

Section 4.80 Storm Drainage

- 4.81 Storm sewers, culverts and related installations shall be provided to:
 - 4.811 Permit unimpeded flow of natural water courses;
 - 4.812 Ensure adequate drainage of all low points along the line of streets;
 - 4.813 Intercept storm water run-off along streets at intervals related to the extent and grade of the area drained;
 - 4.814 Provide positive drainage away from on-site sewage disposal facilities;
 - 4.815 Take surface water from the bottom of vertical grades. Crossing gutters will not be permitted.
- 4.82 All artificial water courses and drainage ditches shall be enclosed in underground pipes, storm sewers or conduits, or if authorized by the Township Supervisors, shall be constructed at ground level as a concrete paved gutter which meets Township regulations, of sufficient diameter or size to adequately contain the maximum amount of water normally expected to flow there-through during the course of any year, as the same may be determined by the Township Supervisors.
- 4.83 Where existing storm sewers are reasonably accessible, proposed subdivisions shall be required, if necessary, to connect therewith.
- 4.84 In the design of storm drainage facilities, special consideration shall be given to avoidance of problems which may arise from the concentration of storm water run-off onto adjacent development or undeveloped properties.
- 4.85 Storm drainage facilities should be designed not only to handle the anticipated peak discharge from the property being subdivided, but also the anticipated increase of run-off that will occur when all the property at a higher elevation in the same watershed is fully developed.
- ✓ 4.86 Where a subdivision is traversed by a water course, drainage way, channel, or stream, there shall be provided a drainage easement conforming substantially with the line of such water course, drainage way, channel, or stream and of such width as will be adequate to preserve the unimpeded flow of natural drainage, or for the purpose of widening, deepening, relocating, improving or protecting such drainage facilities. Any change in the existing drainage way shall be subject to the approval of the Pennsylvania Department of Environmental Resources when the Department has jurisdiction.

- 4.87 All streets shall be so designed as to provide for the discharge of surface water from their rights-of-way.
- 4.88 The slope of the crown on proposed streets shall be not less than $\frac{1}{8}$ of an inch per foot and not more than $\frac{1}{3}$ of an inch per foot.
- 4.89 Adequate facilities shall be provided at low points along streets and where necessary to intercept run-off, especially at pedestrian crossings.
- 4.891 Storm sewers and related installations shall be required only when the run-off of storm water cannot be satisfactorily handled within the street cartway.

Section 4.90 Public Use and Service Areas

4.91 Public Open Spaces

4.911 In reviewing subdivision plans, the Township Planning Commission shall consider whether community facilities, especially schools, in the area are adequate to serve the needs of the additional dwellings proposed by the subdivision, and shall make such report thereon as it deems necessary in the public interest.

4.912 Subdividers shall give earnest consideration to the providing of facilities and the reserving of areas for facilities normally required in residential neighborhoods, including churches, libraries, schools and other public buildings; parks, playgrounds and playfields; shopping and local business centers. Areas provided or reserved for such community facilities should be suitably prepared for its use at the expense of the subdivider and should be adequate for building sites, landscaping and off-street parking as appropriate to the use proposed. Prior to the preparation of plans, subdividers of large tracts should review with the staff of the County Planning Commission the minimum standards for various community facilities applicable to the tract being subdivided.

4.913 In subdivisions which are intended to provide housing for more than fifty (50) families, the Township Planning Commission shall make a recommendation regarding the reservation of space for recreation.

4.92 Community Assets

4.921 Consideration shall be shown for all natural features such as large trees, water courses, historic areas and structures, and similar community assets which, if preserved, will add attractiveness and value to the remainder of the subdivision. Trees shall be preserved wherever possible.

4.93 Utility Easements

4.931 Easements with a minimum width of twenty (20) feet shall be provided for poles, wires, conduits, storm and sanitary sewers, gas, water and heat mains and/or other utility lines intended to service the abutting lots. No structures or trees shall be placed within such easements.

4.932 To the fullest extent possible, easements shall be centered on or adjacent to rear or side lot lines.

4.933 There shall be a minimum distance of twenty-five (25) feet, measured from the right-of-way line, between any proposed dwelling unit and any petroleum, petroleum products or natural gas transmission line which traverses the subdivision.

4.9331 No company intending to install any petroleum, petroleum products or natural gas transmission line shall be allowed to construct the line on less than fifty (50) foot right-of-way, such line to be installed in the center of the right-of-way, and shall comply to the applicable standards of the Pennsylvania Public Utilities Commission.

4.934 Underground telephone lines shall be provided in all new subdivisions and land developments. When cable television lines are installed, they shall also be placed underground. Underground electric distribution lines shall be installed in all new subdivisions and land developments of five dwelling units or more. In existing subdivisions with five or more unimproved lots any extensions of the electric distribution lines shall be placed underground. An approved plan for the utilization of an electric distribution system shall be submitted to the Township prior to the recording of a final plan. The following procedure will be followed in reviewing lands subject to underground electric service:

4.9341 Upon receipt of a Preliminary Plan or an official Sketch Plan for review, the Planning Commission will forward a copy of the notice of review to the appropriate utility company. This would apprise the utility company of the project status and indicate that a developer would be contacting them in the near future.

4.9342 The Commission will, upon receipt and review of a Final Plan, forward a letter of review, indicating approval (possibly subject to certain conditions) to all parties including the utility company involved. In this letter, the developer is directed to contact the appropriate utility company and secure an approved plan for the underground electric system. A copy of this approved plan will be required prior to County endorsement of any plan for recording. The responsibility for securing this approval and coordinating the plan with the utility company would be the developer's or his representatives.

4.94 Erosion and Sediment Controls

4.941 Land shall not be developed or changed by grading, excavating, or by the removal or destruction of the natural topsoil, trees, or other vegetative cover unless adequate provisions for minimizing erosion and sedimentation are provided.

4.942 A plan for erosion and sediment control shall be prepared. The plan shall meet all requirements of the Berks County Conservation District and the Pennsylvania Department of Environmental Resources and be approved by the Berks County Conservation District, the Township, and the Pennsylvania Department of Environmental Resources, when applicable.

- 4.943 The following guidelines shall be applied as needed in developing erosion and sediment control measures:
- 4.9431 Stripping of vegetation, grading, filling, excavating or other alteration of the landscape shall be kept to a minimum and shall be done in such a way that will minimize erosion.
 - 4.9432 Whenever feasible, natural vegetation shall be retained, protected, and supplemented.
 - 4.9433 The disturbed area and the duration of exposure shall be kept to a practical minimum.
 - 4.9434 Disturbed soils shall be stabilized as quickly as practicable.
 - 4.9435 Temporary vegetation and/or mulching shall be used to protect exposed critical areas during development.
 - 4.9436 The permanent vegetation and mechanical erosion control and drainage measures shall be installed as soon as practical in the development.
 - 4.9437 Provisions shall be made to effectively accommodate the increased run-off caused by changed soil and surface conditions during and after development. Where necessary, the rate of surface water run-off shall be mechanically retarded.
 - 4.9438 Until disturbed areas are stabilized, sediment in run-off water shall be trapped by the use of debris basins, sediment basins, silt traps, or similar measures.
- 4.944 The following guidelines shall be applied as needed in excavation and fills as part of erosion and sediment controls:
- 4.9441 All lots, tracts, or parcels shall be graded to provide positive drainage away from buildings, without ponding.
 - 4.9442 Grading and cut-fill operations shall be kept to a minimum to ensure conformity with the natural topography, to minimize the erosion hazard, and to adequately handle surface runoff.
 - 4.9443 Natural drainage patterns shall be preserved wherever possible and desirable.
 - 4.9444 Adequate provisions shall be made to prevent surface water from damaging the cut face of excavations and the sloping surfaces of fills.

