ORDINANCE NO. 363

AN ORDINANCE OF THE TOWNSHIP OF LOWER MAKEFIELD, BUCKS COUNTY, PENNSYLVANIA, AMENDING THE PROVISIONS OF THE LOWER MAKEFIELD TOWNSHIP CODE RELATED TO SUBDIVISION AND LAND DEVELOPMENT TO PROVIDE FOR LOW IMPACT DEVELOPMENT DESIGN STANDARDS AND STORM WATER MANAGEMENT PRACTICES

WHEREAS, the Board of Supervisors of the Township of Lower Makefield, Bucks County, Pennsylvania, after public hearing and a careful review of the Subdivision and Land Development provisions of the Lower Makefield Township Code has determined that the health, safety and general welfare of the residents and property owners of Lower Makefield Township will be served by amending the Subdivision and Land Development provisions of the Lower Makefield Township Code in accordance with the provisions of this Ordinance.

WHEREAS, the purpose of the amendment is to provide a mechanism to utilize alternative methods of project design and stormwater management referred to as Low Impact Development ("LID").

WHEREAS, LID strategies will contribute to the implementation of the Township's Comprehensive Plan and will meet multiple objectives such as flood mitigation and open space, natural resource, and habitat protection while still meeting the standards and requirements set forth under the Township's National Pollutant Discharge Elimination System (NPDES) permit and Act 167 watershed plan requirements.

WHEREAS, the application of LID strategies to reduce total and effective impervious surfaces, retain natural features and vegetation, and reduce the development footprint may result in the significant reduction or elimination of traditional stormwater collection, storage and treatment system requirements.

NOW, THEREFORE, BE IT ORDAINED and ENACTED that the provisions of the Lower Makefield Township Code as it relates to Subdivision and Land Development are amended as provided hereinafter.

Section 1. The provisions of **ARTICLE I, Title; Purpose, Section 178-2 A**, are hereby amended by adding a Subsection (11) and a Subsection (12) as follows:

(11) To recognize stormwater as an important natural resource and maximize its infiltration into our aquifers, streams and rivers to the extent feasible to enhance the quality of our water supply and to protect our natural resources.

(12) To provide guidelines for LID site design in order to:

(a) Retain open space or natural resource protection areas preferably in contiguous blocks or linear corridors where feasible, for the protection of the best stormwater management features identified in the site analysis process. The open space layout should be situated in a location that will have the most success at providing a buffer next to impervious surfaces.

(b) Orient residential lots to minimize site disturbance, maximize the benefits of minimal earth disturbance, facilitate sheet flow into natural resource protection areas and biorention/raingarden facilities, and promote community aesthetics, livability and privacy.

(c) Eliminate stream crossings with roads and conveyance systems, whenever possible. Minimize impervious surfaces by reducing building footprints and setbacks, road length and width, parking areas, and driveways.

(d) Minimize the connectivity of impervious surface by directing stormwater from impervious areas into swales or as low velocity sheet flow to adjacent undisturbed open space areas or bioretention areas.

(e) Integrate small, dispersed bioretention areas to capture, store, and infiltrate stormwater on-site.

(f) Maintain pre-development flow path lengths in natural drainage patterns, whenever possible.

(g) Layout roads and lots to follow topographic contours to minimize soil and vegetation disturbance.

(h) Utilize pervious paving surfaces such as porous pavement and pavers for roads, driveways, parking lots or other types of drivable or walkable surfaces, where feasible.

(i) Direct rooftop runoff to infiltration areas or to cisterns for non-potable reuse or utilize vegetated roof systems to evaporate and transpire stormwater.

Section 2. The provisions of **Article III, Word Usage and Definitions, Section 178-11**, **Definitions,** are hereby amended by adding the following definitions:

BEST MANAGEMENT PRACTICE (BMP) – Activities, facilities, designs, measures or procedures used to manage storm water impacts from Land Development activities, to meet state water quality requirements, to promote groundwater recharge and to otherwise meet the purposes of this Ordinance. BMPs include but are not limited to infiltration, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, forested buffers, sand filters and detention basins. Structural BMPs are permanent appurtenances to the project site.

LOW IMPACT DEVELOPMENT (LID) -- A land use development strategy that emphasizes protection and use of on-site natural features integrated with engineered, small-scale hydrologic controls at the parcel and subdivision scale to manage stormwater and more closely mimic pre-development watershed hydrologic functions. LID techniques may be considered an alternative to traditional, structural stormwater management solutions.

Section 3. The provisions of **Article IV, Procedures and Phasing of Plans, Section 178-12. Requirements for review**, are hereby deleted and in lieu thereof shall read as follows:

§ 178.12 Requirements for review.

A. In order to discharge the duties imposed by law, the Township has adopted the following procedures that shall be observed by all applicants, developers, and their agents.

B. Review Process and Plan Submissions – The following plan review steps represent the approach used in the Township. The number of plan sets to be submitted will be set by resolution of the Board of Supervisors.

	Minor Subdivision	Major Subdivision	Land Development
Pre-Application Meeting	Recommended	Recommended	Recommended
Site visit with Township	Recommended	Recommended	Recommended
Existing Resources and Site Analysis Map (part of sketch plan, if submitted, and preliminary plan sets)	Not required	Required as part of plan submission	Required as part of plan submission

Four-Step Design Process	Not required	Required as part of plan submission	Required as part of plan submission
Sketch Plan	Recommended	Recommended	Recommended
Preliminary Plan	Not required	Required	Required
Final Plan	Required	Required	Required

C. Preliminary and final plans shall be reviewed in accordance with the requirements of the Pennsylvania Municipalities Planning Code. The requirements for each plan stage are contained in plan requirements §§ 178-17, 178-20, 178-24 and 178-28 and in Articles X through XV.

D. The presentation of a preliminary plan and a final plan shall be considered separate submissions and the maximum review period shall be permitted for each plan.

