Freeway Landfill and Dump Closure – Dig and Line Design Basis Report

Prepared for
Minnesota Pollution Control Agency

June 2021

4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
952.832.2600
www.barr.com

c-clf2-15r

Freeway Landfill and Dump Closure – Dig and Line

Design Basis Report

June 2021

Contents

List of Figures

List of Appendices

1 Introduction

This Design Basis Report (DBR) documents the design basis for one of the remedial options under consideration at the Freeway Landfill (Landfill) and Freeway Dump (Dump) (collectively the Site). The Minnesota Pollution Control Agency (MPCA) is the project owner and has engaged Barr to develop plans that will be used to obtain construction bids for two remedial options: (1) the Dig and Line option, and (2) the Dig and Haul option. This DBR aggregates data and assumptions required to design the Dig and Line option for the Landfill and Dump. The Dig and Haul option is the subject of a separate design basis report.

1.1 Design Objective

The overall objectives of the project, which were presented in the Focused Feasibility Study (FFS; Barr 2019b), generally involve remediation of the Landfill and Dump, which are both unlined disposal areas containing primarily municipal solid waste (MSW) and construction debris (CD), along with coal ash and other miscellaneous types of refuse. The Dig and Line option involves excavating the waste and placing it within a new lined facility to be constructed on Site.

This remediation will address the current and future risks associated with the presence of unlined waste materials at the Site. In general, the remediation will address the currently inadequate waste containment, which will also help reduce risks associated with direct contact with the waste, groundwater migration of contaminants from the waste, and landfill gas generation from the waste (Barr, 2019b). The groundwater migration pathway risks include existing concerns with periodic flooding and groundwater inundation of the unlined waste, plus future migration concerns related to the higher groundwater conditions that will occur when the Kraemer Quarry dewatering ends south of the Landfill (Barr, 2015 and 2019b).

As the design work advances, the design documents produced through this work will also support:

- Permitting
- Closure construction cost estimating
- Construction bidding
- Legislative decision-making around project selection and funding

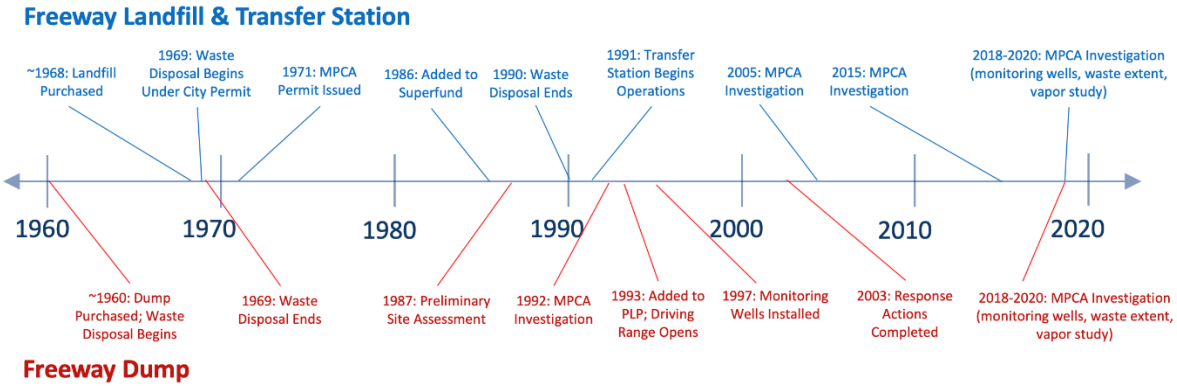
This design is an interim remedy, focused on addressing immediate impacts associated with the presence of waste without adequate containment. MPCA acknowledges that wider-ranging topics, such as current or future groundwater conditions or surrounding land uses are beyond the objective of this project, but it is also recognized that waste consolidation and containment will be an important component to reduce overall risks when wider risk pathways are evaluated and addressed in the future.

During the design process, Barr has periodically met with MPCA and other stakeholders to update the basis of design outlined in this report.

1.2 Background

The Site is located in Burnsville, Dakota County, Minnesota, on the south side of the Minnesota River near Interstate 35W (with the Landfill located west of Interstate 35W and the Dump located east of Interstate 35W), as shown on Figure 1-1. The current and anticipated Site conditions are outlined in the Focused Remedial Investigation Report (Barr, 2019a). The Site is unique in that current Site hydrogeological conditions are highly influenced by groundwater pumping at the adjacent KMM quarry, and consideration has been given to both current conditions and the anticipated future conditions when the quarry pumping operations cease. Additional Site background, history, and project details are presented in the Focused Remedial Investigation Report (Barr, 2019a) and Focused Feasibility Study (FFS, Barr, 2019b).

Based on historical landfill records, files provided by the MPCA, and historical aerial imagery the following approximate chronology of significant milestones has been developed for the Site.



