments for open channels and storm sewers. Several preliminary layouts should be considered. Identify other factors that will influence the alignment and grade, such as: utilities, buildings, erodibility of the soil, available right-of-way, etc.
- J. Determine the location of storm water storage facilities and how detention/retention will affect the rest of the system.
- K. Determine the amount of flow in the street and roughly space the inlets accordingly.
- L. Calculate the preliminary sizes of the storm sewers.
- M. Calculate the runoff flowing through each primary drainageway and determine the right-of-way required to convey the flows. Determine if the combined capacity of the street and storm sewer system is adequate to maintain surface flows within the allowable limits during a primary storm. Where primary drainageways consist of homeowner(s)' yards, determine the flow path and the associated limits in order to define the perpetual flow easements.
- N. Conduct detailed hydrologic calculations to compute design flows at all drainage structures of interest.

- O. Calculate on-site and off-site flows.
- P. Compute the runoff of storms ranging from the one (1)-year storm event to the one hundred (100)-year storm event.
- Q. Determine if storm water detention is required. Size the storage facility in accordance with specified criteria and regulations.
- R. Locate and size inlets for the specified secondary system return frequency. Determine where carryover flow occurs and make necessary adjustments to the computations.
- S. Determine the hydraulic grade line for the required storm frequency. Confirm that the hydraulic grade line is below permissible level. Make adjustments to the grade, size, and/or alignment as required to comply with criteria.
- T. Check the operation of the overall secondary system during the design storm and confirm that sufficient outfall capacity is available.
- U. Check the function of the storm water facilities during the one hundred (100)-year storm event. Confirm that retention/detention dams, which could pose a threat to property or human safety if they fail, are designed to handle flows even larger than the primary design storm.
- V. Evaluate the operation of culverts and bridges. Define the area affected by backwater flooding and indicate that this land should remain undeveloped.
- W. Evaluate the function of the entire drainage and storm water system for storms ranging from the one (1)-year frequency through the one hundred (100)-year storm event. Make any necessary adjustments.

1.6[H] - Submission Requirement:

The Storm Water Management Report shall contain all the information necessary to determine that the project complies with the storm water design criteria. The Storm Water Management Report shall contain at least the following information:

- 1.6.1[H] - Project Narrative
- 1.6.2[H] - Site Characteristics

- 1.6.3[H] - Maps
- 1.6.4[H] - Hydraulic Calculations
- 1.6.5[H] - Drainage Plans.

The Storm Water Management Plan may be submitted in two (2) phases: a preliminary plan and a final plan as described herein. The total plan shall include sufficient information to evaluate the environmental characteristics of the affected areas, the potential impacts on water resources, and the effectiveness and acceptability of any proposed storm water management measures. The preferred format is a bound report with a table of contents.

The preliminary plan shall include the project narrative, site characteristics, and maps. The final plan shall include the information contained in the preliminary plan, hydraulic evaluation, and drainage plans. On smaller projects the preliminary and final plan may be combined. For subdivisions developed in multiple phases, a drainage plan for the entire development is required. Approval of a preliminary storm water management plan shall be effective for a period of one (1) year following the date of approval, unless an extension is granted.

1.6.1[H] - Project Narrative:

The project narrative should give a general description of the project. It should include a description of the proposed work and the proposed storm water management for the project area. Drainage concerns in the local area and potential impacts should be addressed. The design criteria to be used in the hydraulic evaluation should be presented in the preliminary submittal.

1.6.2[H] - Site Characteristics:

A one hundred (100) feet equals one (1) inch-scale topographic map of the site shall be prepared to show both the existing and proposed contours at two (2)-foot intervals. The map shall include an area sufficient to evaluate downstream impacts for proposed facilities. When drainage areas are large and cover offsite areas, a USGS map may be used to show off-site drainage. The following shall be included on the site plan:

- A. All drainage swales and patterns;
- B. All storm sewers and structures;
- C. All watercourses, impoundments, and wetlands on or adjacent to the site or into which storm water flows; and

- D. Site development--all structures, pavement, curbing, open space, etc. should be shown and clearly marked.

1.6.3[H] - Maps:

- A. Location Map;
- B. Soils maps indicating soil types found on the site with drainage area delineated and any additional boring locations and logs;
- C. Pre/post watershed delineation including areas and flow path used to generate time of concentration;
- D. One hundred (100)-year flood plain, if any; and
- E. Wetland delineation - proper notification to the Army Corps of Engineers if wetlands are affected by this project.

1.6.4[H] - Hydraulic Calculations:

The following calculations are required when applicable:

- A. Runoff coefficient or curve number calculations (pre and post development);
- B. Time of concentration calculations (pre and post development);
- C. Peak discharge calculations [pre and post development one (1), two (2), five (5), ten (10), twenty-five (25), fifty (50), and one hundred (100)-year storm events];
- D. Required storage volume;
- E. Routing calculations;
- F. Structure sizing calculations;
- G. Pavement drainage--gutter spread and inlet capacity;
- H. Storm sewer sizing calculations including twenty-five (25)-year hydraulic grade, full flow capacity, mean velocity, and discharge;

- I. Ditch calculations; and
- J. Erosion control and rock channel protection requirements.

1.6.5[H] - Drainage Plans:

Grading Plan:

A one hundred (100)-scale (or better) topographic map of the site should be prepared to show existing and proposed contours at appropriate intervals. The proposed contours shall be within plus or minus one (1) foot of final grade on all buildable lots. A note shall be included on the plans stating the same. Side yard and backyard drainage shall be addressed. The grading limits should be indicated on the plan, if different from the final grading plan. The builder shall be responsible for final grading of all lots and the developer shall be responsible for all work within the right-of-way and easements necessary to convey the flow of water per the storm water management plan.

All existing and proposed drainage swales and patterns, storm sewers, detention/retention basins, outlet structures, pavement, curbing, grassed areas, etc., should be shown and clearly marked. The location of all permanent and/or maintenance easements required around storm water management facilities shall be shown.

Plan and Profiles:

All existing and proposed utilities, storm sewers, inlets, manholes, catch basins, and culverts shall be shown and clearly marked. Storm sewer profiles shall be included and all existing and proposed utilities shown. Drainage design information shall be labeled: size, type, length, invert, grade, slope and station and offset of all structures. Include details for structures (catch basins, manholes, and outlets). Hydraulic information at the storm sewer outlet should include: total drainage area, discharge, and the hydraulic grade line. Culvert profiles shall include Hydraulic Design Data consisting of: drainage area, twenty-five (25)-year and one hundred (100)-year discharge, velocity, and headwater elevations.

Type of channel and/or ditch protection with dimensions and thickness shall be clearly labeled. Flow arrows showing direction of flow in ditches and underdrains shall be shown. Location of easements shall be shown.

Erosion and Sediment Control Plan (ESCP)

The ESCP shall be reviewed and approved by the Knox Soil and Water Conservation District and included in the final plans before approval by the Knox County Engineer.

APPENDIX [H].

ARTICLE 2.

CALCULATING STORM WATER RUNOFF

2.1[H] - Introduction:

This section describes the guidelines necessary for calculating runoff generated from a watershed or project area. This article presents several acceptable methods of calculating surface water runoff rates and volumes. Selection of the appropriate method should be based on the size of the drainage area and the output information required.

2.2[H] - Methods:

2.2.1[H] - Rational Method:

The rational method may be used to determine the peak rate of runoff from areas of no more than twenty (20) acres. The formula used in the rational method is:

$$Q = C i A$$

Where,

Q = Peak rate of runoff in cubic feet per second (cfs) C = Runoff coefficient, a dimensionless coefficient i = Average rainfall intensity measured in inches per hour (in./hr.) A = Drainage area in acres.

Limitations -

- A. This method yields only a peak flow; not volume of runoff.
- B. This method is less accurate for large drainage areas.
- C. Drainage basin characteristics should be fairly homogeneous.
- D. This method assumes that a rainfall duration equal to the time of concentration results in the greatest peak discharge.

Runoff Coefficients:

Good judgement must be used in selecting the appropriate runoff coefficient. The runoff coefficient, C for a specific project site is dependent upon the hydrologic soil group and the existing or proposed land use. Table 2.1[H] Rational Method Runoff Coefficients, C lists average values that relate the runoff coefficient to land use and to the hydrologic group of the soil. If the land use and the hydrologic soils are homogeneous for the entire drainage area, a runoff coefficient value can be obtained directly from Table 2.1[H] Rational Method Runoff Coefficients, C. If there are multiple land uses or soil types, a weighted average must be calculated.

Soils are classified into four (4) hydrologic soil groups (A, B, C, and D) according to their minimum infiltration rate. The four (4) groups are defined as follows:

Group A soils have low runoff potential and high infiltration rates. These soils consist primarily of deep, well-drained sands and gravel and have a high rate of water transmission.

Group B soils have moderate runoff potential and moderate infiltration rates. These soils consist primarily of moderately deep to deep, moderately well to well-drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Group C soils have moderately high runoff potential and low infiltration rates. These soils consist primarily of soils in which a layer near the surface impedes the downward movement of water, and soils with moderately fine to fine texture. These soils have a low rate of water transmission.

Group D soils have high runoff potential and very low infiltration rates. These soils consist primarily of clay soils with a high swelling potential, soils with permanently high water tables, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission.

The soils in the area of interest may be identified from soil maps. These maps can be obtained from the Knox Soil and Water Conservation District Office.

As a result of urbanization, the soils' infiltration characteristics could significantly change. Due to development, native soil profiles may be mixed,

compacted, removed, or filled with material from another area. This should be accounted for and the runoff coefficient values adjusted accordingly.

Also note that the values of Table 2.1[H] Rational Method Runoff Coefficients, C are only applicable to storms no greater than a ten (10)-year return frequency, because infiltration and other losses have a proportionally smaller effect on runoff. To account for the increase in runoff occurring during larger storms, a "frequency coefficient" shall be used with the runoff coefficient. Table 2.2[H] Rational Method Runoff Coefficient Adjustment Factor, C_f lists frequency coefficients to be multiplied by the runoff coefficient.