E. The owner of the parcel of land to be subdivided or developed shall submit a written statement granting the Board of Supervisors, its authorized agents and representatives, the Planning Commission, and the representatives of the County and municipal departments and agencies having responsibility for review and/or approval under this ordinance the right to enter the parcel of land for the purpose of inspection and enforcement of the requirements, terms, and conditions imposed herein.

F. Plan Review by Adjacent Municipalities

(1) Applications for tracts of land along the municipal boundary shall submit one additional set of plans, which shall be forwarded to the adjacent municipality for its comments.

(2) The Township may solicit comments from an adjacent municipality even if the plan is not on the boundary of the Township, where a plan, in the opinion of the Township, affects the adjacent municipality, in which case additional plan sets may be required.

(3) When comments are solicited from the adjacent municipalities, the Planning Commission and the Board of Supervisors shall review the reports from the adjacent municipality as part of the plan review process.

G. Required Notification of Surrounding Property Owners - Any applicant submitting plans for a major subdivision or a land development shall notify all individuals or entities who own real estate within one thousand (1000) feet of the proposed major subdivision or land development of the pendency of such major subdivision or land development proposal in writing in a form acceptable to the Township. Such notice shall be made by regular mail to the landowner's last known address. The address on the tax rolls shall be considered the last known address. Such notice shall be mailed within fifteen (15) days of the submission of the first plan submission (sketch or preliminary). Verification of mailing, including a copy of the names, addresses and tax parcel numbers of each person to whom the notice was mailed, shall be given to the Township within fifteen (15) days of submission.

H. Refiling Plans - Any plan which meets any one of the criteria below shall be considered to be a new plan and shall be accompanied by an application, fees and all required information.

1. A plan which is submitted after a previous plan for the same property has been withdrawn shall constitute a new plan.

2. A plan which is submitted after a plan for the same property has been approved or rejected shall constitute a new plan.

3. A plan which is submitted demonstrating an entirely new lot layout, street configuration, new use, or building location and layout for the same land that was included in a prior plan shall constitute a new plan.

Section 4. The provisions of **Article IV, Procedures and Phasing of Plans, Section 178-13. Phased plans**, are hereby deleted and in lieu thereof shall read as follows:

§ 178.13 Procedures for Plans

The following procedures are to be followed for plans submitted to the Township. The content of the plan submissions will vary depending on the type of plan submitted (sketch, preliminary, or final) and are specified by the terms of this ordinance.

A. Pre-Application Meeting – It is recommended that a pre-application meeting be held with the applicant and the Township to introduce the applicant to the Township's zoning and subdivision regulations and procedures, to discuss the applicant's objectives, and to schedule site visits, meetings and plan submissions as described below. Applicants are also encouraged to present the Existing Resources and Site Analysis Map described below at this meeting.

B. Applicants shall submit an Existing Resources and Site Analysis Map (ERSAM)- Applicants shall submit an ERSAM, prepared in accordance with the requirements contained in this section. The purpose of this submission is to familiarize officials with existing conditions on the applicant's property and within its immediate vicinity and to provide a complete and factual reference for making a site visit. This analysis shall be provided prior to the site visit. Contents of the ERSAM shall be as follows:

(1) Applicability - All applicants for preliminary or final subdivisions or land developments shall submit the ERSAM. It is recommended that this information be provided with pre-submission sketch plans. No preliminary or final plan will be accepted by the Township which does not include the ERSAM.

(2) Review by the Township - The first item to be discussed when the plan reaches reviewing boards and commissions shall be the ERSAM. No discussion of a preliminary plan shall occur until the applicant has provided a satisfactory ERSAM meeting all requirements. The purpose of the ERSAM is to ensure that all development in the Township occurs in a manner that respects the natural environment and that the applicant and the Township have a solid understanding of the natural conditions of any proposed development site, as well as conditions

around the site which provide the context for the proposed development. It is recommended that this plan be prepared prior to the pre-application meeting and site visit.

(3) Required Contents of ERSAM

(a) Site boundaries.

(b) Existing Resources Inventory- A comprehensive analysis of existing conditions on the proposed development site and areas within 500 feet, showing:

[1] Soils- Soils types within the site, based on maps contained in the Soil Survey of Bucks County, Pennsylvania, U.S. Department of Agriculture, as last revised. The soil classifications and boundary lines of all soils located on the tract shall be shown with reference to any alluvial soils, hydric soils, floodplain soils boundary and agricultural soils (Class I, II, III and IV). Soil descriptions for all soil types shall be provided. Any building or septic system restrictions due to wet soils, seasonably high water table or other restrictions shall be noted on the plans and considered in the site layout. Hydrologic soil groups shall be noted.

[2] Topography- Contour lines measured at vertical intervals of two (2) feet. Such slopes shall be determined by an on-site survey, not interpolation of U.S.G.S. maps.

[3] Slope areas- Areas to be shown graphically. The amount of each area in each slope category shall be shown numerically, with a calculation of the amount of the slope to be preserved and the amount and percentage to be disturbed:

[a] 8% to less than 15%
[b] 15% to 25%
[c] Greater than 25%

[4] Ridge lines and watershed boundaries.

[5] Floodplain areas, using FEMA maps. When no FEMA mapping has been prepared, a determination of the floodplain for any stream with a drainage area of three (3) acres of more shall be made by the applicant.

[6] Vegetative cover conditions on the property, including forest and woodland areas and large trees standing alone (i.e. outside of forest or woodland areas measuring ten (10) inches diameter at four (4) feet above natural ground cover).

[7] Streams, watercourses, Waters of the Commonwealth, Waters of the United States, lakes, ponds, springs and all natural drainage areas with an explanation of how site drainage works.

[8] Wetlands - Areas of wetlands on the proposed development parcel shall also be indicated, as evident from testing, visual inspection, or from the presence of wetland vegetation.

