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Appendix A-5.28 Additional Macrophyte Information
Bay Lake is located north of 30th Street North and west of Oakgreen Avenue North, in Baytown Township. The Bay Lake watershed includes about 849 acres, of which 614 acres are within Baytown Township and 235 acres are within West Lakeland Township. The Bay Lake watershed includes several small, basins that are landlocked under typical conditions. The area tributary to Bay Lake includes a 300-acre agricultural area northwest of the lake that drains into Bay Lake via a drain tile. Figure 5.28-1 shows the Bay Lake watershed.

Approximately a third of the watershed is presently developed as residential lots of 2.5 to 5 acres. The estimated future (2030) land use for Baytown Township and West Lakeland Township includes rural or large-lot residential development throughout most of the watershed, with lots ranging from 2.5 to 10 acres. The area northwest of Bay Lake is anticipated to remain agricultural. The Bay Lake Reserve, a cluster subdivision along the western shore of Bay Lake, was permitted by the VBWD in the fall of 2003. The area that drains into Bay Lake via drain tile is zoned for commercial food production. Figure 5.28-2 shows the existing (2010) and estimated future (2030) land use of the Bay Lake watershed.

Recreational use of Bay Lake is currently limited to lake residents who use the lake for aesthetic viewing. As part of the Bay Lake Reserve subdivision on the west side of the lake, a trail and dock were built along the western shore of the lake.
The Minnesota Department of Natural Resources (MDNR) used the lake as a walleye rearing pond during 1983 and 1984. Because rearing efforts were unsuccessful during both years, the lake is no longer used for rearing purposes.

Bay Lake and its watershed lie within the Baytown/West Lakeland Township Groundwater Contamination Site and Special Well and Boring Construction Area (SWBCA). See Section 4.2 for more discussion about the Baytown Township Groundwater Contamination Site.

5.28.2 Water Quality Management Plan

The VBWD classified and will manage Bay Lake as a Low Priority waterbody (see Section 4.1 – Water Quality) based on the lack of public access and classification as a wetland by the Minnesota Pollution Control Agency (MPCA). The MPCA has previously classified Bay Lake as a shallow lake and included Bay Lake in its 2014 draft 303(d) impaired waters list. Following discussion with the VBWD, the MPCA agreed that Bay Lake should be classified as a wetland and the basin was removed from the 2014 303(d) impaired waters list. The VBWD classification for Bay Lake is consistent with its classification in the 2005 VBWD Plan. In the VBWD 1995 Plan, Bay Lake was classified as a Level V (wetland) water body.

The water quality of Bay Lake is poor. The VBWD has a non-degradation water quality policy which sets “action triggers” for all of its major waterbodies. Section 4.1 – Water Quality discusses the action triggers in more detail. Action triggers for VBWD lakes consider the following water quality parameters (summer average) relative to MPCA water quality standards and prior water quality data (i.e., trend analysis):

- Secchi disc depth
- Total phosphorus
- Chlorophyll $a$

Specific water quality implementation tasks for Bay Lake include the following:

1. The VBWD will cooperate with other entities to monitor the water quality of Bay Lake at the interval(s) specified in Section 4.1 – Water Quality for Low Priority waterbodies. As for all Low Priority waterbodies, the VBWD will perform additional monitoring or other actions on a case-by-case (see Table 4.1-6).

The VBWD will evaluate the average summertime water quality (total phosphorus, chlorophyll $a$, and Secchi disc transparency) and compare it to applicable water quality standards (Table 4.1-1) and applicable action triggers (described in Section 4.1.7.5).
2. The VBWD will cooperate with other entities in support of macrophyte management efforts. VBWD efforts may include:

- point-intercept surveys of aquatic vegetation
- preparation of lake vegetation management plans (LVMP)
- completion of Invasive Aquatic Plant Management (IAPM) Permit applications
- design of herbicide treatment programs
- participation in meetings with MDNR staff
- other technical analysis

3. The VBWD will continue to implement its Rules and Regulations (2013, as amended) in the Bay Lake watershed. The VBWD Rules address water quality performance standards for development and redevelopment projects, as well as required vegetated buffers around VBWD lakes, streams, and wetlands. The VBWD Rules and Regulations are included in this Plan as Appendix A-4.5.

