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SEWRPC Staff Memorandum

EVALUATION OF PROPOSED STORMWATER QUANTITY MANAGEMENT FOR THE PIKE RIVER WATERSHED PORTION OF THE PROPOSED FOXCONN DEVELOPMENT IN THE VILLAGE OF MOUNT PLEASANT

April 10, 2019

INTRODUCTION

In a meeting with the Southeastern Wisconsin Regional Planning Commission (SEWRPC) staff on February 22, 2018, Kenosha County Executive Jim Kreuser requested that SEWRPC prepare a floodplain evaluation for that portion of the proposed Village of Mount Pleasant Electronic & Information Technology Manufacturing (EITM) Zone and associated roadway expansion that is located within the Pike River watershed (Map 1). That zone includes the proposed Foxconn manufacturing campus and possible future supporting businesses. The analysis was requested to assess the impact of the development on the flood discharges and stages along receiving streams in the watershed, taking into account both the increased runoff rates and volumes from the development as well as local stormwater management requirements to limit the impact of those increased rates and volumes.

Subsequent to that meeting, SEWRPC staff prepared a scope for services for the requested study.[1] The following tasks were performed under this study as identified in the scope of services:

- Modify the regulatory Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) hydrologic model to reflect the increased level of development.

- Revise the hydrologic model to reflect stormwater controls consistent with the Village of Mount Pleasant ordinance requirements for areas outside of the Des Plaines River watershed.

- Run the revised hydrologic model to compute flow values for the 50- through 1-percent-annual probability flood events.

- Compare the post-development 50-percent and 1-percent flows to the FEMA FIS regulatory flows.

[1] SEWRPC Staff Memorandum – *Scope of Work for Floodplain Evaluation of the Foxconn Development in Mount Pleasant,* February 28, 2018, revised March 15, 2018.

DESCRIPTION OF STUDY AREA

As shown on Map 1, the EITM zone consists of a tax incremental district (TID) with four distinct areas indicated for development purposes. The area within the Pike River watershed includes the eastern portions of TID Areas I, II, and North Area, as well as all of TID Area III. The first three areas lie between the watershed divide and CTH H, bounded by CTH KR on the south and Louis Sorenson Road on the north. TID Area III is bounded by CTH H on the west, 90th Street on the east, CTH KR on the south, and Braun Road on the north.

Within the Pike River watershed, the study area includes the headwater areas of four tributaries to either the Pike River or the South Branch Pike River (Pike Creek). These include Chicory Creek, Lamparek Ditch, and Waxdale Creek, located in Racine County, and School Tributary which is located in Kenosha County. Regulatory floodplains based on detailed studies have been established for all four of these tributaries, although only the Lamparek Ditch regulatory floodplain extends into the EITM zone. Within the EITM zone the Lamparek Ditch floodplain is mostly contained within the stream channel.

The initial phase of the Foxconn development is located in the eastern two-thirds TID Area I, extending from the Kilbourn Road Ditch (Des Plaines River watershed) to CTH H.

As part of the EITM zone development, expansion of surrounding roadways is proposed. The impact of that roadway expansion was also considered for this study. Roadway widening and/or reconstruction will be carried out by the Wisconsin Department of Transportation (WisDOT) along portions of STH 11, CTH H, CTH KR, and Braun Road. A future widening of CTH KR east of the WisDOT work is also proposed by Kenosha and Racine Counties.

HYDROLOGIC ANALYSIS

Model Description

Regulatory FIS hydrologic models for streams in the Pike River watershed were taken from multiple sources and are not consistent with one another. For the streams evaluated for this study the regulatory models and their sources are as follows:

- Pike River in Racine County: U.S. Environmental Protection Agency (U.S. EPA) Hydrologic Simulation Program-Fortran (HSPF) continuous simulation model submitted for a 2009 Letter of Map Revision (LOMR) application to FEMA and reflecting Phases 1-3 of the Village of Mount Pleasant Pike River restoration project. The model was originally developed by SEWRPC staff in 2000 and amended for the LOMR by consultants working for the Village. Both the input files and software to run the model were available for use in this study.

