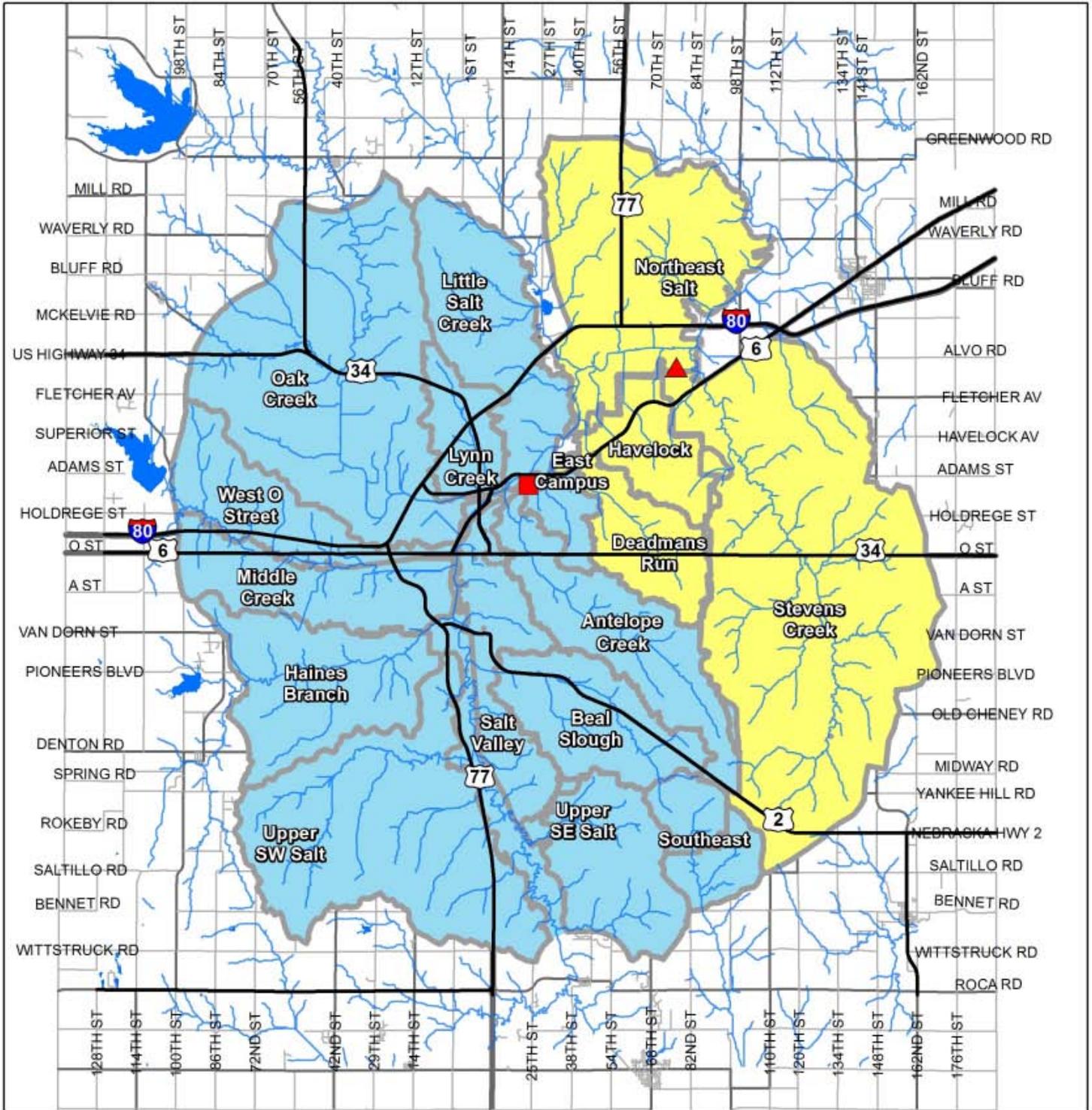

PLANNED AND POTENTIAL WWTF IMPROVEMENTS

10.1 INTRODUCTION

This chapter identifies future improvements to the two existing WWTF's. The current WWTF's include the Theresa Street WWTF and the Northeast WWTF. The current service areas for these facilities are shown in Figure 10.1.