5.28.2.1 Water Chemistry Data

Water quality samples have been collected from Bay Lake beginning in 2003, and annually since 2006 (with the exception of 2011, when sampling was not performed). Water quality samples are typically analyzed for total phosphorus and chlorophyll \( a \), and Secchi disc transparency (see Appendix A-4.1 – Water Quality Background Information). Available water quality data is presented in Figure 5.28-3. Water quality collected over the most recent 10 year period is summarized in Table 5.28-1.

### Table 5.28-1 Summary of Bay Lake summer average water quality (2004 – 2013)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>10-year Average (2004-2013)</th>
<th>Trend in Average</th>
<th>MPCA Standard(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>ug/L</td>
<td>382</td>
<td>None</td>
<td>NA</td>
</tr>
<tr>
<td>Chlorophyll ( a )</td>
<td>ug/L</td>
<td>184</td>
<td>None</td>
<td>NA</td>
</tr>
<tr>
<td>Secchi Disc Depth</td>
<td>m</td>
<td>0.46</td>
<td>None</td>
<td>NA</td>
</tr>
</tbody>
</table>

\(^{1}\)MPCA eutrophication water quality standards are not applicable to wetlands

While water quality in Bay Lake fluctuates annually, water quality has been consistently poor since monitoring began in 2003. Summer average Secchi disc transparency is consistently less than 1 meter, with a minimum of about 0.3 meters observed in 2008, 2009, and 2012. The highest (i.e.,
worst) observed summer average chlorophyll \( a \) and summer average total phosphorus concentrations were observed in 2007. Water quality observed in 2013 was comparatively better than previous years (see Figure 5.28-3).

The most recent 10-years of data identify no statistically significant trends in total phosphorus, chlorophyll \( a \), or Secchi disc transparency.

### 5.28.2.2 Biological Data

Biological data including macrophyte (large aquatic plant), phytoplankton (non-rooted floating plants – algae), zooplankton (microscopic aquatic animals), and fisheries data can provide insight into the ecological quality of a waterbody. Section 4.2 (Water Quality Background Information) provides more information about the importance of fisheries and other biological data.

The Bay Lake fishery is not currently managed by the MDNR. No stocking or surveying programs are currently in place. The lake does not have a fisheries-use classification and no fish consumption advisories are issued for Bay Lake. The Minnesota Department of Natural Resources (MDNR) used the lake as a walleye rearing pond during 1983 and 1984. Because rearing efforts were unsuccessful during both years, the lake is no longer used for rearing purposes.

The VBWD conducted macrophyte (large aquatic plant) surveys on June 12, 2003, August 19, 2003, June 4, 2009, and June 5, 2012. Appendix A-5.28 includes the 2003, 2009, and 2012 macrophyte survey information. VBWD collects macrophyte data to identify the conditions of plant growth throughout the lake. Macrophytes are the primary producers in the aquatic food chain, converting the basic chemical nutrients in water and soil into plant matter through photosynthesis, which becomes food for all other aquatic life. Macrophytes are vitally important for a healthy wetland and, thus, are important for Bay Lake.

In 2003, the plant community in Bay Lake consisted almost exclusively of coontail (\( \text{Ceratophyllum demersum} \)). While this plant provides habitat for the fish and aquatic animals living within the lake, the plant’s dominance indicates a lack of plant diversity. The lake’s transparency data indicate poor light conditions, preventing the growth of other plant species. Coontail can tolerate very low light conditions, while other plants require more light (Borman et al., 1997). The lake’s water chemistry data indicate changing the lake’s plant community is probably unrealistic. Coontail is a native species commonly found in Minnesota lakes.