Based on the results from investigations conducted to date, the MPCA has determined that additional waste management efforts are needed for the Landfill and Dump. As the Site conditions have been assessed, the MPCA has maintained on-going consultation with US Environmental Protection Agency (US EPA), Dakota County, the City of Burnsville, and other stakeholders. Although there is some variation between those parties as to a specific course of action for additional waste management at the Site, all parties have been in agreement that additional waste management efforts are needed to address existing and anticipated future Site risks.

The FFS (Barr, 2019b) was developed with remedial action objectives to:

- Prevent direct contact with MSW
- Restrict infiltration into the MSW
- Restrict groundwater contact with MSW (includes current conditions, flood conditions for the Minnesota River, and the anticipated future conditions of higher groundwater when the dewatering ends at the adjacent quarry)
- Restrict leachate migration from the MSW towards groundwater and surface water receptors
- Prevent migration of MSW-generated landfill gas into nearby buildings

Three variations of the dig-and-line remedial alternative were developed to an approximate 30% design stage. Each variation presented a different blend of landfill footprint and height. Generally, the lowest cost variation was the smallest footprint/tallest height while the highest cost option was the largest footprint/lowest height. After evaluating each variation and considering public comment, the MPCA selected Variation C, which was a hybrid option between the two extremes.

1.3 Project Schedule

The following table presents the anticipated project schedule, based on information provided by the MPCA. As the project develops, the schedule may be adjusted.

Deliverable/Task	Deliverable/Task Date
30% Design Submittal	Completed (February 2020)
Public Comment Period	Completed (April 2020)
90% Design Submittal	June, 2021
Final Design Submittal	October, 2021
Bidding Starts	October, 2021
Bidding Ends	Early 2022
Construction Starts	Spring/Summer 2022

1.4 Site Access

The MPCA is seeking access from property owners to finalize remaining field investigations and on-site permitting activities that will be conducted as the design is advanced, and to complete project construction. Delays in securing access will delay the Project Schedule.

1.5 Report Organization

The report is organized into sections that encompass both administrative and technical aspects of the design. It is intended to succinctly present the design basis components, and is therefore presented in brief, bullet-style format to illustrate key assumptions and design decisions that have been established by MPCA and Barr, with input from other stakeholders. Substantial supporting information is presented in other sources, which are cited throughout this report.

2 Existing Conditions

2.1 Location

The Site is comprised of two project areas: the Landfill and Dump. Multiple parcels are associated with the Site and are controlled by various ownership entities, including the R.B. McGowan Company, Inc., Freeway Transfer, Inc., Quarry Property, LLC, Michael B. McGowan, and Trustees of the Richard B. McGowan irrevocable Trust Agreement, dated October 22, 1997. For the remainder of this DBR, those various entities will be referred to as the Site Owner. Property boundaries and ownership in the vicinity of the Site are presented in the FFS (Barr, 2019b) and are shown on Figure 1-1.

The limits and depth profiles of the waste are based on soil borings, test trenches, historical aerial photographs, and topography. The limits of waste associated with both the Dump and Landfill extend beyond parcels owned by the Site Owner and onto adjacent properties. Additional information on the limits and depth profiles are presented within the FFS (Barr, 2019b). The following sections describe the two project areas.

2.2 Freeway Landfill – Existing Conditions

- Adjacent/Related Property Uses – Owned by Site Owner
    - Freeway Transfer Station – within eastern portion Landfill site
    - Dumpsters, and various material and equipment storage – on top of existing waste cover near site roads
    - Quarry to the west – outside of waste footprint
        - Area: ~29 acres
        - Base elevation: ~672 ft
        - Existing conditions: exposed bedrock, usually mostly dry
        - Current use: concrete crushing operations, material stockpiles
- Adjacent Property Uses – Not by Site Owner
    - Port Marilyn LLC (salt storage and barge transfer systems) to the north
    - Kraemer Quarry to the south
    - I-35W to the east
    - Minnesota River to the north
- Age of waste: Accepted sanitary waste between 1969 and 1990
- Area of waste extent: ~140 acres
- Liner: none
- Cover: vegetated soil covered over the majority of the area. Trees present on the east and south sides.
- Surface and Subsurface Information:
    - Topography: The maximum elevation of the Landfill is approximately 750 ft at its peak near the center of the property. The ground surface slopes downward in all directions to an elevation of approximately 700 ft at the property limits. This slope is relatively gentle, generally ranging from 2% to 4%, with the exception of the east and south edges where

steeper 20-30-foot-long slopes up to approximately 30% are present. The ridge on the east side of the Landfill is adjacent to an intermittent surface water channel that runs north to the river, between the Landfill and Highway 35W.

