APPENDIX E
GROUNDWATER ASSESSMENT

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Commerce Township, Oakland County, Michigan

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1.0 HYDROGEOLOGICAL CHARACTERISTICS

1.1 Regional Aquifers

Geologic characteristics and groundwater resources of Oakland County have been the subject of studies dating from 1906. A survey of groundwater resources was conducted as a doctoral dissertation in 1953 by Andrew Mozola. This work was published by the Geological Survey Division of the Michigan Department of Conservation in 1954 and has been consistently referenced by subsequent researchers.

The majority of Commerce Township lies within an extensive glacial outwash plain trending southwest to northeast through Oakland County. The outwash plain lies between two moraine systems (Fort Wayne and Defiance moraines). The outwash deposits form unconfined aquifers throughout the extent of the outwash plain and form confined aquifers where outwash deposits are buried by finer-textured glacial tills and glacial lakebed clays. In many areas, unconfined aquifers are present in surficial sands overlying deeper confined aquifers.

Surface drainage patterns within the outwash plains are described in reports as poorly developed, due to the granular soils and the relatively recent age of the glacial deposits. Some surface water bodies have no distinct surface water inlets or outlets and are expressions of the groundwater surface. Inflow and outflow are through groundwater flow or flow into or out of adjoining wetlands.

The outwash plain is identified by Mozola (1954) as a recharge area for aquifers in central and eastern Oakland County. Precipitation and infiltration, either directly onto permeable soils or by runoff and infiltration from streams and wetlands, recharges surficial aquifers in the outwash plains and recharges buried, confined aquifers underlying the moraines and glacial lake plains to the east of Commerce Township. Subsequent researchers, in preparing environmental assessments for proposed highway alignments, have described the area between Pontiac Trail and M–59 (Highland Road) in Highland, White Lake, and Waterford Townships as a recharge area for aquifers in Oakland County[31]. Each of these sources describes extensive areas of Commerce, Highland, White Lake, and Waterford Townships, covering tens of square miles, as a regional groundwater recharge area.

1.2 Aquifers in Section 24

Surficial deposits in Section 24 of Commerce Township are predominantly outwash, covering the Links of Pinewood and Eldorado golf courses and residential and light industrial areas to the north and west. The southeast corner and eastern edge of the section are part of a till plain with more clay-rich soils.

Aquifers within Section 24 were evaluated by a review of well logs obtained from the Michigan Department of Environmental Quality (MDEQ) on-line well log archive. A total of 89 well logs were available for Section 24, largely concentrated in residential areas in the northwest corner and west side of the section. Recorded well depths range from 46 to 241 feet, with an average depth of 95 feet. Typical well logs indicated a surficial sand layer ranging from 4 feet up to 100

[31] FHWA and MDOT, *Draft Corridor/Alignment Environmental Section 4f Statement for the Proposed Location of the M-275 Freeway, from I-96 North to M–5M–5M–59*, March 1, 1976, and *Draft Supplemental Environmental Impact Statement for M-275, I-96 to I-75, Oakland County*, June 30, 1983.

feet in thickness, with an average thickness of 24 feet. The surficial sand is underlain by a clay layer, or interbedded clay and sand layers, with net clay thicknesses ranging from 3 feet to 208 feet, with an average thickness of 45 feet. Screened intervals of the wells are within sand and gravel outwash aquifers underlying the clay layers. The majority of well logs indicate the aquifer or aquifers are confined, as indicated by static water levels well above the base of a clay layer.

Only two well logs recorded continuous sand and gravel with no clay layers reported – these observations may be due to the relatively shallow depth of one of the wells and the drilling methods used, rather than an indication of absence of the clay layer.

It appears that, from the surface water elevations of ponds and wetlands along the course of Glengary Creek, and recorded depths on well logs, the surficial sand layer forms an unconfined aquifer throughout most of Section 24. Groundwater flow in this aquifer is likely to the west toward Wolverine Lake and Commerce Lake, as indicated by surface water elevations. Based on well logs, topography, and local surface water bodies, the localized, shallow groundwater flow system in this aquifer extends to the east into Section 19 of West Bloomfield Township, north to the vicinity of Richardson Road (approximately ½ mile to the north of Section 24, south to the vicinity of Pontiac Trail, and west to Wolverine Lake.