- Pike River in Kenosha County: U.S. EPA HSPF model developed by SEWRPC staff for a 1996 amendment to the SEWRPC Planning Report No. 35, *A Comprehensive Plan for the Pike River Watershed*. Both the input files and software to run the model were available for use in this study.

- Chicory Creek, Lamparek Ditch, and Waxdale Creek: Hydrocomp Simulation Program (HSP) continuous simulation model developed by SEWRPC staff for SEWRPC Planning Report No. 35, published in 1983. While the model input files were available, the HSP software needed to run the model was not.

- School Tributary: U.S. Soil Conservation Service (SCS) (now Natural Resource Conservation Service (NRCS)) TR-20 design storm model developed by the SCS for a 1978 flood hazard study for the Pike River watershed. The input files for this model were not available. Also, the TR-20 software has

undergone numerous changes since 1978, thus the ability to replicate the original model results would be unlikely.

For this study, the HSPF model from the 2009 Village of Mount Pleasant LOMR submittal was used. That model represents the most up-to-date representation of the watershed available. It reflects SEWRPC planned year 2020 land use conditions in the watershed along with Phases 1-3 of the Pike River restoration project in the Village of Mount Pleasant. The LOMR model is designed to simulate continuous streamflow using recorded precipitation for the period of 1940-1998. Simulated annual peak discharge values are obtained from the model and fitted to a Log Pearson Type III probability distribution to derive flow-probability relationships at various stream locations. The peak flood discharge values are obtained from these probability relationships. Input files for the model were obtained from the Wisconsin Department of Natural Resources.

Subsequent to development of the 2009 LOMR HSPF model the Village of Mount Pleasant completed the remaining phases of the Pike River restoration project. In 2014 the Village submitted a request to FEMA for a Conditional Letter of Map Revision (CLOMR) for the remaining phases 4-9 of that project. That CLOMR submittal included a revised U.S. Army Corps of Engineers HEC-RAS hydraulic model that reflected all phases of the river restoration project. The CLOMR hydraulic model also included revised flood discharges reflecting those additional phases. Efforts to obtain the updated HSPF model used to develop those revised discharges for use in this study were unsuccessful. An attempt was made by SEWRPC staff to revise the 2009 LOMR HSPF model using information from the CLOMR HEC-RAS model, however, the resulting discharges did not match those from the CLOMR submittal. Therefore, a revised HSPF model that reflects all phases of the Pike River restoration project was not used for this analysis. Since the purpose of this study was to test the relative change in flood discharge due to the proposed EITM development and roadway expansion, use of the 2009 LOMR model was deemed adequate.

Land Use

As noted above, the hydrologic model used for this analysis reflects SEWRPC planned year 2020 land use conditions (Map 2). That land use plan included a much lower degree of development within the Mount Pleasant EITM zone than what is currently envisioned. For this analysis, the land use assumptions were revised to reflect an expanded degree of industrial development, along with the proposed expansion of STH 11, CTH H, CTH KR and Braun Road. Consistent with the Mount Pleasant Year 2035 Master Plan,[2] it was assumed that current natural areas, along with the regulatory floodplain, would not be developed. The revised planned land use assumed for this analysis is depicted on Map 3.

Within the HSPF model, land use is represented as a combination of pervious and impervious land covers. The Pike River watershed model utilizes five pervious land cover categories and one impervious. The pervious categories consist of lawn, open space, agricultural, forest, and wetland. For the EITM zone, industrial land was assumed to consist of 80 percent impervious and 20 lawn. These percentages are consistent with the assumptions used by the SIGMA Group, Inc. in the design of stormwater detention basins for the initial phase of the Foxconn development. Proposed roadway expansion was reflected by increasing the percentage of impervious area based on the increase in pavement relative to the existing roadways. Proposed roadway cross sections obtained from the WisDOT were used for this purpose. For the future expansion of CTH KR by Kenosha and Racine Counties east of Old Green Bay Road, a pavement expansion to three lanes was assumed per County staff comments at a May 30, 2018, interagency staff meeting.