- Estimated Volumes:
  - Volume of waste: ~5,300 KCY (maximum depth ~51 ft, average depth ~22.9)
  - Volume of cover soils: ~1,400 KCY (maximum depth ~29 ft, average depth ~6.0)
  - Volume of material beneath waste (above bedrock): ~1,400 KCY (maximum depth ~47 ft, average depth ~6.1 ft
- Soil Quality: Cover soil and material beneath waste is assumed to be generally free of impacts, largely meets the MPCA definition of Unregulated Fill, and is acceptable for soil re-use on-site as part of restoration
- Bottom of waste elevation: ~698 ft average (varies from 684 ft to 714 ft)
- Bedrock elevation: ~691 ft average (varies from 654 ft to 703 ft)
- Sources:
  - Ground surface developed from data presented in Section 3.5 (aerial survey)
  - Subsurface data (top of waste, bottom of waste, and bedrock) developed from the following sources:
    - Soil borings by Gorman Surveying, Inc. in May 2005
    - Monitoring wells completed by Conestoga-Rovers and Associates in June 2015
    - Soil borings and test trenches by Barr in April 2018
  - See Section 6.5 for additional assumptions

2.3 Freeway Landfill – Water and Groundwater

- Minnesota River Design Assumptions:
  - Normal water level: 689.1 ft
    - Source: estimated based on USGS gage data at Ft. Snelling, and adjusted for distance upstream
  - Ordinary High Water Level (OHWL): 700.0 ft
    - Source: Technical memo prepared by Barr Engineering Co., *OHWL Determination at Black Dog Generating Plant*, June 20, 2014
  - 10% annual chance flood elevation: 707.2 ft
    - Source: Dakota County Flood Insurance Study, March 16, 2016
  - 2% annual chance flood elevation: 713.5 ft
    - Source: Dakota County Flood Insurance Study, March 16, 2016
  - 1% annual chance flood elevation: 716.2 ft
    - Source: Dakota County Flood Insurance Study, March 16, 2016
  - 0.2% annual chance flood elevation: 722.0 ft
    - Source: Dakota County Flood Insurance Study, March 16, 2016
- Existing Groundwater Elevation beneath Landfill (with KMM pumping):
  - Minnesota River at normal water level: ~667 ft average (varies from 633 ft to 693 ft)
  - Minnesota River at flood conditions: ~677 ft average (varies from 647 ft to 715 ft)

        - Flood condition represents 1% annual chance flood with a total flood time of 120 days (based on review of previous floods of similar magnitude, 60-day rise and 60-day fall)
- Future Predicted Groundwater beneath Landfill (with future mine pit lake operating at elevation 690 ft as desired by the City of Burnsville):
    - Minnesota River at normal water level: ~696 ft average (varies from 691 ft to 703 ft)
    - Minnesota River at flood conditions: ~700 ft average (varies from 693 ft to 715 ft)
        - Flood condition represents 1% annual chance flood with a total flood time of 120 days (based on review of previous floods of similar magnitude, 60-day rise and 60-day fall)
- Current and predicted (i.e., the design condition) groundwater elevation contour maps are included as Figures 2-1 through 2-4. Additional predicted contour maps (not for the design condition) are included in Appendix A.

2.4 Freeway Dump – Existing Conditions

- Current Property Use by Site Owner
    - Driving range over the majority of the area
- Adjacent Property Uses – Not by Site Owner
    - Vacant land/wetlands (Black Dog Preserve Wildlife Refuge) to the north and east, owned by Northern States Power Company (Xcel Energy) and US Fish and Wildlife Services
    - Allstate Self Storage facility to the south and southeast
    - Public bike path to the immediate west
    - I-35W to the west beyond bike path
    - Black Dog Lake to the north beyond the wildlife refuge
- Age of waste: Accepted sanitary waste in the 1960's
- Area of waste extent: ~34 acres
- Liner: none
- Cover: vegetated soil covered. Trees and gravel parking lot present on the south side. Shrubs present on the east, north, and west edges.
- Surface and Subsurface Information:
    - Topography: The majority of the Dump is a generally flat-top mound that sits above the surrounding wetland at elevations ranging from approximately 720 ft to 730 ft. The raised elevation of the Dump extends beyond the north and east boundaries of the Dump property. The surrounding wetland is located at an elevation ranging from approximately 700 ft along the north perimeter to about 710 ft to the southeast of the Dump.
    - Estimated Volumes:
        - Volume of waste: ~860 KCY (maximum depth ~31 ft, average depth ~15.7 ft)
        - Volume of cover soils: ~140 KCY (maximum depth ~23 ft, average depth ~2.6 ft)
        - Volume of material beneath waste (above bedrock): ~130 KCY (maximum depth ~14 ft, average depth ~2.3 ft)

- Soil Quality: Cover soil and material beneath waste is assumed to be generally free of impacts, largely meets the MPCA definition of Unregulated Fill, and is acceptable for soil re-use on-site as part of restoration
- Bottom of waste elevation: ~706 ft average (varies from 690 ft to 716 ft)
- Bedrock elevation: ~702 ft average (varies from 687 ft to 716 ft)
- Sources:
  - Ground surface developed from data presented in Section 3.5
  - Subsurface data (top of waste, bottom of waste, and bedrock) developed from the following sources:
    - Monitoring wells completed by Bergerson-Caswell in November of 1997.
    - Monitoring wells, soil borings, and test trenches completed by Barr in March 2018, March 2019, and May 2019.
  - See Section 6.5 for additional assumptions