- 4.9445 Cut and fills shall not endanger adjoining property.
- 4.9446 Fill shall be placed and mechanically compacted to minimize sliding and erosion of the soil.
- 4.9447 Fills shall not encroach on natural water courses, flood plains, or constructed channels.
- 4.9448 Grading shall not be done in such a way so as to divert water onto the property of another landowner without the expressed consent of the Township Supervisors and the adjoining landowner.
- 4.9449 During grading operations, necessary measures for dust control shall be exercised.
- 4.9450 Grading equipment shall not cross live streams. Provisions must be made for the installation of culverts or bridges.

✓ ✓ 4.95 Standards for Mobile Home Parks

- 4.951 Mobile home parks shall be considered subdivisions and shall comply with all the design standards and improvement specifications found in Articles IV and V of this Ordinance.
- 4.952 The submission, review, approval or disapproval, and recording of any mobile home park shall be in accordance with the provisions of Article II of this Ordinance.
- 4.953 The Plan of any mobile home park shall comply with the requirements stated in Article III of this Ordinance.
- 4.954 All mobile home parks shall comply with all the requirements for mobile home parks as may be listed in the Township Zoning Ordinance and other Township ordinances and regulations established for mobile homes parks by the Commonwealth of Pennsylvania.

ARTICLE V - IMPROVEMENT SPECIFICATIONS

Section 5.00 General Requirements

- 5.01 Physical improvements to the property being subdivided shall be provided, constructed and installed as shown on the Record Plan, in accordance with the requirements of the Township.
- 5.02 As a condition to review of a Final Plan by the Township Planning Commission, the subdivider shall agree with the Township as to installations of all improvements shown on the Plan and required by these regulations. Before the Record Plan may be endorsed by the Township Planning Commission, the subdivider shall submit a completed original copy of the Subdivision Improvements Agreement.
- 5.03 All improvements installed by the subdivider shall be constructed in accordance with the design specifications of the Township; where there are no applicable Township specifications, specifications furnished through the County Planning Commission, County Engineer, Pennsylvania Department of Transportation, Pennsylvania Department of Environmental Resources, or such other State agency as applicable shall be used. If there are no applicable county or state regulations, the Commission may authorize that specifications be prepared by a Registered Professional Engineer.
- 5.04 Supervision of the installation of the improvements required by Section 5.10 following shall in all cases be the responsibility of the Township or of the appropriate state regulatory agency.

Section 5.10 Required Improvements: The following improvements, as shown on the Record Plan, shall be provided by the subdivider.

- 5.11 Street grading: All streets shall be graded at full right-of-way width. All portions of street right-of-ways not included within street cartways shall be graded at a slope of no less than 2:1.
- 5.12 Cartway paving: All streets shall be paved to full cartway width (as shown on the Final Plan) in accordance with Township regulations.
- 5.13 Curbs: Curbs as required by the Township shall be installed along both sides of all streets, except where the average lot frontage (measured at the building reserve line) is one hundred (100) feet or larger, and except along service streets. Curbs shall be either the vertical type or the rolled curb and gutter type, except that rolled curbs shall not be used on streets whose grade exceeds six (6) per cent, or on any collector or major streets. The transition from one type of curb to another shall be made only at a street intersection, and adequate provisions shall be made for driveway entrances.

5.14 Sidewalks:

5.141 Sidewalks shall be a minimum of four (4) feet in width and shall be installed on both sides of all streets except:

5.1411 Except where required for the extension of existing, abutting sidewalks, no sidewalks shall be required along minor streets where the average lot frontage is one hundred (100) feet or larger, unless such streets are within the required walking distance area of a school or community facilities encouraging pedestrian traffic.

5.1412 Along service streets.

5.1413 Where required, sidewalks shall be installed on only one (1) side of marginal access streets.

5.15 Sewers:

5.151 Storm Sewers: Storm sewers and related facilities shall be installed consistent with the design principles and requirements contained in Section 4.60 of these regulations.

5.1511 Wherever a subdivider proposes that individual on-site sanitary sewage disposal system shall be utilized within the subdivision, the subdivider shall require (by deed restriction or otherwise), as a condition of the sale of each lot or parcel within the subdivision, that such facilities shall be installed by the purchaser of such lot or parcel at the time that a principal

building is constructed, and in accordance with these regulations.

- 5.1512 Where studies by the County Planning Commission and the Township indicate that construction or extension of sanitary trunk sewers to serve the property being subdivided appears probable within a reasonably short time (up to five years), the Township shall require the installation and capping of sanitary sewer mains and house connections, in addition to the installation of temporary, individual, on-site sanitary sewage disposal systems. It shall however, be the responsibility of the Township or other such appropriate agency to supervise the design and installation of such capped sewers.
- 5.1513 Sanitary sewage disposal systems shall be provided consistent with the requirements contained in Section 4.60 of this Ordinance.
- 5.1514 If individual on-site systems are not used, the subdivider shall provide a community or public sanitary sewage disposal system. The design and installation of all systems shall be subject to the approval of the Township. A community sewage disposal system shall be subject to satisfactory provision for the maintenance thereof.

5.16 Water Supply:

- 5.161 Water supply shall be installed consistent with the design principles and requirements contained in Section 4.70 of these regulations.
- 5.162 Where the subdivider proposes that individual on-site water supply systems shall be utilized within the subdivision, the subdivider shall either install such facilities or shall require (by deed restriction or otherwise), as a condition of the sale of each lot or parcel within the subdivision, that the facilities shall be installed by the purchaser of such lot or parcel at the time that a principal building is constructed, and in accordance with these regulations.
- 5.163 Wherever economically feasible, the subdivision shall be provided with a complete public or community water distribution system. The design and installation of such public system shall be subject to the approval of the engineer of the appropriate water utility company or municipal engineer; the design and installation of such

community distribution system shall be subject to the approval of the Pennsylvania Department of Environmental Resources and such system shall be further subject to satisfactory provision for the maintenance thereof.

- 5.164 Fire Hydrants: Wherever a public or community water supply system is provided, fire hydrants shall be installed within 600' of all existing and proposed structures, measured by way of accessible streets (as specified by the Middle Department Association of Fire Underwriters).

5.17 Monuments:

- 5.171 Permanent stone, concrete or steel pin monuments shall be accurately (as specified by Section 3.312) placed at the intersection of all lines forming angles and at changes in directions of lines in the boundary (perimeter) of the property subdivided.
- 5.172 All monuments shall be placed by a Registered Professional Engineer or Surveyor so that the scored (by an indented cross in the top of the monument) point shall coincide exactly with the point of intersection of the line being monumented.
- 5.173 Monuments shall be set with their top level with the finished grade of the surrounding ground, except:
- 5.1731 Monuments which are placed within the lines of existing or proposed sidewalks shall be so located (preferably beneath the sidewalks) that their tops will not be affected by lateral movement of the sidewalks, and
- 5.1732 Where monuments are located beneath a sidewalk, proper access shall be provided for their use.
- 5.1733 Where sidewalks are existing, a stone point (a four inch square chisel cut with a drill hole in the center) may be substituted for a monument.
- 5.174 All streets shall be monumented (preferably on the right-of-way lines or the five (5) foot range line) at the following locations:
- 5.1741 At least one monument at each intersection;
- 5.1742 At changes in direction of street lines, excluding curb arcs at intersections;

- 5.1743 At each end of each curved street line, excluding curb arcs at intersections;
- 5.1744 At intermediate points wherever topographical or other conditions make it impossible to sight between two otherwise required monuments;
- 5.1745 At such other place along the line of streets as may be determined by the Township Engineer to be necessary so that any street may be readily defined in the future.
- 5.175 Markers: Metal markers are to be accurately placed at all lot corners.
- 5.18 Street Signs: Street name signs shall be installed at all street intersections. The design and placement of such signs shall be subject to approval by the Township.
- 5.19 Street Lights: In accordance with the conditions to be agreed upon by the subdivider, the Township, and the appropriate public utility, street lights may be required to be installed in all subdivisions.