[a] The Township may verify the wetland delineation if any of the following site-specific criteria are applicable:

(i) It is recommended by the Township Engineer due to uncertainties raised by the applicant's delineation or conflicts exist between the applicant's delineation and wetlands information obtained from other sources including surrounding subdivisions.

(ii) More than one acre of wetlands is on-site.

(iii) Wetlands on-site are associated with a wetland system of ten or more contiguous acres.

(iv) On-site wetlands are adjacent to a park, wildlife refuge or sanctuary, or other open space area managed for resource preservation purposes.

[b] If any of the three wetlands parameters (hydric soils, hydrophytic vegetation or evidence of hydrology) are present on a site proposed for development, a separate wetlands delineation of sufficient detail to allow for thorough review by Township officials must be submitted to the Township. As part of the delineation process, a field investigation shall be performed and wetlands boundaries on the site shall be verified and flagged. Delineation and verification shall be performed by a qualified wetlands professional. The person or organization performing the delineation shall certify that the delineation has been performed in accordance with the criteria for wetlands delineation established in the Corp of Engineers Wetlands Delineation Manual (Wetlands Research Program Technical Report Y-87-1, Final Report, January 1987) or any more restrictive amendments thereto. Wetlands shall be defined by metes and bounds.

[c] In the event the applicant's and the Township's delineations are conflicting, the delineation that

causes the preservation of the larger area of wetlands shall govern.

[9] Existing land uses.

[10] Historic buildings and resources.

[11] All recorded easements.

[12] Existing buildings, structures, and roads.

[13] Photographs of the site including views of the proposed development site from all abutting public roads.

[14] Any Pennsylvania Natural Diversity Inventory Sites.

[15] Reference to any areas or properties designated as preservation areas by the Lower Makefield Township Open Space Plan.

[16] Orientation of site to sun for use of solar resources.

[17] Any pedestrian or equestrian trails commonly used on the property.

[18] Aerial photograph of the site not more than 5 years old or the most recent available from the Delaware Valley Regional Planning Commission.

[19] Location relative to and impact on the Delaware Canal State Park (if the property abuts the state park).

[20] Geologic formations on the proposed development parcel, including rock outcroppings covering 25 square feet or more, cliffs, escarpments, sinkholes.

C. Site Visit - After preparing the ERSAM, applicants shall arrange for a site visit of the property by Township representatives and shall distribute copies of the site analysis plan prior to the on-site meeting. Applicants are encouraged to accompany the Township representatives. The purpose of the visit is to familiarize officials with the property's existing conditions and special features, to identify potential site design issues, and to provide an informal opportunity to discuss site design concepts, including the general layout of designated required open space (if applicable), potential locations for proposed buildings and street alignments, stormwater management concepts, and protection of resources (natural and historic). Comments made by the Township representatives or their staff and consultants shall be as only advisory and are not binding on either the Township or the applicant. It shall be understood by all parties that no formal recommendations can be offered, and no official decisions can be made, at the site visit or during the sketch plan process.

D. Pre-Plan Conference - Following the site visit and prior to the first plan submission, the applicant shall meet with Township officials to discuss the findings of

the site visit and to develop a mutual understanding on the general approach for subdividing and/or developing the property. At the discretion of the Township, this conference may be combined with or occur during the site visit.

E. Four-Step Design Process – The applicant shall use the four-step design process to determine the most suitable development strategy for the site. The layout of lots or development shall occur so that the areas identified as being important in the site analysis are preserved and the areas of secondary importance are used for development. These Low Impact Development (LID) practices emphasize protection and use of on-site natural features integrated with engineered, small-scale hydrologic controls at the parcel and subdivision scale to manage stormwater and more closely mimic pre-development watershed hydrologic functions. The steps in the four-step design process are as follows:

Step 1: Delineation of Areas to be left undisturbed

Proposed open areas to be left undisturbed shall be designated using the maps and materials in the ERSAM. The Township's maps of preserved and open space lands in the Comprehensive Plan, Open Space Plan, and Park and Recreation Plan shall also be referenced and considered. The pre-application conference and the site visit shall be used to determine those areas that should have minimal or no disturbance.

The open areas identified at this stage of the design process shall include consideration for stormwater management, taking into account areas suitable for groundwater recharge and infiltration.

Step 2: Preparation of Resource Conservation Plan

Analysis of how resources will be protected. Narrative shall be provided indicating the ways in which the applicant will respect the existing features of the land described in the site analysis.

1. Limits of disturbance on site - the limits of the grading and soil disturbance shall be shown, with areas designated as important areas delineated and protected.

2. Areas that are to be preserved should be described, including prime agricultural soils, woodlands, vegetation, slopes, views, or any other areas identified in step 1.

3. Description of the manner in which stormwater will be captured on site for maximum infiltration, including a narrative describing the pros and cons of infiltration on the site. This should indicate that the areas best suited for stormwater infiltration have been selected for that purpose, based on hydrologic soil groups and the stormwater management requirements of this ordinance.

4. Description and plan showing that existing natural contours and vegetation will be respected.

5. Limits on site disturbance and resources applicable to the site due to zoning ordinance requirements shall be shown.

6. Description of any historic buildings or resources on the site and proposed efforts to preserve them.

7. Description and plan indicating how the site layout will provide advantageous solar orientation.

Step 3: Location of Structures and Alignment of Infrastructure

Buildings, streets, trails, utilities, and stormwater management.

1. Building area shall be identified based on the areas set aside for development.

2. Upon designating the building sites, a street plan shall be designed to provide vehicular access to the development which reflects a logical relationship to topographic conditions. Impacts of the street plan on open areas to be protected shall be minimized, particularly with respect to crossing environmentally sensitive areas such as wetlands and traversing slopes exceeding 8 percent.

3. Applicant shall also indicate the locations and method for providing water service, wastewater, and stormwater management facilities.

Step 4: Drawing Lot Lines

For developments where lots are proposed, lot lines are drawn as required to delineate the boundaries of individual lots.