Please note, the product $(C) \times C_r$ must not exceed 1.0.

NOTE: The remainder of this page has been left blank intentionally to allow for the following Table to be properly formatted.

TABLE 2.1[H]
Rational Method Runoff Coefficients, C

	<u>Hydrologic Soil Group & Corresponding C Factor</u>				
<u>Proposed Land Use Description:</u>	<u>B</u>	<u>C</u>	<u>D</u>		
Cultivated land:	0.30	0.43	0.50		
Pasture or range land:	0.16	0.36	0.47		
Meadow: <u>good</u> condition	0.13	0.30	0.43		
Wood or forest land:	0.10	0.29	0.41		
Open spaces, lawns, parks, golf courses, cemeteries, etc.: <u>Good</u> condition: grass cover 75% or more of area	0.16	0.36	0.47		
Commercial or business area (85% impervious area)	0.77	0.83	0.86		
Industrial district (75% impervious area)	0.66	0.74	0.80		
<u>Residential:</u>					
<u>Average Lot Size:</u>	<u>Average % Impervious:</u>				
1/8 acre or less		65	0.59	0.72	0.77
1/4 acre		38	0.37	0.54	0.64
1/3 acre		30	0.32	0.50	0.61
1/2 acre		25	0.29	0.47	0.59
1 acre		20	0.26	0.45	0.57
2 acres		<20	0.23	0.41	0.50
Paved parking lots, roofs, driveways, etc.			0.96	0.96	0.96
<u>NOTE:</u> Table 2.1[H] herein is adapted from Technical Release 55, U.S. Dept. of Agriculture, Soil Conservation Service (SCS).					
<u>NOTE:</u> Runoff coefficients not applicable for storms over a ten (10)-year frequency. For storms greater than a ten (10)-year frequency, the runoff from the additional rainfall shall be adjusted using the adjustment factor found in table 2.2[H] Rational Method Runoff Coefficient Adjustment Factor, C _r .					

NOTE: The above table values have been adjusted for local use in the calculation procedure to be more conservative. This should be accounted for in the calculations for your project, as the runoff coefficient values have been adjusted and several of the hydrologic soil groups have been eliminated.

TABLE 2.2[H]
Rational Method Runoff
Coefficient Adjustment Factor, C_f

<u>Storm Frequency</u>	<u>C_f</u>
Two (2) year	1.00
Five (5) year	1.10
Ten (10) year	1.15
Twenty-five (25) year	1.20
Fifty (50) year	1.25
One Hundred (100) year	1.33

Source: *Urban Hydrology for Small Watersheds*
 USDA, SCS, TR-55 (June 1986)

Rainfall Intensity/Time of Concentration -

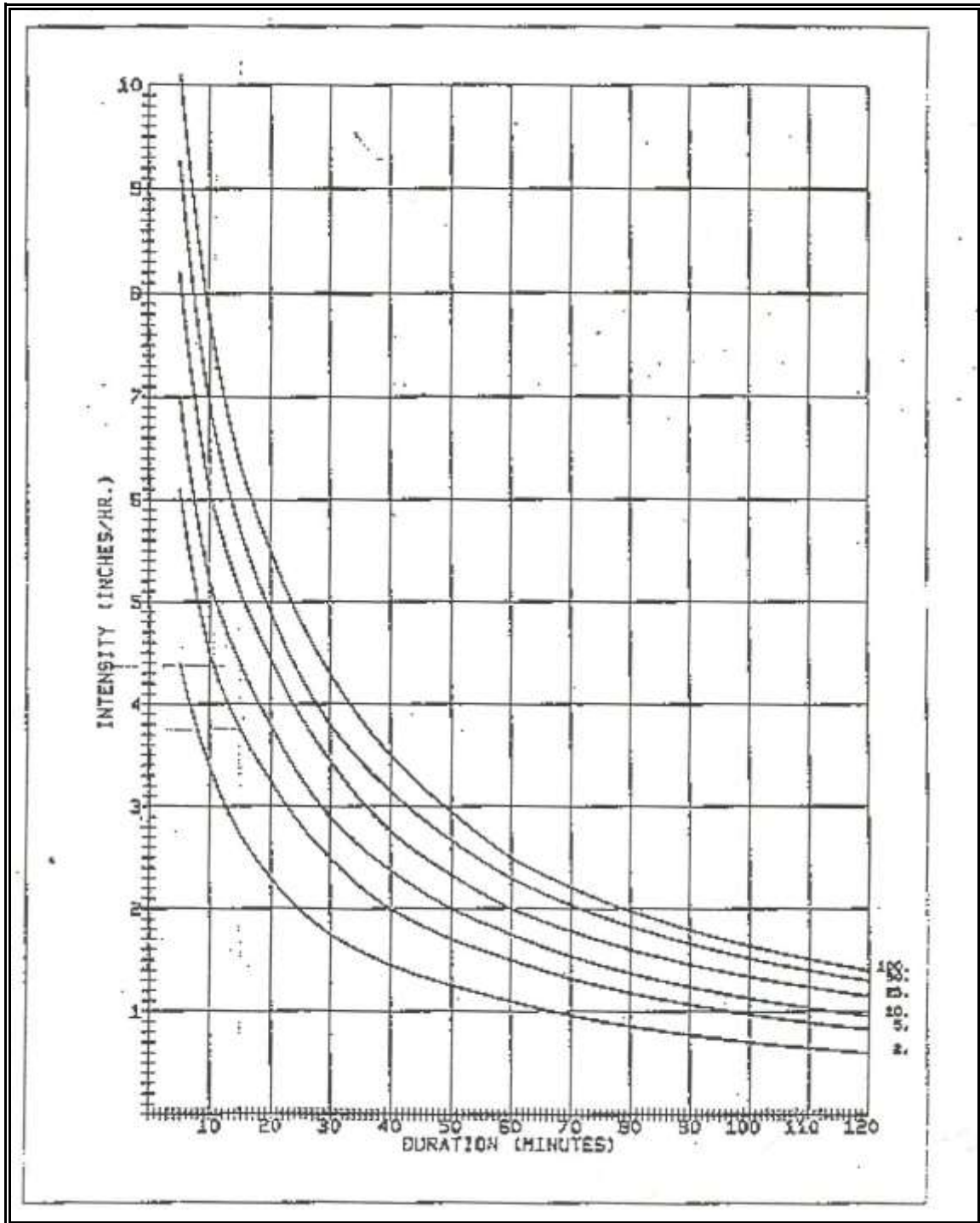
The rainfall intensity may be selected from Table 2.3[H] Rainfall Intensity Frequency or Figure 2-1[H] Rainfall Intensity - Frequency Duration Curve. The rainfall duration used to select the intensity shall be equal to the time of concentration, T_c . The time of concentration is defined as the time for a discrete particle of rainfall to flow from the most hydraulically remote point in the drainage area to the point in interest. There are a number of methods that can be used to estimate the time of concentration. The preferred methods for calculating time of concentration are using either Figure 2-2[H], Overland Flow Chart, or the TR-55 Method. The time of concentration can be calculated as the travel time within the various consecutive flow segments. The minimum time of concentration to be used is ten (10) minutes.

TABLE 2.3[H]
Rainfall Intensity Frequency

Time in Minutes	Frequency in years					
	2	5	10	25	50	100
5.0	4.20	5.12	6.00	7.00	8.00	9.00
6.0	4.05	4.94	5.80	6.75	7.70	8.65
7.0	3.90	4.76	5.60	6.50	7.40	8.30
8.0	3.78	4.63	5.43	6.30	7.15	8.00
9.0	3.64	4.50	5.28	6.15	6.95	7.75
10.0	3.58	4.34	5.12	6.00	6.80	7.60
10.5	3.51	4.24	5.01	5.90	6.66	7.46
11.0	3.44	4.14	4.90	5.80	6.52	7.33
11.5	3.37	4.05	4.79	5.69	6.37	7.17
12.0	3.30	3.96	4.68	5.60	6.22	7.02
12.5	3.23	3.88	4.60	5.50	6.10	6.89
13.0	3.16	3.80	4.52	5.40	5.98	6.77
13.5	3.10	3.73	4.44	5.30	5.85	6.64
14.0	3.05	3.67	4.37	5.20	5.73	6.52
14.5	3.01	3.60	4.29	5.10	5.64	6.43
15.0	2.97	3.54	4.22	5.00	5.56	6.35
15.5	2.91	3.47	4.13	4.90	5.45	6.20
16.0	2.85	3.41	4.05	4.80	5.34	6.05
16.5	2.80	3.35	3.98	4.71	5.24	5.95
17.0	2.75	3.30	3.92	4.63	5.15	5.86
17.5	2.71	3.24	3.86	4.56	5.08	5.77
18.0	2.67	3.18	3.80	4.49	5.01	5.68
18.5	2.62	3.13	3.75	4.43	4.92	5.59
19.0	2.58	3.08	3.70	4.36	4.84	5.50
19.5	2.55	3.04	3.64	4.30	4.77	5.41
20.0	2.52	3.00	3.58	4.23	4.71	5.32
20.5	2.47	2.96	3.53	4.16	4.64	5.25
21.0	2.42	2.92	3.48	4.10	4.58	5.18
21.5	2.40	2.88	3.44	4.05	4.52	5.10
22.0	2.38	2.84	3.40	4.00	4.46	5.02
22.5	2.35	2.80	3.35	3.95	4.40	4.91
23.0	2.32	2.77	3.31	3.90	4.34	4.80
23.5	2.28	2.73	3.26	3.82	4.28	4.77
24.0	2.24	2.70	3.21	3.75	4.24	4.74
24.5	2.21	2.66	3.17	3.70	4.18	4.67
25.0	2.18	2.63	3.14	3.65	4.12	4.60

