SECTION 17 OF MICHIGAN SAFE DRINKING WATER ACT

APPLICATION INFORMATION PACKAGE

Production Well PW-101
White Pine Springs Site
Osceola Township, Osceola County, Michigan

Submitted To: **NESTLÉ WATERS NORTH AMERICA INC.**
19275 8 Mile Road
Stanwood, MI 49346

Submitted By: Golder Associates Inc.
15851 South US 27, Suite 50
Lansing, MI 48906 USA

July 2016

Project No. 1541147

A world of capabilities delivered locally

Golder Associates

EXECUTIVE SUMMARY

Nestle Waters North America Inc. (NWNA) is requesting that the Michigan Department of Environmental Quality (MDEQ) grant approval pursuant to Section 17 of the Michigan Safe Drinking Water Act (SDWA) to increase the maximum permitted withdrawal capacity of production well PW-101 at the White Pine Springs site in Osceola County from 150 gallons per minute (GPM) to 400 GPM.

Production well PW-101 is a Type IIa public water supply well used by NWNA as a water source for spring water bottled at its Ice Mountain facility in Stanwood, Michigan. The well was constructed in 2001, and later permitted as a Type IIa public water supply well with a baseline withdrawal capacity of 150 GPM.

NWNA has been measuring water elevations and stream flows near the White Pine Springs site for up to 16 years, beginning at the initial phases of project development in 2000. Wetland and aquatic community surveys and assessments have also been regularly conducted over the term of the project. The long-term monitoring (LTM) program provides a significant and comprehensive database of baseline hydrologic and ecologic conditions.

A 100 GPM increase in withdrawal capacity of well PW-101 was registered through use of the MDEQ Water Withdrawal Assessment Tool (WWAT) on April 16, 2015. On January 5, 2016, after conducting a site-specific review, MDEQ approved and registered an additional increased withdrawal capacity of 150 GPM from production well PW-101, for a total withdrawal capacity of 400 GPM. MDEQ determined in its site specific review pursuant to MCL 324.32706c that there will be no individual or cumulative adverse resource impacts resulting from the proposed withdrawal. However, the combined increases in withdrawal capacity approved in 2015 (100 GPM) and 2016 (150 GPM) exceed the threshold of 200,000 gallons per day (138 GPM) over the original baseline capacity of the well, requiring approval from MDEQ under Section 17.

This application information package provides data and documentation evaluating the environmental, hydrologic, and hydrogeologic conditions that exist at the site, and the predicted effects of the increased withdrawal. The predicted effects of a 400 GPM steady-state withdrawal are presented in this report with respect to groundwater supplies for nearby water users, the base flow of streams, and ecological habitats of nearby wetlands and aquatic communities.

The proposed withdrawal meets the applicable standard of Section 32723 of the Natural Resources and Environmental Protection Act. NWNA respectfully requests that approval be issued allowing the withdrawal capacity of production well PW-101 to be increased to 400 GPM.

Table of Contents

List of Figures

List of Attachments

1.0 SUMMARY OF THIS APPLICATION

Production well PW-101 (WSSN 20166-67) is a Type IIa public water supply well constructed in 2001 and later permitted as a Type IIa public water supply well with a baseline capacity of 150 GPM. The well is used by NWNA as a source of spring water bottled at its Ice Mountain facility in Stanwood, Michigan.

On April 16, 2015 NWNA registered a 100 GPM increase in withdrawal capacity through the WWAT. On December 4, 2015, NWNA requested a site-specific review for an additional 150 GPM increase which was approved on January 5, 2016. MDEQ determined in its site specific review pursuant to MCL 324.32706c that there will be no individual or cumulative adverse resource impacts resulting from the proposed withdrawal.

The combined registrations represent an increase of 250 GPM over the well's original baseline capacity of 150 GPM. The increase exceeds the threshold of 200,000 gallons per day (approximately 138 GPM), above which withdrawals for bottled water production must also seek approval under Section 17 of the SDWA.

This report provides data and documentation evaluating the environmental, hydrological, and hydrogeological conditions that exist, and the predicted effects of the increased withdrawal, which provide a reasonable basis for the determination to be made under Section 17 of the SDWA. This Application Information Package is organized as follows:

Section 2: Description of the proposed increased withdrawal

Section 3: Description of the existing hydrogeological, hydrological, and environmental conditions

Section 4: Predicted effects of the proposed increased withdrawal

Section 5: Documentation that the proposed increased withdrawal meets the applicable standard provided in Section 32723 of the Natural Resources and Environmental Protection Act (NREPA)

Section 6: Commitment to undertake activities, if needed, to address hydrologic impacts

Section 7: Conclusion

2.0 DESCRIPTION OF THE PROPOSED WITHDRAWAL

Production well PW-101 is located on an NWNA-owned property (the "White Pine Springs" property) in Osceola Township, Osceola County, Michigan (Figure 2.1). The well was constructed in 2001, and is permitted as a Type IIa public water supply well with a baseline withdrawal capacity of 150 GPM (WSSN 20166-67, Attachment A-1). On April 16, 2015, a 100 GPM increase in the withdrawal capacity of PW-101 was registered (Registration ID# 3908-20154-32; Attachment A-2). The well was approved for a rate of 250 GPM by the Central Michigan District Health Department (CMDHD) on June 29, 2015 (Permit No. W15-67-01; Attachment A-3). The 100 GPM increase over the original baseline capacity of 150 GPM is equivalent to an increased daily withdrawal capacity of 144,000 GPD, which did not exceed the 200,000 GPD threshold established in Section 17 of the SDWA.

On January 5, 2016, an additional 150 GPM increase in the withdrawal capacity was registered by the MDEQ after a site-specific review was conducted pursuant to MCL 324.32706c (Registration ID# 4125-201512-31; Attachment A-4). The combined registrations, which total 250 GPM above the well's original baseline capacity of 150 GPM, exceed the 200,000 GPD threshold at which an approval is required under Section 17 of the SDWA.

2.1 Location and Source of the Proposed Withdrawal

Production well PW-101 is located in the NE ¼ of the SW ¼ of the NE ¼ of Section 20, Osceola Township (T18N, R8E), Osceola County, Michigan (Figure 2.1). The survey coordinates of the well are:

- Latitude: 43.939622
- Longitude: -85.291933

The well withdraws water from a glacial sand and gravel aquifer. The well is constructed with an 87-foot long stainless steel screen; the top of the well screen is set 94 feet below grade. A stainless steel well casing extends from the top of the screen, to 1.6 feet above grade. The MDEQ Water Well Record is provided as Attachment A-5.

Production well PW-101 is located in an area of low rolling hills composed of glacial drift. The ground surface elevations around well PW-101 are approximately 1,150 feet above mean sea level (ft amsl). Topographic elevations in the study area near well PW-101 range from a high of 1,220 ft amsl north of well PW-101; to approximately 1,080 ft amsl at the springs and wetlands along Twin Creek, south of well PW-101 (Figure 2.1). The study area is generally 100 to 200 feet higher in elevation that the Muskegon River near Evart, located approximately 3 miles southeast of well PW-101.

Well PW-101 is physically located within the Chippewa Creek watershed, close to the topographic divide with the Twin Creek watershed (Figure 2.1). Both Chippewa Creek and Twin Creek are tributaries of the Muskegon River.

2.2 Location and Nature of the Proposed Use

PW-101 is used as a source of spring water for bottling. The well is connected by pipeline to a truck loading station located near US-10 in Evart. Water is transported by truck from the loading station to the Ice Mountain bottling facility in Stanwood, Michigan.