Section 5.20 Recommended Improvements

The following improvements, intended to enhance the sales value of the subdivision as well as to benefit the municipality, are recommended:

- ✓ 5.201 Shade Trees: Reasonable efforts should be made by the subdivider to preserve existing shade trees and, in addition, deciduous hardwood trees with a minimum diameter of one and one-half (1-1/2) inches should be provided, in accordance with conditions to be agreed upon by the Township and, if necessary, the appropriate public utility. Where provided, such trees shall be planted between the public street right-of-way line and the building reserve (setback) line at least ten (10) feet from the public street right-of-way line. No trees or bushes shall be planted between the sidewalk and curb.

ARTICLE VI - DEFINITIONS

- Section 6.10 Unless otherwise expressly stated, the following terms shall, for the purpose of these regulations have the meaning indicated:
- 6.11 Words in the singular include the plural and those in the plural include the singular.
- 6.12 Words in the present tense include the future tense.
- 6.13 The words "person", "subdivider", and "owner" include a corporation, unincorporated association and a partnership, or other legal entity, as well as an individual.
- 6.14 The word "building" includes structure and shall be construed as if followed by the phrase "or part thereof".
- 6.15 The word "water course" includes channel, creek, ditch, dry run, spring, stream and river.
- 6.16 The words "should" and "may" are permissive; the words "shall" and "will" are mandatory and directive.
- 6.20 Other terms or words used herein shall be interpreted or defined as follows:
- 6.21 Alley: See Service Street
- 6.22 Block: An area bounded by three (3) or more streets.
- 6.23 Building; Any enclosed or open structure other than a boundary wall or fence, occupying more than four (4) square feet of area.
- Detached - a building which has no party wall.
- Semi-detached - a building which has only one (1) party wall in common with another building.
- Attached - a building which has two (2) party walls in common with another building.
- ✓ 6.24 Building Setback Line: The line within a property defining the minimum required front yard distance between any building to be erected, and an adjacent existing or proposed street right-of-way.
- 6.25 Cartway (Roadway): The portion of a street right-of-way, paved or unpaved, intended for vehicular use.
- 6.26 Clear Sight Triangle: An area of unobstructed vision at street intersections defined by lines of sight between points at a given distance from the intersection of the street center lines.

- 6.27 Commission: The Planning Commission of the Township of Bethel, Berks County, Pennsylvania.
- 6.28 County: The County of Berks, Commonwealth of Pennsylvania.
- 6.29 County Planning Commission: The Planning Commission of the County of Berks.
- 6.30 Crosswalk (Interior Walk): A publicly or privately owned right-of-way for pedestrian use extending from a street into a block or across a block to another street.
- 6.31 Dwelling Unit: Any structure, or part thereof, designed to be occupied as living quarters as a single housekeeping unit.
- 6.32 Easement: A right-of-way granted, but not dedicated, for limited use of private land for a public or quasi-public purpose, and within which the owner of the property shall not erect any permanent structures, but shall have the right to make any other use of the land which is not inconsistent with the rights of the grantee.
- 6.33 Endorsement: The application of the County Planning Commission's review stamp and the signature of the Executive Director to the Final Plan. The application of the signatures of at least a majority of the Township Supervisors and the Township Seal to the Plan.
- 6.34 Engineer: A licensed professional engineer registered by the Commonwealth of Pennsylvania.
- 6.35 Executive Director: The Executive Director of the Planning Commission of the County of Berks.
- 6.36 Grade: The inclination, with the horizontal, of a road, unimproved land, etc., which is generally expressed by stating the vertical rise or fall as a percentage of the horizontal distance.
- 6.37 Improvements: Those physical additions and changes to the land that may be necessary to produce usable and desirable lots.
- 6.38 Land Development: (1) the improvement of one or more contiguous lots, tracts or parcels of land for any purposes involving (a) a group of two or more buildings, or (b) the division or allocation of land between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, building groups or other features; (2) a subdivision of land.
- 6.39 Landowner: The legal or beneficial owner or owners of land including the holder of an option or contract to purchase (whether or not such option or contract is subject to any condition), a lessee if he is authorized under the lease to exercise the rights of the landowner, or other person having a proprietary interest in land, shall be deemed to be a landowner for the purpose of this Ordinance.

- 6.40 Lot: Any parcel of land, regardless of size, intended as a unit for transfer of ownership, use, or improvement or for development.
- 6.41 Lot Area: The area contained within the property lines of a lot (as shown on the Plan), excluding space within all streets and within all permanent drainage easements, but including the areas of all other easements.
- 6.42 Marker: A metal pipe or pin of at least 1" outside diameter and at least 30" in length.
- 6.43 Mobile Home Park: A parcel of land under single ownership which has been planned and improved for the placement of two or more mobile homes for nontransient use.
- 6.44 Monument: A stone or concrete monument with a flat top at least 4" in diameter or square. It is recommended that the bottom sides or radius be at least 2" greater than the top to minimize movements caused by frost. The monument should contain a copper or brass dowel (1/4" drill hole) and at least 30" in length (36" preferred). A steel pin monument should contain a steel pin at least 30" in length (36" preferred) with the bottom encased in concrete to a minimum depth of 8" having the same specifications regarding width at top and bottom as a stone or concrete monument.
- 6.45 Multiple Dwelling Building: A building providing separate dwelling units for three or more families.
- 6.46 Municipality: The Township of Bethel, Berks County, Pennsylvania.
- 6.47 Performance Guarantee: A bond or the deposit of funds or securities in escrow sufficient to cover the cost of the required improvements as estimated by the Township Supervisors.
- 6.48 Plan, Sketch: An informal plan, not necessarily to exact scale, indicating salient existing features of a tract and its surroundings and the general layout of a proposed subdivision.
- 6.49 Plan, Preliminary: A tentative subdivision plan (and including all required supplementary data), in lesser detail than a Final Plan, showing approximate proposed street and lot layout as a basis for consideration prior to preparation of a Final Plan.
- 6.50 Plan, Final: A complete and exact subdivision plan (and including all required supplementary data), prepared for official recording as required by statute, to define property rights and proposed streets and other improvements.
- 6.51 Plan, Record: The copy of the Final Plan which contains the original endorsements of the County Planning Commission, the Township Planning Commission and the Township Supervisors, and which is intended to be recorded with the County Recorder of Deeds.

- 6.52 Plan, Major Street: That element of the Comprehensive Plan, now or hereafter adopted, which shows the general location, alignment and dimensions, and the identification and classification of existing and proposed streets, highways and other thoroughfares.
- 6.53 Plan, Official: The Comprehensive Development Plan and/or Master Plan and/or Future Land Use Plan and/or Ultimate Right-of-way Plan and/or Official Map and/or Topographical Survey and/or other such Plans, or portions thereof, as may have been adopted, pursuant to statute, for the area of the Township of Bethel in which the subdivision is located.
- 6.54 Planning Commission, or Township Planning Commission shall mean the Bethel Township Planning Commission.
- 6.55 Plat: A map or plan of a subdivision, whether Preliminary or Final.
- 6.56 Public Grounds: Includes (1) parks, playgrounds and other public areas, and (2) sites for publicly owned buildings and facilities.
- 6.57 Reserve Strip: A parcel of ground in separate ownership separating a street from other adjacent properties, or from another street.
- 6.58 Resubdivision: Any replatting or resubdivision of land, limited to change in lot lines on approved Final Plan or Recorded Plan as specified in Section 2.52 of these regulations. Other replattings shall be considered as constituting a new subdivision of land. See also Subdivision.
- 6.59 Reverse Frontage Lot: A lot extending between and having frontage on two generally parallel streets, (excluding service streets), with vehicular access solely from one street.
- 6.60 Review: Wherever the Township Planning Commission possesses such jurisdiction, the action of "Review" shall also include "Review and Approval", or if necessary, "Review and Disapproval".
- 6.61 Right-of-Way: The total width of any land reserved or dedicated as a street, alley, crosswalk or for other public or semi-public purposes.
- 6.62 Roadway: See Cartway.
- 6.63 Sanitary Sewage Disposal, On-Site: Any structure designed to biochemically treat sanitary sewage within the boundaries of any individual lot.
- 6.64 Sanitary Sewage Disposal, Community: A sanitary sewage collection system in which sewage is carried from individual lots by a system of pipes to a central treatment and disposal plant, generally serving a neighborhood area.
- 6.65 Sanitary Sewage Disposal, Public: A sanitary sewage collection system in which sewage is carried from individual lots by a system of pipes to a central treatment and disposal plant.