[2] *As amended November 13, 2017.*

Stormwater Controls

With the exception of land located within the Des Plaines River watershed, the Village of Mount Pleasant stormwater ordinance requires that for new development, measures shall be employed to maintain the pre-development peak runoff rates for the 1-year, 24-hour and 2-year, 24-hour storm events, and to reduce the post-construction 100-year, 24-hour peak runoff rate to the 10-year, 24-hour pre-development runoff rate, or to the maximum extent practicable.

Although the 2009 LOMR HSPF model used for this study reflects planned future land use conditions in the watershed, it does not reflect application of stormwater controls for future development. Since the goal of this analysis is to determine whether or not the Mount Pleasant stormwater controls are adequate to address increased runoff from the Foxconn development, the model was revised to reflect such controls, but only within the EITM zone as well as where specifically proposed by WisDOT as part of the planned roadway expansion. As seen from comparison of Maps 2 and 3, there is now a significant increase in the level of development proposed in the EITM zone relative to that assumed for the 2009 LOMR model.

For the initial phase of the Foxconn development within TID Area I, information related to proposed stormwater detention basins designed to meet the Village's ordinance was obtained from the SIGMA Group, Inc. on April 20, 2018. Proposed stormwater basins B and C for that phase of development will discharge to Lamparek Ditch, while proposed basin D will discharge to School Tributary. Along with runoff from the proposed Foxconn development, basins B, C, and D are also designed to contain runoff from the proposed adjacent roadway expansion along Braun Road, CTH H, and CTH KR, respectively.

In addition to the stormwater basins described above for the initial phase of the Foxconn development, design information was also provided by Kapur & Associates, Inc. (WisDOT consultants) for five stormwater detention basins proposed along the CTH KR corridor between CTH H and STH 31. These basins are designed to address increased runoff from the planned expansion of that roadway.

For the remaining EITM area development, conceptual stormwater controls were developed by SEWRPC staff. In each HSPF model subbasin that extends into the EITM zone, a stage-storage-discharge relationship representing a hypothetical stormwater detention basin was developed to address runoff from future development. Detention basins were sized using the requirements specified in the Mount Pleasant stormwater ordinance. A 24-hour duration design storm based on the NOAA Atlas 14 rainfall amounts and U.S. Natural Resource Conservation Service MSE3 storm distribution was applied in the HSPF model to estimate initial storage volumes for the basins. The basins were then simulated in the HSPF design storm model to check that they met the target discharge rates. Volumes were adjusted as needed until the outfall discharge targets were met.

The 2009 LOMR HSPF model was revised by incorporating the Foxconn stormwater basins designed by Sigma Group, the CTH KR basins designed by Kapur & Associates, and the hypothetical basins determined by SEWRPC staff. Contributing drainage area for each model subbasin was adjusted to account for the area contributing to each of these stormwater basins. Outflow from each of the stormwater basins was directed to the appropriate stream reach in the HSPF model.

Model Simulation and Results

Once the above-noted changes were made, the HSPF model was run for the entire simulation period from 1940-1998. Simulated annual peak discharges were then fitted to a Log Pearson Type III distribution using the U.S. Army Corps of Engineers HEC-FFA software, as was done for the regulatory LOMR model. The resulting flood flow estimates were then compared to those from the regulatory model.

Table 1 lists by stream the pre- and post-EITM development flood flows for the 50-percent and 1-percent-annual probability events. The results show that when controls based on the Mount Pleasant stormwater ordinance requirements are employed, flood discharges generally would be maintained and in some cases could potentially be reduced.