2.3 Estimated Average Monthly and Annual Volumes

The current permitted capacity of PW-101 is 250 GPM, and an additional 150 GPM withdrawal capacity has been registered with the MDEQ Water Use Division (Attachment A-4). The total maximum approved capacity being requested is 400 GPM.

The requested rate of 400 GPM equates to a monthly maximum withdrawal of 17,280,000 gallons in a 30-day month, or 210,240,000 gallons in a 365-day year.

The withdrawal will be nearly 100% consumptive. Small volumes will be returned to the Muskegon River watershed at the well site, the truck loading station in Evart, and the bottling facility in Stanwood.

2.4 Equipment to be Used for the Proposed Withdrawal

Production well PW-101 is equipped with a Grundfos model 300S500-13 submersible pump, and a Franklin 50-hp motor. This pump and motor will continue to be used if the requested increase is approved. In addition, NWNA will construct a booster pump station along the water pipeline which runs from the White Pine Springs well house to the load station located in the City of Evart. NWNA will obtain all approvals required under Michigan's Safe Drinking Water Act and local ordinances for the booster pump station at a later date.

The specific capacity of PW-101 is calculated as the ratio of well yield to water level drawdown in the production well. Calculated from the water level decline measured at the end of an 8-day, 400 GPM constant-rate pumping test in June 2001, the specific capacity of PW-101 is 31.7 gallons per minute per foot (GPM/ft).

The submersible pump installed in production well PW-101 is suspended on 66 feet of 4-inch diameter stainless steel drop pipe. The top of the submersible pump is 64.4 feet below grade, and 29.6 feet above the top of the well screen. At a pumping rate of 400 GPM, the water level will decline from approximately 38 feet to 51 feet below grade, leaving more than 13 feet of water column above the pump intake. Based on the specific capacity of the well, and accounting for natural seasonal variations in groundwater levels, well PW-101 can safely maintain a pumping rate of 400 GPM.

3.0 EVALUATION OF THE EXISTING HYDROGEOLOGICAL, HYDROLOGICAL, AND ENVIRONMENTAL CONDITIONS

Hydrogeological, hydrological, and environmental conditions in the vicinity of PW-101 have been evaluated for 16 years. The following sections summarize the baseline setting of the proposed increased withdrawal.

3.1 Description of Monitoring Program

NWNA initiated a long-term monitoring (LTM) program in July 2000 at the start of project development. Monitoring wells and shallow drive points were installed to measure and monitor groundwater levels. Stilling wells and staff gauges were installed to measure surface water levels. Gauging stations were established along Chippewa Creek, Twin Creek, and their tributary branches; and V-notch weirs were installed at representative springs to measure surface water flows. Ecological monitoring programs of stream and wetland habitats were initiated in 2003.

The hydrologic monitoring network currently consists of the following points:

- 39 monitoring wells, including ten wells instrumented with datalogging pressure transducers that record water levels once per day;
- 11 shallow groundwater drive points, including three instrumented with datalogging pressure transducers that record water levels once per day;
- 8 stilling wells to measure surface water levels, including three instrumented with datalogging pressure transducers that record water levels once per day;
- 12 staff gauges, and 2 surveyed bridge abutments, that are used to measure surface water levels in springs, wetlands, and streams;
- 3 V-notch weirs where spring flows are monitored;
- 10 gauging stations where stream flow is manually measured with an electromagnetic flow meter.

The 16-year dataset represents a valuable long-term record of natural hydrological and ecological conditions. NWNA plans to continue the LTM program.

3.2 Description of Groundwater and Aquifer Conditions

Well PW-101 draws water from a glacial sand and gravel aquifer. The characteristics of the aquifer were investigated by completing soil borings, monitoring wells, aquifer testing, and the LTM program. The following sections summarize the hydrogeologic characteristics of the aquifer.

3.2.1 Aquifer Setting

Glacial drift at the White Pine Springs site consists of Wisconsinan-age till and glaciofluvial deposits, resulting from ice lobes converging from the east (Saginaw lobe) and west (Michigan lobe). Sand and gravel represent approximately 50 to 75 percent of the glacial deposits (Westjohn and Weaver, 1998).

A total of 41 monitoring wells were drilled in the vicinity of production well PW-101 to characterize stratigraphy and groundwater conditions. Two of the 41 wells were artesian relative to the ground surface upon completion, and have since been abandoned (MW-4i and MW-109i). The locations of the monitoring wells are provided on Figures 3.1a and 3.1b. Boring logs and well construction logs are provided in Attachment B.

Stratigraphic cross-sections illustrating characteristics of the glacial deposits near production well PW-101 are provided as Figures 3.2, 3.3, and 3.4. Generally, the uppermost 200 feet of the glacial sequence is dominated by a massive sand and gravel deposit, with discontinuous lenses of fine-textured silt and clay. The stratigraphy is consistent with depositional mapping completed by Farrand and Bell (1982), which interprets local quaternary geology as coarse-textured glacial till (Figure 3.5).

The glacial aquifer extends laterally beyond the boundaries of the Chippewa Creek and Twin Creek watersheds. The Muskegon River bounds the southern and southeastern extent of the aquifer. The groundwater model domain defining the limits of the aquifer encompasses more than 50 square miles (Figure 1 of Attachment C).

The thickness of the glacial deposits in the vicinity of the site is estimated to be between 400 and 600 feet (Western Michigan University, 1981). The uppermost bedrock unit, the Jurassic-age “red beds” of central Lower Michigan, is not considered an aquifer and has negligible effect on the hydrology of the glacial aquifer (Westjohn and Weaver, 1998).

3.2.2 Aquifer Characteristics

Based on exploratory borings drilled on the site, the aquifer is at least 150 feet thick in the immediate vicinity of well PW-101. The depth to groundwater at well PW-101 is approximately 38 feet below grade. The bottom of the aquifer is interpreted as a hard clayey sand layer at 192 feet below grade.

Groundwater generally occurs under water-table conditions. The direction of groundwater flow generally follows surface topography, flowing in a south to southeasterly direction toward Twin Creek, Chippewa Creek, and the Muskegon River (Figure 3.6).

An extended pump test of the aquifer at rates equal to or exceeding the proposed 400 GPM withdrawal rate was completed at well PW-101 in June 2001. For the first eight days (192 hours) of testing, PW-101 was pumped at a constant rate of 400 GPM, and for the last day (24 hours) the well was pumped at 700 GPM. Water levels in production well PW-101, nearby observation wells, shallow groundwater points, and surface water stilling wells were monitored during the entire test period. Hydraulic parameters of the aquifer were calculated from the aquifer test drawdown data (Section 2 of Attachment C; SSPA 2016). The specific yield

of the aquifer was calculated to be 0.14 (unitless), and the transmissivity was calculated to be 8,100 ft^2/d (60,000 gpd/ft), a value consistent with a prolific water supply aquifer (Driscoll, 1986).

3.2.3 Aquifer Recharge and Discharge Characteristics

Annual precipitation at the nearest National Weather Service stations is 36.6 inches in Big Rapids, approximately 20 miles southwest of Evart; and 34.03 inches in Cadillac, approximately 20 miles north-northwest of Evart (based 1980-2010 Normals). The recharge rate in the groundwater model was calibrated at 14 inches per year (Section 2 of Attachment C; SSPA 2016).