It is important to determine when the treatment facility expansions will be required in order to plan for future funding. In the past, the City has planned for improvements at the treatment facilities based on 1.5 percent growth, and as capacity and regulations require. However, for this master plan update a growth rate of 1.2 percent will be utilized as determined by the City.

Specific improvements are outlined in the following sections below. Where applicable, specific improvements identified in the current CIP were incorporated into this document. All improvements identified are considered planning level, and detailed engineering studies are recommended to finalize timing, location, and design criteria for each project.



Legend

- Theresa St. WWTP **WWTF Service Areas**
- ▲ Northeast WWTP Northeast WWTF
- Streams and Lakes Theresa Street WWTF
- Basin Outlines



FIGURE 10.1 – EXISTING WWTF SERVICE AREAS
 WASTEWATER FACILITIES MASTER PLAN UPDATE – 2014
 CITY OF LINCOLN, NEBRASKA

10.2 NUTRIENT REMOVAL

As previously discussed, nutrient removal is likely to be implemented within the next permitting cycle. This requirement will likely require cities such as Lincoln to implement nutrient removal at their wastewater treatment facilities within the next 5 to 10 years. For planning purposes, it has been assumed that biological nutrient removal (BNR) will be the method used to meet the future Nitrogen and Phosphorous limits.

From a cost standpoint, this will mean that BNR facilities will need to be constructed to allow the existing facilities to meet the anticipated discharge limits. The costs for the next capacity increase will include an allowance from BNR in the capacity increase cost. Based on recent experience in the Midwest, the planning level cost for future expansion including BNR is \$12.50.

10.3 TREATMENT PLANT IMPROVEMENTS

To estimate the timing of the treatment plant improvements, flows were projected for the entire planning period using a growth rate of 1.2 percent. This growth rate was selected based upon input from the City and is slightly smaller than the 1.5 percent growth rate previously used in 2007 master plan. The starting point for the AAD flow projections was based on historic flow data from 2000 through 2013 for each plant. This average AAD flow was then utilized to calculate the starting MMAD flow by multiplying it by the average MMAD:AAD ratio from 2000 through 2013.

10.3.1 Theresa Street WWTF Improvements

Currently, the Theresa St WWTF has a MMAD capacity of 27.4 mgd. The projected flows at the 1.2 percent growth over the planning period is shown in Figure 10.2 where it can be seen that plant expansions will be needed by 2027, 2058, and 2069. These expansions have been conceptually planned and are shown schematically in Figure 10.3. A summary of the estimated planning costs for these improvements is presented in Table 10.1. The improvements for each planning tier are summarized below. It should be noted that no Tier III improvements are identified for the Theresa Street WWTF in the master plan update although the treatment facility is projected to exceed its design capacity of 45 mgd in 2069. This is due to the fact that there is no room on the existing WWTF site for new treatment facilities beyond what is envisioned for 45 mgd expansions. Thus additional studies will need to be performed to define future expansions to the WWTF in the future as the flows increase.

10.3.1.1 Summary of Theresa Street WWTF Improvements

Projects Identified in Current CIP or Identified by City for Tier I

- Emergency Generator Installation
- Headworks/Grit Corr Rehab
- Biogas Study

- Digester Boiler Installation
- Stain Press Replacement & Relocation
- Security Gate at South Entrance
- Bar Screen Replacement
- Solids Handling Improvements – Thickening
- Solids Handling Improvements – Digestion
- Influent Pumping Upgrades
- Westside Odor Control Improvements
- Liquid Dumpstation Improvements
- Construct Solids Storage Pad
- Wet Weather Treatment
- 12.6 mgd Central Train BNR Expansion
- TSTP NDEQ Nutrient Study/Improvements

Tier II Projects

- Additional 4 MG Peak Flow Treatment/Storage
- 5 mgd East Train BNR Expansion
- Add Fourth Digester
- Additional Fourth Digester
- Additional 5 MG Peak Flow Treatment/Storage