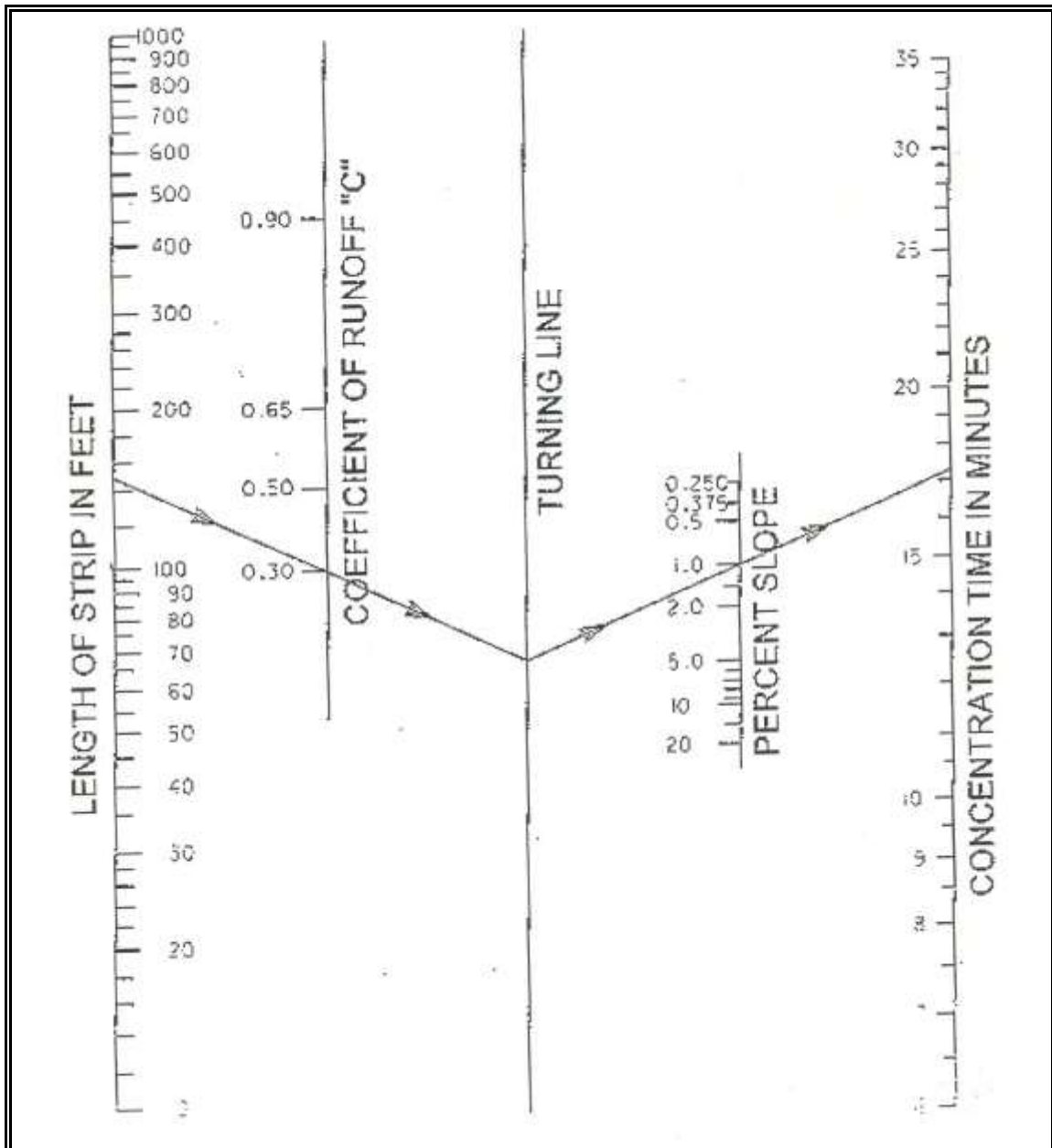
Time in Minutes	Frequency in years					
	2	5	10	25	50	100
25.5	2.16	2.60	3.11	3.61	4.06	4.57
26.0	2.14	2.58	3.08	3.58	4.04	4.54
26.5	2.12	2.55	3.04	3.54	3.98	4.47
27.0	2.11	2.52	3.00	3.50	3.92	4.40
27.5	2.09	2.49	2.97	3.45	3.88	4.38
28.0	2.07	2.46	2.94	3.40	3.85	4.32
28.5	2.04	2.43	2.91	3.35	3.80	4.27
29.0	2.02	2.40	2.88	3.30	3.76	4.22
29.5	1.99	2.38	2.85	3.27	3.72	4.18
30.0	1.97	2.35	2.82	3.24	3.68	4.14
31.0	1.93	2.30	2.77	3.17	3.60	4.04
32.0	1.90	2.24	2.72	3.10	3.52	3.94
33.0	1.86	2.19	2.66	3.02	3.46	3.86
34.0	1.82	2.15	2.60	2.94	3.40	3.78
35.0	1.78	2.10	2.55	2.87	3.32	3.70
36.0	1.74	2.05	2.50	2.80	3.24	3.62
37.0	1.72	2.01	2.45	2.75	3.19	3.56
38.0	1.70	1.97	2.40	2.70	3.14	3.50
39.0	1.67	1.93	2.36	2.64	3.08	3.44
40.0	1.64	1.89	2.32	2.58	3.02	3.38
41.0	1.61	1.85	2.28	2.53	2.96	3.31
42.0	1.58	1.82	2.24	2.48	2.90	3.24
43.0	1.55	1.79	2.21	2.44	2.85	3.19
44.0	1.52	1.76	2.18	2.40	2.80	3.14
45.0	1.50	1.74	2.14	2.36	2.76	3.09
46.0	1.48	1.72	2.10	2.32	2.72	3.04
47.0	1.45	1.69	2.06	2.28	2.69	3.01
48.0	1.42	1.66	2.02	2.24	2.66	2.98
49.0	1.40	1.64	2.00	2.22	2.62	2.94
50.0	1.38	1.62	1.96	2.18	2.58	2.90
60.0	1.20	1.40	1.72	2.08	2.24	2.54
80.0	1.00	1.18	1.48	1.74	1.88	2.14
100.0	0.82	1.00	1.20	1.42	1.60	1.80
120.0	0.68	0.86	1.00	1.20	1.34	1.48

Figure 2.1[H] RAINFALL INTENSITY - FREQUENCY DURATION CURVE



Source: U.S. Weather Bureau.

Figure 2.2[H] OVERLAND FLOW CHART



The TR-55 Method determines the time of concentration by computing the travel time associated with runoff over three (3) types of flow paths: sheet flow, shallow concentrated flow, and open channel flow. The three (3) types of flow are defined as follows:

Sheet flow is flow over plane surfaces. The flow depth is very shallow, so consequently Manning's Roughness Coefficient (n) is modified to include the effect of drag over the plane surface and its irregularities. Table 2.4[H] Manning's Roughness Coefficient (n) presents Manning's roughness coefficients for sheet flow for various surface conditions. Sheet flow is limited to distances less than three hundred (300) feet. The travel time may be determined by using Manning's kinematic solution given below.

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}}$$

Where,

T_t = travel time (hr.)

n = Manning's roughness coefficient {Table 2.4[H] Manning's Roughness Coefficient (n)}

L = flow length (ft.)

P_2 = 2-year, 24-hour rainfall (in.) {Table 2.5[H] Rainfall, P (inches/d)}

s = Slope of hydraulic grade line (land slope, ft./ft.)

<p align="center"><u>TABLE 2.4[H]</u> <u>Manning's Roughness Coefficient (n)</u></p>			
<u>for Sheet Flow</u>		<u>for Open Water Carriers</u>	
Surface description	n	Surface description	n
Smooth surface (concrete, asphalt gravel, or bare soil)	0.011	Bare earth	0.02
Fallow (no residue)	0.05	Seeded	0.03
Cultivated Soils: Residue < 20%	0.06	Sod	0.04
Cultivated Soils: Residue > 20%	0.17	Pavement (concrete)	0.015
Grass: short prairie (lawns)	0.15	Pavement (bituminous)	0.015
Grass: dense	0.24	Paved shoulders	0.02
Grass: Bermuda	0.41 0.13	Grouted riprap	0.22
Woods	0.40	Rock Channel Protection: For Ditches: For Large Channels	0.06 0.04

<p align="center"><u>TABLE 2.5[H]</u> <u>Rainfall, P (inches per day)</u></p>	
<u>Frequency for 24 hours</u>	<u>Intensity</u>
One (1) year	2.1
Two (2) year	2.3
Five (5) year	3.0
Ten (10) year	3.5
Twenty-five (25) year	3.9
Fifty (50) year	4.4
One hundred year (100)	4.6
<p><u>Source:</u> U.S. Department of Commerce, <i>Weather Bureau</i> <i>Technical Paper No. 40, Rainfall Frequency Atlas of the United States</i> May 1961</p>	

Shallow concentrated flow occurs after sheet flow. The travel time may be determined by the following equation:

$$T_t = \frac{L}{3600V}$$

Where,

Tt = travel time (hr.)

L = flow length (ft.)

V = average velocity (ft./sec.)