Precipitation in the Twin Creek and Chippewa Creek watersheds recharges groundwater, runs off as surface water, evaporates, or is transpired by vegetation. Groundwater discharges at perennial springs along Chippewa Creek and Twin Creek, or flows south beyond the creeks to the Muskegon River.

The flow characteristics of Chippewa Creek, Twin Creek, and the Muskegon River are discussed in Section 3.3, and the effects of the proposed increase on the flow and level of these streams are discussed in Section 4.

3.2.4 Groundwater Monitoring

Natural and pumping-induced variations in groundwater levels have been monitored for up to 16 years through NWNA's long-term monitoring (LTM) program. Measurements of groundwater levels began soon after the first monitoring wells were completed in 2000. Monitoring well locations are numbered, and additionally designated with letters to classify with respect to relative depth in the groundwater system:

- "U" – denotes a very shallow, hand-installed well less than 10 feet deep
- "S" – denotes "shallow" wells installed in the spring aquifer
- "I"– denotes "intermediate" depth wells installed in the spring aquifer
- "D" – denotes "deep" wells installed in the spring aquifer
- "L" – denotes wells installed below the interpreted bottom of the spring aquifer

Additionally, shallow drive points (designed "DP-#", or "SP-#", or "Vent-#") have been installed to measure shallow groundwater levels in and near wetlands. Drive points are typically less than 10 feet deep.

Groundwater levels are currently measured in monitoring wells and shallow drive points 10 times per year. Datalogging pressure transducers record water levels daily in ten monitoring wells and three shallow groundwater drive points.

Groundwater hydrographs are provided in Attachment D:

- Monitoring well clusters MW-1i,d and MW-5i,d; and single wells MW-2i, MW-3i, MW-6i, MW-7i, MW-8i, MW-9i, MW-10i, MW-13i, MW-111d, and MW-113d monitor groundwater

levels in the spring aquifer near springs and wetlands in closest proximity to PW-101 (Attachment D-1a).

- Monitoring well clusters MW-104i,d; MW-105s,d,L, and MW-107i,d; and single wells MW-106d and MW-114i monitor groundwater levels in the direction of private residential wells (Attachment D-1b).

Groundwater levels naturally peak in early summer, in response to spring recharge, and recede to their annual minimum in winter. Over the full 16-year record, groundwater levels range approximately 4 to 5 feet in areas north of well PW-101; and between 2 to 3 feet in the area between well PW-101 and the springs. At nearly all monitoring points the lowest levels were observed in February 2004; and the highest were observed in July 2006, prior to the use of well PW-101.

3.3 Hydrologic and Ecologic Characteristics of Streams

Well PW-101 is physically located in the Chippewa Creek watershed, close to the topographic divide with the Twin Creek watershed (Figure 2.1). Both creeks are tributaries of the Muskegon River. The following sections discuss the hydrology and ecology of Chippewa Creek, Twin Creek, and the Muskegon River, summarizing data and studies completed over the last 16 years.

3.3.1 Hydrologic Characteristics

3.3.1.1 Muskegon River

The Muskegon River is the second-longest river in Michigan and the second-longest tributary of Lake Michigan. The river flows 216 miles southwest from Houghton Lake in Roscommon County, to Lake Michigan at the City of Muskegon.

The nearest gauging station on the Muskegon River to the White Pine springs property is the United States Geological Survey (USGS) Gauge #04121500 (Muskegon River at Evart, MI). The average flow of the Muskegon at Evart is 483,000 GPM for the period of record from 2000 to 2015. The index flow during the same period is approximately 225,000 GPM, with the calendar month with the lowest median flow being August.

3.3.1.2 Chippewa Creek

The westernmost perennial headwaters of Chippewa Creek are located approximately 1,700 feet southeast of well PW-101. Chippewa Creek flows generally east-southeast for approximately 2.5 miles, entering the Muskegon River just north of the City of Evart (Figure 3.7). The surface catchment area of Chippewa Creek is 3.93 square miles.

A series of low-head dams are located on Chippewa Creek southeast of well PW-101. The dams impound a series of recreational ponds, referred to as the Decker Ponds on USGS topographic maps. The total area of these ponds is approximately 16.6 acres.

The flow of Chippewa Creek and one of its tributaries has been measured by NWNA at five gauging stations (Figure 3.8). Gauging station SF-17 at the 90th Street bridge is the furthest downstream measurement location on the main channel, but is over a mile upstream of where the creek meets the Muskegon River. Gauging station SF-19 is located where an unnamed tributary flows beneath 8-Mile Road, and enters the main channel of Chippewa Creek downstream of SF-17. The combined flows measured at these two locations capture most of the flow in the Chippewa Creek watershed (Attachment D-2):

- Stream flow has been measured at SF-17 since January 2003 (114 measurements to date). The median flow is 2,058 GPM, and the index flow is 1,892 GPM.
- Stream flow has been measured at SF-19 since February 2003 (100 measurements to date). The median flow is 195 GPM, and the index flow is 170 GPM.

3.3.1.3 Twin Creek

Twin Creek is a coldwater tributary of the Muskegon River. The headwaters of Twin Creek is a series of wetlands east of Strawberry Lake, approximately 2.5 miles west-northwest of well PW-101 (Figure 3.8). Twin Creek is approximately 5.5 miles in length, and flows southeasterly to the Muskegon River near the 80th Street bridge in Evart. A significant but unnamed perennial branch of Twin Creek flows south past the western perimeter of the White Pine Springs study area. The surface catchment area of Twin Creek is 22.15 square miles.

There are two dams located on the tributary branch of Twin Creek immediately west of the White Pine Springs property. One dam is located approximately one-half mile north of 9 Mile Road and creates an impoundment with a surface area of approximately 3.8 acres. A second dam is located south of 9 Mile Road, and creates an impoundment with a surface area of approximately 4.5 acres. A third low-head dam creates a 0.6 acre impoundment downstream of the study area, on the north side of the 7 Mile Road.

The flow of Twin Creek has been measured by NWNA at several gauging locations for as much as 15 years (Figure 3.8). Gauging station SF-13 is the furthest downstream, located at the 80th Street bridge in Evart, approximately 800 feet upstream of the mouth of Twin Creek at the Muskegon River. A hydrograph illustrating the flow of Twin Creek at SF-13 is provided on Attachment D-2.

- Stream flow has been measured at SF-13 since September 2001 (130 measurements to date). The median flow at SF-13 is 3,819 GPM; and the index flow is 3,326 GPM.

3.3.2 Ecological Characteristics of Chippewa and Twin Creeks

Chippewa Creek and Twin Creek are coldwater tributaries of the Muskegon River and have similar ecological characteristics. Field surveys of stream habitats and fish communities have been conducted since 2003.

3.3.2.1 Habitat Characteristics

The stream channels of Twin Creek, Chippewa Creek, and their tributaries are typically covered by a canopy of stable and maturing vegetation communities. Typically, this consists of a forested canopy above the stream channel and vegetated stream banks; however, in areas that had previously been flooded by beaver activity, stream banks are covered with a predominance of emergent and scrub/shrub wetland vegetation.

Shade from canopy vegetation moderates water temperature, helping to maintain cool season temperatures. In addition, vegetation provides stream bank stability and serves as a source of woody debris used by fish for cover and feeding opportunities.

