Appendix A
ENVIRONMENTAL FEATURES

Geology and Topography

During the Paleozoic era of geological history, Jackson County and the state as a whole was inundated by successive warm, shallow seas during which large amounts of sediment were deposited. These deposits were subsequently lithified to form bedrock. Waterloo Township sits upon bedrock formed during the Pennsylvanian and Mississippian periods of geological history in Michigan. It is rare that a township exhibits more than one bedrock formation yet Waterloo Township exhibits four distinct materials including limestone, shale, and sandstone. The Ice Age brought four successive continental glaciers across the Great Lakes area. As these ice sheets moved southward from Canada, they scoured and abraded the surface of the land leaving behind deeper valleys and more rounded hilltops. The advancing glaciers carried large quantities of rock materials scraped and gouged from the land's surface. These materials were then deposited during the melting of the ice to form drift materials covering the bedrock below. The bedrock geology of Michigan can be generally described as bowl shaped in that the depth to the bedrock generally increases as one moves toward the center of the state. While the depth to bedrock in portions of the state exceed 700 feet, the depth in Waterloo Township ranges from approximately 5 to 75 feet and increases across the Township in a northeasterly direction.

The majority of Waterloo Township is comprised of level to nearly level lands. Except for the southern quarter of the Township, the land rarely exceeds grades of 3%. However, the southern quarter of the Township reflects far more topographic relief. The overall land character of the southern quarter is rolling and often exceeds grades of 10% and, less frequently, exhibits grades as high as 25% or more (see Figure D-1). Elevations range from approximately 910 feet to 1,140 feet above sea level. The lowest elevations are generally associated with the southwestern regions of the Township near Portage Lake and Little Portage Lake. The highest elevations are generally found in the Township's far southern bounds, most particularly northwest of Pond Lily Lake in the extreme southeastern corner of Township. The vast majority of the Township falls within the 915-950 elevation range.

Drainage and Water Courses

Waterloo Township is characterized by more than a dozen lakes and an extensive network of wetlands interconnecting these water bodies, which serve to collect area runoff and drain the Township's upland areas (see Figure D-1). The largest of the lakes is Portage Lake in the southwest corner of the Township and covers more than 400 acres. Other water bodies approaching 150 acres or more in size include Clear Lake in the southeast corner of the Township and Little Portage Lake situated directly northeast of Portage Lake. Portage River is the only river course within the Township, beginning at the center of the Township and flowing westward into Little Portage Lake and then further westward north of Portage Lake into Henrietta Township and Blackman Township where it ultimately joins the Grand River. In addition to the extensive wetlands and numerous lakes, the Township is characterized by many creeks and streams which further provide for area drainage. Many of these waterways in the north half of the Township are under the jurisdiction of the Jackson County Drain Commission.

Lands abutting or in close proximity to drainage courses, including streams, ponds, and lakes, are subject to flood conditions where the drainage courses do not have the capacity to accommodate the rate of runoff from a single rainfall or numerous rainfalls over a relatively short period of time. Historically, no flooding of any large scale significance has occurred in Waterloo Township. This is due in large part to the comparatively limited development within the Township, and the existence of an extensive network of drainage courses and wetlands to carry and store runoff.

No Federal Emergency Management Agency studies have been done at this time to identify areas of the Township which may be susceptible to flooding brought on by particularly intense rainfalls. It should be noted that though Waterloo Township may be relatively free of the threat of flooding, improperly managed land development practices within the Township, as within any community, can impact flood conditions both in the Township and in communities downstream.

Vegetation

The vegetative cover within Waterloo Township can be classified into three broad categories: natural, agricultural, and residential. Approximately one third of the Township is characterized by agricultural crop land and nearly the entire balance of the Township, except for residences and water bodies, is characterized by natural vegetation areas. The majority of this vegetation is located within the Waterloo State Recreation Area (W.S.R.A.). Natural vegetation includes woodlands, wetlands, and scrub lands.

Though upland woodlands can be found throughout most areas of the Township, they are far more predominant in the Township's southern third (see Figure D-2). The vast majority of the woodlands are characterized by upland hardwoods (maple, beech, ash).