2.5 Freeway Dump – Water and Groundwater

- Black Dog Lake Design Assumptions:
  - Normal water level: 695.5 ft
    - Source: estimated based on USGS gage data at Ft. Snelling, and adjusted for distance upstream
  - Ordinary High Water Level (OHWL): 697.0 ft
    - Source: Technical memo prepared by Barr Engineering Co., *OHWL Determination at Black Dog Generating Plant*, June 20, 2014
  - 1% annual chance flood elevation: 715.0 ft
    - Source: Dakota County Flood Insurance Study, March 16, 2016
- Existing Groundwater beneath Freeway Dump (with KMM pumping):
  - Minnesota River at El. 699 ft (June 17, 2019): ~706 ft (varies from 699 ft to 710 ft)

3 General Design Items

3.1 Deliverables

- Reports:
  - Design Basis Report
    - Living Document
    - Final with 90% design submittal
- Construction Drawings and Specifications
  - Construction Drawing List under separate cover
  - Specification List under separate cover
    - Select Programs/Procedures within specifications:
      - Quality Control/Quality Assurance within specifications
      - Waste Screening Procedure within specifications
      - Contingency Action Plan – Contractor to produce as submittal
  - 90% design submittal
  - Final design/bid package submittal
- Permits: See Section 4.0
- Cost Estimating
  - FFS – Completed
  - Public Comment Period/60% Design Progress – Completed
  - Final Design
- Estimated Construction Schedule
  - Public Comment Period/60% Design Progress – Completed
  - Final Design
- Construction Documentation Report
  - With construction
- Miscellaneous
  - Liner/Enhanced Liner Selection Documentation – Completed

3.2 Specifications/Contracting

- Upfront documents: coordinate with MPCA - Admin
  - AIA Document A201 – General terms and conditions (expected to require an expanded supplementary conditions)
- Specifications: Barr Specifications using CSI MasterFormat
  - MnDOT 2018
- Bidding style:
  - Unit prices
  - Considerations to time/durations vs lump sum
  - Allowances provided for utility hookups
  - Significant bid alternatives are not anticipated

3.3 Coordinate System

- Coordinate System: Dakota County Coordinates (U.S. Survey Feet)
- Horizontal Datum: North American Datum of 1983 (NAD83) (2011 Adjustment)
- Vertical Datum: North American Vertical Datum of 1988 (NAVD88)
- Benchmarks/Control Points
    - Provided by Ayres Associates on 06-16-2020

3.4 CAD/Drawings Standards

- Barr Drawing Standards (MPCA does not have specific requirements)
- Software: Autodesk Civil 3D, 2017

3.5 CAD Existing Conditions

Item	Source	Date
Topography	LiDAR from Ayres Associates	Provided 06-12-2020
Aerial Imagery	Aerial imagery from Ayres Associates	Provided 06-12-2020
Existing Utilities	Utility locate and survey from MN DNR	Provided 05/26/2021
Land Control	Boundary survey from MN DNR	Provided 5/27/2021 (not incorporated into 90% design)
Wetlands	Barr Field Survey 2019; Technical Evaluation Panel meeting June 2021	Delineation Report October 2019
Existing Roads and Infrastructure	Linework provided from Ayres Associates (aerial imagery)	Provided 06-22-2020

3.6 Property Access and Future Use

- Access to property – TBD (MPCA to coordinate)
- Future Use: Depiction of parcel use during and after project shown on Figure 3-1

3.7 New Utilities

- Water
    - Potable: No potable water
    - Sanitary
        - No permanent sanitary facilities
        - Leachate – see Section 9 for Leachate Management
    - Fire water: No permanent fire water
    - Material conditioning during construction: To be provided and coordinated by contractor
- Electrical: See Section 16 for Electrical information
- Communication: No communication other than for leachate monitoring will be provided

3.8 New Buildings

- New Storage Shed: Approximately 30' x 20' for maintenance and storage of equipment and spare parts for future landfill operations.
- New Electrical Building to support landfill operations: See Section 16.3

3.9 Landfill Siting

- The project involves cleanup/corrective measure to an existing facility (net reduction of impacts of waste), and is not considered a new solid waste management facility
- New liner limits are to be located within the existing waste footprint.