Pebble counts and substrate particle size data were collected in stream segments on Twin Creek. Woody debris, organic matter, and sand were the most frequently sampled substrate particles among stream segments. Although pebble counts were not conducted in stream segments on Chippewa Creek, sand and woody debris were frequently observed within these sections of Chippewa Creek.

The impounded Decker Ponds, unlike the streams, have limited canopy cover and, as a result, water temperatures are expected to fluctuate over a much larger range than the water temperatures in Twin Creek and Chippewa Creek.

General water quality characteristics in the ponds, with the exception of dissolved oxygen, are expected to be similar to those in Twin Creek and Chippewa Creek due to the relatively short residence times of water flowing through the ponds. Dissolved oxygen concentrations in the ponds are expected to be lower than those in Twin Creek and Chippewa Creek during the summer months because of the elevated temperatures of the pond water and the accumulation of decaying biological material in the ponds.

3.3.2.2 Fish and Macroinvertebrate Populations

Surveys were conducted annually from 2006 to 2013, and once every other year since 2013, to investigate and monitor aquatic communities near well PW-101. Four sample stations are located in the Twin Creek watershed, and three sample stations are located in the Chippewa Creek watershed. The surveys are typically conducted in mid-July to late-July each year. Attachment F provides additional detail regarding the methods and findings of the surveys (AEM 2016a).

Both creeks are designated by Michigan Department of Natural Resources (MDNR) as trout streams (MDNR, 2006), and the surveys confirmed that Chippewa and Twin Creeks are coldwater fisheries. Nine fish species have been observed at the Twin Creek stations, including brown trout and brook trout. Six fish species have been observed at the Chippewa Creek stations, with brown trout, creek chubs, and mottled sculpin being the most frequently observed. Fish species have remained consistent over the period of monitoring.

Fifty-seven different taxa of macroinvertebrates have been collected from Twin Creek, and 46 different taxa have been collected from Chippewa Creek. Amphipods and Dipterans (predominantly midges from the Family C*hironomidae*) were the most frequently collected organisms. Stoneflies (P*lecoptera*) and mayflies (E*phemeroptera*) were more frequently sampled within Twin Creek, and Dipterans were more frequently sampled in Chippewa Creek. The greatest diversity of macroinvertebrates collected from Twin Creek and Chippewa Creek was predominantly observed from the Orders of Diptera, Ephemeroptera, and Trichoptera.

Threatened and endangered aquatic species were also evaluated at the seven sample collection locations (Attachment G). No Michigan Natural Feature Inventory (MNFI) listed fish or invertebrate species have been observed in either Twin Creek or Chippewa Creek (Attachment G, AEM 2016b).

3.4 Hydrologic and Ecologic Characteristics of Wetlands

Wetlands in the vicinity of well PW-101 were identified and designated using a combination of National Wetland Inventory (NWI) mapping; soil surveys; aerial photographs; and field verification (ECT 2016). The wetland study area included NWNA-owned properties, and adjacent properties for which access had been granted in Sections 17, 20, and 21 of Osceola Township. Wetlands identified in the survey are shown on Figure 3.9a. Eight of these wetlands are connected to the spring aquifer as described below and discussed in detail in Attachment E (ECT 2016). The other wetlands are perched above the regional aquifer.

3.4.1 Hydrologic Characteristics of Water-Table Wetlands

3.4.1.1 Chippewa Creek Wetlands

Wetlands A, CC, FF, OO, and PP in the Chippewa Creek watershed are inferred to be connected to the water table (Figures 3.9a and 3.9b).

Wetland A: Wetland A is associated with the westernmost headwaters of Chippewa Creek, approximately 2,000 feet southeast of well PW-101 (Figure 3.9b). The wetland consists of the westernmost Decker Pond, located west of 100th Avenue, and is rimmed with springs and wetland vegetation, particularly on its western and northern perimeters. Two spring-fed, perennial tributaries flow into and through the wetland from the west. Flow in the perennial tributaries, and groundwater and surface water levels in the wetland, have been monitored through the LTM program since 2001.

Wetland CC: Wetland CC consists of springs and wetland vegetation lining the perimeter of the northernmost Decker Pond, east of 100th Avenue, approximately 2,300 feet from well PW-101 (Figure 3.9b). North of Wetland CC, groundwater vents to a ravine as a series of springs, forming a small tributary that flows south into the wetland and pond.

Wetland FF: Wetland FF is located southeast of the Decker Ponds and approximately 3,800 feet southeast of PW-101 (Figure 3.9b). Wetland FF is dependent on the levels of the impounded Decker Ponds. The

wetland has not been directly monitored as part of the LTM program, but staff gauges SG-201 and SG-202 have monitored the levels of the two Decker Ponds since 2003.

Wetlands OO and PP: Wetlands OO and PP are located east of the Decker Ponds (Figure 3.9b) and have not been directly monitored as part of the LTM program due to their distance from well PW-101 (4,700 feet and 4,300 feet, respectively).

3.4.1.2 Twin Creek Wetlands

Wetlands G, H, and R in the Twin Creek watershed are inferred to be connected to the water table (Figures 3.9a and 3.9c).

Wetland G: Wetland G is located approximately 2,000 feet southwest of PW-101. Water levels near Wetland G have been monitored since 2001. Surface water is seasonally observed, typically in early spring and declines 1.5 to 2 feet through summer and fall due to transpiration, and infiltration to shallow groundwater. The wetland may drain west into Wetland R during high water levels. The presence of muck soils indicates nearly constant saturation (ECT 2016).

Wetland H: Wetland H is located approximately 1,700 feet southwest of PW-101. Shallow groundwater levels approximately 100 feet east of Wetland H have been monitored at shallow groundwater well MW-4u since 2000. Surface water has been observed in the wetland during late winter and early spring. Surface water flow from the Wetland H has not been observed, but based on topography, Wetland H may occasionally drain toward Wetland G.

Wetland R: Wetland R is the extensive wetland complex located along both sides of both the main stem of Twin Creek, and the unnamed tributary of Twin Creek that crosses 9-Mile Road west of well PW-101 (Figure 3.9a and 9c). The portion of Wetland R between 8-Mile and 9-Mile Roads (Section 20, Osceola Township) is estimated to be at least 150 acres. The wetland is characterized by numerous areas of groundwater discharge, with several groups of springs venting from the spring aquifer. Most data collection activities have focused on the relatively small portion of Wetland R approximately 1,700 feet directly south of PW-101, where groundwater springs nearest to PW-101 are located.

3.4.2 Ecological Characteristics of Wetlands

Ecological habitat assessments of wetlands in the Chippewa Creek and Twin Creek watersheds have been conducted regularly since 2003. The most recent ecological assessment prepared to assess the potential effects of the proposed increased withdrawal is provided as Attachment E (ECT 2016).

In support of this application, ecological assessments of the eight water table wetlands were completed (Attachment E, ECT 2016). The biologic and hydrologic characteristics of each of these wetlands are summarized as follows:

- Wetlands were classified as, or a combination of, four different wetland types: palustrine emergent wetlands (PEM); palustrine forested wetlands (PFO); palustrine open water wetlands (POW); or palustrine scrub-shrub wetlands (PSS).
- Low permeability clayey and/or organic (peat and muck) soils in the wetlands were confirmed by ECT by augering shallow soil borings (up to 36 inches deep). A confining unit was not observed in the first 36 inches below Wetland H, but boring logs from drilling well MW-4i (formerly designated MW-4d, Attachment B) indicate the presence of low-permeability sediments resulting in strong artesian conditions.
- Wetlands had standing water, soils saturated at the surface, or a combination of the two during ECT's wetland assessment in the spring of 2016.