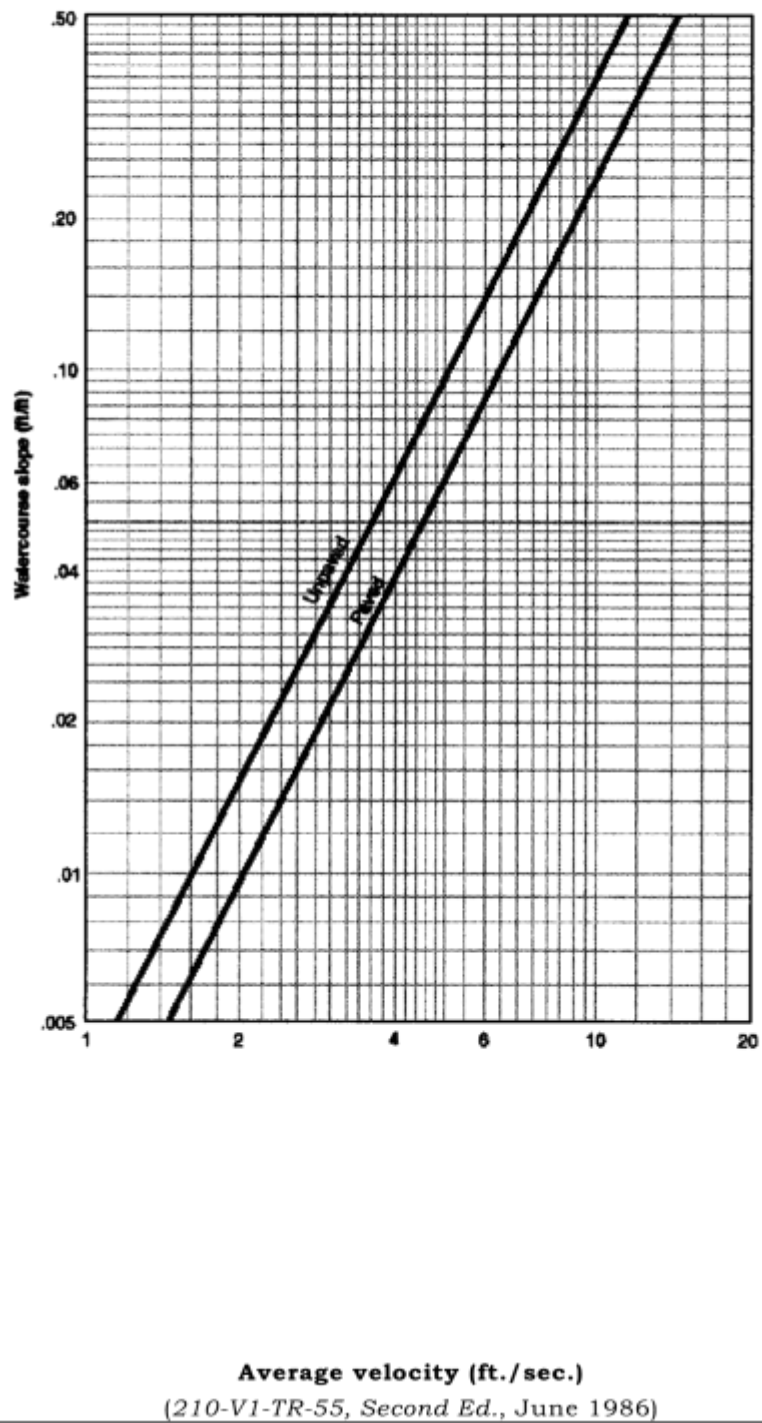
The average runoff velocity in the equation above may be determined from Figure 2-3[H] Average Velocities for Estimating Travel Time for Shallow Concentrated Flow or by using the equations below:

1. $V = 16.1345(s)^{0.5}$: For unpaved surfaces
2. $V = 20.3282(s)^{0.5}$: For paved surfaces

Where,

s = Slope of hydraulic grade line which may be assumed to be the same as the average land slope (ft./ft.)

FIGURE 2.3[H]
Average Velocities for Estimating Travel Time
for Shallow Concentrated Flow



Open channel flow occurs when runoff collects into well-defined open channels. Usually, open channels are assumed to begin where surveyed cross sectional information has been obtained or where channels are well defined on aerials or maps. The travel time may be determined from the same method used in shallow concentrated flow, with the exception being that velocity should be calculated by using Manning's equation for open channel flow. Average flow velocity is usually determined for bank-full-flow.

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$$

Manning's Equation is:

Where:

V = average velocity (ft./sec.)

r = hydraulic radius (ft.) and is equal to (a/p_w)

a = cross sectional flow area (ft.²)

p_w = wetter perimeter (ft.)

s = slope of the hydraulic grade line (channel slope, ft./ft.)

n = Manning's roughness coefficient for open channel flow.

2.2.2[H] - Modified Rational Method:

In the design of a storm water detention or retention basin, the volume of runoff is as important as the peak rate of runoff. The Rational Method approximates the peak rate only. Therefore, the Modified Rational Method was developed to estimate runoff and storage hydrographs.

The Modified Rational Method is based upon the original Rational Method and, therefore, is bound by the same limitations and constraints. It is an expansion of the original method in that it assumes that many rainfall events will have a duration greater than the time of concentration for the project area. The peak rate of runoff will remain the same as in the original Rational Method, but runoff volumes will be generated.

The Modified Rational Method involves creating a series of runoff hydrographs for varying storm durations. The peak rate of runoff of each hydrograph is calculated using the original Rational Method with the rainfall intensity corresponding to durations greater than the time of concentration, T_c , for the appropriate design storm. The storm intensity (see Figure 2-1[H] Rainfall Intensity - Frequency Duration Curve) reflects a decrease in intensity as the duration increases. Therefore, the peak of the hydrograph will decrease as longer durations are assumed.

A trapezoidal hydrograph is assumed to estimate the required runoff volume. The peak rate is reached at a time equal to the time of concentration, T_c . The flow remains at that level until the end of the storm at time T when it starts to decrease and reaches zero at a time of $T + T_c$. The reason for using T_c for the peak is that T_c is assumed to be independent of the rainfall intensity. Therefore, as long as the duration is greater than T_c , the peak will be reached at T_c . Each of the additional hydrographs thus formed must be routed through the proposed design in order to determine the storm duration, which will require the largest volume.

To estimate the volume of storage, the basin outflow hydrograph must be generated and superimposed on the runoff hydrograph. The outflow hydrograph is determined by assuming a specific outflow structure and computing the discharge for various levels of storage.

The Method of calculation of run-off and resultant design of systems, whether culverts, ponds, ditches, or other, is iterative and use of the Rational Method described herein is labor intensive and very time consuming. There are several proven, affordable and effective computer software programs that quickly compute the iterative calculations and are strongly suggested for design of storm water systems. They are based, at least, in part on U.S. Department of Agriculture, Soil Conservation Service, Technical Releases 20 and 55, for example HydroCAD (Version 7.0 - 2003) by Applied Microcomputer System and Pond Pack by Haested Methods. In addition, a Windows based TR55 program is downloadable from the SCS website. Acceptable calculation methods include TR-20, or TR-55, or both, or a similar storage indication method, level pool routing that most calculation models use.

APPENDIX [H].

ARTICLE 3.

RUNOFF CONTROL METHODS

3.1[H] - Introduction:

In order to satisfy the runoff control requirements presented in Appendix [H]. - Article 1. - General Requirements, storm water management measures will be necessary for most land development.

Surface storm water management facilities are the most widely used measure for controlling peak discharge. Surface storm water management facilities include:

Preferred:

- A. Retention basins; and
- B. Detention basins.

Optional:

- A. Parking lot storage;
- B. Rooftop storage;
- C. Underground storage tanks;
- D. Underground storage conduits;
- E. Infiltration/recharge ditches;
- F. Infiltration/recharge trenches; and
- G. Dry wells.

Most of this article will be directed to the design of storm water detention or retention basins, but the concepts can be applied to other storm water facilities. Omission of such facilities is not intended to discourage their use since other measures may be more suitable in certain situations. Regardless of

the device selected, its maintenance, function, and impact should be assessed.

3.2[H] - Retention/Detention Basins:

A detention basin is a "dry pond" used to temporarily store or detain the excessive runoff generated during a storm. A retention basin is a "wet pond" that maintains a permanent pool of water, with storage volume above the normal water level.

The basic steps for designing retention or detention basins are as follows:

- A. Determine basin location and type.
- B. Determine the allowable maximum release rates.
- C. Generate inflow hydrographs for the one (1), two (2), five (5), ten (10), twenty-five (25), fifty (50) and one hundred (100)-year storms.
- D. Estimate the amount of storage required for each storm.
- E. Design the basin to accommodate the necessary storage.
- F. Develop storage vs. stage curve and discharge vs. stage curve for the basin.
- G. Estimate elevations for top of dam and for water surface for the various storms and determine feasibility with grading design.
- H. Determine preliminary size and configuration of the outlet structure.
- I. Perform hydrologic routing computations through the preliminary outlet structure.
- J. Based on results obtained in step I. above, modify grading and/or outlet structure to achieve acceptable performance.

3.3[H] - Design Criteria:

3.3.1[H] - Detention Basins:

Design Storm Frequency:

Twenty-five (25)-year frequency, twenty-four (24)-hour duration.

Adopted November 10, 2005, Knox County Board of Commissioners

Discharge Rate:

1. One (1), two (2), five (5), ten (10), twenty-five (25)-year storm: Equal to one (1)-year frequency, Twenty-four (24)-hour duration pre-development; and
2. Fifty (50) and one hundred (100)-year storm: Equal to pre-development.

Volume Determination:

The required storage volume shall be determined by standard hydrologic engineering methods. (See Appendix [H]. - Article 3.4[H] - Methods for Determining Storage Capacity.)

Basin Slopes:

The side slopes of a detention basin, unless paved or riprapped, shall not exceed 4:1 (h:v) to ensure maintenance capability.

The minimum bottom slope to properly drain the basin shall be one percent (1.0%). Paved surfaces and channels are no longer permitted.

Maximum Water Depth:

The maximum water depth shall not exceed ten (10) feet.

Minimum Embankment Width:

The minimum top width of the embankment shall be ten (10) feet for non-vehicular traffic and twelve (12) feet for vehicular traffic.

Minimum Freeboard Height:

The minimum freeboard height required is twenty-four (24) inches above the one hundred (100)-year elevation.

Discharge Control Structure:

Control devices may either be single-stage or multi-stage devices. They shall be designed such that the allowable discharge rate is not exceeded at the highest water level. The structure shall be

designed with a bleed-down mechanism sized to discharge one-half (1/2) inch of detention volume in twenty-four (24) hours.

Control structures should be constructed of reinforced concrete. The structures shall be fixed (non-operable). The structure shall be constructed such that the public health, safety, and welfare is protected. Location shall be selected for ease of maintenance. A "baffle" shall be included to prevent blockage from debris. A fifty percent (50%) increase in the net area of grated inlets is required to allow for such blockage.