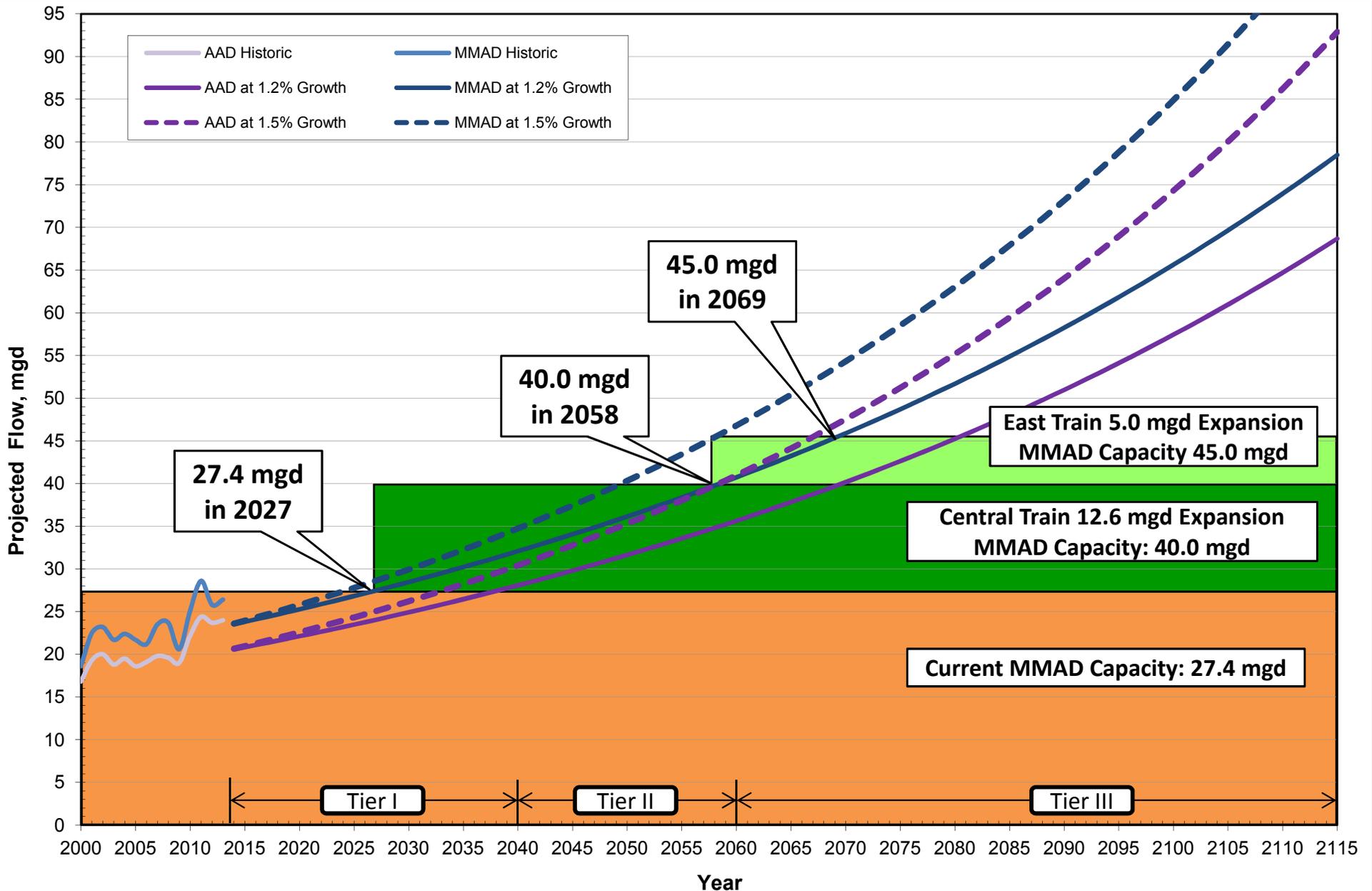
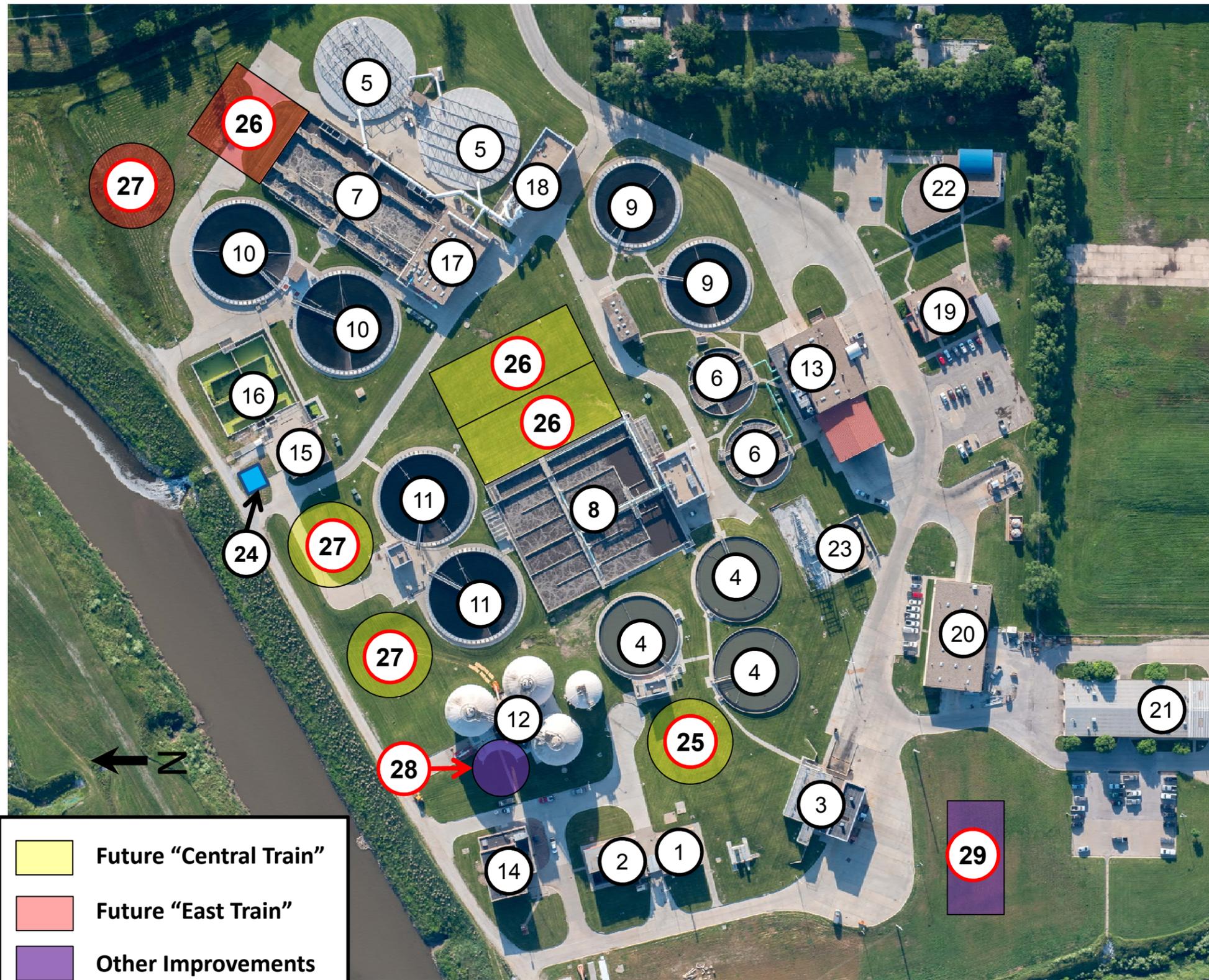