4 Permitting

4.1 Permitting Requirements and Assumptions

- Barr to coordinate
    - Joint Permit Application for Activities Affecting Water Resources in Minnesota, which covers the following federal and state requirements:
        - Federal – U.S. Army Corps of Engineers jurisdiction of wetland impacts under Section 404 of the Clean Water Act, which also triggers evaluations of Cultural Resources and Threatened and Endangered Species, which we believe to not be significant based on the following work completed to date:
            - Cultural Resources – a request was submitted to the Minnesota State Historic Preservation Office (SHPO). One previously recognized site was present within the project area. We believe the site is no longer present and therefore there will be no historic properties affected by the project.
            - Threatened and Endangered Species – Northern Long Eared Bat and Raptor surveys were completed and none were identified within the project area.
        - State – Wetland Conservation Act (administered by the City of Burnsville), Public Waters Work Permit (Department of Natural Resources), and MPCA requirements under Section 401 of the Clean Water Act
    - Lower Minnesota River Watershed District Individual Permit
    - Minnesota General Permit for Construction Stormwater under NPDES/SDS
    - Minnesota No Rise Certificate
- Contractor to coordinate
    - Demolition Permit
    - Minnesota Department of Labor and Industry (MNDLI) – State Electrical Permit
    - MnDOT Right of Way Permit
        - required for waste excavation within R.O.W.
    - Well Sealing Permit: Contractor to obtain
    - Permits associated with other discharge options
- MPCA to coordinate
    - MCES industrial discharge permit for landfill leachate
    - MPCA Industrial Stormwater Permit
- Additional requirements
    - City of Burnsville:
        - City of Burnsville does not require any permits (grading, tree preservation, etc.) as the state process supersedes the city process (email from 12/20/2019)
    - Dakota County
        - Assumption is that the project will be considered a Nonconforming Site under Dakota County Ordinance 110. The alternatives to that assumption are to either

obtain variances from certain elements of ordinance, or proceed without Dakota County approval.

- FEMA Letter of Map Revision (LOMR) is not required (based on No-Rise condition); however, a Conditional LOMR may be submitted following project to update flood maps

4.2 Wetlands

A wetland delineation report was completed by Barr in 2019 (Barr, 2019c) and several meetings were held with permitting agencies. Due to restrictions on accessing the site, The Technical Evaluation Panel meeting was held

The general approach to addressing wetlands as part of the design is as follows:

- Identify wetlands that require protection and/or mitigation (completed as part of the delineation)
- Minimize wetland impacts to the extent practicable
- Restore impacted wetlands to the extent practicable
- Remaining impacted wetland mitigation efforts will include purchasing wetland credits

4.3 ARARs

An evaluation of Applicable and Relevant or Appropriate Requirements (ARARs) was completed as part of the FFS (Barr, 2019b). The ARAR evaluation included a wide-ranging look at rules and permit requirements from a federal, state, and local perspective. The reader is encouraged to review that report for additional detail.

4.4 US EPA Coordination

The MPCA will coordinate with US EPA on final remedy selection (Dig & Haul vs. Dig & Line) and work to establish a Record of Decision or other determination for the selected interim remedy.

5 Demolition and Removals

5.1 Applicable Codes and Standards

- American National Standards Institute (ANSI) ANSI A10.6 – Safety and Health Requirements for Demolition Operations
- Minnesota Department of Health
- OSHA excavation

5.2 Deliverables

- Construction Drawings and Specifications

5.3 Landfill

- Site Owner to remove/relocate:
    - Dumpsters
    - Equipment and misc. materials/debris from existing quarry
    - If Site Owner fails to remove above, contractor will provide allowance for additional removals as necessary
- Structures: To be demolished/removed by contractor
    - Concrete slab
    - Assumes asbestos abatement not required
- Equipment: Equipment not removed by Site Owner will be demolished/removed by contractor
- Transfer Station: Salvage, protect, or replace infrastructure such as lighting, signs, and fencing
- Road surfacing: Reclaim pavement for off-site crushing as Class 7 aggregate beneficial reuse as feasible
- Monitoring wells: Abandon and remove wells within waste excavation extent. Protect wells outside of waste excavation extent.
    - New monitoring wells to establish new network after completion of landfill construction
        - Assume outside of general contract (Barr to provide MPCA a budgetary estimate)
- Utilities:
    - Protect and or salvage existing utilities, as feasible, that are associated with operations that will remain
    - Remove and replace existing sanitary and potable waterlines to transfer station in kind
- Disposal: All removed material shall be properly recycled, salvaged, or disposed of in an approved landfill
    - New lined facility is the preferred disposal location, assuming material is determined to be Acceptable, as defined by the Specifications

5.4 Dump

- Structures: To be demolished/removed by contractor
    - Office Trailer and slab

    - Assumes asbestos abatement not required (or very minimal)
- Equipment and light poles: To be demolished/removed by contractor
- Fencing and gates: salvage, protect, or replace fencing and gates
- Road surfacing: Reclaim pavement for off-site crushing as Class 7 aggregate beneficial reuse as feasible
- Monitoring wells: Abandon and remove wells within waste excavation extent. Protect wells outside of waste excavation extent.
    - New monitoring wells to establish new, reduced network (assume not part of construction contract)
- Utilities: remove encountered utilities
- Disposal: All removed material shall be properly recycled, salvaged, or disposed of in an approved landfill
    - New lined facility is the preferred disposal location, assuming material is determined to be Acceptable, as defined by the Specifications