In 2009 and 2012 most of the macrophytes in Bay Lake were emergent plants such as bulrushes (\( \text{Scirpus sp.} \)) growing along the lake’s shoreline. A single species of algae, stonewort (\( \text{Nitella sp.} \)) was found in the lake in 2009 but not in 2012. Exotic (undesirable non-native) species were not identified in the lake.

There are no phytoplankton (microscopic plants), or zooplankton (microscopic animals) data for Bay Lake.
5.28.3 Water Quantity Management Plan

Bay Lake has no surface water outlet; it is landlocked. The VBWD established the 100-year flood level at Elevation 898 in its 1987 Water Management Plan. In 2003, a consultant for the Bay Lake Reserve subdivision constructed an XP-SWMM computer model of the watershed using Washington County’s 2000 two-foot contours and ran a 50-year continuous simulation of the water levels using climatological data from a Stillwater station. The VBWD performed a statistical analysis of the modeled water levels and determined a 1% probability (i.e., 100-year) flood level for Bay Lake at Elevation 891.5. The VBWD Managers approved this elevation at their May 22, 2003 meeting, and is the current VBWD 100-year flood elevation as of the writing of this Plan.

The Bay Lake XP-SWMM modeling predates the National Oceanographic and Atmospheric Administration’s (NOAA) publication of Atlas 14, Volume 8 (see Section 4.7.6). Atlas 14 contains updated precipitation data for Minnesota. Over the next several years The VBWD plans to update the 100-year flood level for lakes, including Bay Lake, to reflect Atlas 14 precipitation data and other current data sources. These updates may result in an increased flood level for Bay Lake.

Although Bay Lake does not have an outlet, the overflow elevation of Bay Lake is at the intersection of Norcrest Avenue and 26th Street North at approximately Elevation 925.5, according to the Washington County 2000 two-foot interval topographic maps. The overflow route would carry water south into the Mergens Pond drainage area should the lake overtop. The VBWD is not aware of any low homes in the 100-floodplain of Bay Lake.

The VBWD has no plans to control water levels on Bay Lake. The VBWD began water level monitoring on Bay Lake in 2009. Figure 5.28-4 presents water level data available for Bay Lake.

The management of the Baytown Township Groundwater Contamination Site may impact the water levels of Bay Lake. The VBWD will work with Washington County to ensure the impacts will not significantly impact (raise or lower) the water levels.

5.28.4 Groundwater

The Bay Lake watershed lies within the Baytown Township Groundwater Contamination Site and Special Well and Boring Construction Area (SWBCA). Following the detection of volatile organic compounds (VOCs) in the groundwater in 1987 and 1988, the Minnesota Department of Health (MDH) issued a well-drilling advisory (now SWBCA) for portions of West Lakeland Township, Baytown Township, and the City of Bayport. This advisory puts limits on the construction of new wells, and requires additional water testing of new wells. The SWBCA remains in effect as of the writing of this Plan.

More information regarding the Baytown Township Groundwater Contamination and SWBCA is included in Section 4.2.6.3 of this Plan. Current information about this site may be obtained from the MDH and the MPCA.
5.28.5 References


Borman, S., R. Korth, and J. Temte. 1997. Through the Looking Glass … A Field Guide to Aquatic Plants. Wisconsin Lakes Partnership (Cooperative Extension of the University of Wisconsin—Extension and the Wisconsin Department of Natural Resources). Stevens Point, WI.