- 6.66 Septic Tank: A covered watertight settling tank in which raw sewage is biochemically changed into liquid and gaseous states to facilitate further treatment and final disposal.
- 6.67 Sight Distance: The required length of roadway visible to the driver of a motor vehicle at any given point on the roadway when the view is unobstructed by traffic. Sight distance measurements shall be made from a point 4.5' above the centerline of the road surface to a point 0.5' above the centerline of the road surface.
- 6.68 Soil Percolation Test: A field test conducted to determine the suitability of the soil for on-site sanitary sewage disposal facilities by measuring the absorptive capacity of the soil at a given location and depth.
- 6.69 Street: A strip of land, including the entire right-of-way (i.e. not limited to the cartway) intended for use as a means of vehicular and pedestrian circulation to provide access to more than one (1) lot. The word "street" includes thoroughfare, avenue, boulevard, court, expressway, highway, lane, road and alley. Streets are further classified according to the functions they perform:
- 6.691 Minor or Local Streets: A street used primarily to provide access to abutting properties;
- 6.692 Internal Street: A minor street used for circulation and access within a development project involving multi-residence or commercial or industrial uses;
- 6.693 Cul-de-Sac Street: A minor street intersecting another street at one end, and terminating in a vehicular turnaround at the other end;
- 6.694 Half (Partial) Street: A street, generally parallel and adjacent to a property line, having a lesser right-of-way width than normally required for improvement and use of the street;
- 6.695 Marginal Access Street: A minor street, parallel and adjacent to a major street (but separated from it by a reserve strip) which provides access to abutting properties and control of intersections with the major street;
- 6.696 Collector Street: A street which, in addition to providing access to abutting properties, intercepts minor streets to provide a route serving fifty (50) or more dwelling units to give access to community facilities and/or other collector and major streets. (Streets in industrial and commercial subdivisions shall generally be considered collector streets.)

- 6.697 Private Streets: A privately owned street not dedicated by the Township.
- 6.698 Major Street: A street serving a large volume of comparatively high-speed and long-distance traffic, including all facilities classified as main and secondary highways by the Pennsylvania Department of Transportation.
- 6.699 Service Street (Alley): A minor right-of-way providing secondary vehicular access to the side or rear of two or more properties.
- 6.70 Subdivider: Any landowner, agent of such landowner or tenant with the permission of such landowner, who makes or causes to be made a subdivision of land or a land development.
- 6.71 Subdivision: The division or redivision of a lot, tract or parcel of land by any means into two or more lots, tracts, parcels or other divisions of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, transfer of ownership or building or lot development; provided, however, that the division of land for agricultural purposes into parcels of more than ten acres not involving any new street or easement of access shall be exempted. The term subdivision shall refer, as appropriate in this ordinance, to the process of subdividing land or to the land proposed to be subdivided.
- The term subdivision includes resubdivision.
- 6.72 Supervisors: Board of Supervisors of the Township of Bethel, Berks County, Pennsylvania.
- 6.73 Surveyor: A licensed surveyor registered by the Commonwealth of Pennsylvania.
- 6.74 Township: The Township of Bethel, Berks County, Commonwealth of Pennsylvania.
- 6.75 Township Secretary: The person designated by the Board of Township Supervisors to perform the duties of the Secretary of the Township as set forth in Section 5.40 of the Second Class Township Code or by his duly authorized representative.
- 6.76 Township Supervisors: Board of Supervisors of the Township of Bethel, Berks County, Pennsylvania.
- 6.77 Tile Disposal Field: A system of open jointed or perforated pipes laid in the upper strata of the soil to distribute sewage effluent into the soil for absorption and vaporization.

- 6.78 Water Distribution System, On-site: A system for supplying and distributing water to a single dwelling or other building from a source located on the same lot.
- 6.79 Water Distribution System, Community: A system for supplying and distributing water from a common source to two or more dwellings and/or other buildings within a single neighborhood.
- 6.80 Water Distribution System, Public: A system for supplying and distributing water from a common source to dwellings and other buildings, but generally not confined to one neighborhood.

ARTICLE VII - ADMINISTRATION AND AMENDMENT

Section 7.10 Fees

- 7.11 The Township Supervisors shall establish by resolution a Schedule of Fees to be paid by the subdivider. In the case of a Minor Subdivision the fee shall be paid at the time of filing of a Sketch Plan of Record. In the case of subdivisions reviewed under Section 2.54, the fee shall be paid at the time of filing of Sketch and Final Plans. In the case of all other subdivisions and land developments, fees shall be paid at the time of Sketch Plan and Preliminary Plan submissions.
- 7.12 The Schedule of Fees shall be obtainable from the Township Secretary.
- 7.13 No Final Plan or Sketch Plan of Record shall be approved unless all fees have been paid in full.

Section 7.20 Modifications

- 7.21 The provisions of these regulations are intended as minimum standards for the protection of the public health, safety and welfare. The Planning Commission reserves the right to modify or to extend them conditionally in individual cases as may be necessary in the public interest, provided, however, that such variation shall not have the effect of nullifying the intent and purpose of these regulations. The list of such modifications and the reasons for them shall be entered in the minutes of the Planning Commission and a copy of this entry shall be transmitted to the Township Secretary, together with the approved plans, for their approval. Upon approval by the Supervisors, said modifications shall be clearly defined and entered on the Final Plan and signed by the Chairman of the Township Supervisors.
- 7.22 No changes, erasures, modifications or revisions shall be made in any plan of a subdivision or land development after the plan has been endorsed by the Supervisors, unless the plan is first resubmitted to and approved by the Township Supervisors in accordance with the provisions of this Ordinance.

Section 7.30 Challenges

- 7.31 Any person desiring to challenge the validity of any provision of this Ordinance or any amendment thereof shall make such challenge as prescribed by law.
- 7.32 Any person aggrieved by action of the Township Supervisors may appeal the action as prescribed by law.

Section 7.40 Penalties

- 7.41 No lot, parcel or dwelling unit in a subdivision or land development shall be sold, no permit to erect any building upon land in a subdivision or land development shall be issued, and no buildings shall be erected in a subdivision or land development until a Final Plan of such subdivision or land development shall have been approved and properly recorded and until improvements have been either constructed or guaranteed.
- 7.42 Any person, partnership or corporation who or which being the owner or agent of the owner of any lot, tract or parcel of land shall lay out, construct, open or dedicate any street, sanitary sewer, storm sewer, water main or other improvements for public use, travel or other purposes or for the common use of occupants of buildings abutting thereon, or who sells, transfers or agrees or enters into an agreement to sell any land in a subdivision or land development or erect any building thereon, unless and until a final plat has been prepared in full compliance with the provisions of this Ordinance and has been recorded as provided herein, shall be guilty of a misdemeanor.
- 7.43 Upon conviction of such misdemeanor, such persons or the members of such partnership or the officers of such corporation or the agent of any of them responsible for such violation shall pay a fine not exceeding one thousand dollars (\$1,000) per lot or parcel or per dwelling within each lot or parcel. All fines collected shall be paid to the Township. The description by metes and bounds in the instrument of transfer or other document used in the process of selling or transferring shall not exempt the seller or transferor from such penalties or from the remedies herein provided.
- 7.44 The Township Supervisors may initiate and maintain civil action:
- 7.441 To obtain an injunction against the owner or agency who attempted the improper sale or conveyance of land.
- 7.442 To set aside and invalidate any conveyance of land made prior to recording of any subdivision or land development.
- 7.45 Nothing herein shall prevent the Township from taking such other action necessary to prevent or remedy any violation.

Section 7.50 Keeping of Records

The Township Planning Commission and the Township Supervisors shall keep a record of their findings, decisions, and recommendations relative to all subdivision and land development plans filed for review. Such records shall be made available to the public for review.