5.5 Tree removal

- Timing: require to be removed as late as possible to provide construction screening
- Removals: Offsite or chipped on-site permitted, burning prohibited (contractor select method)

6 Excavation and Waste Relocation

6.1 Applicable Codes and Standards

- OSHA excavation
- OSHA HAZWOPER

6.2 Deliverables

- Construction Drawings and Specifications
    - Select Programs/Procedures within specifications:
        - Quality Control/Quality Assurance within specifications
        - Waste Screening Procedure within specifications
    - Contractor to submit
        - Sequence plan
        - Excavation plan (slopes and heights stamped by Professional Engineer)

6.3 Waste/Material Screening

- Material screening to be completed by Owner and Contractor
    - Screening to characterize waste as Acceptable or Unacceptable
        - Acceptable Waste Examples (assumed to be significant majority)
            - Mixed Municipal Solid Waste
            - Ash
        - Unacceptable Waste Examples
            - Hazardous material
            - Batteries
            - Sludges
            - Drums
            - Tires
            - Asbestos-containing Material
- Disposal
    - Significant majority of waste assumed to be appropriate for disposal in new onsite facility
    - For materials that are not acceptable (i.e., hazardous waste, tires, etc), landfill acceptance and specific waste screening procedures required by accepting landfill(s) will be responsibility of Contractor

6.4 Waste Removal Limits

The limits of waste associated with both the Dump and Landfill extend beyond parcels owned by the Site Owner and onto adjacent properties, as shown within the FFS (Barr, 2019b). The following list documents the assumptions around waste removal.

- Landfill
    - Horizontal (removed/not removed)

        - Site Owner Property
            - Stop excavation around Transfer station (edge of pavement, buffer on building)
            - Full removal of remainder of waste
        - Interstate 35W Right-of-Way
            - Full removal (requires access agreement to be obtained by MPCA)
        - Port Marilyn LLC (Salt Storage)
            - Stop excavation at property boundary near buildings/infrastructure
            - Remove waste in other portions of parcel (requires access agreement to be obtained by MPCA)
    - Vertical (depth beneath and above waste)
        - Full waste recovery by standard earthwork equipment is assumed
        - Waste removal volume estimates include an average of 12 inches soil beneath waste and 6 inches of soil above waste
        - Peat beneath waste to be visually inspected to determine if material is considered waste
            - Peat within extent of future landfill or structures to be removed for geotechnical purposes
            - Peat assumed to be clean material and remain in place for earthwork balance
- Dump
    - Horizontal extent (removed/not removed)
        - Site Owner Property
            - Full removal
        - Interstate 35W Right-of-Way
            - Partial removal, stop extent 2 ft from bike path (note for a field call) with steeper slope (draw at 1H:1V) (requires access agreement to be obtained by MPCA)
        - Allstate Self Storage facility
            - Not removed, stop extent at property boundary (note for a field call)
        - Northern States Power Company (Xcel Energy)
            - Full removal (requires access agreement to be obtained by MPCA)
        - US Fish and Wildlife Services
            - Full removal (requires access agreement to be obtained by MPCA)
    - Vertical (depth beneath and above waste)
        - Assumed 12 inches beneath waste and 6 inches above waste
- Excavation slopes = 2H:1V (assumed for volume analysis)

6.5 Waste Excavation Volume Estimates

- Landfill ~5,200 KCY
- Dump ~860 KCY
- Total ~6,100 KCY

6.6 Waste Capacity Requirements

- Assume waste capacity required within new lined facility matches entire waste volume excavated
    - Significant majority of waste excavated to be placed in new lined facility (only wastes screened out will be excluded, see Section 6.3 for additional information)
- Swell/Shrinkage: Assumed 1:1 bank to compacted
- 10% Contingency
    - Peat (if determined to be waste) would be accounted for under contingency
- Due to the age and condition of the waste, it is assumed that minimal intermediate or long-term cover will be required; however, there will be requirements for controlling odor, vectors, trash, and dust. No landfill capacity is allocated for cover materials

6.7 Cover and Fill Soils Estimates

- Onsite:
    - Landfill ~1,400 KCY
    - Dump ~140 KCY
    - Quality: Assumed to be suitable as common fill and topsoil
- Import:
    - Quality: meet requirements of MPCA Unregulated Fill BMP and Dakota County Ordinance 110, with consideration given to accessibility and placement of soils

6.8 Rock Removal/Blasting

- Rock Removal may be required for liner and utility construction (blasting, ripping, hammering)
    - Rock Blasting may be allowed, contractor permit would be required

7 Liner

7.1 Applicable Codes and Standards

- Minnesota Rule 7035, Solid Waste
- Minnesota Rule 7035.2815 Mixed Municipal Solid Waste Land Disposal Facilities
- Minnesota Rule 7035.1590 through 7035.2500 Industrial Solid Waste Land Disposal Facilities
- Geosynthetic Institute Standards and Methods
- ASTM D6747-15: Standard Guide for Selection of Techniques for Electrical Leak Location of Leaks in Geomembranes
- ASTM D7007-15: Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earthen Materials