ECT also completed a review of state and federal threatened and endangered species databases covering the areas where the wetland assessments were conducted, and identified three species with the potential to occur in the wetlands assessed based on habitat preferences. During its assessment of wetlands, ECT noted habitat and plant community types commonly associated with those three species to determine if those species could be present based solely on habitat preferences. None of the three species were observed by ECT during its assessment of wetlands inferred to be connected to the aquifer (Attachment E, ECT 2016), but ECT did not conduct species-specific searches. Suitable habitat was not present for one of the species (short-eared owl).

3.5 Existing Nearby Uses of Hydrologically Connected Waters

Chippewa Creek and Twin Creek are coldwater streams. Neither stream is used to supply water for agricultural, municipal, or industrial applications. There are no high capacity groundwater or surface water withdrawals in either watershed, with the exception of the City of Evart water supply wells, discussed below. The primary uses of both Chippewa Creek and Twin Creek are ecological and recreational.

There are approximately 45 residential wells within a 1-mile radius of well PW-101. Approximately half of these are located on the same (northern) side of Twin Creek from PW-101 (Figure 3.10). The nearest residential wells are located approximately 2,000 feet from PW-101. As discussed further in Section 4.1, an increased withdrawal from 150 GPM to 400 GPM is predicted to result in approximately 1 foot of additional aquifer drawdown at the nearest residential well (SSPA 2016).

A property owner southeast of the White Pine Spring property owns approximately 15 Type IIb public water supply wells, nine of which are located within approximately a one-mile radius of PW-101. The Type IIb wells collectively withdraw less than 20,000 gallons of water per day. As discussed further in Section 4.1, the proposed increase of well PW-101 from 150 GPM to 400 GPM is predicted to result in less than 1 foot of additional aquifer drawdown at the nearest Type IIb well (SSPA 2016).

The nearest Type I and Type IIa public water supply wells are located in the City of Evart's Twin Creek wellfield, approximately 2.5 miles south-southeast of production well PW-101. These production wells range in permitted capacity from 290 to 500 GPM. Water levels and production capacity at the City of Evart wellfield are not expected to be affected by withdrawals from PW-101 due to their distance from well PW-101.

4.0 PREDICTED EFFECTS OF THE PROPOSED WITHDRAWAL

The proposed increased withdrawal has been evaluated by MDEQ with respect to its potential to cause an Adverse Resource Impact, as defined in Part 327 of Public Act 459 of 1994 (Michigan Natural Resources and Environmental Protection Act). The proposed increase to 400 GPM was registered in January 2016 after a site-specific review as a Zone A withdrawal (Attachment A-4), indicating that the withdrawal is unlikely to negatively impact characteristic fish populations of either Twin Creek or Chippewa Creek.

The predicted effects of the withdrawal on aquifer levels, stream flows, and surface water levels have further been assessed through groundwater modeling by SSPA, and the studies prepared by ECT and AEM that rely on the changes in groundwater levels and stream flow predicted by the modeling. The findings resulting from these studies are summarized in the following sections.

4.1 Groundwater

A groundwater model was prepared by SSPA (2016) to evaluate the proposed increase in the withdrawal capacity of well PW-101 from 150 GPM to 400 GPM. The model outputs presented in Attachment C, and summarized in this section, predict the additional impacts associated with increasing a steady-state withdrawal by 250 GPM, from the baseline 150 GPM to a new proposed maximum withdrawal rate of 400 GPM.

Figure 19 of Attachment C (SSPA 2016) illustrates the predicted effects of the proposed withdrawal on aquifer groundwater levels. The proposed increased withdrawal initially derives water from aquifer storage, creating an area of lowered groundwater levels (“cone of depression”) around well PW-101. The modeled cone of depression is roughly circular, but truncated where the aquifer discharges near Twin Creek and Chippewa Creek.

After 10 years of continuously pumping PW-101 at the increased rate of 400 GPM, additional aquifer drawdown of approximately 1 foot is predicted at the nearest residential wells. The proposed increased withdrawal is therefore not expected to adversely impact nearby residential wells, or the Type IIb wells. Five sentinel monitoring wells located in the direction of the nearest residences and Type IIb wells will continue to be monitored as part of the LTM program.

4.2 Stream Flow

At steady-state conditions, the proposed increased withdrawal from 150 GPM to 400 GPM will ultimately diminish aquifer discharge to Chippewa Creek, Twin Creek, and the Muskegon River by a total of 250 GPM. The groundwater model estimates that the 250 GPM reduction would be distributed as follows (SSPA 2016):

- The flow of Twin Creek (upstream of SF-13) will be reduced by 127 GPM

- The flow of Chippewa Creek (upstream of SF-17) would be reduced by 90 GPM.
- The balance of 33 GPM would be distributed as reductions to Chippewa Creek downstream of SF-17, and reductions in direct discharge to the Muskegon River.

Ultimately the flow of the Muskegon River would be decreased by 250 GPM because the affected tributaries are in the Muskegon River watershed.

4.3 Stream Stage

The average water levels in Twin Creek and in Chippewa Creek are predicted to decline only minimally as the result of the decrease in flow (Attachment C, SSPA 2016). The change in levels were calculated from the exponential stage-discharge relationships developed for these streams:

- The 118 GPM reduction at SF-9 corresponds to approximately a 0.01-foot reduction in stage.
- The 58 GPM reduction at SF-16 corresponds to approximately a 0.01-foot reduction in stage.

These are small changes in the context of the natural variability of stream stage, and unlikely to cause significant habitat or morphological changes to either stream.

4.4 Water Temperature

The average monthly stream temperature in the summer in Twin Creek at SF-6 was estimated to increase by less than 0.2°C as the result of increased groundwater production from PW-101. The projected temperature changes were estimated using the Stream Segment Temperature model (SSTEMP v.2) developed by the USGS (Attachment C; SSPA 2016). Temperature changes in Chippewa Creek at SF-16 and SF-17 were determined to be negligible as the summer water temperatures in Chippewa Creek are strongly affected by the impounded Decker Ponds.

4.5 Aquatic Communities

The characteristic fish populations of both Chippewa Creek and Twin Creek are typical of high quality cold water streams. Brook and brown trout as well as other cold water species, such as mottled sculpin and blacknose dace, are present throughout each system (Attachment F; AEM 2016a). The small projected change of 0.2^{o}C in the average summer temperature of each stream is unlikely to change the characteristic fish or macroinvertebrate communities. Changes to stream habitat and morphology resulting from the predicted 0.01-foot reduction in stream stage are expected to be extremely small (Attachment F; AEM 2016a).

The MDEQ determined in its site-specific review pursuant to MCL 324.32706c that there will be no individual or cumulative adverse resource impacts to characteristic fish populations in Chippewa Creek, Twin Creek, or the Muskegon River resulting from the proposed increased withdrawal.

4.6 Wetlands

The groundwater drawdown contours calculated by SSPA (Attachment C, Figure 19) were incorporated by ECT to evaluate potential impacts to wetlands. The model-predicted drawdown contours, surface topographic contours, and inferred groundwater contours were superimposed onto aerial photographs to identify the eight water table wetlands which may potentially be impacted by the proposed increased withdrawal (Figures 2, 3, 4, 7, and 8 of Attachment E). The contours indicate that:

- Up to 1 foot of drawdown may occur in the spring aquifer in the vicinity of Wetland H.
- Between 0.5 and 1 feet of drawdown may occur in the spring aquifer in the vicinity of Wetlands A, G, R, and CC.
- Less than 0.5 feet of drawdown may occur in the spring aquifer at Wetlands FF, OO, and PP.