Documentation - Applicants shall be prepared to submit maps indicating the findings of each step of the design process, if so requested by the Planning Commission or the Board of Supervisors.

F. Where a tract is to be developed in phases, a complete preliminary plan for the entire tract shall be submitted initially.

G. Preliminary approval for the subdivision or land development must be obtained for the entire development. Final approval may be obtained phase by phase.

H. The extent of each phase for which a separate final plan is to be submitted shall be shown and a time schedule presented for the submission of the final plan for those phases. The order of development shown on the preliminary plan must be adhered to, and, if changes are required, plans must be refiled and reviewed and approved.

I. Each phase of a development must be designed so that it could be developed independently and stand on its own meeting all applicable Township ordinances without other phases, including the street system, utilities, provision of required open land and protection of all natural resources.

Section 5. The provisions of **Article VI, Preliminary Plan, Section 178-20. Information and standards required, Subsection E (16)**, are hereby deleted and in lieu thereof shall read as follows:

(16) A proposed stormwater management plan in compliance with the requirements of the ordinances relating to stormwater management for the Delaware River South Watershed and the Neshaminy Creek Watershed, including a plan of the surface drainage system of the tract to be subdivided or developed, shall be provided along with supporting calculations showing watershed areas, inlets, pipe size and material, pipe slope, headwalls, endwalls and manholes and a statement of the

design parameters utilized in arranging and sizing the system. The Township requires the use of Non-Structural BMPs (as described in the Pennsylvania Stormwater Best Management Practices Manual, Draft April 2006) ("Manual"), as such Manual may be amended from time to time, to the maximum extent possible because of their ability to minimize stormwater runoff and not just mitigate stormwater-related impacts. Prevention can be achieved as the result of making the land development happen in ways other than through use of standard or conventional development practices. Prevention and Non-Structural BMPs go hand in hand and can be contrasted with Structural BMPs that provide mitigation of those stormwater impacts, which cannot be prevented and/or avoided. If Non-Structural BMPs cannot be used the reasons why must be demonstrated to the Township's satisfaction.

Section 6. The provisions of **Article VI, Preliminary Plan, Section 178-20. Information and standards required, Subsection F(3)(a)[6]**, are hereby deleted and in lieu thereof shall read as follows:

[6] Location of all surface and subsurface drainage facilities including BMPs and public utilities in the vicinity of storm and/or sanitary sewer lines. Sufficient design information shall be provided for each BMP so that an evaluation of whether the BMP meets the required design for credit can be made.

Section 7. The provisions of **Article VI**, **Preliminary Plan, Section 178-20. Information and standards required,** are hereby amended by adding a new Subsection G to read as follows:

G. Environmental assessment. An environmental impact assessment (EIA) report shall be submitted for all land developments and all subdivisions which involve three (3) or more dwelling units or lots; provided, however, that a subdivision of lots, all of which are greater than ten (10) acres in area, shall be exempt from the requirements of an EIA report regardless of the number of lots if all of the lots are deed restricted from further subdivision. The EIA shall meet all the requirements set forth in Exhibit 6 attached to this Ordinance.

Section 8. The provisions of **Article X, Design Standards and Improvement Requirements**, **Section 178-40. Street standards**, are hereby deleted and in lieu thereof shall read as follows:

§ 178.40 Street standards.

A. The following is a general guide to the standards for the various classifications of streets. When these standards are in conflict with those established by others, these standards shall take precedence.

STREET CLASSIFICATION	Right-of-Way Width (feet)	Cartway Width	Design Speed (MPH)
Arterial	100 to 120	Per PennDOT classifications	35-45
Collector	80	36	35-45
Local, residential (Historic District)	40	26	25-35
Local, residential (all other districts)	56	26	25
Local, industrial and commercial	60	36	25-35

B. Additional rights-of-way and cartway widths may be required by the Township in order to lessen traffic congestion, to secure safety from hazards, to facilitate the adequate provision for transportation and other public requirements, to promote Township-wide circulation and mobility, to provide adequate on-street parking and to promote the general welfare. Where it is determined that the anticipated traffic circulation and parking patterns meet the above objectives, cartway widths for portions of local roads may be reduced to 24 feet at the discretion of the Township to encourage Low Impact Development.

C. Where a subdivision or land development abuts or contains an existing street of inadequate right-of-way width, additional right-of-way width shall be dedicated to conform to the standards set by the Township. Where a subdivision or land development abuts or contains an existing street of inadequate cartway width, the applicant shall be required to widen and/or reconstruct the roadway to meet current Township standards. If the Township Engineer determines that core borings are necessary to determine the condition of the existing street, these shall be completed by the developer at the developer's expense.

D New half or partial streets will not be permitted.

E. Wherever a tract to be subdivided or developed borders on an existing half or partial street, the other part of the street shall be plotted.

Section 9. The provisions of **Article X, Design Standards and Improvement Requirements**, **Section 178-42. Vertical street alignment**, are hereby deleted and in lieu thereof shall read as follows:

§ 178.42 Vertical street alignment.

A. Center line grades shall not be less than one percent (1%) on streets with curbs and one-half percent (1/2%) on streets without curbs. A minimum slope of one percent shall be provided along the gutter line.

B. The maximum street grades shall be as follows:

(1) Local Streets – 12 percent

(2) Arterial and collector streets– 8 percent

C. Vertical curves shall be used at changes of grade exceeding one percent (1%) and shall be designed in relation to the extent of the grade change and to provide the following minimum sight distances:

(1) For over crests (summits), each four percent (4%) difference in gradients shall use one hundred twenty-five (125) foot length of curve.

(2) For under crests (sags), each four percent (4%) difference in gradients shall use one hundred (100) foot length of curve.

D. Where the grade of any street at the approach to an intersection exceeds four percent (4%), a leveling area shall be provided having a grade of no more than 4% over a distance of at least 50 feet measured from the intersecting right of way line.