Surface drainage within Section 24 is toward the drainage course of Glengary Creek, which is shown on the Walled Lake USGS 7.5-minute topographic quadrangle map flowing from Pleasant Lake in Section 20 of West Bloomfield Township, through wetlands in Section 19 of West Bloomfield Township, then through Section 24 of Commerce Township, and eventually flows into wetlands at the east end of Wolverine Lake in Section 23 of Commerce Township. Much of the flow in Glengary Creek in Section 24 is through culverts and a series of ponds; the net flow of water along the drainage course is likely a combination of surface water and groundwater flow.

Within Section 24, recharge to the surficial unconfined aquifer is likely from precipitation and infiltration on the predominantly sandy loam soils that cover the majority of the section. Based on the relatively shallow depth of the underlying clay layer and the presence of relatively permeable sand and peat soils along the course of Glengary Creek, the localized groundwater flow system apparently consists of recharge in the northern and central portions of Section 24, general westward flow, and eventual discharge to Wolverine Lake, Commerce Lake, and/or tributaries to the Huron River. The presence of a clay layer or clay layers in water well logs throughout Section 24 indicates precipitation, snowmelt, and runoff within the section do not provide recharge to the deeper aquifers that supply local water wells.

Recharge areas for the deeper aquifers within Section 24 are not identified in the available sources. The range of surface elevations in Section 24 (928 feet to 950 feet MSL) and the surface water elevations of Commerce Lake, Wolverine Lake, and surrounding smaller lakes and wetlands (907 feet to 916 feet MSL) suggests that these lakes may serve as recharge areas for deeper aquifers within Section 24. It is possible that precipitation and runoff infiltrate into a shallow surficial aquifer within Section 24, with subsequent discharge to surface water to the west, which then recharges the deeper aquifers within Section 24. Such a system of groundwater and surface water flow, discharge, and recharge is plausible considering the complexity of surface water drainage and confined and unconfined aquifers.

2.0 WELLS / WATER SUPPLY

Water supply for Section 24 is a combination of private water wells and public supply. The subdivision in the northwest corner of the section was developed during the 1980s and residences on Jennella Drive, Green Oak Drive, and Kenicott Drive are supplied by individual water wells. Other private water wells are located in the northeast corner of the Section and along Haggerty Road. Public water mains are located along Pontiac Trail, Haggerty Road, Oakley Park Road, and Welch Road. Municipal water supplies are available to support future development.

3.0 GROUNDWATER QUALITY

The most recent study of groundwater quality in Oakland County was conducted during 1998.[32] This study included sampling and analysis of 38 wells throughout the county and analysis of related databases. Three of the wells noted in this study are located in or near the Village of Wolverine Lake to the west of Section 24. The results of this study indicated groundwater quality parameters within Commerce Township are within acceptable ranges. Concentrations of arsenic, chloride, and nitrate were mapped on a countywide basis with color-codes indicating ranges of these parameters for each section. The maps and specific results for groundwater samples from wells in or near Wolverine Lake indicated concentrations of arsenic, chloride, and nitrate are below maximum contaminant levels (MCLs) or secondary maximum contaminant levels (SMCLs).

4.0 EFFECTS OF DEVELOPMENT

The planned development in Section 24 is not likely to affect groundwater recharge or groundwater quality.

The planned development alternatives will create additional impervious surface through construction of the Martin Parkway, residential areas in the north-central and southwest portions of the section, and in the Lifestyle center in the southeast corner of the section. Although development can be anticipated to decrease infiltration and increase direct surface runoff in those specific areas, the planned implementation of stormwater detention and retention requirements, preservation of flood plain and wetlands along the Glengary Creek drainage course will allow infiltration within the flood plain, with no net effect on the shallow groundwater and surface water flow system. In particular, it is expected that runoff retained on the site of the various developments will afford a residence time such that groundwater infiltration and subsurface discharge to Glengary will be maintained at pre-development levels, or increased over pre-development levels.

With a continuous clay layer essentially isolating the deeper aquifers tapped for potable uses, the planned development is unlikely to affect recharge and groundwater quality of these deeper aquifers. Use of retention and detention facilities for stormwater will prevent or mitigate water quality effects on the shallow groundwater/surface water flow system along the Glengary Creek drainage course.

[32] U.S. Geological Survey, Michigan District and Oakland County Health Division, *Ground-Water Quality Atlas of Oakland County, Michigan,* 2000.

5.0 REFERENCES

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