Discharge Velocities:

Discharge velocities shall be controlled to prevent scouring and erosion of the downstream channel.

Emergency Spillway: One Hundred (100)-year Frequency, Twenty-four (24)-hour Duration:

Where an earthen spillway is utilized, the emergency overflow shall be located where undisturbed natural material exists and shall not be located over the control structure or discharge pipe. The emergency overflow may be incorporated into the outlet control structure or a combination of the outlet control structure and earthen spillway.

Erosion and Sediment Control:

Provisions for erosion and sediment control during and after construction of basins or any other storm water management facility shall be the same as required for any other construction activity.

Barriers to Access:

Fencing around the storage facility is generally undesirable from an operation and maintenance standpoint. Barriers may be desirable, however, to delineate the area reserved for storm water control. When required, these barriers shall be designed in consideration of the aesthetics of the site and surrounding area. Landscaping and grading or natural wood fencing can offer suitable alternatives.

Aesthetics:

Any storage facility should serve as an aesthetic improvement to the surrounding area. The use of landscaping is encouraged and may be required for certain sites. The planting or preservation of desirable native vegetation as recommended by USDA/NRCS should be a part of the storage facility design.

Permanent Maintenance Easements:

A permanent maintenance easement twenty (20) feet in width shall be provided around the perimeter of the basin. A permanent maintenance access easement twenty (20) feet in width shall be provided to the detention facility. This area shall be appropriately designed for maintenance vehicles accessing the facility.

3.3.2[H] - Retention Basin:

The general criteria for detention basins shall also apply to retention basins with the following additional modifications:

Permanent Pool Area:

The maximum permanent pool area shall not exceed fifteen percent (15%) of the upstream watershed area.

Permanent Pool Depth:

The minimum depth from the normal water level to the bottom of the side slope shall be three (3) feet. At least fifty percent (50%) of the pool area shall be a minimum of six (6) feet deep or twenty-five percent (25%) of the pool area shall be a minimum of eight (8) feet deep. It is recommended that a shallow perimeter of the pond extend from the bottom of the side slope for a distance of eight (8) feet into the pond area. This is a safety feature in case of accidental or intentional entry into the pond.

Stagnation:

Provisions shall be made to prevent the water in the pond from becoming stagnant. Methods to prevent nutrient enrichment and aeration devices are appropriate.

Embankment Width:

The minimum top embankment width shall be ten (10) feet for non-vehicular traffic, and twelve (12) feet for vehicular traffic.

Draining:

Provisions shall be made for completely draining the pond to allow for periodic cleaning, inspection, or other maintenance. Drain facilities may be an integral part of the outlet structure or may be a separate structure.

Sediment:

Probable quantities of sediment from the drainage area shall be estimated for the expected life of the pond. Provisions for occasional removal of sediment shall be included in the basin design.

Permanent Maintenance Easement:

A permanent easement, a minimum twenty (20) feet in width, shall be provided around the perimeter of the retention pond. The easement is measured from the water's edge at the maximum storage elevation or the outside bottom of the embankment side slope. A permanent maintenance easement twenty (20) feet in width shall be provided for access to the retention facility. This area shall be appropriately designed for maintenance vehicles accessing the facility.

Shoreline and Embankment Protection:

Shoreline and embankment protection shall be provided where necessary to prevent erosion.

3.3.3[H] - Parking Lot Storage:

Parking lot storage involves shallow ponding in specifically graded areas of a parking lot.

Limitations:

The release features of the stored runoff into the storm sewer system shall be controlled. These may be an inconvenience to users due to ponding during storms or clogging of flow control

devices. There may be potential problems of icy conditions during cold weather. This method is not appropriate for storing large volumes.

The parking lot storage criteria shall be as follows:

Maximum Water Depth:

The water depth in the storage area shall not exceed six (6) inches for the design storm and the maximum water depth is nine (9) inches for the one hundred (100)-year storm.

The maximum water level shall not be greater than finished floor elevation of adjacent building structures.

Storage Location:

The storage area(s) should be located in the least used portion of the parking facility. The ponded area shall be at least fifty (50) feet from any building.

Maximum Slope:

The recommended maximum surface slope of the storage area is five percent (5%).

Minimum Slope:

The minimum surface slope of the storage area shall be one percent (1%).

Overflow:

Provisions shall be included for overflow of runoff from storms greater than the design storm. Overflow provisions should also be included for probable clogging of the flow control devices.

Storage Volume:

The required storage volume shall be determined by the methods discussed in Appendix [H]. - Article 3.4[H] Methods for Determining Storage Capacity.

Hydraulic Gradient:

The hydraulic gradient of the storage facility shall be indicated on the plans for the design storm and the one hundred (100)-year storm.

3.3.4[H] - Rooftop Storage:

Rooftop storage is surface storage provided on flat rooftops designed for temporary ponding with special roof drain controlled release features. Rooftop storage utilizes the built-in structural capacity of rooftops to store rainfall.

Existing structures conforming to local building codes should meet the support requirements for specified snow and live loading. This allowance can be utilized for storm water without additional support, depending upon the structural condition of the building and roof. Modifications of roof drains to allow them to function as controlled release devices would be required.

Rooftop storage could be incorporated into the design of new buildings. Directing the water to lawn or infiltration/recharge areas is recommended.

The main disadvantages of rooftop storage are the inspection and maintenance requirements. Such installations may not be readily accessible. Clogging and/or unauthorized removal of the flow control devices may occur, making routine inspections necessary. A report of inspections shall be provided to the Knox County Engineer annually. Details for continuing inspections at the developer/owner's expense shall be made a part of any plan involving rooftop storage.

The Knox County Engineer shall not be responsible for the review or approval of the proposed structural integrity of any building. The Knox County Engineer will only be responsible for the review of the storm water criteria portions of any rooftop storage project.

Maximum Water Depth:

The maximum water depth shall be determined by the developer's Design Engineer in accordance with the type of roof proposed for the building.

Live Load:

The roof structure shall be designed for a minimum live load as specified in the local building code(s) in effect at the time of the design, or to building industry standards.

Slope:

A minimum roof pitch of one-quarter inch (0.25)/ft. to the outlet device shall be provided to assure complete drainage.

Overflow:

Overflow drains shall be provided to accommodate major storms and shall be located above the maximum water depth. Roof scuppers are to be provided in parapet walls.

Waterproofing:

The building structure shall be designed to provide a watertight roof.

Flow Control Device:

The flow control device shall be in compliance with the local building code(s), if applicable, and the National Plumbing Code. Drain pipes and down spouts may be of standard design.

3.3.5[H] - Underground Storage Tanks:

Underground storage areas can be applicable where land area is very valuable, such as in industrial and commercial areas. They are usually an underground tank, chamber, or large pipe with a controlled release structure.

Materials:

Underground storage facilities shall be constructed of reinforced concrete. The structural design shall be in accordance with current design practice.

Pipe Size:

The minimum size drain pipe for storage shall be twelve (12) inches. The size of the pipe of the discharge from the storage is determined elsewhere in this document.

Access:

An access hatch or manway shall be provided for inspection and maintenance. All openings shall be properly secured to minimize unauthorized entry and safety hazards.

Capacity:

The required storage volume and discharge release rate shall be determined using the same method as for surface storage facilities. A flow control device, such as a simple weir or orifice, shall be included.

Overflow:

Overflow provisions shall be included to accommodate the less frequent storms up to and including the one hundred (100)-year storm runoff.

Draining:

The storage tank shall include provisions for completely draining the tank. The minimum slope of the tank bottom shall be five tenths percent (0.5%).

3.3.6[H] - Conduit Storage:

Conduit storage is very similar to underground tank storage. Conduit structures, which are oversized or enlarged storm sewer pipes, are generally applied to urban areas where land values are high and storage basins and ponds are undesirable. This method is usually expensive and impractical for runoff control of large areas or for storm runoff from high-intensity storms.

Conduit structures shall be designed in accordance with the specified criteria for underground storage tanks, except special consideration shall be given to the structural strength and load-carrying capacity of the conduit, as well as the bearing capacity of the soil. Perforated pipe may be used where soil conditions are favorable for infiltration methods.

3.3.7[H] - Infiltration/Recharge Systems:

Infiltration methods are designed to help restore the natural hydrologic system and promote water quality by allowing storm water to percolate into the ground. Infiltration of storm water reduces the amount of rainfall that becomes runoff. Infiltration also improves groundwater recharge.

The success of an infiltration/recharge system depends on the type of soils and groundwater system in the area. Soils with low permeability and shallow bedrock depths are poor locations for infiltration methods. Sediments, oils, and other debris can cause clogging of the soil surface. Adequate inspection and maintenance must be provided.

Infiltration/recharge methods are usually limited to handling relatively small sources of runoff such as roof drains, small parking lots, and tennis courts. Two (2) specific infiltration methods are dry wells and infiltration trenches. Any infiltration design method must be approved by the Knox County Engineer before its inclusion in a Storm Water Management Plan.

Dry Wells:

Dry wells vary in depth from six (6) feet to several hundred feet, depending on the depth of the permeable soil strata and the depth to bedrock. Diameters range from less than three (3) feet up to several feet.

Dry wells should be filled with crushed stone or washed two (2) inch gravel. Storage volume shall be computed and specified in the plans.

Dry wells are most applicable for storing runoff from rooftops and other areas relatively free of sediment and debris.

Infiltration Trenches:

Infiltration trenches consist of shallow excavated trenches, generally two (2) to ten (10) feet deep, backfilled with a coarse stone aggregate, allowing for the temporary storage of storm runoff in the voids between the aggregate material. The stored runoff then gradually infiltrates into the surrounding soil.

The surface of the trench may consist of stone, gabion, sand, or grass cover.

The permeability or final infiltration rate of the various soil classifications will be a limiting factor in the selection and location of infiltration trenches. Soil classes with infiltration rates greater than or equal to twenty seven hundredths inch (0.27)/hour can be considered for the use of infiltration trenches.