FIGURE 10.2 – THERESA STREET WWTF PROJECT MMAD FLOWS

WASTEWATER FACILITIES MASTER PLAN UPDATE – 2014
CITY OF LINCOLN, NEBRASKA



- | | |
|--------------------------------------|---------------------------------------|
| 1. South Influent Pump Station | 17. Secondary Solids Thickening |
| 2. North Influent Pump Station | 18. Odor Scrubber Facility |
| 3. Grit Removal Facility | 19. Laboratory |
| 4. Central & West Primary Clarifiers | 20. Treatment Facility Maintenance |
| 5. East Primary Clarifiers | 21. Collection System Maintenance |
| 6. West Aeration Basins | 22. WW Division Administration |
| 7. East Aeration Basins | 23. Electrical Substation |
| 8. Central Aeration Basins | 24. CRES Effluent Pump Station |
| 9. West Final Clarifiers | 25. Future Primary Clarifier |
| 10. East Final Clarifiers | 26. Future Aeration Basin |
| 11. Central Final Clarifiers | 27. Future Secondary Clarifier |
| 12. Anaerobic Digesters | 28. Future Digester |
| 13. Solids Dewatering Facility | 29. Selector Basins for BNR |
| 14. Co-Generation Facility | |
| 15. UV Disinfection Facility | |
| 16. Chlorine Contact Basins | |