Due to the presence of low permeability soils, the actual reductions in the surface water levels, and shallow groundwater levels in the wetlands are expected to be less than the predicted drawdown in the spring aquifer. Even in the absence of low-permeability soils beneath the wetlands, the model-predicted drawdowns listed above would still have only limited effects on the wetland ecology:

- A 1-foot reduction of groundwater levels could shorten or eliminate the seasonal surface inundation at Wetland H. However, a shorter period of inundation may result in wetland surface subsidence, which in turn would compensate for lower groundwater elevations.
- A 0.5 to 1-foot reduction in groundwater levels is not likely to affect seasonal high water levels in Wetlands G, R, A, or CC.
- Wetlands FF, OO, and PP are unlikely to be affected by the increased withdrawal due to their distance from well PW-101.

A reduction in the duration of surface saturation at Wetlands A, C, G, H, and R may potentially promote germination of woody shrubs and trees. An increase in shrubs and trees is not likely to change the ecology of wetlands because they already occur naturally, but the potential for colonization of invasive shrubs (i.e. autumn olive) may increase slightly.

Given the presence of low-permeability soils, observed wetland hydrology, and the degree of predicted drawdown associated with the proposed 250 GPM increase in withdrawal capacity, measureable effects on wetland functional ecology are not expected (Attachment E, ECT 2016).

4.7 Threatened and Endangered Species

MNFI-listed threatened and endangered species have not been observed in either wetland or aquatic communities. The aquatic surveys of Chippewa Creek and Twin Creek undertaken since 2003 have not observed any threatened or endangered species. Annual field observations of wetlands A, R, G, and H conducted by ECT since 2003 have not observed the presence of any threatened or endangered species. The proposed withdrawal is furthermore unlikely to have negative effects on ecological habitats or any

threatened and endangered species that might inhabit them (Attachment E; ECT 2016; and Attachment G, AEM 2016b).

5.0 MEETING OF APPLICABLE STANDARD PROVIDED IN SECTION 32723 OF THE NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT ("NREPA")

A. All water withdrawn, less any consumptive use, is returned, either naturally or after use, to the source watershed.

"Source watershed" is defined in MCL 324.32701(1)(kk) to mean "the watershed from which a withdrawal originates. . . . If water is withdrawn from the watershed of a direct tributary to a Great Lake, then the source watershed shall be considered to be the watershed of that Great Lake and its connecting waterways, with a preference for returning water to the watershed of the direct tributary from which it was withdrawn."

The withdrawal will take place within the watershed of the Muskegon River, which is a direct tributary to Lake Michigan. The Lake Michigan watershed is the source watershed, the Muskegon River watershed is the watershed of the direct tributary to Lake Michigan from which the withdrawal originates and to which the water, less consumptive use, is returned.

A small amount of water withdrawn from the White Pine Springs well may be discharged to groundwater and surface water at each of the following: (1) the well site in Osceola Township, (2) the NWNA load station in the City of Evart, and (3) the Stanwood bottling plant. All of these are located in the Great Lakes watershed and within the watershed of the Muskegon River. The remaining water is packaged at the Stanwood plant into containers of 5.7 gallons (20 liters) or less as bottled drinking water, as defined in the food code, 2005 Recommendations of the Food and Drug Administration of the United States Public Health Service. This water bottling is a "consumptive use" under MCL 324.32701(1)(k).

Thus, all water withdrawn, less the consumptive use, is returned to the source watershed (the Great Lakes Watershed) and to the watershed of the direct tributary from which it was withdrawn (the Muskegon River watershed).

B. The withdrawal will be implemented so as to ensure that the proposal will result in no individual or cumulative adverse resource impacts.

MDEQ determined in its site specific review pursuant to MCL 324.32706c that there will be no individual or cumulative adverse resource impacts resulting from the proposed withdrawal. See **Attachment A-4**. Similarly, the effects described in Section 4.0 above show that no impairment of the quantity or quality of waters or water dependent natural resources is predicted to occur as a result of the proposed withdrawal.

C. The withdrawal will be implemented so as to ensure that it is in compliance with all applicable local, state, and federal laws as well as all legally binding regional interstate and international agreements, including the boundary waters treaty of 1909.

NWNA has registered the proposed increased withdrawal pursuant to MCL 324.32705, after a site specific review by the MDEQ, and therefore the proposed withdrawal will be in compliance with Part 327. See **Attachment A-4**. In order to undertake the withdrawal, NWNA will construct a booster pump station along the water pipeline which runs from the White Pine Springs well house to the load station located in the City of Evart. NWNA will obtain all approvals required under Michigan's Safe Drinking Water Act and local ordinances for the booster pump station.

NWNA previously obtained approval from the Central Michigan Health Department to drill the White Pine Springs well. See **Attachment A-6**. NWNA obtained approval from the MDEQ under the SDWA for the well to be used as a Type IIa water supply well, and source approval for water from the well to be used as a bottled water source. See **Attachment A-1**. The MDEQ issued a permit certifying that the construction plans for the existing well house and the pipeline running from the well to the Evart load station met the requirements of the SDWA and authorizing construction. See **Attachment A-7**. NWNA was issued a similar SDWA construction permit by the MDEQ for the load station located in the City of Evart. See **Attachment A-8**. NWNA has obtained a SDWA water hauler license from the MDEQ authorizing tankering of White Pine Springs water from the Evart load station to the Stanwood bottling plant. See **Attachment A-9**. NWNA will obtain a zoning permit from Osceola Township for the booster pump station, and will obtain any necessary building, electrical or plumbing code permits prior to construction.

The Boundary Waters Treaty of 1909 was agreed to by the United States and Canada to provide a mechanism for the resolution of disputes over water bordering the two countries and to insure the waters of the Great Lakes remain navigable. The United States and Canada share no border on Lake Michigan (the Great Lakes watershed in which the withdrawal will take place), however. No structures or potential impediments to navigation will be installed within a Great Lake as a part of the proposed withdrawal. There will be no violation of the Boundary Waters Treaty of 1909 as a result of the proposed withdrawal.

By virtue of compliance with the provisions of Part 327, the proposed withdrawal will comply with the Great Lakes-St. Lawrence River Basin Water Resources Compact. See MCL 324.32730(c).

D. The proposed use is reasonable under common law principles of water law in Michigan and based upon a consideration of the following factors:

1. The proposed withdrawal is planned to use water efficiently and will minimize waste of water.

NWNA certifies it will be in compliance with the applicable water conservation measures. See Section E below.

Water from the proposed withdrawal from well PW-101 is intended to be bottled as spring water. The overall ratio of the amount of water withdrawn from all of NWNA's Michigan wells to the amount of water bottled at the Stanwood plant in 2015 was 1.36. This water use ratio includes water used at the plant for employee use, equipment and line sanitation, and other non-bottling purposes. Spring water, such as that withdrawn from well PW-101 will have an even lower water use ratio. The plant's water use ratio is better (lower) than the ratio for carbonated soft drinks (Average 2.02) and for other bottled water facilities (Average 1.47) (Antea Group, 2012).

All water that is not bottled for drinking purposes returns to the Muskegon River watershed which is a direct tributary to the source watershed. See Section A above.