The minimum recommended trench depth is three (3) feet, which would include two (2) feet of the aggregate reservoir covered by one (1) foot of soil. In general, the trench should be designed as deep as possible to minimize the surface area. However, the soil infiltration rate below the trench will dictate the maximum depth.

The trench bottom shall be kept at least two (2) feet to four (4) feet above the bedrock and/or the seasonally high ground water table in the area. Infiltration trenches shall also be located at least one hundred (100) feet horizontally away from any water supply well.

The trench design volume equals the upstream runoff volume contributing to the trench, plus the volume of rain that falls on the surface area of the trench, minus the exfiltration volume out of the trench bottom. The volume of water exfiltrating during the filling period of the trench may be significant for permeable soils.

The volume of rainfall runoff entering the trench can be defined in terms of the trench geometry. The gross volume required for the trench is equal to the volume of water that must be stored divided by the porosity of the course stone aggregate used to fill the trench.

Vegetative buffers of at least twenty (20) feet in width are required upstream of the trench when the contributing runoff may carry sediment.

3.4[H] - Methods for Determining Storage Capacity:

The basic purpose of a storm water basin is to regulate and reduce the rate of runoff from the contributing drainage area by providing temporary storage of excess runoff. Therefore, the major design considerations are the volume of storage required and the maximum allowable release rate. In order to design a storm water basin, a flow routing procedure must be used to determine the required storage volume for the selected design storm and the permissible discharge rate.

There are numerous storm water-routing methods which are applicable for routing an inflow hydrograph through a storm water basin. Several standard methods may be used for estimating the volume requirements. One of the most widely used methods of determining the required storage volume in storm water basins is the Storage-Indication Method. This mathematical

flowrouting method consists of a trial and error process based on the continuity equation.

The Method of calculation of run-off and resultant design of systems, whether culverts, ponds, ditches, or other, is iterative and use of the Rational Method described herein is labor intensive and very time consuming. There are several proven, affordable and effective computer software programs that quickly compute the iterative calculations and are strongly suggested for design of storm water systems. They are based, at least, in part on U.S. Department of Agriculture, Soil Conservation Service, Technical Releases 20 and 55, for example HydroCAD (Version 7.0 - 2003) by Applied Microcomputer System and Pond Pack by Haested Methods. In addition, a Windows based TR55 program is downloadable from the SCS website. Acceptable calculation methods include TR-20, or TR-55, or both, or a similar storage indication method, level pool routing that most calculation models use.

APPENDIX [H].

ARTICLE 4.

PAVEMENT DRAINAGE

4.1[H] - Introduction:

Proper drainage of roadway pavement is essential to the service life of streets and to traffic safety. A good drainage design can provide lower street maintenance costs by protecting pavement and subgrades from unnecessary deterioration. Water on roadways slows traffic and contributes to accidents from hydroplaning, reduced visibility, and icy conditions. Effective removal of runoff is influenced by geometric characteristics such as longitudinal slope, cross slope, and type of curb and gutter section. These geometric features affect the location and spacing of inlets.

Additional information concerning pavement drainage and theory can be obtained from the Federal Highway Administration Hydraulic Circular No. 22, *Urban Drainage Design Manual*, as updated. Also refer to Ohio Department of Transportation's *Location and Design Manual, Vol. 2 Drainage Design*, as updated, for additional charts, etc. which may be helpful.

4.2[H] - Design Criteria for Pavement Drainage:

- A. Design Storm Frequency: Five (5)-year frequency,
Twenty-four (24)-hour duration.
- B. Method to Establish
Design Flow: Rational Method.
- C. Time of Concentration to First Inlet:
 1. Minimum Time: Ten (10) minutes
 2. Maximum Time: Fifteen (15) minutes.
- D. Maximum Spread of Flow into Traveled Lane:
 1. Two (2)-lane roads: Six (6) feet
 2. Four (4)-lane roads: Eight (8) feet.

E. Roughness Coefficients:

{See Table 2.4[H] Manning's Roughness Coefficient (n) for
Manning's n.}

F. Allowable Inlets and Catch Basin Types:

1. Continuous Grades: Inlet single wide ODOT CB-3A (with or without sump) or I-2A
2. Sags: Inlet double wide ODOT CB-3.

4.3[H] - Inlet Spacing:

Inlet location is determined by spread on the pavement and geometric controls, which require inlets at a specific location. The following information is required to adequately design the location of the inlets:

- A. A layout or plan sheet suitable for outlining the drainage areas;
- B. Road profiles;
- C. Typical section (including superelevation);
- D. Grading cross sections; and
- E. Contour maps.

Examples of locations controlled by the roadway geometrics include, but are not limited to the following:

- A. Low points or sags in the gutter;
- B. Any location where water could flow into the traveling lane, including but not limited to the following:
 1. Intersections;
 2. Cross walks;
 3. Upgrade of bridge deck, prior to descending driveways; and
 4. Behind curbs, shoulders or sidewalks to drain low areas.

It should be noted that curbed pavement sections and pavement inlets are not efficient means for handling extraneous drainage. Runoff from areas draining towards the pavement should be intercepted by roadside channels or inlets before it reaches the roadway.

Design spread is the criterion used for locating inlets between those required by geometric and other controls. Numerous computer programs are available to perform such calculations.

APPENDIX [H].

ARTICLE 5.

STORM SEWERS

5.1[H] - Introduction:

Storm sewer systems are designed to collect and carry storm runoff from the inlets or catch basins to the predetermined outlet. Storm sewer systems shall be sized to convey the flow from areas naturally contributing to the roadway and any intercepting flow from existing storm sewers, including field tile(s).

5.2[H] - Storm Sewer Criteria:

A. <u>Design Storm Frequency:</u>	Ten (10)-year frequency, Twenty-four (24)-hour duration (design for just full capacity)
B. <u>Methods to Establish Design Flow:</u>	Appropriate methods described in Appendix [H]. - Article 2. Calculating Storm Water Runoff
C. <u>Minimum Time of Concentration:</u> 1. First ditch catch basin/inlet: 2. First pavement inlet:	Fifteen (15) minutes Ten (10) minutes
D. <u>Minimum Cover:</u> 1. <u>Concrete Pipe:</u> a. Under Pavement: b. Other Locations: 2. <u>Plastic Pipe:</u> a. Under Pavement: b. Other Locations:	Nine (9) inches from top of pipe to bottom of subgrade Eight (8) inches from top of pipe to bottom of subgrade Twenty four (24) inches from top of pipe to bottom of subgrade Twelve (12) inches from top of pipe to bottom of subgrade
E. <u>Velocity:</u> 1. Minimum: 2. Maximum:	Three (3) ft./sec. for design flow Fifteen (15) ft./sec. for design flow

F. Maximum Distance Between Manholes or Suitable Clean-out Points:

1. Conduits under thirty-six (36) inches: Three hundred (300) linear feet
2. Conduits thirty-six (36) to sixty (60) inches: Five hundred (500) linear feet
3. Conduits over sixty (60) inches: Seven hundred (700) linear feet

G. Minimum Pipe Size:

Twelve (12) inches

H. Pipe Roughness Coefficient:

1. Concrete Pipe
< sixty (60) inches: 0.015
2. Concrete Pipe
> sixty (60) inches: 0.013
3. Polyethylene Pipe: 0.012

I. Hydraulics at Structures:

Special consideration should be given to the hydraulic head losses through structures connecting different size conduits and conduits having a change in vertical and/or horizontal alignment. Crowns shall be matched when connecting different size conduits. The inverts of catch basins, manholes, and other structures should be formed to minimize turbulence and collection of debris.

Alternatively, manholes and catch basins may be designed with a minimum one tenth (0.1) foot drop in head to account for hydraulic head losses. In other words, the outlet pipe must be one tenth (0.1) foot lower than the inlet pipe.

J. Hydraulic Design:

The Manning equation is to be used for determining the conduit size required to convey the flow for the ten (10)-year design storm. The Manning formula for pipes flowing full may be expressed in the following form to determine pipe size:

Where,

$$D = 1.335 \left[\frac{(Qn)^{3/8}}{S^{3/16}} \right]$$

D = Pipe Diameter, ft. Q = Design Flow, cfs

n = Manning's roughness coefficient {See Table 2.4[H] Manning's Roughness Coefficient (n)}

S = Slope, ft./ft.

APPENDIX [H].

ARTICLE 6.

CULVERTS

6.1[H] - Introduction:

A culvert is a relatively short length of conduit used to transport storm water through an embankment or some other obstructing feature. There are many types of culverts for a variety of uses. The type of culvert used depends on such factors as hydraulic performance, limitations on water surface elevations, embankment height, construction and maintenance costs, channel characteristics, and public safety considerations. Although all of these factors are crucial in the design of culverts, this chapter will mainly focus on the selection of culvert size to convey flow adequately.

There are two (2) basic types of culvert flow: inlet and outlet control. The basis for the classification is the location of the control section. The hydraulic capacity of the culvert depends upon a different combination of factors for each type of control. The Federal Highway Administration *Hydraulic Design of Highway Culverts* (HDS No. 5), as updated, contains theories and charts and graphs used to aid in the design of culverts.

6.2[H] - Design Criteria for Culverts:

- A. Design Storm Frequency: Twenty-five (25)-year frequency,
 Twenty-four (24)-hour duration.

[It should be noted that a flood hazard evaluation using a check discharge based on the one hundred (100)-year frequency shall be made for all culverts.]

B. Maximum Allowable Headwater for Design Storm:

1. One thousand (1,000) acres or greater:
 Two (2) feet below edge of pavement;
2. Less than one thousand (1,000) acres:
 One (1) foot below edge of pavement;

3. Deep Ravine Culverts:
Four (4) feet above inlet crown;
4. Adjacent to buildings:
Two (2) feet below lowest ground elevation at building;
5. Flood Plain area:
Three (3) feet below edge of pavement; and
6. One hundred (100)-year frequency:
Two (2) times the pipe diameter.

