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MEETING OF THE HIGHLANDS COUNCIL**

**RMP Program: Carbonate Rock (Karst) Topography**  
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<p><b>Issue Overview</b></p>	<p>Karst is a type of land surface, or topography, that is formed at the surface of carbonate rock formations when water dissolves the rock over time. This process causes surface depressions and the development of such features as sinkholes, sinking streams, enlarged bedrock fractures, caves, and underground streams. Sinking streams and sinkholes direct surface water runoff into karst aquifers with little or no attenuation of any transported contaminants. Stormwater basins, septic system leaching fields and sewers may also contribute contaminants directly to ground water through karst features. In addition to ground water concerns, communities in karst areas must contend with safety concerns as sinkholes can have damaging effects to large manmade objects. The Highlands Region has several large areas with carbonate rock formations, usually river valleys such as the Musconetcong, South Branch Raritan and Lamington, and karst features exist in some – but not all – of these areas.</p>
<p><b>RMP Policies and Objectives Addressed</b></p>	<p><b>Policy 1.6.1.1</b> To map areas of the Highlands Region that are underlain by carbonate rocks to define a Carbonate Rock Area.  <b>Policy 1.6.1.2</b> To identify and delineate land areas that drain surface water into the Carbonate Rock Area, as changes in the quantity, quality and rate of discharge of surface water runoff from upslope lands can impair ground water resources in the Carbonate Rock Area.  <b>Policy 1.6.1.3</b> To establish and maintain an inventory of karst features in the Highlands Region.  <b>Policy 1.6.1.4</b> To ensure that municipalities in, or draining to, the Carbonate Rock Area protect public health and safety and the quality of ground waters from inappropriate land uses and pollutant discharges.  <b>Objective 1.6.1.4.1</b> Identification of critical requirements for development ordinances to be adopted by municipalities, with technical guidance.  <b>Objective 1.6.1.4.2</b> Applications for site plan or subdivision approval will include a multi-phased geotechnical site investigation (e.g., test borings, test pits, etc.) to locate any potential karst features and potential hazards to public health and safety, structures and ground water quality.  <b>Objective 1.6.1.4.3</b> Municipal and Highlands Council development reviews and requirements shall ensure that all potential hazards to public health and safety, structures and</p>

	<p><i>ground water quality are fully addressed and mitigated in the construction plans and subsequent approval process, with the maximum emphasis on nonstructural measures, including, but not limited to, avoidance of modifications to the karst features.</i></p> <p><b>Objective 1.6.1.4.4</b> <i>Public works projects, including but not limited to water supply, sewerage, stormwater and transportation facilities, shall be constructed and maintained such that the potential for damage from karst features and the contamination of ground water are avoided.</i></p>
<b>Program Summary</b>	<p>Implementation of a Carbonate Rock Program is necessary to address the potential problems that are common to karst areas. The program is not intended to restrict development yields, but rather to provide for the adoption of a site assessment and design process for karst areas that allows applicants, municipalities, and the Council to identify any karst concerns at a site and to incorporate appropriate design features in order to minimize future sinkhole (or other karst feature) formation, damage to development, and the potential for ground water contamination.</p> <p>The Highlands Council has utilized existing New Jersey Geologic Survey and United States Geological Survey data to map those areas of the Highlands Region that are underlain by carbonate rocks. These areas collectively are referred to as the Carbonate Rock Area. Since changes in the quantity, quality, and rate of discharge of surface water runoff from upslope lands can impair ground water resources in the Carbonate Rock Area, lands that drain surface water into the Area will be delineated by the Council using LiDAR topographic analyses or other topographic data where LiDAR data are not available. Development ordinances will be adopted by municipalities within affected land areas that will serve to protect public health and safety from potential hazards common to karst areas.</p>
<b>Identification of Critical Requirements for Development Ordinances</b>	<p><b>Program Description</b></p> <p>The Highlands Council will identify critical requirements for development ordinances to be adopted by municipalities that have land areas that are within or drain to the Carbonate Rock Area. Given that the best design solution to karst-related problems is dependant upon the actual subsurface conditions below a particular area, the preparation of a one-design-fits-all-requirement for the entire Region is not appropriate. Performance standards provide flexibility regarding the specific actions to be taken to achieve local goals. Municipalities will adopt development ordinances and performance standards that are consistent with the critical requirements identified by the Council.</p>
<b>Development of Carbonate Rock Area Guidance Manual</b>	<p><b>Program Description</b></p> <p>The Highlands Council will develop a technical guidance manual for use by municipalities that have land areas that are within or drain to the Carbonate Rock Area. The guidance will contain requirements for a multi-phased geotechnical study to locate any potential karst features and potential hazards to public health and safety, structures, and ground water quality. The required multi-stage investigation will allow the applicant, as well as the municipality and Council, to predict problems and to estimate the associated costs based upon a growing body of knowledge for the area in question. The initial phase of work will be accomplished relatively inexpensively, yet the applicant can develop preliminary costs and evaluate the feasibility of the development along with the municipality and the Council. An existing guidance manual, developed by the North Jersey Resource Conservation &amp; Development Council, will be used as one basis for the Council's work.</p>

	The Council will also provide guidance to municipalities regarding development of strategies with respect to public works projects in lands that are within or drain to the Carbonate Rock Area.
<b><i>Establishment and Maintenance of Karst Inventory</i></b>	<b>Program Description</b> The Highlands Council, working with municipalities during the site plan and subdivision approval process, will establish and maintain an inventory of karst features that are found in the Highlands Region.