E. Sight Distances. In no case shall any combination of vertical or horizontal curves provide sight distance less than those specified in the AASHTO Manual, latest revision.

Section 10. The provisions of **Article X, Design Standards and Improvement Requirements, Section 178-45. Cul-de-sac streets,** is hereby amended by deleting **Subsection D** and replacing it with a new Subsection D and by adding a new Subsection E to read as follows:

D. A planted island with a pervious or bioretention landscaped area where runoff can be directed shall be required at the Township's discretion in the center of the cul-de-sac to encourage Low Impact Development. If provided, the planted island shall be forty (40) feet in diameter. Ownership and maintenance of the planted island shall be designated on the approved final plan of the subdivision or land development.

E. All public cul-de-sac streets shall have a snow storage easement to facilitate snow removal, where necessary.

Section 11. The provisions of **Article X, Design Standards and Improvement Requirements**, **Section 178-46. Curbs,** are hereby deleted and in lieu thereof shall read as follows:

§ 178-46. Curbs.

A. To encourage Low Impact Development, curbs are discouraged along proposed streets except where required by the Township when deemed necessary for stormwater management, traffic control, pedestrian safety, or to provide for roadway stability. Curbs are allowed when the sidewalk is adjacent and connected to the traveled way provided they are used only on one side of the road and the road cross slope is away from the curb or if curb cuts are utilized to drain runoff to a vegetated open channel or bioretention area behind the curb.

B. Where curbs are not provided a shoulder meeting the requirements of the Township, which may consist of grass paver, shall be provided.

C. All curbs must meet the requirements of the Americans with Disabilities Act and the Pennsylvania Universal Accessibility Act and all other regulatory requirements, as applicable.

D. Design Standards.

(1) Curbs shall be constructed in accordance with the standards shown on the Typical Roadway Section as attached to this chapter and may be constructed of concrete or Belgian Block.

Section 12. The provisions of **Article X, Design Standards and Improvement Requirements, Section 178-47. Sidewalks and walkway requirements,** are hereby amended by deleting Subsections A and D and replacing them with new Subsections A and D to read as follows:

A. Sidewalks shall be provided on both sides of all streets where required by the Township for safety and convenience.

(1) The minimum width of all sidewalks shall be five (5) feet to meet the requirements of the Americans with Disabilities Act (ADA), unless otherwise approved by the Board of Supervisors. For sidewalks located in a street right-of-way there shall be a minimum five (5) feet wide planting strip between the curb and sidewalk to be used for the location of the underground utilities, vegetated open channels or bioretention areas.

(2) The grades and paving of the sidewalks shall be continuous across driveways.

(3) The construction of all sidewalks shall be in accordance with the requirements of the Township. Sidewalks may be constructed of porous materials provided the runoff through the material will not be directed towards the subgrade of the roadway. Porous materials for sidewalks and trails which abut lots, in lieu of a roadside sidewalk, shall be ADA compliant. Porous asphalt and porous concrete will be considered ADA compliant in regards to surface texture.

(4) At corners and pedestrian street-crossing points, sidewalks shall be extended to the curbline with an adequate apron area for anticipated pedestrian traffic.

D. All sidewalks and sidewalk ramps must meet the requirements of the Americans with Disabilities Act and the Pennsylvania Universal Accessibility Act. Where sidewalk grades exceed five (5) percent, a non-slip surface texture shall be used.

Section 13. The provisions of **Article X, Design Standards and Improvement Requirements, Section 178-57. Offstreet parking,** are hereby amended by deleting Subsections C, E and M and replacing them with a new Subsections C, E and M to read as follows:

C. Where underlying soils may not be conducive to infiltration, bioretention areas should be incorporated into the parking lot as concaved landscaped areas (i.e. situated lower than the height of the parking lot surface so that stormwater runoff is directed as sheet flow into the bioretention area). Bioretention areas can be used in concert with alternative paving surfaces to maximize the attenuation of runoff. Spacing and layout of the bioretention area should be designed so runoff is maintained as sheet flow from the driving surfaces into the bioretention area. The travel path of sheet flow across a parking lot to a bioretention area should be limited to cross only one driving lane and across one set of parking stalls before arriving at the side slopes of the bioretention area. Where bioretention areas are not practical, there shall be a planting strip at least 10 feet wide between every 20 contiguous parking spaces in a row and planted with street trees from the list of acceptable street trees which shall serve as a physical separation between every 20 parking spaces. Any plants used shall be native in origin.

E. All internal parking lots, separator islands and aisles shall be confined within curbing, except where direct overland flow or curb cuts are utilized to drain runoff to a vegetated open channel or bioretention area behind the curb. Parking lots that incorporate bioretention into the landscaped portions of the parking lot should use concrete curb blocks as wheel stops to protect the bioretention area from traffic intrusion while also allowing the parking lot runoff to flow by.

M. All automobile parking areas shall be paved and constructed in accordance with Township specifications. The design should incorporate alternative paving surfaces into the parking lot to promote infiltration of the runoff without the need for conventional catch basins and pipe systems.

Section 14. The provisions of **Article XI, Landscape and Open Lands Requirements, Section 178-80. Landscape plan required,** are hereby amended by adding the following to the end of that section to read as follows:

Because of the many environmental benefits stemming from the use of native plants, it is recommended that developers give serious consideration to using such plants in their individual home landscape designs.

Section 15. The provisions of **Article XI, Landscape and Open Lands Requirements, Section 178-85. Tree protection standards,** are hereby amended by adding a new Subsection H(4) to read as follows:

(4) Trees of ten (10) inches caliper or more which are proposed to be removed during any stage of development, grading and/or construction within a subdivision or land development shall be replaced with an approved tree or trees of the type provided for in this Ordinance. Said replacement trees shall meet the following size limitations:

(a) Trees with a diameter of ten (10) inches or more but less than eighteen (18) inches which are removed shall each be replaced with no less than four (4) trees measuring two and a half (2½) to three (3) inches in caliper.