C. Method to Calculate Design Flow:

(Refer to Appendix [H]. - Article 2. - Calculating Storm Water Runoff for discussion of appropriate methods to determine design flows.)

D. Manning's "n" Value:

- | | |
|-----------------------|--|
| 1. Concrete pipe: | 0.013 to 0.015 |
| 2. Slab top culverts: | 0.017 to 0.025 |
| 3. Box culverts: | 0.012 |
| 4. Plastic pipe: | 0.012 (the entrance end should be strapped to the HW-4B headwall). |

E. Minimum Scour Velocity: 2.0 ft./s.

F. Maximum Allowable Culvert Outlet Velocity:

- | | |
|---|------------------------------------|
| 1. Bare earth: | 2 ft./s. |
| 2. Sod: | 5 ft./s. |
| 3. Jute matting: | 4 ft./s. |
| 4. Rock channel protection: | 5 ft./s. |
| 5. Rock channel protection
with concrete end sill: | 18 ft./s. |
| 6. Over eighteen (18) ft./s.: | Consult with Knox County Engineer. |

- G. Minimum Cover: Nine (9) inches from top of rigid pipe to bottom of subbase; and
Twenty four (24) inches from top of flexible pipe to bottom of subbase.
- H. Maximum Cover:

(Refer to ODOT Section 1008 Headwalls.)
- I. Headwalls:
1. Half headwalls: ODOT HW-4 B
2. Full headwalls: Where slope stabilization is necessary.
- J. Rock Channel Protection:

Use Figure 1101-7 in the Ohio Department of Transportation's *Location and Design Manual, Volume 2*, as amended, to determine length and depth of possible rock channel protection at the outlet of all cross road culverts.
- K. Minimum Culvert Size: Twelve (12) inches.

APPENDIX [H].

ARTICLE 7.

OPEN CHANNEL

7.1[H] - Introduction:

An open channel is a passageway for storm water runoff, which allows part of the storm water to be exposed to the atmosphere. Open channels include natural waterways, canals, ditches, flumes, culverts, and pipes flowing by gravity. This article will cover open channels that are not piped. For piped flow, see Appendix [H]. - Article 5. - Storm Sewers and Appendix [H]. - Article 6. - Culverts. Open channel flow occurs when runoff collects into well-defined open channels. Usually, open channels are assumed to begin where surveyed cross sectional information has been obtained or where channels are indicated on aerials or maps.

Under uniform flow conditions, open channel velocity (V) and discharge (Q) may be determined by utilizing the following two (2) equations:

Manning's Formula:

$$V = \frac{1.49}{n} R^{2/3} s^{1/2}$$

Where,

V = mean velocity in the channel, ft./sec.

n = Manning's roughness coefficient

R = hydraulic radius, ft.

s = friction slope, ft./ft

Continuity Equation:

$$Q = V A$$

Where,

Q = flow rate in the channel, sfs

V = mean velocity in the channel, ft./sec.

A = cross-sectional flow area, ft.²

The hydraulic radius is given as:

Where,

$$R = \frac{A}{P}$$

R = hydraulic radius, ft.

A = cross-sectional area, ft.²

P = wetter perimeter, ft.

In order to simplify hydraulic calculations, it is assumed that the channel can be divided into segments in which uniform flow exists. Uniform flow describes a hydraulic condition in which the flow depth, flow area, velocity and discharge remain constant over a channel reach with fixed section characteristics such as shape and lining material. These conditions are only met when the channel slope equals the friction slope. When a channel flows with uniform flow conditions, the flow depth is called the normal depth.

7.2[H] - Design Criteria:

A. Design Storm Frequency:

	ADT < 2000	ADT > 2000
1. Depth:	5-year frequency, 24-hour duration	10-year frequency, 24-hour duration
2. Velocity:	2-year frequency, 24-hour duration	5-year frequency, 24-hour duration

B. Maximum Depth of Flow:

1. Drainage swales:	0.8 Bank Full Stage Roadside
2. Ditches:	9" Below Edge of Pavement 12" Below Edge of Pavement

C. Maximum Allowable Velocity:

1. Bare earth: 2.0 ft./s.
2. Seeded: 2.5 ft./s.
3. Sod: 5.0 ft./s.
4. Jute mat: 4.0 ft./s.
5. Excelsior mat: 5.0 ft./s.
6. Rock channel protection: 18.0 ft./s.
7. Over 18 ft./s.: Consult with Knox County Engineer
(For other erosion control products, submit supporting documentation for approval by the Knox County Engineer.)

D. Manning's "n":

1. Bare earth: 0.02
2. Seeded: 0.03
3. Sod or jute mat: 0.04
4. Excelsior mat: 0.04
5. Grouted riprap: 0.02
6. Rock channel protection: 0.06 for ditches
0.04 for large channels
7. Pavement lining: 0.015

E. Minimum Depth of Flow:

1. Roadside ditch: 24 inches
2. Top of bank: 12 inches to full flow elevation

F. Maximum Sideslope: 3:1 (h:v)**G. Minimum Bottom Slope: 0.50%****H. Catch Basin Type:**

See ODOT Standard Construction Drawings for Catch Basins.

APPENDIX [H].

ARTICLE 8.

BRIDGES

8.1[H] - Introduction:

A bridge is any structure more than ten (10) feet wide erected over a depression or an obstruction, such as water, railway, etc., to carry traffic or other moving loads. Length is measured along the center of the roadway between undercopings of abutments or extreme limits of the openings for multiple boxes.

8.2[H] - Design Criteria:

Design Storm Frequency: One hundred (100)-year frequency,
Twenty-four (24)-hour duration.

8.3[H] - General Design Procedures:

The design criteria for bridges can be found in the latest edition and interim specifications for both the Ohio Department of Transportation's *Bridge Design Manual* and the American Association of State Highway and Transportation *Officials' Standard Specifications for Highway Bridges*.

8.4[H] - Bridges on Private Property:

When development of part or all of a watershed requires a structure, such as a bridge or a concrete box culvert, the homeowner, builder, or developer shall:

- A. Check with the Flood Plain Administrator to determine whether the Flood Plain Regulations apply. Generally, the bridge (structure) should be designed to handle a twenty-five (25)-year flood [unless in a designated flood plain, then one hundred (100)-year flood] elevation, and shall have no adverse impact on upstream or downstream properties.
- B. Request a recommendation from the Knox County Engineer and/or the Knox Soil and Water Conservation District. The recommendation may be to complete a hydrologic study if the site for the proposed bridge (structure) is in a designated flood plain.

- C. Hire a testing lab/environmental consultant to do soil borings to determine the bearing capacity of soil, and the makeup of the soil strata for the abutment pilings. This will determine the suitability of the selected site for the proposed bridge.
- D. Retain a Professional Engineer licensed in the State of Ohio to design the bridge (structure) using as a minimum AASHTO loading criteria or alternate military standard, for not less than thirty (30) tons load limit, and not less than twelve and one-half (12.5) feet in width. The proposed design shall be submitted to the Knox County Engineer for review before proceeding with construction.
- E. The contractor selected should have experience with constructing bridges (structures) and should provide a list of references to the developer or owner.
- F. Upon request and payment of a fee, the Knox County Engineer's office can provide periodic inspection during construction, and can include the bridge (structure) in the County's annual bridge (structure) inspection once completed. Otherwise, the results of inspections by a Certified Professional Engineer shall be filed with the Knox County Engineer. It is recommended that the bridge (structure) be inspected at a minimum of every other year, but annually fifteen (15) years post-construction.
- G. The developer must apply to the Army Corps of Engineers (Huntington, West Virginia office, 304 . 529 . 5210) to obtain a nationwide permit. The application (a two-page form) and additional information regarding the permit process can be found at the following web site:

<http://www.lrh.usace.army.mil/or/permits/apply.asp#forms>.
- H. If more than twenty thousand (20,000) square feet of area will be disturbed, a sediment and erosion control plan is required with the application for the storm water permit.
- I. If more than one (1) acre is (to be) disturbed, the developer will need to send a notice of intent (NOI) to the Ohio EPA, and provide a sediment and erosion control plan (as described in H. immediately above).

APPENDIX [H].

ARTICLE 9.

WATER QUALITY

AT TIME OF ADOPTION BY THE BOARD OF KNOX COUNTY COMMISSIONERS (NOVEMBER, 2005) KNOX COUNTY IS NOT UNDER ENVIRONMENTAL PROTECTION AGENCY (EPA) MANDATE TO ENFORCE THE WATER QUALITY COMPONENT OF STORM WATER MANAGEMENT. THE HEREIN *ARTICLE 9. WATER QUALITY* ESTABLISHES BASIC LANGUAGE AND REQUIREMENTS WHICH MUST BE ENABLED BY LEGISLATION AT THE LOCAL (COUNTY) LEVEL.

9.1[H] - Introduction:

In 1972 Congress amended the Federal Water Pollution Control Act, which is also known as the Clean Water Act (CWA). Many studies of storm water runoff have confirmed that uncontrolled storm water runoff is detrimental to the environment.

The National Pollutant Discharge Elimination System (NPDES) was implemented to improve surface water quality. Phase I included major industrial facilities, city storm sewer systems greater than one hundred thousand (100,000) population, and construction sites greater than five (5) acres. Phase II, now implemented, includes municipalities smaller than one hundred thousand (100,000) and construction sites of one (1) to five (5) acres.

9.2[H] - Design Criteria:

- A. Implement best management practices (BMP's);
- B. Pre-treatment may be required for commercial or industrial projects;
- C. Ratio of flow length and pond width should be at least 3:1; and
- D. A forebay is recommended for larger basins and may be required by the Knox County Engineer.

9.3[H] - Best Management Practices:

Adopted November 10, 2005, Knox County Board of Commissioners

The Center for Watershed Protection has reference material on Best Management Practices (BMP's) which includes planning, design, specifications and maintenance information.