7.2 Deliverables

- Construction Drawings and Specifications
    - Select Programs/Procedures within specifications:
        - Quality Control/Quality Assurance within specifications
- Miscellaneous
    - Liner/Enhanced Liner Selection Documentation – Completed
        - See Section 7.6 for additional information

7.3 Design Requirements

- Liner system must have a leachate collection efficiency of at least 95% of the precipitation that falls on the system, Minnesota Rule 7035.2815 Subp. 7 paragraph J
- Liner system in combination with the cover system must achieve an overall site efficiency of 98.5% collection or rejection of the precipitation that falls on the system, Minnesota Rule 7035.2815 Subp. 7 paragraph A

7.4 Geometry

- Interior embankment slopes = 3H:1V
- Liner base slopes = 2% (minimum), 10% (maximum), Minnesota Rule 7035.2815 Subp. 7 paragraph G
- Leachate collection trench slopes = 0.5% (minimum)
- Leachate collection trench side slopes = 2' depth at 3H:1V
- Number of leachate collection sumps = 6
- Sump slopes = 5' depth at 3H:1V
- Sump bottom dimensions = 10' x 10'
- Liner base maximum un-intercepted leachate flow distance = 100', Minnesota Rule 7035.2815 Subp. 9 paragraph E
- Liner elevation: Minimum waste elevations to be above future predicted groundwater at normal Minnesota River conditions, see Section 2.3 for additional information.

7.5 Liner type

- Enhanced Composite Liner System overlying the waste, consisting of the following components listed from top to bottom:
    - Waste buffer layer: primarily soil-like waste materials buffer layer (mostly soil) in bottom three feet of waste
    - Drainage layer
        - 12″ sand
        - Minimum permeability of 1 x 10^{-3} cm/s
    - Barrier Layer
        - 60 mil HDPE Geomembrane
        - Geosynthetic Clay Liner
        - 2′ compacted clay liner
            - Maximum permeability of 1 x 10^{-7} cm/s
    - Native soil/sub-base material
        - Remove/replace peat, organics, and other unsuitable subgrade materials

7.6 Liner/Enhanced Liner Selection Documentation - Completed

- Memorandum (Barr, 2020) documenting:
    - Base liner option
    - Recommended enhanced liner
    - Other alternatives that were not selected based on:
        - Schedule
        - Cost
        - Constructability
        - Performance
        - Operation/maintenance
        - Risk

7.7 Quality Control

- A leak location survey will be performed on the geomembrane liner
- Destructive and non-destructive testing will be completed

8 Cover

8.1 Applicable Codes and Standards

- Minnesota Rule 7035, Solid Waste
- Minnesota Rule 7035.2815 Mixed Municipal Solid Waste Land Disposal Facilities
- Minnesota Rule 7035.1590 through 7035.2500 Industrial Solid Waste Land Disposal Facilities
- Geosynthetic Institute Standards and Methods
- GSE Drainage Design Manual
- Designing with Geosynthetics, Koerner, Robert M.

8.2 Deliverables

- Construction Drawings and Specifications
    - Select Programs/Procedures within specifications:
        - Quality Control/Quality Assurance within specifications

8.3 Design Requirements

- Contain or reject at least 90% of the precipitation falling on the system, Minnesota Rule 7035.2815 Subp. 6 paragraph D (2)
- Liner system in combination with the cover system must achieve an overall site efficiency of 98.5% collection or rejection of the precipitation that falls on the system, Minnesota Rule 7035.2815 Subp. 7 paragraph A

8.4 Geometry

- Slopes = 5H:1V (maximum), 3% (minimum), Minnesota Rule 7035.2815 Subp. 5 paragraph G
- Diversion drainageways/drainage control berms every 200', Minnesota Rule 7035.2815 Subp. 5 paragraph E
    - 1% (minimum)

8.5 Cover Types

- Landfill Cover:
    - Turf establishment (straw mat erosion control blanket)
    - 6" Topsoil
    - 18" Rooting soil
    - Drainage layer
        - Geocomposite
    - Barrier Layer
        - Geomembrane – 40 MIL LLDPE
    - 12" Buffer material layer (soil-like waste materials)
    - Waste
- Restoration – see Section 13

9 Leachate Management

9.1 Applicable Codes and Standards

- Minnesota Rule 7035, Solid Waste
- Minnesota Rule 7035.2815 Mixed Municipal Solid Waste Land Disposal Facilities

9.2 Deliverables

- Construction Drawings and Specifications

9.3 Design Requirements

- Liner system in combination with the cover system must achieve an overall site efficiency of 98.5% collection or rejection of the precipitation that falls on the system, Minnesota Rule 7035.2815 Subp. 7 paragraph A
- Design leachate management system to provide pumping capacity and storage to limit leachate to a maximum elevation of 1-foot above liner (after closure).