(b) Trees with a diameter of eighteen (18) inches or more but less than thirty (30) inches which are removed shall each be replaced with no less than seven (7) trees measuring two and a half (2½) to three (3) inches in caliper.

(c) Trees with a diameter of thirty (30) inches or more which are removed shall each be replaced with no less than ten (10) trees measuring two and a half (2½) to three (3) inches in caliper.

All trees proposed to be removed shall be measured at a height of four (4) feet above finished grade level. All replacement trees to be planted shall be measured at a height of six inches (6") above the finished grade level in accordance with American Association of Nurserymen Standards. Replacement trees may be planted within, but not in place of, required buffers, street trees, trees in parking lots or trees planted on individual lots or common open space. Where development takes place on fully wooded lots, the Township may permit replacement trees to be planted in an off-site location approved by the Township. Alternatively, the Township may accept a contribution to a capital account established by the Township for the planting of trees at approved locations within the Township. The Board of Supervisors shall, from time to time, by Resolution establish appropriate amounts for contributions in lieu of either on-site or off-site tree replacement and shall, from time to time, establish appropriate locations for planting replacement trees.

Section 16. The provisions of **Article XI, Landscape and Open Lands Requirements,** are hereby amended by adding a new **Section 178-87. Open space standards,** to read as follows:

§ 178-87 Open space standards.

A. General

(1) Open space shall not include land occupied by commercial, industrial, residential or other non-recreational uses, land reserved for future parking areas for non-recreational uses, stormwater management facilities, wastewater management facilities, and/or the yards or lots of dwelling units. Open space shall not include left over areas, remnants of land remaining after lotting out, or other unusable areas.

(2) The applicant shall provide a method of physically delineating private lots from open space areas. Such method shall include shrubbery, trees, markers or other methods acceptable to the Township. All plants shall be native in origin. Evergreens or shrubbery shall be a minimum height of two (2) feet at the time of planting. Deciduous trees shall have a minimum trunk diameter of two and one-half (2 1/2) inches at a height of six (6) inches above the finished grade at the time of planting.

(3) Open space shall not include parcels with a length-to-width ratio of less than 4:1, or less than 75 feet in width, except for such lands specifically designed as neighborhood greens, playing fields, or trail links.

(4) Open space, except for land set aside for farmland, shall be directly accessible to the largest practicable number of lots within the subdivision. Non-adjoining lots shall be provided with safe and convenient pedestrian access to open space.

(5) Open space shall not include required buffer areas.

(6) Open space shall be linked with trails that are accessible to the residents of the subdivision. Consideration shall also be given to providing for public access on such trails if they are linked to other publicly-accessible walkway systems within the Township. Provisions should be made for access to the open space, as required for land management and emergency purposes.

Section 17. The provisions of **Article XIII, Stormwater Management, Erosion, and Sediment Control and Grading, Section 178-93. Stormwater management and surface runoff control,** are hereby amended by deleting **Subsections A, B, C, D (9), (10) and (15) and E** and by adding new **Subsections A, B, and C** to read as follows:

A. General.

(1) The Township requires that all Development comply with the Low Impact Development Practices as outlined in the requirements of the Pennsylvania Stormwater Best Management Practices Manual, Draft April 2006 ("Manual"), as such Manual may be amended from time to time. The Manual provides guidance on the development of site controls through the use of Best Management Practices (BMPs). The most appropriate BMPs for stormwater management vary from site to site; however, the basic concepts are the same and they can be condensed into the following ten principles:

[a] Prevent stormwater impacts, especially pollutants.

[b] Mitigate pollutants that cannot be prevented.

[c] Manage storm water as a resource.

[d] Sustain the hydrologic balance (quantity and quality).

[e] Integrate stormwater into the initial site design process.

[f] Preserve and utilize natural systems (soil, vegetation, etc.).

[g] Manage stormwater as close to the source as possible.

[h] Disconnect/Decentralize/Distribute.

[i] Slow down stormwater by increasing the Time of Concentration, rather than piping and accelerating it.

[j] Inspect and maintain.

(2) The control guidelines presented in the Manual are comprehensive, and reflect the Pennsylvania Comprehensive Stormwater Policy to restore natural hydrology, including velocity, current, cross-section, runoff volume, infiltration volume, and aquifer recharge volume. The guidelines will help sustain stream base flow and prevent increased frequency of damaging bank full flows in local waterways. The guidelines also will help prevent increases in peak runoff rates for larger events (2- through 100-year) on both a site-by-site and watershed basis. When applicable, Act 167 watershed plans (Chapter 173 Stormwater Management – Delaware River South Watershed and Chapter 174 – Stormwater Management - Neshaminy Creek Watershed) may require additional rate controls to reduce cumulative flooding impacts downstream.

(3) Where site conditions offer the opportunity to reduce the increase in runoff volume, groundwater recharge shall be utilized based on the following scientific observations:

[a] The 2-year event encompasses 95% or more of the annual runoff volume across the state;

[b] Volume reduction BMPs based on this standard will provide a storage capacity to help reduce the increase in peak flow rates for larger runoff events;

[c] In a natural stream system in Mid-Atlantic States, the bank full stream flow occurs with in a period of approximately 1.5 years. If

the runoff volume from storms less than the 2-year event are not increased, the fluvial impacts on streams will be lessened.

[d] Volume reduction BMPs based on this standard will provide a storage capacity to help reduce the increase in peak flow rates for larger runoff events.

(4) The Township requires all applicants to design using Low Impact Development techniques for stormwater design. Conventional land development too often results in extensive site clearing, where existing vegetation is destroyed, and the existing soil is disturbed, manipulated, and compacted. All of this significantly affects stormwater quantity and quality. These conventional land development practices too often fail to recognize that the natural vegetative cover, the soil mantle, and even the topologic form of the land are integral parts of the water resources system that needs to be conserved and kept in balance, even as land development continues to occur.