The Ohio Department of Natural Resources publishes a manual, *Rainwater and Land Development, Ohio's Standards for Storm Water Management Land Development and Urban Stream Protection* providing the framework for site planning, pollution prevention, runoff control, and stream channel construction and restoration. Contact:

Center of Watershed Protection
8391 Main Street
Ellicott City, Maryland, 21043
Telephone: 410 . 461 . 8323 Fax: 410 . 461 . 8324

ODNR, Division of Soil & Water Conservation
1939 Fountain Square Court, Building E-2 Columbus, Ohio,
43224-1336
Telephone: 614 . 265 . 6610 Fax: 614 . 262 . 2064.

9.3.1[H] - Minimizing Directly Connected Impervious Areas:

Impervious surfaces collect and accumulate pollutants deposited from the atmosphere, leaked from vehicles, and derived from other sources. During storms, accumulated pollutants are quickly washed off and rapidly delivered to streams, ponds, lakes, etc. where aquatic life is affected and water quality is reduced.

By planning a site layout so that the impervious areas do not directly drain into a pond, lake, etc. or directly into storm sewer pipes, pollutants reaching the aquatic life can be reduced and water quality can be maintained. Vegetated ditches and channels instead of piped systems also allow the vegetation to reduce the pollutant loading.

Maintenance requirements include mowing the vegetation.

9.3.2[H] - Filter Strip:

Filter strips rely on the use of vegetation to slow runoff velocities and filter out sediment and other pollutants from the storm water. To be effective, however, filter strips require the presence of sheet flow across the entire strip. Once flow concentrates to form a channel, it effectively short-circuits the filter strip. Unfortunately, this usually occurs within a short distance in urban areas. It is doubtful whether sheet flow can be maintained over a distance of one hundred fifty (150) feet for pervious areas and seventy five (75) feet for

impervious areas [one (1) parking bay]. In most common designs, runoff is directed from a parking lot into a long filtering system composed of a stone trench, a grass strip, and a longer wooded strip.

The grass portion of the filter strip provides pre-treatment for the wooded portion. In addition, a six (6) inch stone drop is to be located at the edge of the parking lot and the filter strip is to prevent sediment from depositing at the critical entry point. The filter strip typically is an on-line practice, so it must be designed to withstand the full range of storm events without eroding.

The grass portion of the system provides an ideal location to stockpile snow where the meltwater can gradually infiltrate into the soil.

Maintenance requirements include removing the sediment buildup at the edge of the parking lot to maintain inflow and mowing the grass portion of the filter strip.

9.3.3[H] - Filters:

Filtering systems utilize media such as sand, gravel, peat, grass, soil, or compost to filter out pollutants entrained in the storm water. Designs can use more than one (1) media type. The media is incorporated in a filter bed with the surface area, depth and profile being key design elements.

The surface area is based on the impervious area percentage, the media, rainfall patterns and water quality requirements. Depth usually ranges from eighteen (18) inches to four (4) feet. Shallow beds are more cost effective since pollutants are trapped in the top few inches of media. Sediment chambers are recommended for some types of filter media.

Maintenance requirements include cleaning or replacing media, removal of debris and vegetation, and maintaining the structural integrity of the chamber components (spalling and cracking of concrete, rusting of grates, cracking in pipes, etc.)

9.3.4[H] - First Flush Basin:

A first flush basin, also known as a sediment forebay, is a small basin used to catch the sediment prior to the storm water entering a retention basin. The small basin is dredged periodically allowing an extended time frame for dredging the retention basin.

The basin should be sized to accommodate one-tenth to twenty-five hundredths of an inch (0.1 - 0.25) runoff volume per impervious acre.

For example,

Impervious area = 72.4 acres

Minimum volume required = 0.1" (72.4 acres)
(12"/ft.) = 0.6 ac.-ft.

Maintenance requirements include mowing and periodic dredging.

9.3.5[H] - Wet Basin:

Conventional wet basins have a permanent pool of water for treating incoming storm water runoff. A properly designed outlet control structure can enhance the treatment capability by limiting the discharge of pollutants.

9.3.6[H] - Wet Extended Detention Basin:

Extended detention incorporates diversion devices to create a longer flow path between the inlet and outlet structures.

9.3.7[H] - Dry Basin:

Conventional dry detention basins store storm water temporarily in a depressed or low area and release the storm water at a pre-determined rate. Most of the time they are dry.

Maintenance requirements include mowing and upkeep of the discharge structure.

Like wet basins, dry basins can have extended detention elements incorporated to enhance the treatment capability.

9.3.8[H] - Wetlands:

Shallow marsh systems create favorable conditions for the growth of emergent wetland species. Depths range from zero (0) to eighteen (18) inches. A combination of wetlands with extended detention features such as micro pools or with wet basins may also be considered. A micro pool is a small pocket of deeper water. Micro pools may be designed to store up to fifty percent (50%) of the required treatment volume.

Maintenance requirements are minimal.

9.3.9[H] - Infiltration Systems:

A conventional infiltration trench is a shallow excavated trench that has been backfilled with stone to create an underground reservoir. Storm water

gradually exfiltrates from the bottom and sides of the trench into the soils and eventually into the groundwater.

An infiltration basin utilizes a basin instead of a trench and incorporates underdrains to assist removal of standing water. Porous pavement is considered an infiltration system. Infiltration systems are only considered a BMP if they are enhanced. An enhanced infiltration system has pre-treatment elements to remove sediment and oil/grease.

Maintenance requirements include cleaning or replacing media, removal of debris and vegetation, and maintaining the structural integrity of the chamber components (spalling and cracking of concrete, rusting of grates, cracking in pipes, etc.)

9.3.10[H] - Bio-retention Systems:

Bio-retention is a practice of managing and treating storm water runoff using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression. The method combines physical filtering and adsorption with biological processes. The system consists of the following:

- A. A flow-regulating structure;
- B. A pre-treatment filter strip;
- C. A grass channel;
- D. A sand bed;
- E. A pea gravel overflow curtain drain
- F. A shallow ponding area;
- G. A surface organic layer of mulch
- H. A planting soil bed
- I. Adequate plant material
- J. A gravel underdrain system; and
- K. An overflow system.

Bio-retention is a water quality BMP and may not have sufficient capacity for water quantity provisions. Special provisions may be required to meet the quantity requirements.

Maintenance requirements are similar to other planted bed requirements.

APPENDIX [H].

ARTICLE 10.

OTHER JURISDICTIONS

10.1[H] - Wetlands:

The Army Corps of Engineers and USEPA have jurisdiction over construction involving wetlands. A copy of the wetland delineation shall be submitted to the Knox County Engineer's Office.

The Knox County Engineer will not approve improvement plans, or final plats, until a permit from the Army Corps of Engineers and/or USEPA has been issued.

10.2[H] - Dams:

The Ohio Department of Natural Resources has jurisdiction over dams. (See Ohio's Laws for Constructing Dams, Dikes or Levees.)

The Knox County Engineer will not approve improvement plans, or final plats, until a permit from the Ohio Department of Natural Resources has been issued.

APPENDIX [H].

ARTICLE 11.

INSPECTION & MAINTENANCE

11.1[H] - Introduction:

The Knox County Engineer is responsible for inspection of construction activities in subdivisions. More specifically, the following operations may be inspected:

- A. Preliminary grading;
- B. Backfilling of all trenches and excavations in the right-of-way;
- C. Preparation of subgrade;
- D. Form setting;
- E. Paving;
- F. Inlet construction;
- G. Curing of rigid pavement;
- H. Removal of forms;
- I. Berm compaction;
- J. Sidewalk construction and joint sealing;
- K. Storm sewer construction; and
- L. Any construction within the right-of-way.

For payment of fees, see the Fee Schedule for Engineering and Inspection contained herein.

11.2[H] - Inspection - As Per Plan:

During construction, the work will be inspected as per plan. Any changes to the plans must be submitted in writing to the Knox County Engineer. Approval must be obtained prior to any construction change activity. "As-built" drawings are required upon completion of the project.

11.3[H] - Inspection of Facilities:

When construction has been completed and prior to release of the Performance Bond, the Knox County Engineer will inspect the site and develop a list of items to be completed or repaired. (Commonly referred to as the "Punch List".) Once the punch list items have been adequately addressed at the Knox County Engineer's discretion and with his approval, the Maintenance Bond will be accepted and the Performance Bond released.

Prior to release of the Maintenance Bond, the Knox County Engineer will inspect the site and develop a punch list of items to be completed or repaired. Once these items have been adequately addressed at the Knox County Engineer's discretion and with his approval, the Maintenance Bond will be released.

After release of the Maintenance Bond, the Knox County Engineer will conduct annual inspections of the drainage facilities with the Knox Soil and Water Conservation District.

(Notice: The Knox County Engineer must be notified twenty-four (24) hours in advance for any construction activity. This includes items appearing on the punch list that need to be repaired.)

11.4[H] - Routine Maintenance:

The developer is responsible for routine maintenance until the Maintenance Bond has been released and the County has accepted responsibility. Routine maintenance includes (but is not limited to):

- A. Mowing;
- B. Debris Control;
- C. Silt Removal;
- D. Erosion Repair; and

E. Road Cleaning.

11.5[H] - Repairs:

All disturbed signs, guardrails, mail and/or paper boxes, drives and drive culverts shall be repaired and/or replaced as directed by the Knox County Engineer.

All disturbed and/or damaged storm sewer pipes, storm sewer appurtenances, pavements, berms, and ditches shall be repaired and/or replaced as directed by the Knox County Engineer.

All repairs shall be completed prior to release of the Maintenance Bond.

Repairs are considered a construction activity where a twenty-four (24) hour notice is required.

11.6[H] - Permanent Maintenance:

When appropriate, permanent maintenance of any system, including but not limited to, ditches, detention or retention ponds, riprap, tiles, or culverts for managing storm water and erosion/sedimentation shall be arranged through petition to the Board of County Commissioners prior to approval of any final plat considered under these regulations and release of both the Performance Bond and the Maintenance Bond.