Section 7.60 Responsibility

The subdivider shall be responsible for observing the procedures established in this Ordinance and for submitting all plans and documents as may be required.

Section 7.70 Conflicts

7.71 Whenever there is a difference between the minimum standards specified herein and those included in other official Township regulations the more stringent requirements shall apply and are not hereby repealed.

7.72 All existing ordinances or parts of ordinances which are contrary to the provisions of this Ordinance are hereby repealed to the extent necessary to give this Ordinance full force and effect (except as noted in Section 7.71).

Section 7.80 Revision and Amendment

7.81 The Township Supervisors may amend this Ordinance. Any amendments shall be made in accordance with the procedures established by law.

Section 7.90 Severability

7.91 Should any article, section, subsection, paragraph, clause, phrase, or provision of this Ordinance be declared by a court of competent jurisdiction to be invalid, such judgement shall not affect the validity of the Ordinance as a whole or any part or provision thereof other than the part so declared to be invalid.

APPLICATION FOR CLASSIFICATION OF SKETCH SUBDIVISION PLAN

To: Bethel Township Planning Commission

Application is hereby made for the classification of a Sketch Plan of a proposed subdivision of land hereinafter more particularly described.

1. Applicant's Name: _____

Address: _____

Phone _____

2. Name and address of present owner (if other than #1 above).

Name: _____

Address: _____

3. Interest of applicant if other than owner _____

4. Location of subdivision _____
(street)

(tax map block)

(lot nos.)

5. Number of proposed lots _____

6. Area of entire tract _____, and portion being subdivided

7. Development plans:

a. Sell lots only? (Yes or No) _____

b. Construct houses for sale? (Yes or No) _____

c. Other _____

8. Name and address of person preparing Sketch Plan.

Name: _____

Address: _____

Phone _____

Signature of applicant _____

Form #1 (cont'd.)

For Township Use Only

Received by _____ Date _____
Secretary of Planning Commission

Action of Planning Commission. Classified as exempt from Standard Procedures
by unanimous action (Yes or No) _____

Classified not exempt (Yes or No) _____

Signatures of Planning Commission Chairman and Township Secretary if classified as
exempt.

Chairman

Secretary

APPLICATION FOR REVIEW OF PRELIMINARY SUBDIVISION PLAN

To: Bethel Township Planning Commission

Application is hereby made for tentative approval of the Preliminary Plan of a subdivision hereinafter more particularly described.

1. Applicant's Name: _____
Address: _____
_____ Phone _____
2. Name and address of present owner (if other than #1 above).
Name: _____
Address: _____

3. Interest of applicant if other than owner _____
4. Date classified as not exempt by Planning Commission _____
5. Location of subdivision _____, _____
_____ (street)
_____, _____
(tax map block) (lot nos.)
6. Number of proposed lots _____
7. Area of entire tract _____, and portion being subdivided

8. Development plans:
 - a. Sell lots only? (Yes or No) _____
 - b. Construction of houses for sale? (Yes or No) _____
 - c. Other _____
9. Deed restrictions that apply or are contemplated. (If no restrictions, state "None"; if "Yes" attach copy) _____
10. Name and profession of person designing Preliminary Plan.
Name: _____ Profession _____
Address: _____
_____ Phone _____

11. List improvements and utilities and intentions to install or post performance guarantee prior to final approval.

Improvement

Intention

- 1.
- 2.
- 3.
- 4.
- 5.

12. List of maps and other material accompanying application and number of each.

Item

Number

- a.
- b.
- c.
- d.
- e.
- f.
- g.

Signature of applicant _____

(Do not write below this line)

Date received and fee collected

(fee)

(Secretary)

Action of the Township Planning Commission

Date _____ Approved _____ Disapproved _____

(Chairman)

(Secretary)

APPLICATION FOR REVIEW OF FINAL SUBDIVISION PLAN

To: Bethel Township Planning Commission

Application is hereby made for final approval of a Final Plan of a proposed subdivision all as shown and described on the accompanying maps and documents.

1. Applicant's Name: _____

Address: _____

Phone _____

2. Name and address of present owner (if other than #1 above).

Name: _____

Address: _____

3. Date of tentative approval of Preliminary Plan _____

4. Form #2 application number _____

5. Does the Final Plan follow exactly the Preliminary Plan in regard to details and area covered? _____

If not, indicate material changes _____

6. Number of lots proposed for Final Approval _____

7. List of maps and other material accompanying application and number of each.

	Item	Number
a.		
b.		
c.		
d.		
e.		
f.		
g.		
h.		

Signature of applicant _____

 (Do not write below this line)

Date received by Township Secretary _____

 Signature

SUBDIVISION IMPROVEMENTS AGREEMENT

In consideration of the mutual covenants contained herein, it is hereby agreed between the Board of Supervisors of the Township of _____, and _____, the subdivider of the property shown on the plan of _____, dated _____, 19 __, that in accordance with Township requirements and specifications, the responsibility for the provision of the improvements shown on the plan will be as follows:

IMPROVEMENT

TO BE PROVIDED BY:

	<u>COST</u>	<u>Subdivider</u>	<u>Township</u>	<u>Other (specify)</u>
Street Grading	_____	_____	_____	_____
Street Base	_____	_____	_____	_____
Street Paving	_____	_____	_____	_____
Curbs	_____	_____	_____	_____
Sidewalks	_____	_____	_____	_____
Storm Sewer Facilities	_____	_____	_____	_____
Sanitary Sewers:				
Trunk Lines	_____	_____	_____	_____
Mains	_____	_____	_____	_____
House Connections	_____	_____	_____	_____
On-Site Sewage Facilities	_____	_____	_____	_____
Water Mains	_____	_____	_____	_____
On-Site Water Supply	_____	_____	_____	_____
Fire Hydrants	_____	_____	_____	_____
Street Monuments	_____	_____	_____	_____
Street Name Signs	_____	_____	_____	_____
Street Lights	_____	_____	_____	_____
Erosion and Sediment Controls	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

The subdivider agrees to furnish to the Township as-built drawings of all improvements listed in the Subdivision Improvements Agreement which are to be provided by the subdivider.

The cost of Township inspection of all improvements shall be paid by the Subdivider. An estimated cost for such inspection shall be included within the Improvements Guarantee. The supervision of all installations shall be the responsibility of the _____.

This agreement shall be subject to such modifications as may be mutually agreed upon by the subdivider and the Township.

(Witness)

(Signature of Subdivider)

(Witness)

Form #4 - Page 2

Approved by resolution of the Board of Supervisors of
at the meeting of _____, 19 ____.

Township

(Seal)

SOIL PERCOLATION TEST REPORT

	Time	Depth of water	Drop	Remarks
No. _____				
Depth _____				
Soil Type _____				

Rate of fall _____ min/in.				

No. _____				
Depth _____				
Soil Type _____				

Rate of fall _____ min/in.				

No. _____				
Depth _____				
Soil Type _____				

Rate of fall _____ min/in.				

I hereby certify that the above information is true and correct and that these tests were made under my supervision by _____ in accordance with the procedures required by the Pennsylvania Department of Environmental Resources.

Registered Engineer, or Qualified Sanitarian

(Seal)

Date

File No. _____

File Name _____

Received _____

SUBDIVISION SEWAGE DISPOSAL REPORT

The following information is required for subdivisions where individual septic tanks and sub-surface disposal fields are planned. Seven (7) copies of this report, accompanied by the required number of copies of the Preliminary Subdivision Plan showing the location of test holes, shall be submitted to the Township. Percolation tests shall be made and tabulated by a licensed Engineer or qualified Sanitarian. The procedures for conducting the tests shall be as required by the Pennsylvania Department of Environmental Resources.

Name of subdivider: _____ Phone No. _____

Address: _____

Subdivision Name: _____

Total area: _____ Acres. Proposed typical lot area: _____ sq. ft.