Identifying a site's natural resources and evaluating their values and functional importance is the first step in minimizing the impact of stormwater generated from land development. Where they already exist on a proposed development site, these natural resources should be conserved and utilized as a part of the stormwater management solution. Stormwater is a resource that must be conserved. In fact, many vegetation and soil-based structural BMPs are in fact "natural structures" that perform the functions of more "structural" systems (e.g., porous pavement with recharge beds). In addition, it is strongly recommended that the developer utilize the guidelines provided in the Manual, Chapter 4 "Integrating Site and Stormwater Management" in planning the site design. In particular, the developer shall perform sufficient subsurface investigations (in accordance with the following guidelines) to accurately determine the existing conditions.

B. Preliminary Subsurface Investigation for Determination of Recharge Characteristics of Site

(1) Statement and Purpose:

All major subdivisions and site plans will conduct a subsurface investigation prior to completing a layout of a development plan. The objective of the preliminary investigation is to obtain data that would allow for the development of a conceptual model of surface runoff and subsurface recharge on a development site. With regard to groundwater recharge it is important that the applicant, during the site design phase of the project, understand how groundwater recharges at a site. An understanding of these elements will provide the engineer with a guide for infiltration BMPs at the site (i.e. shallow or deep infiltration surfaces) and an understanding of the requirement to maintain the hydrogeologic characteristics of a site. All investigations shall be conducted in accordance with the most recent revision of the Manual and with the criteria listed below. All investigations shall be witnessed by a representative of the Township.

(2) Method of Investigation:

A subsurface investigation comprising of supervised test pits shall be undertaken to characterize the underlying hydrogeologic characteristics of a development site. The frequency of test pits shall be as follows:

Site Size	Number of Test Pits
Initial 5 acres:	1 test pit per acre, minimum of 2 test pits
>5 acres to 20 acres:	5 test pits plus 1 test pit per 2 acres beyond the initial 5 acres
>20 acres	13 test pits plus 1 test pit per 5 acres beyond the initial 20 acres

All test pits shall be progressed to a minimum depth of 10 feet or to bedrock refusal, whichever is less. The test pits shall be prepared in accordance with USDA-National Cooperative Soil Survey (NCSS) standards, and identify all soil horizons and substratums, as well as limiting horizons, evidence of seasonal high groundwater (mottling) and observed groundwater seepage. This field investigation shall be conducted by an ARCPACS or PAPSS certified Soil Scientist.

Utilizing the data obtained through the preliminary subsurface investigation, a Pennsylvania licensed Geologist or, ARCPACS or PAPSS certified Soil Scientist shall create a *conceptual model* of the surface and subsurface drainage patterns of the site for use by the design engineer in developing drainage system layout and infiltration BMPs. The *conceptual model* shall include estimates of pre-development recharge of groundwater and a determination of the primary routes for subsurface drainage, either through recharge of on-site or off-site streams or wetlands, or through deeper recharge of regional aquifers. The conceptual model shall also discuss the impacts of the proposed development on adjacent wetlands and streams, and provide schematics or conceptual cross sections of the proposed method of maintaining the existing drainage and recharge patterns. The design engineer, in developing a concept and ultimately designing the site must match both the pre-development recharge rates and patterns.

(3) BMP Specific Subsurface Investigation

[a] Statement and Purpose:

The purpose of the final subsurface investigation is to determine the recharge characteristics and ability of soils and the underlying aquifer to infiltrate the required volume of groundwater. All structural infiltration BMP designs shall be supported by an individual soil log and infiltration test to determine the infiltration rate at each BMP. The soils logs at each BMP will be conducted in the identical manner as in the preliminary subsurface investigation, identifying the soil profile, limiting horizons, seasonal high groundwater and observed seepage. For all developments using detention basins as the primary means of infiltration, a groundwater mounding analysis must be performed in addition to the tests below to determine whether of not the underlying aquifer will be able to manage the infiltration loading proposed without raising the groundwater to within two (2) feet of the infiltration surface or affecting nearby structures. The mounding analysis shall be progressed utilizing at least three (3) groundwater monitoring

wells per detention basin, and one 72-hour aquifer pumping stress test. The field testing procedure for a mounding analysis shall be submitted to the Township Engineer for review and approval prior to performing the work.

[b] Frequency of Infiltration Testing:

At the level of infiltration, testing shall conform to the following frequency:

Detention/Retention BMPs (Infiltration Basins, Dry Wells/Seepage Pits, Open Bottom Bioretention, Sandfilters, Rain Gardens, Infiltration Beds):

1 test per 5,000 square feet or fraction thereof of infiltrative surface, minimum of 1 test up to 400 square feet, and 2 tests for infiltrative surfaces of 400 square feet and greater.

Linear Infiltration BMPs (Swales, Trenches and Strips)

1 test per 100 feet or fraction thereof, minimum 2 tests.

[c] Testing Procedures

All infiltration testing methods shall be conducted in accordance with the most recent revision of the Manual, as amended from time to time. Currently, double-ring infiltrometer and percolation tests are the two principle methods for measuring soil infiltration. For infiltration basins, double-ring infiltrometer tests alone shall be utilized.

There may be instances where the rock content is sufficient enough to limit the use of either the double-ring infiltrometer or percolation tests. In this instance, the following infiltration test may be conducted after approval of the Township:

<u>Procedure for Pilot Infiltration Test (P.I.T.)</u>

(a) The following equipment is required for a P.I.T.:

1. Excavating equipment capable of producing a test basin as prescribed in (b) below; and

2. A water supply; and

3. A means for accurately measuring the water level within the basin as required in (c) below. It is recommended that a calibrated PVC pipe or rod be used to measure the drop.

(b) A pit meeting the following requirements shall be excavated within or immediately adjacent to the proposed infiltration BMP.