Nestlé is committed to environmentally sound businesses practices, including the efficient use of water. For example, the Stanwood bottling facility when constructed in 2002, obtained a Leadership in Energy and Environmental Design (LEED) certification. LEED certification is evaluated in five environmental categories, one of which is water use efficiency. Water efficient measures that are consistent with the LEED certification process were implemented into the initial design of the facility. Water efficient landscaping design, or selecting plant species adapted to the climate conditions of Michigan, was implemented in the initial design of the facility. Utilizing native plants in the site landscaping eliminates the need for irrigation water, therefore reducing the overall facility water use. High efficiency plumbing fixtures reduce overall factory water use. Low-flow lavatory faucets and toilets with automatic controls were installed in the facility when constructed.

The Nestlé Environmental Management System (NEMS), in place since 1995, is an internal standard established to provide guidance to Nestlé facilities to control and improve its environmental performance. NEMS comprises a suite of internal standards and guidelines specific to water conservation practices.

An example of a NEMS initiative is the Factory Water Mapping. A complete water map documents water use through metering from the source of the water through the factory to the wastewater effluent for the Stanwood Factory. The Water Map serves to illustrate and account for all the water as it passes through the bottling processes. It becomes a reference to identify opportunities for greater efficiency in water use.

Examples of specific water use reduction projects that have been implemented at the Stanwood facility include:

- Recycled rinse water used in the facility cleaning process is recirculated though the onsite cooling towers to maximize the use of the water before it is sent to the waste water effluent.
- Installation of a new filler nozzle design which reduces waste water generated when the bottles are overfilled.
- Optimization of the "Clean in Place" (CIP) process eliminated additional steps therefore reducing overall water use in the CIP process.

2. Efficient use is made of existing water supplies at this location.

The efficient use of water currently being withdrawn from the White Pine Springs well is demonstrated by the points set forth in Section D(1) above.

3. The proposed use is in balance with economic development, social development and environmental protection considerations and other existing or planned water withdrawals and water uses sharing the water source.

a. Economic Development.

NWNA is a major employer in the Mecosta/Osceola County area. Its 250 employees make it one of the area's top employers. Construction of the bottling facility, its equipment and the well site infrastructure represented one of the largest single private economic investments ever made in the area, the total investment being in excess of $181 million. Additional capital investment in NWNA water withdrawal sites exceeds $50 million.

NWNA's annual Michigan payroll is approximately $19.4 million, yielding an average wage of approximately $75,000 per year, and significantly exceeding the median household income for the two-county area. Total payroll impact is conservatively estimated at more than $38 million (RIMS economic impact multiplier of 2+ for food/beverage production). NWNA pays annual local taxes of approximately $1.3 million.

Over 264 vendors, a majority of which are Michigan-based companies, provide services, materials, or equipment to NWNA. NWNA spends approximately $36 million on manufacturing expenses annually with vendors and suppliers, resulting in a multiplier effect of $72 million (RIMS economic impact multiplier).

With respect to the proposed increased withdrawal, NWNA will make an additional capital investment of approximately $870,000 for the new equipment and the booster station which will be subject to property taxes. The increased withdrawal capacity will support NWNA's continued operations in the area. There are no known negative economic development factors associated with the proposed withdrawal.

b. Social Development.

NWNA and its employees in Michigan provide philanthropic support for local and regional organizations. Hundreds of school, church, community, senior, and conservation organizations receive NWNA's support

through donations of approximately two hundred and fifty thousand bottled water products and more than $85,000 in financial contributions annually.

NWNA's Michigan water bottling operation is an integral part of the company's nationwide program for providing bottled water to communities, schools, hospitals, and other facilities when regular drinking water supplies are interrupted. There are no known negative social development factors associated with the proposed withdrawal.

c. Environmental Protection Considerations.

The Part 327 site specific review process has determined there will be no individual or cumulative adverse resource impacts resulting from the proposed increased withdrawal. The discussion in Section 4.0 demonstrates that surface waters, wetlands, aquatic communities and other nearby users of groundwater will not be adversely impacted or impaired by the proposed withdrawal. NWNA has an extensive monitoring network in place to monitor water in the source aquifer and nearby streams and wetlands. Conditions in nearby streams and wetlands are and will continue to be regularly observed and assessed for potential impact.

NWNA has acquired ownership of 328 acres of land surrounding the withdrawal site and entered into land use agreements with the owners of 170 acres of other nearby properties so as to control and restrict uses that could potentially harm the water source. This benefits not only NWNA, but also the other users of the water source and helps protect hydrologically connected waters. The proposed increased withdrawal satisfies environmental protection considerations.

d. Other Existing or Planned Withdrawals and Water Users Sharing the Water Source.

Existing nearby users of hydrologically connected waters are identified in Section 3.5 above. As is discussed in Section 4.1, the proposed withdrawal will have no adverse effect on these users. NWNA agrees to provide timely rectification for any unreasonable interference with the normal operation of other wells caused by the proposed withdrawal, should that occur.

4. The supply potential of the water source is fully adequate, considering quantity, quality, and reliability and safe yield of hydrologically interconnected water sources.

Section 3.1 above and the SSPA report (Attachment C) describe the groundwater and aquifer conditions existing in the vicinity of the proposed withdrawal, as well as the results of an extended pump test of the aquifer at rates equal to or exceeding the proposed 400 GPM withdrawal rate. The White Pine Springs well has demonstrated the capacity to safely maintain a pumping rate of 400 GPM. Section 4.0 summarizes the groundwater modeling completed by SSPA (Attachment C) demonstrating there will be no adverse impacts to any hydrologically connected water sources.

5. The proposed withdrawal is not expected to cause adverse resource impacts under foreseeable conditions.

Based upon a site specific review, it has been determined that the proposed increased withdrawal will not result in individual or cumulative adverse resource impacts. The discussion in Section 4.0 above demonstrates that there will be no adverse impacts from the proposed increased withdrawal on hydrologically connected waters, the aquatic and plant communities dependent upon these waters, wetlands or the other users of water from the source aquifer. As is discussed in Section 3.1, NWNA has an extensive monitoring network in place surrounding the location of the withdrawal. In addition, regular observation and assessments are made of nearby streams and wetlands. NWNA will therefore be able to detect whether there will be any impact beyond what is predicted.

E. Certification that applicant is in compliance with environmentally sound and economically feasible water conservation measures developed by the applicable water user's sector under section 32708a.

Attachment A-10 contains NWNA's certification that it is in compliance with the water conservation measures developed for the beverage industry sector.

F. The proposed withdrawal will not violate public or private rights and limitations imposed by Michigan water law or other Michigan common law duties.

The proposed withdrawal has been approved and registered under Part 327 and will otherwise comply with the requirements of Part 327. NWNA is, through this application, seeking approval under Section 17 of the SDWA, and will obtain all other necessary approvals under that act.

NWNA owns the 80-acre parcel on which the withdrawal well is located. NWNA owns the subsurface formation from a depth of 2 feet below the surface of the earth to 1,000 feet below the surface of the earth on the 110-acre property down gradient of the 80-acre parcel. As is discussed in Section 3.5 above, the estimated draw down of the nearest private well due to the proposed increased withdrawal is approximately 1 foot, which will not impair the ability of that well to produce water.