Maximum number of bedrooms per dwelling unit: _____

Water Supply: _____ Public System _____ Community System _____ On-lot wells

Distance to nearest public water supply: _____

Name of system: _____

Distance to nearest public sewage system: _____

Name of system: _____

Is public sewerage planned for the area? _____ If so, when? _____

Is public water planned for the area? _____ If so, when? _____

Distance to nearest stream: _____ Name: _____

Give information on subsoil conditions to a depth of at least six feet: _____

Give information on water table elevations: _____

The results of the soil percolation tests shall be entered in the Table appearing on the Soil Percolation Test Report which constitutes a part of this report.

Date: _____ Signature of Owner or Applicant: _____

Date of Tests: _____ (by): _____

CERTIFICATION OF OWNERSHIP, ACKNOWLEDGEMENT OF PLAN, AND OFFER OF DEDICATION

The following certification, in the wording shown, must be labelled and completed on the Final Subdivision Plan.

Commonwealth of Pennsylvania
County of Berks

SS

On this, the _____ day of _____, 19____, before me, the undersigned officer, personally appeared _____, who being duly sworn according to law, deposes and says that he is the _____ (1) of the property shown on this plan, that the subdivision plan thereof was made at his/its direction, that he acknowledges the same to be his/its act and plan _____ (2), and that all streets _____ (3) shown and not heretofore dedicated are hereby dedicated to the public use _____ (4).

_____ (5) _____ (6) _____ (7)

_____ (8) _____ (9)

My Commission expires _____, 19____

- (1) insert either: owner, equitable owner, president of the (name of corporation) which is the owner
- (2) whenever applicable, insert: and desires the same to be recorded as such according to law
- (3) whenever applicable, insert: and open spaces contained in lot numbers
- (4) if necessary, insert: except those labelled "not for dedication" (and any other restrictions or reservations)
- (5) where necessary, signature of secretary of corporation
- (6) signature of individual, or partners, or of president of corporation
- (7) if necessary, corporate seal
- (8) signature and (9) seal of notary public or other officer

APPENDIX II

CERTIFICATION OF ACCURACY

The following certification, in the wording shown, must be labelled and completed on the Final Subdivision Plan:

I hereby certify that the plan shown and described hereon is true and correct to the accuracy required by the Subdivision and Land Development Ordinance of the Township of Bethel, and that the perimeter monuments have been accurately placed as required by Section 5.17 thereof.

_____, 19____ (1) _____ (2)

- (1) Signature of the Registered Engineer or Surveyor responsible for the preparation of the Plan.
- (2) Seal of the Engineer or Surveyor.

APPENDIX III

CERTIFICATE OF MUNICIPAL APPROVAL

The approval of the Final Plan by each municipality in which the subdivision is located must be indicated on the Record Plan, in substantially the following form:

At a meeting held on _____, 19_____, the Board of Supervisors of the Township of Bethel, by _____ (1) _____, duly enacted, approved the subdivision plan of the property of _____ (2) _____, as shown hereon.

_____ (3) _____

_____ (4) _____

(1) insert either a Resolution or Ordinance #

(2) insert name of property owner

(3) signature of the Township Supervisors

(4) municipal seal

APPENDIX IV

METHOD FOR STORM DRAINAGE RUNOFF CALCULATIONS

I. Rational Formula

- A. The method used in calculating runoff shall be the Rational Formula

$Q = CIA$, in which "Q" is the storm flow in cubic feet per second, "C" is a coefficient indicating the degree of imperviousness of the drainage area, "I" is the intensity of rainfall in inches per hour for the particular frequency of storm used, and "A" is the drainage area in acres.

B. Values of Coefficient "C"

1. Coefficient "C" used for the calculation of runoff shall be based upon existing development in the drainage area and on the anticipated ultimate use of the undeveloped land in the drainage area which will result under the municipal zoning ordinance. "C" is an estimation of the percentage of rainfall which will result in immediate storm water runoff. Such factors as permeability of the soil, topography, percentage of area occupied by buildings, roads, and driveways, etc. are to be considered in determination of a coefficient. Suggested "C" values with respect to general character of the tributary area are as follows:

<u>Description of Area</u>	<u>Range of Runoff Coefficients</u>	<u>Recommended Runoff Coefficient^{1,2}</u>
Rural areas	0.15 - 0.30	0.25
Industrial and Commercial Areas	0.60 - 0.90	0.75
Residential Areas		
One and Two Family	0.30 - 0.50	0.40
Apartments and Townhouses	0.50 - 0.70	0.60
Mixed Residential Areas	0.30 - 0.70	0.50

The ranges of coefficients classified with respect to the character of the surface types in the drainage area are as follows:

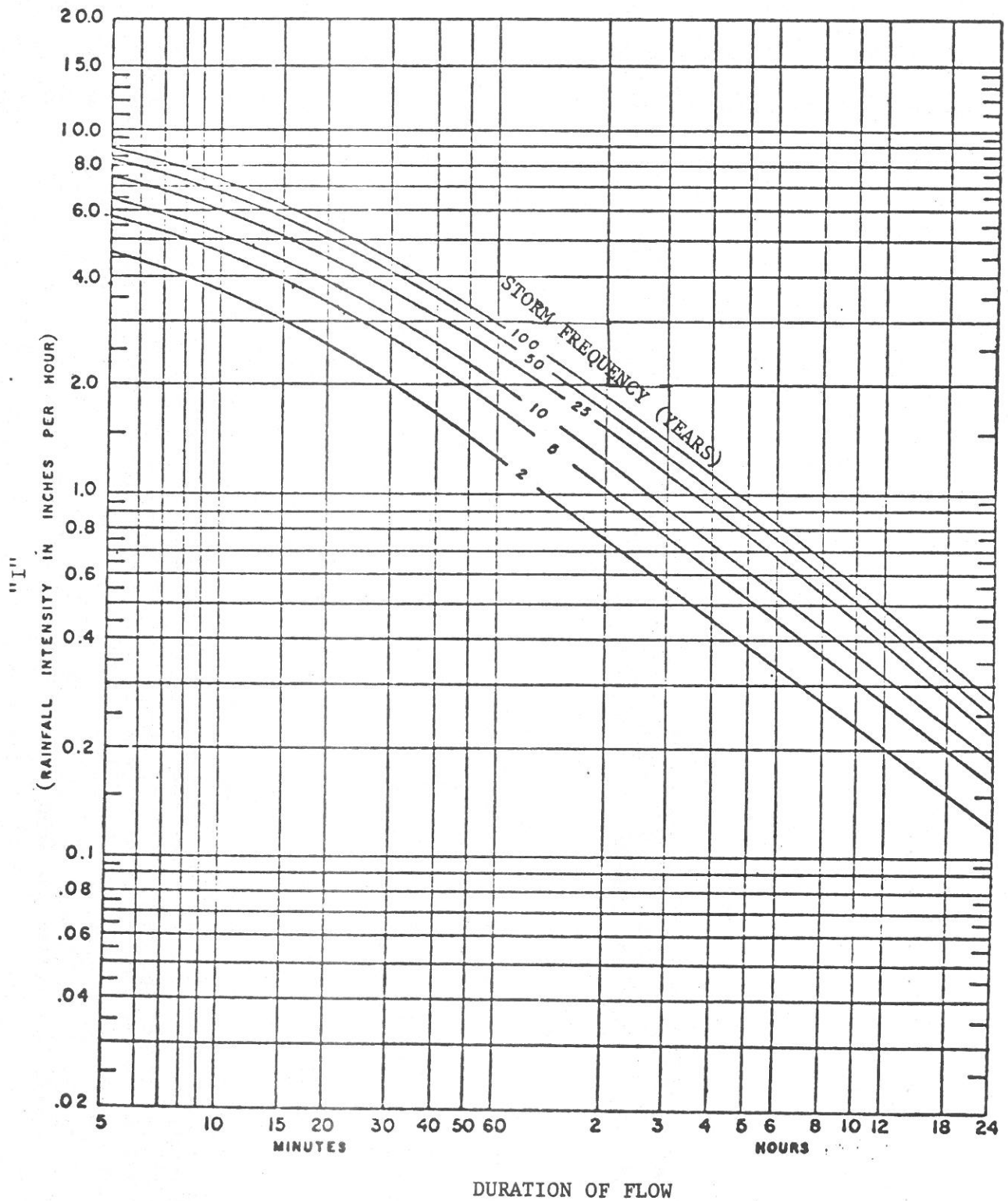
<u>Character of Surface</u>	<u>Range of Runoff Coefficients</u>	<u>Recommended Runoff Coefficient^{1,2}</u>
Lawns		
Sandy Soil	0.10 - 0.20	0.15
Clay Soil	0.15 - 0.35	0.25
Bare Earth Surfaces		
Sandy Soil	0.15 - 0.50	0.35
Clay Soil	0.35 - 0.75	0.50
Woods or Heavy Brush		
Sandy Soil	0.15 - 0.30	0.30
Clay Soil	0.25 - 0.60	0.40
Impervious Surfaces		
(asphalt, concrete, roof areas, etc.)	0.75 - 0.95	0.85

¹ Use of lower values must be fully justified to the municipality. The municipality may require use of a higher value when deemed in the public interest.