Future "Central Train"
 Future "East Train"
 Other Improvements

FIGURE 10.3 – THERESA STREET WWTF AERIAL PHOTO WITH FUTURE TIER I AND II IMPROVEMENTS
 WASTEWATER FACILITIES MASTER PLAN UPDATE - 2014
 CITY OF LINCOLN, NEBRASKA

| Table 10.1 Teresa Street WWTF Costs | | | | | | | | |
|---|-------------------------------|-----------|---------------|-----------|---|-----------|-------------|---------------|
| Wastewater Facilities Master Plan Update - 2014 | | | | | | | | |
| City of Lincoln, NE | | | | | | | | |
| Tier (Timing) | Year(s) | MP CIP ID | WW Project ID | WW CIP ID | Description | Parameter | Unit Price | Planning Cost |
| I | Current Project | T-1 | 701119 | - | Emergency Generator Installation | LS | - | \$750,000 |
| I | Current Project | T-2 | 701427 | - | Headworks/Grit Corr Rehab | LS | - | \$125,000 |
| I | Current Project | T-3 | 502428 | - | Biogas Study | LS | - | \$200,000 |
| I | Current Project | T-4 | - | 0730 | Digester Boiler Installation | LS | - | \$600,000 |
| I | Current Project | T-5 | - | 0724 | Strain Press Replacement & Relocation | LS | - | \$350,000 |
| I | Current Project | T-6 | - | 0725 | Security Gate at South Entrance | LS | - | \$50,000 |
| I | 2014/15 and 2016/17 | T-7 | - | 0723 | Bar Screen Replacement | LS | - | \$1,800,000 |
| I | 2014/15-2016/17 | T-8 | 702371 | 0728 | Solids Handling Improvements - Thickening | LS | - | \$5,600,000 |
| I | 2014/15-2016/17 | T-9 | - | 0729 | Solids Handling Improvements - Digestion | LS | - | \$780,000 |
| I | 2014/15, 2015/16, and 2017/18 | T-10 | 701131 | 0561 | Influent Pumping Upgrades | LS | - | \$2,200,000 |
| I | 2015/16-2017/18 | T-11 | - | 0727 | SCADA/PLC Upgrades | LS | - | \$600,000 |
| I | 2016/2017 | T-12 | 701429 | 0323 | Westside Odor Control Improvements | LS | - | \$500,000 |
| I | 2017/2018 | T-13 | 701431 | 731 | Liquid Dumpstation Improvements | LS | - | \$500,000 |
| I | 2021/2022 | T-14 | - | - | Construct Solids Storage Pad | LS | - | \$290,000 |
| I | 2022/2023 | T-15 | - | - | Wet Weather Treatment | LS | - | \$2,576,000 |
| I | 2027/28 | T-16 | - | - | 12.6 mgd Central Train BNR Expansion | 12600000 | 12.5 | \$50,400,000 |
| I | | T-17 | - | 0722 | TSTP NDEQ Nutrient Study/Improvements | LS | - | \$19,300,000 |
| Tier I Total | | | | | | | | \$86,621,000 |
| II | - | T-18 | T-10 | | Additional Peak Flow Treatment/Storage | 4,000,000 | \$4.00 | \$16,000,000 |
| II | - | T-19 | T-11 | | 5 mgd East Train BNR Expansion | 5,000,000 | \$12.50 | \$62,500,000 |
| II | - | T-20 | T-12 | | Add fourth digester | LS | \$5,000,000 | \$5,000,000 |
| II | - | T-21 | T-13 | | Additional Peak Flow Treatment/Storage | 5,000,000 | \$4.00 | \$20,000,000 |
| Tier II Total | | | | | | | | \$103,500,000 |
| Tier III Total | | | | | | | | \$0 |

10.3.2 Northeast WWTF

Currently, the Theresa St WWTF has a MMAD capacity of 10.0 mgd. The projected flows at the 1.2 percent growth over the planning period is shown in Figure 10.4 where it can be seen that plant expansions will be needed by 2063, and 2097. These expansions have been conceptually planned and are shown schematically in Figure 10.5. A summary of the estimated planning costs for these improvements is presented in Table 10.2. Since the City owns a large parcel of property around the existing facilities, it is assumed that available land for the expansions would not be an issue. The improvements for each planning tier are summarized and discussed separately below. It should be noted that since the flows have been updated in the master plan update, only two plant expansions are currently identified as opposed to three which were identified in 2007. A summary of the improvements to the Northeast WWTF are outlined below.