Wetlands represent the largest portion of the natural vegetation and account for approximately one third of the total Township area (see Figure D-3). The wetlands are fairly evenly split between lowland hardwoods (ash, elm, red maple) and shrubby and/or aquatic bed environments (alder, dogwood, water willow, etc.). There are only limited stands of lowland conifers.

The expansiveness of the Township's woodland and wetland environments is important in light of the vital role these resources play in flood control, runoff purification, groundwater recharge, wildlife habitats, recreational opportunities, and supporting the rural character of the Township. Of particular significance is the continuous network of woodlands and wetlands within the Township. For instance, woodland-wetland environments near the southern edge of the Township span more than ten miles in length into abutting townships and the City of Stockbridge. This is significant due to the extensive wildlife habitat network that such a wetland-woodland system provides and, as wetlands are environmentally sensitive resources, degradation or pollution of a wetland area can have a destructive impact upon wetlands and related resources further away.

Soils

According to the U.S. Department of Agriculture, Jackson county exhibits ten general soil associations. Five of these associations are found in Waterloo township (see Figure D-1). "Soil associations" refer to the classification of broad patterns of soils, topography, and drainage. A soil association generally consists of one or more major soils and other minor soils. It is the pattern of these major and minor soils (including topography and drainage) which differentiates one association from another. An association often includes individual soils of varying character as is the case in Waterloo Township. All of the five soil associations are characterized by muck soils, to one degree or another, with the Houghton-Palms-Henrietta association comprised entirely of muck soils and running through the Township in a southwest to northeasterly direction.

The soil associations identified by the Natural Resources Conservation Service are very general and it is important to identify with more specificity those soils which appear to present particular opportunities and constraints upon future land use and development in the Township. The character of soils can have a profound impact upon the suitability of future uses of land in regard to groundwater contamination, on-site sewage disposal, and agricultural productivity. The Natural Resources Conservation Service has identified more specific individual soil units throughout the County based upon the characteristics of the upper soil layers (approximately five feet in depth) and this provides

a more reliable basis for township planning purposes.

According to the Natural Resources Conservation Service, approximately three quarters of the Township is characterized by soils that present severe limitations for septic systems (see Figure D-4). Those areas presenting more favorable conditions are scattered throughout the Township without any particular quadrant exhibiting significantly greater concentrations. The severe limitation to on-site sewage disposal is due to several conditions including high water tables, poor soil filter characteristics, limited permeability or excessively high permeability, ponding, and/or soil wetness.

These soil limitations are not unique to Waterloo Township as much of Michigan is characterized by similar conditions. Soils which present limitations to septic systems can often be accommodated with specially engineered septic systems at additional costs. The Jackson County Health Department is responsible for issuing permits for on-site sewage disposal and will not do so unless all county requirements for the septic system have been met. A primary concern is the soil's ability to absorb and break-down the leachate from the septic drain fields before it reaches underground water supplies. This can be particularly troublesome where soils are characterized by high water tables and/or high percolation rates.

Under typical conditions, sites approaching three quarters to one acre in size generally provide adequate opportunities for effective septic systems while also assuring a safe on-site potable water supply. However where development of greater density is being proposed, or where the soils present severe limitations, a public sewer system may be necessary.

It should be noted that while a site may be classified by the Natural Resources Conservation Service as presenting a certain level of limitation to septic systems, on-site investigation may show the classification to be less than fully accurate and/or show that the deeper soils (more than five feet deep) present differing characteristics than the upper layer soils and thus, varying limitations. On-site investigations should be carried out before specific land development projects are initiated.

The Natural Resources Conservation Service has also classified certain soils in Jackson County as being *"prime farmland"* soils in that they are, under proper management, particularly well suited to food, feed, forage, fiber, and oilseed crops and are capable of producing sustained high yields (see Figure D-5). Approximately one quarter of Waterloo Township has been classified as "prime farmland." The "prime farmland" areas reflect a somewhat marbled pattern with the highest concentrations (largest contiguous areas) located in the township's northwest corner.