Along the Pike River main stem, flows for the 50-percent flood event exhibit a slight increase, while flows for the 1-percent event exhibit a slight decrease for the EITM development. The projected changes can be considered negligible, being in the range of one to two percent. Flows at the outlet of the South Branch Pike River also exhibit a negligible decrease of two to three percent. More significant decreases in flood flows are projected along Chicory Creek, Lamparek Ditch, and School Tributary.

The only stream reach exhibiting a potentially significant increase in flow is at the upstream end of Waxdale Creek in the Village of Sturtevant, where the 50- and 1-percent flood discharges may increase by as much as 19 and 21 percent, respectively. This modeled flow increase is due to the presence of an existing stormwater detention basin located at the upstream side of the Canadian Pacific Railway crossing in the Renaissance Industrial Park. That basin detains runoff from land within the industrial park as well as from Waxdale Creek. A portion of the TID North Area is tributary to Waxdale Creek and thus to this stormwater basin. While the hypothetical stormwater basin applied in the HSPF model for TID Area North limits the peak discharge from future development, it does not reduce the expected increase in actual runoff volume. As such, the model results show that this increased runoff volume will eventually move downstream where it will contribute to the amount of water detained in the stormwater pond within the Renaissance Industrial Park. That volume increase translates to an increase in discharge from the Renaissance basin. As shown in Table 1, the increase in flood discharge along Waxdale Creek is quickly assimilated as one moves downstream, with no increase anticipated downstream of the confluence with the Unnamed Tributary to Waxdale Creek, about 0.4 mile downstream of the Canadian Pacific Railway.

CONCLUSION

The analysis described herein demonstrates that, with one small exception, application of the stormwater control requirements set forth in the Village of Mount Pleasant stormwater ordinance is sufficient to address increased runoff rates and volumes from development of that portion of the EITM zone within the Pike River watershed with no significant increase anticipated in downstream flood flows. The exception is along the upstream end of Waxdale Creek, where increased runoff from the EITM development would accumulate in an existing downstream detention basin in the Renaissance Industrial Park, which in turn would increase the peak outflow from that basin. While the impact on flood discharge is limited to a relatively short reach of Waxdale Creek, consideration should be given to employing measures with the EITM development that would address not only increases in peak discharge, but also increases in runoff volume. While not intended to address extreme storm events that result in serious flooding, the Mount Pleasant stormwater ordinance does include requirements for infiltration of runoff from new development where practicable.

For the purpose of this analysis it was not necessary to compute new flood profiles for Lamparek Ditch as called out in the scope of services since no increase in flood flow and accompanying flood stage is expected along that stream.

While the results shown in Table 1 indicate potential decreases relative to the pre-development flows, it must be remembered that, with the exception of the initial phase of the Foxconn development and expansion of surrounding roadways, these flows reflect assumed future conditions that may differ from the final design and layout of the remaining development within the EITM zone. Therefore, it is recommended that the current regulatory flood discharges and associated water surface elevations continue to be used for planning and design purposes.

Pike River Watershed Floodplain Analysis-Mt Pleasant Foxconn Development (00246917-1).DOCX
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3/11/19

Table 1
Flood Discharge[3] Comparison: Full EITM Development with Stormwater Controls (Mount Pleasant Stormwater Ordinance Requirements)

Pike River						
	Flood Event (percent probability)					
	50 Percent			1 Percent		
Location	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference
Upstream of confluence with Waxdale Creek	567	567	0	1220	1220	0
Upstream of confluence with Chicory Creek	1020	1020	0	1930	1920	-1
Upstream of confluence with Lamparek Ditch	1020	1020	0	2040	2020	-1
Upstream of confluence with South Branch of Pike River	921	929	1	1950	1910	-2
Downstream end of Petrifying Springs Park	1220	1230	1	2620	2560	-2
At Wood Road	1210	1220	1	2570	2520	-2
0.5 mile upstream of CTH Y	1210	1220	1	2560	2520	-2
0.3 mile downstream of CTH Y	1200	1210	1	2530	2480	-2
Upstream of confluence with Sorenson Creek	1200	1210	1	2510	2470	-2
0.3 mile upstream of CTH E	1260	1270	1	2590	2540	-2
Upstream of confluence with Kenosha Branch	1250	1270	2	2580	2530	-2
0.15 mile upstream of STH 32	1300	1310	1	2640	2600	-2
0.8 mile upstream of mouth	1310	1320	1	2620	2590	-1
At Mouth	1320	1330	1	2610	2600	0