² Higher coefficient values should be used for storms of 25 year frequency and less frequent storms (50 year frequency, 100 year frequency, etc.)

C. Values of Storm Intensity "I"

1. The value of "I" (in inches per hour) shall be determined using the following curve:



2. It is recommended that storms with a frequency of occurrence of once in five years be used for lower density residential areas, with a frequency of occurrence of once in ten years for higher density residential areas and lower density commercial areas, and with a frequency of once in twenty-five years for higher density commercial areas and industrial areas.
3. The duration of flow shall be the time which it takes runoff from the furthest point of the drainage area to reach the location of the drainage facility to be designed, and shall include overland flow plus gutter flow time plus time of flow through pipes, culverts or natural streams.

D. Suggested Runoff Velocities

In determining the duration of flow, the following runoff velocities should be used:

DESCRIPTION OF COURSE OF RUNOFF WATER	PERCENT SLOPE VS. VELOCITIES					
	0-2%	2-4%	4-7%	7-10%	15%	20%
Woodland or dense grass	0.2	0.3	0.4	0.4	0.4	0.4
Pasture or average grass	0.3	0.4	0.4	0.4	0.5	0.5
Poor grass	0.4	0.5	0.5	0.6	0.7	0.8
Bare Soil	0.5	0.6	0.7	0.8	0.9	0.9
Paved areas	0.8	1.0	1.2	1.4	1.6	2.0

All velocities given are in feet per second.

II. Design of Drainage Facilities

- A. In the design of storm drainage facilities, the following formulas shall be used:

$$v = \frac{1.49}{n} \sqrt[3]{(a/p)^2} \sqrt{s}$$

$$Q = va$$

where:

v = velocity of flow (in feet per second)

n = coefficient of roughness

a = cross-sectional area of structure (in square feet)

p = perimeter of the wetted channel (in feet)

s = slope (in feet per foot)

Q = discharge (in cubic feet per second)

All pipes which are provided shall have a minimum diameter of twelve inches (12").

- B. The coefficient of roughness, " n ", shall be as follows unless otherwise approved by the municipality:

<u>PIPE MATERIAL</u>	<u>"n"</u>
Cast Iron	0.013
Concrete	0.013
Vitrified Clay	0.013
Corrugated Metal	
Plain-Annular	0.024
Paved Invert	0.020
Fully Paved or Smooth-Bore	0.013
Plain-Helical	
18" and smaller	0.015
21" through 24"	0.017
30" through 48"	0.021
larger than 48"	0.024

OPEN CHANNELSRange of "n"

Lined:

Asphalt	0.013 - 0.017
Brick	0.012 - 0.018
Concrete	0.011 - 0.020
Rubble or rip-rap	0.020 - 0.035
Vegetation:	
11 - 24 inches	0.09 - 0.15
6 - 10 inches	0.055 - 0.080
2 - 6 inches	0.045 - 0.060

Excavated:

Earth, straight and uniform	0.020 - 0.030
Earth, winding	0.025 - 0.040
Rock	0.030 - 0.045
Unmaintained or obstructed by debris	0.050 - 0.140

Natural Channels (minor streams, top width at flood stage less than 100 feet):

Regular section, some weeds	0.030 - 0.50
Regular section, dense brush and weeds	0.050 - 0.70
Irregular section with pools	0.040 - 0.10

In choosing "n", it should be noted that any condition which causes turbulence and retards flow results in a greater value of "n".

C. Permissible Stream Velocities in Open Channels

<u>Material</u>	<u>Allowable Velocity (in feet per second)</u>
Well established grass on good soil	
Short pliant bladed grass	5 - 6
Bunch grass-soil exposed	2 - 4
Stiff stemmed grass	2 - 3

<u>Material</u>	<u>Allowable Velocity (in feet per second)</u>
Earth without vegetation	
Fine sand or silt	1 - 2
Ordinary firm loam	2 - 3
Stiff clay	3 - 5
Clay and gravel	4 - 5
Course gravel	4 - 5
Soft shale	5 - 6
Bituminous or cement stabilized channels	6
Rip-Rap	10 - 15
Paved channels	10 - 15

D. Permissible Velocities in Storm Pipe at Design Flow

Minimum	2.5 feet per second
Maximum	12.0 feet per second

III. Additional Notes

- A. All calculations are subject to approval by the municipality.
- B. A drawing showing all drainage areas shall be submitted with the storm water runoff calculations.
- C. Alternative methods of storm water runoff determination may be permitted by the municipality upon written request of the subdivider.
- D. When deemed appropriate by the municipality, storm water runoff determination using alternative methods may be required.
- E. Storm runoff calculations shall be submitted in a format similar to the one presented on page 88.
- F. The subdivider should note that in addition to preparing storm water calculations and designing storm drainage facilities an erosion and sediment control plan for the subdivision will have to be prepared. In conjunction with such plan, more stringent design parameters than listed herein may be required by the agencies which review the erosion and sediment control plan.

G. When open channels are used, side slopes, depth of channel, and width of channel shall be subject to approval of the municipality and shall not be such that a danger to life, property and the public health, safety and welfare results.

APPENDIX V

DETERMINATION OF FLOOD PLAINS

A. Hydrologic Criteria For Estimating Peak Rates of Runoff

1. Drainage Area Less Than One and One-Half (1-1/2) Square Miles

- a. For streams whose drainage area at the point(s) in question is less than one and one-half (1/2) square miles, the Rational Method shall be used for estimating peak rates of runoff. (Refer to Manual of Engineering Practice No. 37, American Society of Civil Engineers, Chapter IV, for a discussion of the Rational Method). The design flood frequency shall be one hundred (100) years.

2. Drainage Areas between One and one-half (1-1/2) and one hundred fifty (150) square miles.

- a. For streams whose drainage area at the point(s) in question is between one and one-half (1-1/2) and one hundred fifty (150) square miles, the following method shall be used. The source of the method is Pennsylvania Department of Transportation Design Manual, Part 2, Highway Design.
 - (1) The watershed is located in the Valley and Ridge Flood Zone. Determine the presence of thick cambro-ordovician limestone in the watershed.
 - (2) Measure on a topographic map the area draining towards the design site. Note this area, A, in square miles, for later use in determining the mean annual flood, Q2.33.
 - (3) Determine Q2.33 using Table 1 (Found on page 92 of this Ordinance) and the area A determined in step (2) above.
 - (4) The flood discharge (Q) is determined by multiplying the Q2.33 value determined in step (3) by 3.1, a factor chosen according to the return period established as a design criterion. The return period established as a design criterion is one hundred (100) years.
 - (5) The design flood discharge (Q design) shall be computed in accordance with the following equation:

$$Q \text{ design} = Q (1+RF+UF+WF-LF)$$

Where RF = Risk Factor
 UF = Urbanization Factor
 WF = Wood Factor
 LF = Limestone Factor

Based on the land development expected in the watershed in the future, the individual factors in the above equation shall be evaluated as follows:

(a) RF (Risk Factor)

The risk factor to be used is 0.67.