10.3.2.1 Summary of Northeast WWTF Improvements

Projects Identified in Current CIP or Identified by City for Tier I

- Aeration Blow Installation
- Emergency Generator Installation
- SCADA/PLC Upgrades
- NPDES Nutrient Removal, Study, Design, Construct
- Odor Control Chemical Feed System Replacement
- Security Gate at Northeast Treatment Plant
- Replace Two Raw-Wastewater Pumps
- Solids Dewatering Improvements
- Replace RDT's
- Wet Weather Treatment

Tier II Projects

- Third Digester
- Additional Peak Flow Treatment/Storage

Tier III Projects

- 5 mgd BNR Expansion
- Additional Peak Flow Treatment/Storage

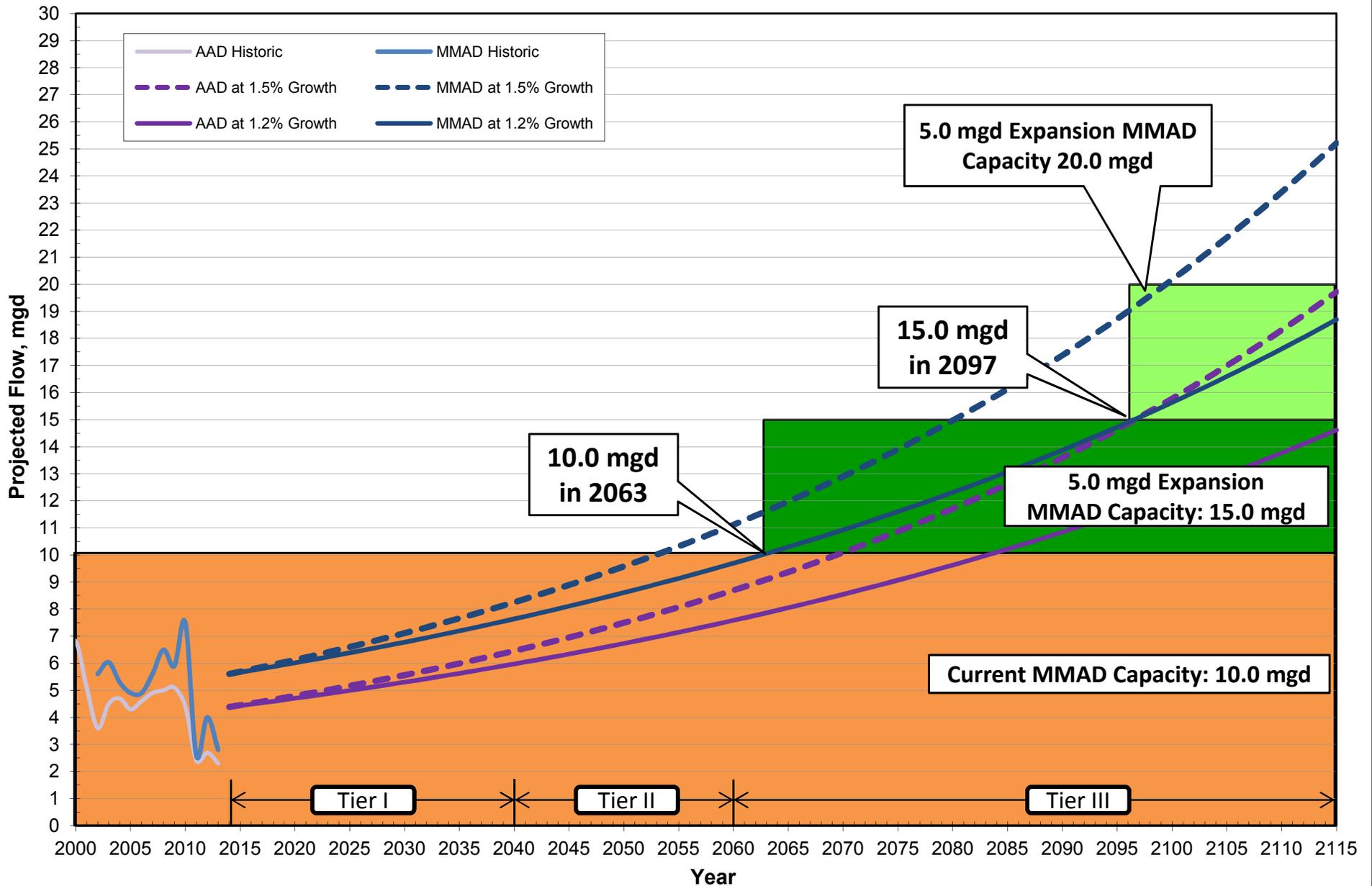
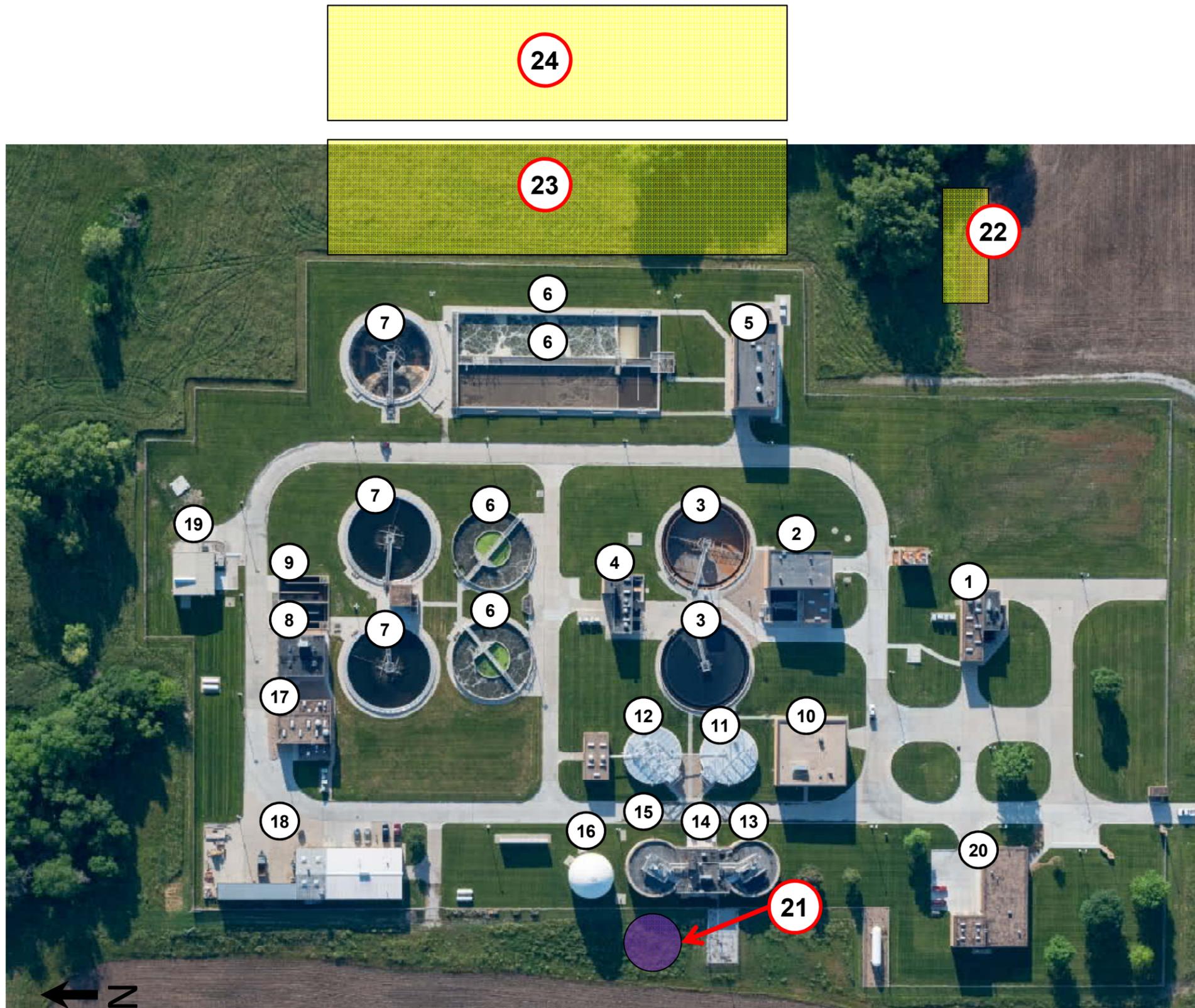