South Branch Pike River						
	Flood Event (percent probability)					
	50 Percent			1 Percent		
Location	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference
Upstream of confluence with School Tributary	422	422	0	1270	1270	0
At Mouth	500	485	-3	1370	1340	-2

[3] *Discharge units are cubic feet per second.*

Waxdale Creek						
	Flood Event (percent probability)					
	50 Percent			1 Percent		
Location	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference
At Canadian Pacific Railway	16	19	19	42	51	21
Upstream of confluence with Unnamed Tributary to Waxdale Creek	21	23	10	48	53	10
0.3 mile downstream of 90th Street (downstream of Unnamed Tributary to Waxdale Creek)	90	89	-1	213	205	-4
At railway spur culvert at south end of S.C. Johnson property	132	132	0	156	156	0
At Mouth	214	214	0	352	352	0

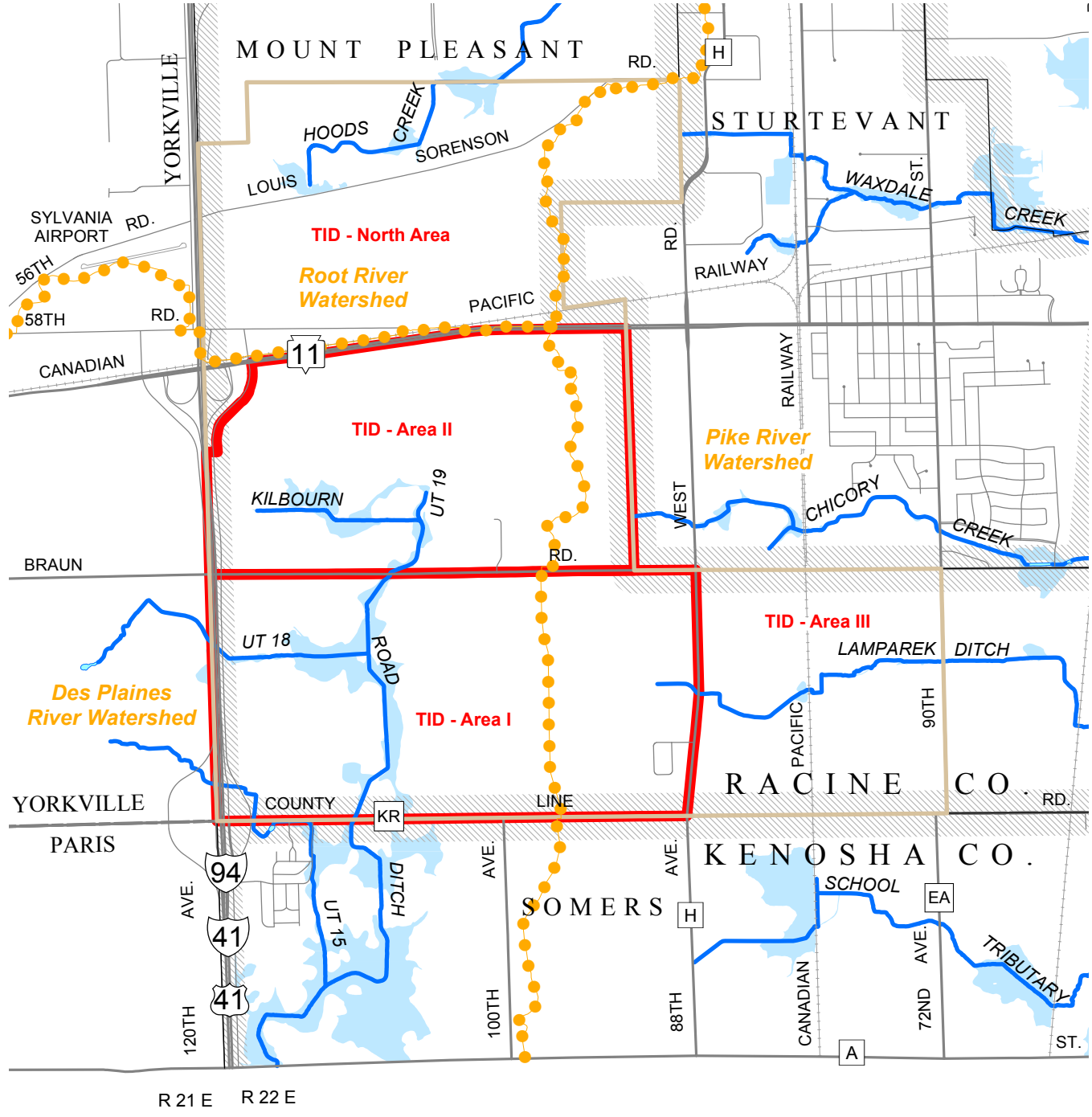
Chicory Creek						
	Flood Event (percent probability)					
	50 Percent			1 Percent		
Location	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference
At 90th Street	38	33	-13	159	105	-34
At Mouth	33	35	6	103	84	-18