(b) UF (Urbanization Factor):

This factor accounts for additional runoff resulting from urbanization of the watershed area. The Urbanization Factor to be applied to the above equation is specified as follows:

$$UF \text{ (Urbanization Factor)} = \frac{\text{Area Developed}}{\text{Total Drainage Area}}$$

No corrections for the Urbanization Factor are required for those watersheds with less than 7% urbanization.

(c) WF (Wood Factor):

The Wood Factor shall be determined as follows:

- i. No correction is required if the drainage area is greater than 5 square miles.
- ii. If the drainage area is 5 square miles or less and the wooded area comprises more than 40% of the watershed no correction for the Wood Factor is required.
- iii. If the drainage area is 5 square miles or less and the wooded area comprises 40% or less of the watershed, use following equation to determine the WF (Wood Factor):

$$WF \text{ (Wood Factor)} = 0.4 - \frac{\text{Wooded Area}}{\text{Total Drainage Area}}$$

(d) LF (Limestone Factor):

In the area where thick Cambro Ordovician limestone comprise more than 50% of the watershed, use 0.4 as the LF (Limestone Factor).

If the thick Cambro Ordovician limestones comprise 50% or less of the watershed, use the following equation to determine the LF (Limestone Factor):

$$LF \text{ (Limestone Factor)} = 0.8 \times \frac{\text{Limestone Area}}{\text{Total Drainage Area}}$$

- (6) If runoff estimates are made for watersheds with man-made controls such as diversion or storage reservoirs or for watersheds with extensive lakes, swamps or excessive flood plain storage, etc., an adjustment to the estimates of flood discharges is required and the Township Engineer shall be consulted as to what adjustments are necessary.

3. Drainage Areas Larger Than One Hundred Fifty (150) Square Miles.

- a. For streams whose drainage area at the point(s) in question is larger than one hundred fifty (150) square miles, the method to be used in estimating peak rates of runoff is that outlined in Pennsylvania Department of Transportation Design Manual Part 2, Chapter 12, Section 25. The recurrence interval to be used is one hundred (100) years. The safety factor to be applied is 1.67.

B. Hydraulics of Flow

1. The flood plain shall be determined by using the Manning Formula to calculate the waterway area required to convey the design flow. (Refer to Manual of Engineering Practice No. 37, American Society of Civil Engineers, Chapter V).

All calculations are subject to the review and approval of the Township Engineer.

SOURCE: Pennsylvania Department of Transportation
Design Manual, Part 2, Highway Design

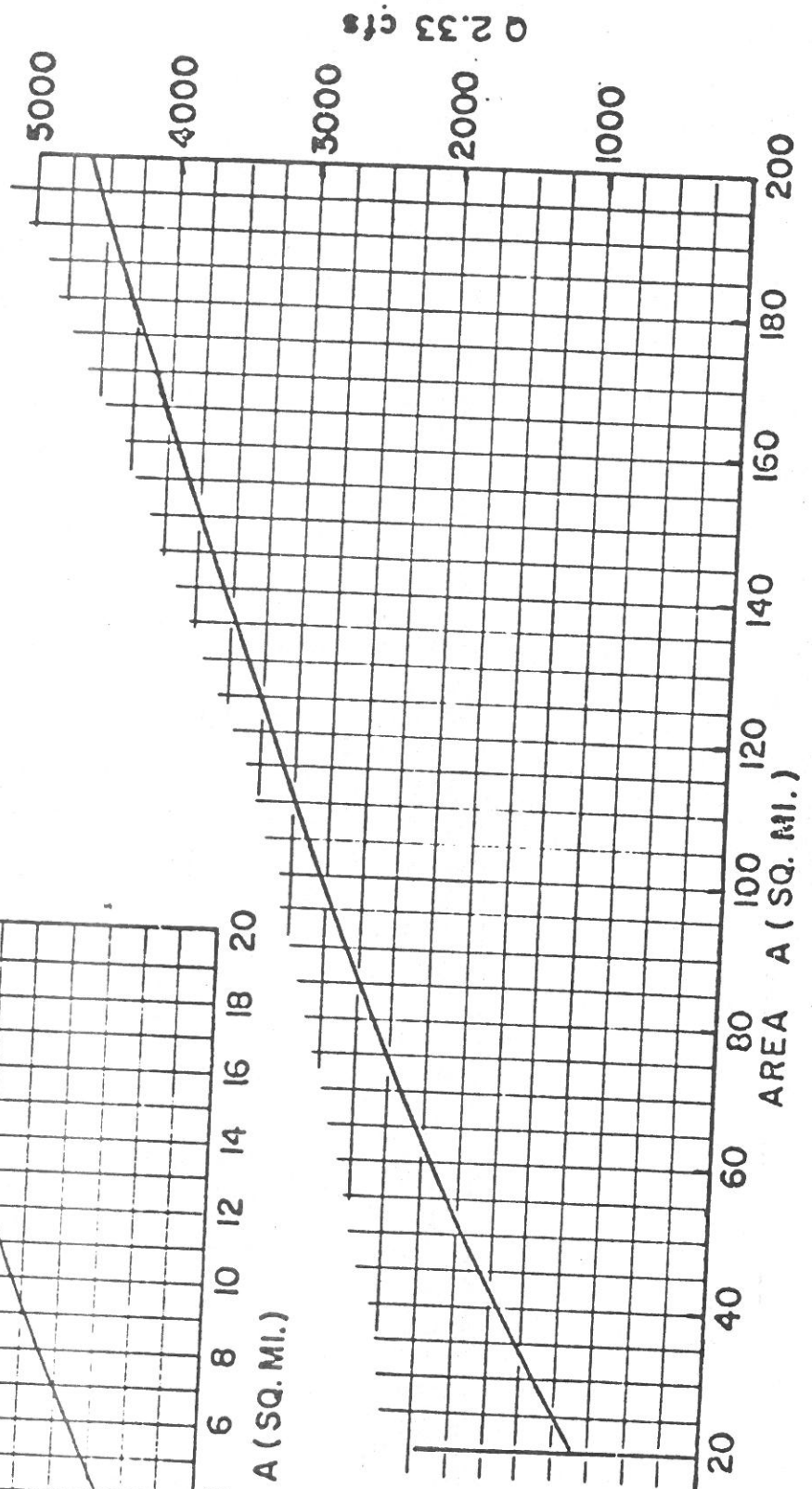
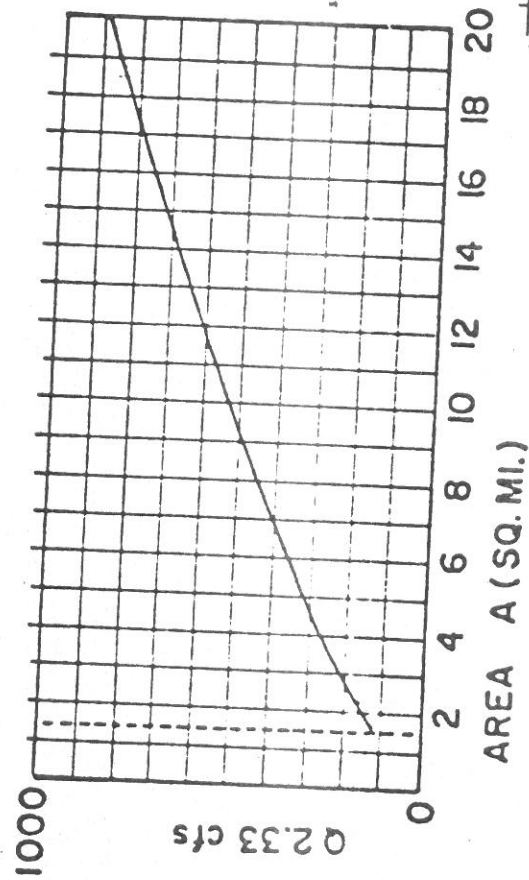


TABLE I:

Curves for Estimating the 2.33-year Flood for Valley & Ridge

day of

Supervisor

Supervisor

Supervisor

Secretary