FIGURE 10.4 – NORTHEAST WWTF PROJECT MMAD FLOWS
 WASTEWATER FACILITIES MASTER PLAN UPDATE – 2014
 CITY OF LINCOLN, NEBRASKA



1. Raw Water Pump Station / Headworks
2. Grit Basins
3. Primary Clarifiers (2)
4. Recirculation Pump Station
5. Aeration Blower Building
6. Aeration Basins (4)
7. Final Clarifiers (3)
8. UV / Liquid Sodium Hypochlorite Disinfection Facilities
9. Chlorine Contact Basins
10. Solids Handling Building
11. WAS Storage
12. TWAS Storage
13. Primary Digester
14. Digester Control House
15. Secondary Digester
16. Gas Storage
17. Liquid Sodium Hypochlorite Building
18. Site Maintenance Building
19. Lincoln Electric System Treated Effluent Pumping Station
20. Control Building
- 21. Third Digester**
- 22. Future Headworks**
- 23. 5 mgd BNR Expansion**
- 24. 5 mgd BNR Expansion**

| Table 10.2 Northeast WWTF Costs | | | | | | | | |
|--|-------------------------------|------------------|----------------------|------------------|---|------------------|-------------------|----------------------|
| Wastewater Facilities Master Plan Update - 2014 | | | | | | | | |
| City of Lincoln, NE | | | | | | | | |
| Tier (Timing) | Year(s) | MP CIP ID | WW Project ID | WW CIP ID | Description | Parameter | Unit Price | Planning Cost |
| I | Current | NE-1 | 502516 | - | Aeration Blower Installation | LS | - | - |
| I | 2016/17 | NE-2 | 702275 | 0470 | Emergency Generator Installation | LS | - | \$500,000 |
| I | 2014/15 | NE-3 | - | 0727 | SCADA/PLC Upgrades | LS | - | \$500,000 |
| I | 2015/16, 2016/17, and 2018/19 | NE-4 | - | 0732 | NPDES Nutrient Removal Study, Design, Construct | LS | - | \$1,250,000 |
| I | 2015/16 | NE-5 | - | 0733 | Odor Control Chemical Feed System Replacement | LS | - | \$75,000 |
| I | 2014/15 | NE-6 | - | 0734 | Security Gate at Northeast Treatment Plant | LS | - | \$50,000 |
| I | 2014/15 | NE-7 | - | 0735 | Diversion Gate Replacement | LS | - | \$20,000 |
| I | 2016/17 - 2017/18 | NE-8 | - | 0736 | Replace Two Raw-Wastewater Pumps | LS | - | \$350,000 |
| I | 2021/22 | NE-9 | - | - | Solids Dewatering Improvements | LS | - | \$800,000 |
| I | 2025/26 | NE-10 | - | - | Replace RDT's | LS | - | \$5,300,000 |
| I | 2025/26 | NE-11 | - | - | Wet Weather Treatment | LS | - | \$1,969,000 |
| Tier I Total | | | | | | | | \$10,814,000 |
| II | - | NE-12 | - | - | Third Digester | LS | - | \$5,000,000 |
| II | - | NE-13 | - | - | Additional Peak Flow Treatment/Storage | 5,000,000 | \$12.50 | \$20,000,000 |
| Tier II Total | | | | | | | | \$25,000,000 |
| III | 2097 | NE-14 | - | - | 5 mgd BNR Expansion | LS | - | \$23,635,000 |
| III | - | NE-15 | - | - | Additional Peak Flow Treatment/Storage | 5,000,000 | \$4.00 | \$20,000,000 |
| Tier III Total | | | | | | | | \$43,640,000 |