Lamparek Ditch						
	Flood Event (percent probability)					
	50 Percent			1 Percent		
Location	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference
0.2 mile upstream of 90th Street	56	47	-16	270	137	-49
At Union Pacific Railway	64	60	-6	317	158	-50
At Mouth	65	65	0	327	166	-49

School Tributary						
	Flood Event (percent probability)					
	50 Percent			1 Percent		
Location	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference	2009 LOMR Model	EITM with Stormwater Controls	Percent Difference
0.1 mile upstream of CTH EA	64	52	-19	334	257	-23
At Mouth	114	87	-24	536	377	-30

Source: SEWRPC

Map 1
Tax Incremental District for the Village of Mount Pleasant



FOXCONN PROJECT AREA BOUNDARY

TAX INCREMENTAL DISTRICT BOUNDARY

FEMA 100-YEAR FLOODPLAIN BOUNDARY

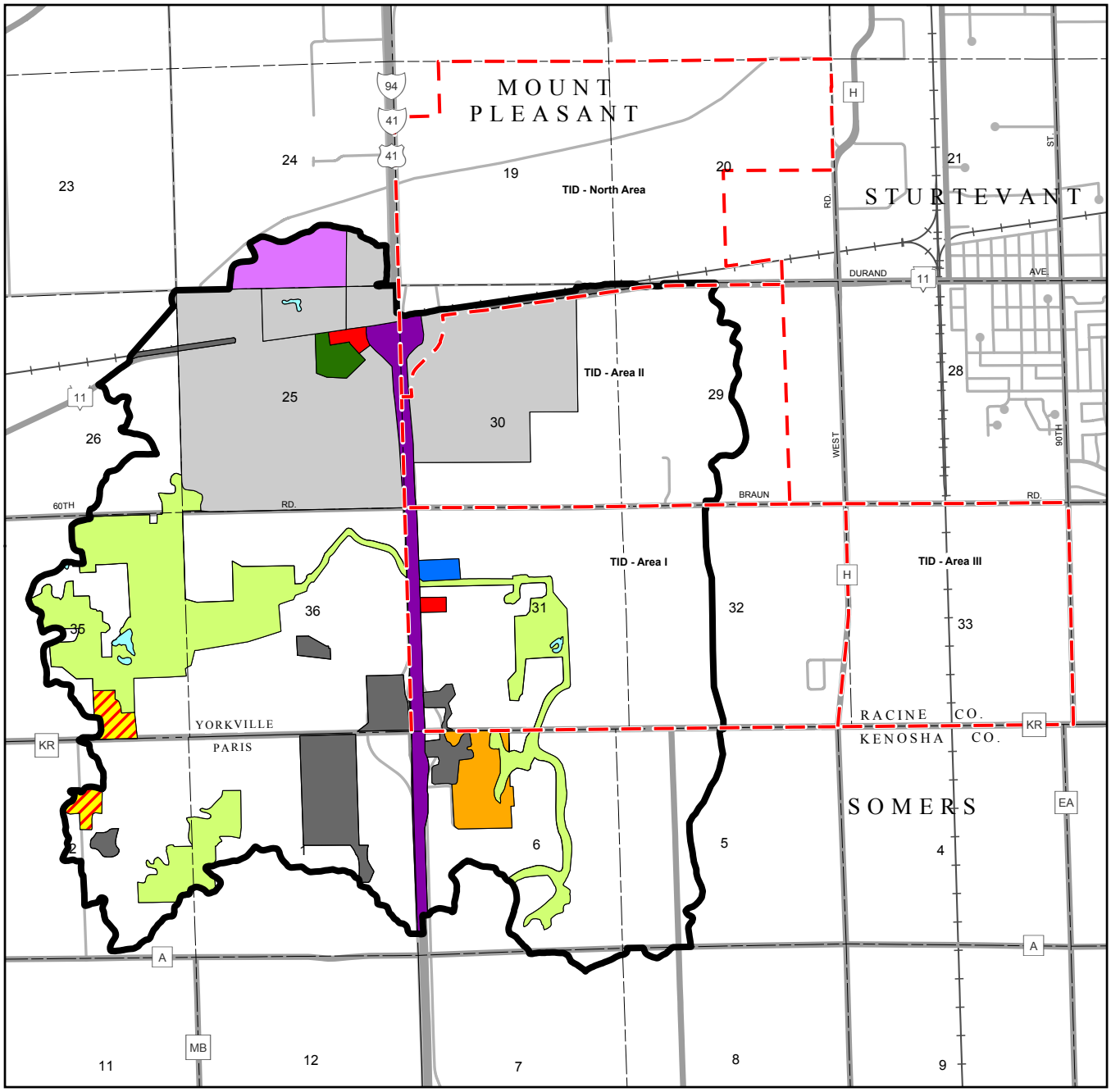
WATERSHED BOUNDARY

N

0 0.25 0.5 Miles

Source: SEWRPC

Map 2
SEWRPC Buildout Land Use for the Kilbourn Road Ditch Subwatershed - Des Plaines River Watershed Plan