The nearest public water resource to the well site is the Muskegon River. There is no reason to conclude that the proposed increased withdrawal will interfere with use of this or any other public water resource by the public or with the MDEQ's ability to maintain public water resources for the public's reasonable use. The 250 GPM proposed increased withdrawal represents 0.11% of the index flow (225,000 GPM) of the Muskegon River, and 0.05% of the average flow (483,000 GPM)

The nearest hydrologically connected surface water bodies are Twin Creek, Chippewa Creek and dam controlled impoundments along both Twin Creek and Chippewa Creek. The impoundments as well as Twin Creek and Chippewa Creek are not navigable based upon Michigan case law, and thus there is no public trust interest in these surface water bodies. Any de minimis reduction in level or flow of water in these surface water bodies has been determined by the MDEQ through a site specific review to not result in any adverse resource impact. The de minimis effect on level and flow will not interfere with any private uses made of these water bodies. Field surveys of Twin Creek and Chippewa Creek did not find the presence of any threatened or endangered species. See AEM Threatened and Endangered Species Report. Attachment G.

An incremental effect of the proposed increased withdrawal on wetland water levels may occur in five wetlands, but is not expected to cause adverse ecological effects. See Section 4.6 and Attachment E. Field observations of these wetlands did not find the presence of any threatened or endangered species.

There is no basis to conclude that the proposed withdrawal will violate any public or private rights and limitations imposed by the Michigan water law or other Michigan common law duties.

6.0 COMMITMENT OF APPLICANT TO UNDERTAKE ACTIVITIES, IF NEEDED, TO ADDRESS HYDROLOGIC IMPACTS.

The proposed increased withdrawal will have a low probability of adverse impact on the waters of Twin Creek, Chippewa Creek, nearby wetlands and the Muskegon River watershed. NWNA will address any unexpected adverse hydrologic impacts from the proposed increased withdrawal, should they occur.

7.0 CONCLUSION

NWNA proposes to increase the withdrawal capacity of well PW-101 from 150 GPM to 400 GPM. The proposed increase has been registered with the State of Michigan through the WWAT and a site-specific review. MDEQ determined in its site specific review that there will be no individual or cumulative adverse resource impacts resulting from the proposed increased withdrawal.

NWNA has additionally evaluated the predicted hydrologic, hydrogeologic, and environmental effects of the proposed increased withdrawal. A groundwater model (Attachment C) was developed to estimate the amount of aquifer drawdown at the nearest residential wells, and the effects of the proposed withdrawal on wetlands and streams. The proposed withdrawal:

- Is unlikely to significantly affect aquifer levels, or the function of the nearest residential wells and public water supply wells;
- Is unlikely to significantly affect the flow, level, or temperature of Chippewa Creek, Twin Creek, and the Muskegon River;
- Is unlikely to result in measurable effects on the functional ecology of wetlands connected to the source aquifer;
- Is unlikely to result in adverse impacts to characteristic fish species of Chippewa Creek, Twin Creek, and the Muskegon River as determined by field surveys and the WWAT.

NWNA established an LTM program during project development that provides a 16-year record of background hydrologic and hydrogeologic conditions. The LTM program monitors groundwater levels, surface water flows and levels, fish communities, and wetland habitats. NWNA is committed to continuing the LTM program.

The proposed withdrawal also meets the applicable standard as established by Section 32723 of the Michigan NREPA (PA 451 of 1994):

- Water withdrawn from PW-101, less consumptive use, will be returned to the Muskegon River watershed.
- The proposed withdrawal will be implemented so as to ensure that the proposed withdrawal will result in no individual or cumulative adverse resource impacts.
- The proposed withdrawal will be in compliance with all applicable local, state, and federal laws, including the boundary waters treaty of 1909.
- The proposed use is reasonable under common law principles of water law in Michigan.
- NWNA certifies that it is in compliance with environmentally sound and economically feasible water conservation measures.
- The proposed withdrawal will not violate public or private rights and limitations.

NWNA commits through this application to undertake activities, if needed, to address unexpected hydrologic impacts of this proposed withdrawal. As documented in this application information package,

there is low probability of unexpected adverse impacts to water users, surface waters, wetlands, or the Muskegon River watershed.

7.1 Request for public notice and opportunity for comment

NWNA requests that the MDEQ provide public notice and opportunity for public comment of not less than 45 days on this application.

7.2 Request for approval

NWNA requests that the MDEQ grant approval pursuant to Section 17 of the Michigan Safe Drinking Water Act to increase the maximum permitted withdrawal capacity for production well PW-101 at the White Pine Springs site in Osceola County to 400 gallons per minute.

8.0 REFERENCES

Advanced Ecological Management (2016a). White Pine Springs Evaluation of Fish, Macroinvertebrates, and Aquatic Habitat Resulting from an Increase in Groundwater Withdrawal. July.

Advanced Ecological Management (2016b). White Pine Springs Threatened and Endangered Aquatic Species Report. July.

Antea Group (2012). Water Use Benchmarking in the Beverage Industry: Trends and Observations 2012. Beverage Industry Environmental Roundtable.

Environmental Consulting & Technology (2016). White Pine Springs, Evart Michigan, Assessment of Wetland Effects. July.

Farrand, W., and D. Bell 1982. Quaternary Geology of Southern Michigan. Department of Geological Sciences, University of Michigan.

S.S. Papadopoulos and Associates (2016). Evaluation of Groundwater and Surface Water Conditions in the Vicinity of Well PW-101, Osceola County, Michigan. July.

Western Michigan University, 1981. Hydrogeologic Atlas of Michigan.

Westjohn and Weaver, 1998. Hydrogeologic Framework of the Michigan Basin Regional Aquifer System. U.S. Geological Survey Professional Paper 1418, 47 p.

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

Golder Associates Inc.
15851 South US 27, Suite 50
Lansing, MI 48906 USA
Tel: (517) 482-2262
Fax: (517) 482-2460

Golder Associates

Figures

ATTACHMENT A

Permits and other MDEQ Documentation

A-1

Source Approval PW-101, Mar 27, 2009

A-2

Registration Receipt, ID#3908-20154-32, Apr 16, 2015

A-3

CMDHD Permit to Alter Public Well, WSSN 20166-67, Jun 29, 2015

A-4

Registration Receipt and Letter, ID#4125-201512-31, Jan 5, 2016

A-5

MDEQ Water Well and Pump Record, PW-101, Well ID 67000003754

A-6

CMDHD Permit to Install Water Supply Facilities, WSSN 20166-67, Nov 17, 2000

A-7

MDEQ Permit for Water System Construction, WSSN 20166-67, Aug 28, 2008

A-8

MDEQ Permit for Water System Construction, #WH54-001, Jun 1, 2009

A-9

MDEQ Water Hauler License #WH54-001, Jun 1, 2009

A-10

NWNA Certification of Compliance with Water Conservation Measures

ATTACHMENT B

Stratigraphic Boring Logs

Designations of four monitoring wells have been updated since their installation.

Well MW-1s is currently identified as MW-1u.

Well MW-3 is currently identified as MW-3i.

Well MW-7 is currently identified as MW-7i.

Well MW-105s is currently identified as MW-105i.

ATTACHMENT C

Groundwater Modeling Report (SSPA 2016)

ATTACHMENT D

Groundwater and Surface Water Hydrographs

ATTACHMENT E

Assessment of Wetland Effects (ECT 2016)

ATTACHMENT F

Evaluation of Fish, Macroinvertebrates, and Aquatic Habitat (AEM 2016a)

ATTACHMENT G

Threatened and Endangered Aquatic Species Report (AEM 2016b)