Figure 5.28-2

BAY LAKE WATERSHED
CURRENT (2010) AND FUTURE (2030) LANDUSE

BAY LAKE SUBWATERSHED

CURRENT (2010) Land Use

Future (2030) Land Use

Source: Metropolitan Council 2010

1 inch = 2,000 feet
Figure 5.28-3

Bay Lake Water Quality
2015 - 2025 Watershed Management Plan
Valley Branch Watershed District
Figure 5.28-4

BAY LAKE WATER LEVELS
2015-2025 Watershed Management Plan
Valley Branch Watershed District

Lake is landlocked

- Water Level
- 100-Year Flood Level
- Discharge Elevation
(925.5 ft, not shown)
Appendix A-5.28  Additional Macrophyte Information
- Macrophyte found throughout entire water body except where noted on map
- Macrophyte densities estimated as follows: 1 = light; 2 = moderate; 3 = heavy

### Submerged Aquatic Plants:

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coontail</td>
<td>Ceratophyllum demersum</td>
</tr>
<tr>
<td>Water stargrass</td>
<td>Zosterella dubia</td>
</tr>
</tbody>
</table>

### Floating Leaf:

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duckweed</td>
<td>Lemna spp.</td>
</tr>
</tbody>
</table>

### Emergent:

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulrush</td>
<td>Scirpus spp.</td>
</tr>
<tr>
<td>Cattail</td>
<td>Typha spp.</td>
</tr>
<tr>
<td>River bulrush</td>
<td>Scirpus fluviatilis</td>
</tr>
<tr>
<td>Arrowhead</td>
<td>Sagittaria</td>
</tr>
</tbody>
</table>

### No Aquatic Vegetation Found:
• Macrophyte found throughout entire water body except where noted on map
• Macrophyte densities estimated as follows: 1 = light; 2 = moderate; 3 = heavy

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submerged Aquatic Plants:</td>
<td>Ceratophyllum demersum</td>
</tr>
<tr>
<td></td>
<td>Zostera dubia</td>
</tr>
<tr>
<td></td>
<td>Elodea canadensis</td>
</tr>
<tr>
<td></td>
<td>Scirpus fluviatilis</td>
</tr>
<tr>
<td></td>
<td>Typha spp.</td>
</tr>
<tr>
<td>Floating Leaf:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Duckweed</td>
</tr>
<tr>
<td></td>
<td>Lemna spp.</td>
</tr>
<tr>
<td>Emergent:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bulrush</td>
</tr>
<tr>
<td></td>
<td>Cattail</td>
</tr>
<tr>
<td></td>
<td>River bulrush</td>
</tr>
<tr>
<td></td>
<td>Scirpus spp.</td>
</tr>
<tr>
<td></td>
<td>Typha spp.</td>
</tr>
<tr>
<td></td>
<td>Scirpus fluviatilis</td>
</tr>
<tr>
<td>No Aquatic Vegetation Found:</td>
<td></td>
</tr>
</tbody>
</table>

Macrophyte Survey
August 19, 2003

Water Quality Monitoring Location

NOT TO SCALE
BAY LAKE MACROPHYTE
SURVEY RESULTS
June 4, 2009
Valley Branch Watershed District

FIELD NOTES:
- Macrophyte densities estimated as follows:
  1=light; 2=moderate; 3=heavy
- No macrophytes found in water body
- Scirpus fluviatilis found around entire lake perimeter, denser areas marked on map
- Sporadic growth of Polygonum sp. and Alisma sp.

Legend

Emergent Plants
Floating Leaf Plants
Submerged Aquatic Plants
No Aquatic Vegetation

Common Name | Scientific Name
---|---
stonewort (algae) | Nitella sp.
river bulrush | Scirpus fluviatilis
water smartweed | Polygonum sp.
water plantain | Alisma sp.
arrowhead | Sagittaria sp.
hardstem bulrush | Scirpus acutus

Imagery Source: 2008 AE
FIELD NOTES:
- Macrophyte densities estimated as follows:
  1=light; 2=moderate; 3=heavy
- No macrophytes found in water body
- Scirpus fluviatilis found around entire lake perimeter, denser areas are marked on map
- Reed canary grass (Phalaris arundinacea) present around entire lake perimeter

Common Name | Scientific Name
-------------|------------------
River bulrush | Schoenoplectus fluviatilis
Northern mannagrass | Glyceria borealis
Hardstem bulrush | Schoenoplectus acutus