1. The bottom of the test basin shall be at the depth of the proposed level of BMP infiltration.

2. The bottom area of the basin shall be a minimum of 50 square feet.

3. A soil profile pit excavated for the purpose of logging the subsurface may be utilized for this test provided that the requirements of (b)1 and 2 above are satisfied.

4. The bottom of the basin should be made as level as possible so that high areas of rock do not project above the water level when the basin is flooded as prescribed in (c) below. Within the depth of the pit where water will be filled, the side slopes should be as close to vertical and consistent in dimension as possible.

5. If ground water is observed within the test basin, the basin flooding test shall not be used.

(c) The following test procedure shall be used for the P.I.T.:

1. Step One: Fill the excavated pit with the approximate depth of water expected to be stored within the specific infiltration BMP (water depths shall be a minimum of 12 inches and no greater than 48 inches) and record the time. Allow the basin to drain for a period of 24 hours. When designing the P.I.T. for a BMP, the designer should be aware that infiltration BMPs must completely drain within a period of 72 hours or less.

2. Step Two: If the basin drains completely within 24 hours after the first flooding, immediately refill the basin to the water depths as described in (c)1 above and start recording the rate of drop. If the basin has not emptied within 24 hours and the water level has dropped less than 6 inches, then the soil stratum being tested cannot to be used for infiltration. If the water level has dropped 6 inches or greater, then fill the pit back to the water depth as described in (c)1 above and start recording the rate of drop every 5 minutes to 4 hours depending on the rate of drop until the pit is empty. If the rate of drop slows to less than 0.25 inches per hour over 2 consecutive hours, then the tested soil stratum shall not be used for infiltration.

3. Step Three: Calculate the rate of infiltration by averaging the time weighted rate of drop from initial filling until the pit has emptied. This rate of infiltration will be used in calculating the drainage time required for the BMP. To account for bio-fouling and clogging with fines, the design rate shall be 50% of the field determined infiltration rate. This rate shall be used in designing the infiltration BMP.

(d) Due to the potential safety hazards which are posed by the excavation of a P.I.T., adequate safety measures shall be taken including those required by OSHA to permit safe access to the excavation areas during the test procedure as well as the use of warning signs or a fence to limit access to the basin by the public during periods when the basin is left unattended, or both.

(e) The basin flooding test shall not be conducted in rock strata which have been blasted with explosives.

C. Design Criteria, General

(1) The stormwater management system shall be designed to meet the requirements of the Manual. In the event that the site is also subject to the requirements of either Chapter 173 Stormwater Management – Delaware River South Watershed or Chapter 174 – Stormwater Management - Neshaminy Creek Watershed, then the more restrictive of the requirements shall apply as determined by the Township Engineer.

(2) The Township requires use of Non-Structural BMPs to the maximum extent possible because of their ability to prevent stormwater generation and not just mitigate stormwater-related impacts. If Non-Structural BMPs cannot be used the reasons why must be demonstrated to the Township's satisfaction. Prevention can be achieved as the result of making the land development happen in ways other than through use of standard or conventional development practices. Prevention and Non-Structural BMPs go hand in hand and can be contrasted with Structural BMPs that provide mitigation of those stormwater impacts, which cannot be prevented and/or avoided.

The following major "areas" of preventive Non-Structural BMPs have been identified in the Manual:

Protect Sensitive and Special Value Features
Cluster and Concentrate
Minimize Disturbance and Minimize Maintenance
Reduce Impervious Cover
Disconnect/Distribute/Decentralize
Source Control

More specific Non-Structural BMPs have been identified for each of these generalized areas, to better define and improve implementation of each of these areas. One of the most challenging technical issues considered in the Manual involves the selection of BMPs that have a high degree of Non-point Source (NPS) reduction or removal efficiency. In the ideal, a BMP should be selected that has a proven NPS pollutant removal efficiency for all pollutants of importance, especially those that are critical in a specific watershed. Exhibit 7, attached to this Ordinance, sets forth a list of all of the BMPs and provides information on where each can be used and their pollutant removal performance or effectiveness.

(3) The Manual (Chapter 8) also provides a methodological approach to take credit for applying these Non-Structural BMPs, provided that the "specifications" defined for each BMP in Chapter 5 of the Manual are properly followed.

(4) The developer shall construct and or install such drainage structures, on-site and off site as necessary to provide a fully functioning stormwater collection and control system meeting the requirements of the Manual. The developer's design shall utilize to the maximum extent possible non-structural BMPs. In the event that the site is also subject to the requirements of either Chapter 173 Stormwater Management – Delaware River South Watershed or Chapter 174 – Stormwater

Management - Neshaminy Creek Watershed, then the more restrictive of the requirements shall apply as determined by the Township Engineer.

Section 18. The provisions of **Article XIII, Stormwater Management, Erosion and Sediment Control and Grading, Section 178-95. Erosion and sediment controls; grading,** are hereby amended by adding a new Subsection F to read as follows:

F. Topsoil protection. All development plans shall include the preservation of topsoil on the site of the development. Topsoil from areas to be disturbed shall be stripped and piled on site and ultimately spread out on the site as appropriate. The site area stripped of topsoil shall be kept to a minimum and no topsoil shall be removed from the site.

Section 19. In all other respects, the Subdivision and Land Development provisions of the Lower Makefield Township Code, as previously amended, are reaffirmed and ratified subject only to the amendments of same as set forth in this Ordinance.

Section 20. Should any Section or provision of this Ordinance be declared invalid by any court of competent jurisdiction, such decision shall not affect the validity of the Ordinance as a whole or any part thereof not declared invalid.

Section 21. This Ordinance shall become effective five (5) days after enactment.

ORDAINED and ENACTED this 20th day of December, 2006.

LOWER MAKEFIELD TOWNSHIP
BOARD OF SUPERVISORS

By:_____

By:_____

By:_____

By:_____

By:_____