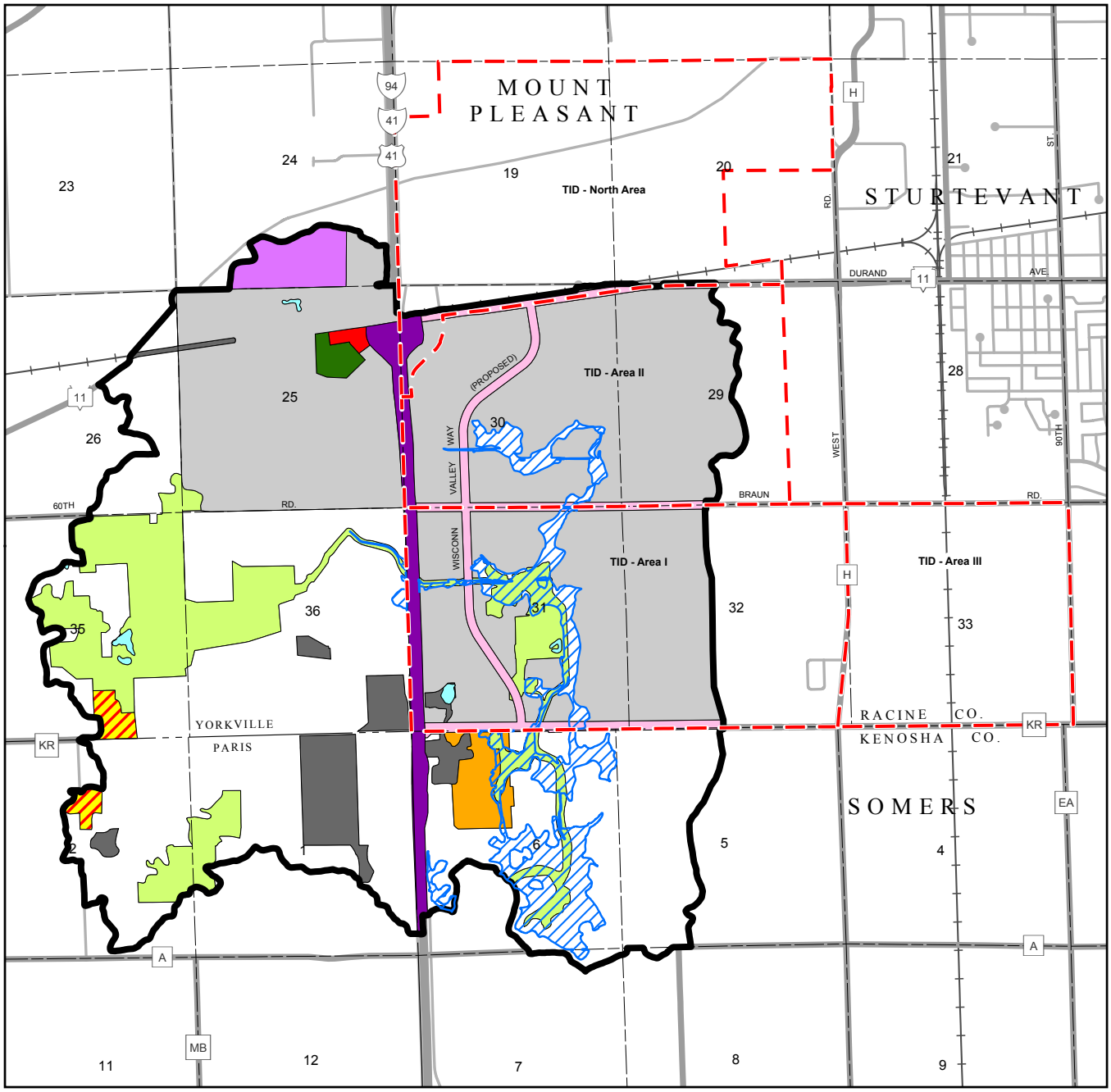
- LOW DENSITY RESIDENTIAL
- MEDIUM DENSITY RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- FREEWAY
- OTHER TRANSPORTATION, COMMUNICATION, AND UTILITIES
- GOVERNMENTAL AND INSTITUTIONAL
- PARK AND RECREATION
- SECONDARY ENVIRONMENTAL CORRIDOR
- ISOLATED NATURAL RESOURCE AREA
- AGRICULTURAL, RURAL RESIDENTIAL, AND OPEN LANDS
- SURFACE WATER

N

0 1 2 3 Miles

Source: SEWRPC

Map 3
Revised SEWRPC Buildout Land Use for the Kilbourn Road Ditch Subwatershed - Mount Pleasant EITM Floodplain Evaluation



- LOW DENSITY RESIDENTIAL
- MEDIUM DENSITY RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- FREEWAY
- ARTERIAL STREETS AND HIGHWAYS
- OTHER TRANSPORTATION, COMMUNICATION, AND UTILITIES
- PARK AND RECREATION
- SECONDARY ENVIRONMENTAL CORRIDOR
- ISOLATED NATURAL RESOURCE AREA
- AGRICULTURAL, RURAL RESIDENTIAL, AND OPEN LANDS
- SURFACE WATER
- FEMA 100-YEAR FLOODPLAINS

N

0 1 2 3 Miles

Source: SEWRPC