9.4 Leachate

9.4.1 Volume During Construction

During construction, leachate management will be the responsibility of the contractor. It is assumed that the quantity of leachate able to be captured from the existing landfill waste as it is exposed and recovered will be minimal. The majority of water that passes through the existing waste and the existing leachate will infiltrate until the waste is moved onto the new liner. Negligible ponding will occur in waste excavation areas. Contractor management of contact stormwater or leachate during construction must meet the following objectives:

- All stormwater contacting waste or leachate from waste must be contained within the existing waste footprint and allowed to infiltrate, or else be collected for management. Water management will include discharge offsite through the MCES system, or other Owner approved measure. Uncontained or direct discharge of contact stormwater or leachate beyond the existing waste limits is prohibited.
- Contact stormwater or leachate within a newly constructed/completed lined portion (partial construction) of the Landfill must be discharged offsite through the MCES system.

Contractor is responsible to design and manage the temporary containment, piping, and pumping controls required to meet these objectives.

9.4.2 Volume After Closure

- Based on anecdotal evidence from the Washington County Landfill, it is assumed that larger volumes of leachate will be generated in the first 2-5 years of operations, before the volumes decrease to a lower and more stable long-term volume.

    - It is estimated that during this timeframe, approximately 3 times the anticipated long term monthly volume will be collected, or approximately 540,000 gallons per month.
- It is assumed that the total monthly leachate volume (after the initial 2-5 year stabilization period) is approximately 180,000 gallons.
    - Scaled based on monthly leachate volume collected from the Washington County Landfill leachate collection system due to its similar waste characteristics, geographical location, landfill design, and operations to the proposed Freeway Landfill.
    - The Washington County Landfill is roughly 1/3 the size as the proposed Freeway Landfill and currently collects 60,000 gallons of leachate each month.
- The anticipated leachate volumes are summarized in Table 1.

Table 9.4.1-1: Leachate Volume

Landfill	Size (acres)	Leachate Volume Collected during first 2-5 years (gal/month)	Leachate Volume Collected after 5 years of operation (gal/month)
Washington County Landfill	25	180,000	60,000
Freeway Landfill	71	540,000 (estimated)	180,000 (estimated)

9.4.3 Leachate Water Quality Characteristics

- Leachate at this site is assumed to be similar to other municipal solid waste landfill leachate, which is currently accepted by MCES.

9.4.4 Leachate Collection (underdrain, sumps, sidewall risers, pumps, carrier pipe, storage)

Once Landfill operation has commenced, leachate will be collected by an underdrain system which flows to one of 6 sumps at the bottom of the landfill. Each sump will be accessed by two sidewall riser pipes that will each house a pump. These pumps will pump the collected leachate through a dual-walled pipe to an underground storage tank described in Section 9.4.5.2. Below is a summary of the leachate collection design assumptions:

9.4.4.1 Underdrains

- 12-inch thick drainage layer with a minimum hydraulic conductivity of 1×10^{-3} cm/sec will be placed above the composite liner system and transfer leachate to the leachate collection trench
- Leachate collection pipes within the leachate collection trench will be embedded in coarse aggregate and sized to accommodate the following:
    - Provide adequate capacity for assumed collection rates
    - Allow jetting equipment to clean extended distances
    - Not be susceptible to pipe crushing
- Leachate collection pipe cleanout access will be via sidewall riser pipe.

9.4.4.2 Sumps

- Sumps will be sized to accommodate the following:

- Large enough for underdrain system components
- Minimize depth to avoid groundwater impacts
- Each sump and associated leachate collection trenches will have over one week of storage after stabilization, based on assumed collection rates
- Side slopes consistent with industry standard

9.4.4.3 Sidewall Riser

Each sump includes access via two sidewall riser pipes that house the pumps used to pump the collected leachate.

- Sidewall risers will be sized to accommodate easy removal of the sidewall riser pump and drop pipe.
- Sidewall risers will be placed on the 3H:1V sideslope and mounded with aggregate.
- Sidewall risers will not be susceptible to pipe crushing.
- Sidewall risers will surface through a concrete head wall.

9.4.4.4 Pump System

Each sidewall riser pipe (2 per sump) will house a pump. These pumps will be capable of leachate management in both the near-term (first 2-5 years, where anticipated flow rates are assumed to be three times greater than long-term equilibrium) and long-term, equalized flow. Assuming a monthly long-term leachate volume of 180,000 gallons per month, 30 days per month, and 6 sumps, it is assumed that approximately 1,000 gallons of leachate will be collected in each sump each day. In the near-term, each sump may collect 3,000 gallons or more per day. The pump system is summarized below:

- Average pumped volume per day (long-term): 1,000 gallons/sump
- Average pumped volume per day (near-term): 3,000 gallons/sump
- Design flow rate: 25 gpm
- Pump Type: wheeled sump drainer
- Pump sequence: alternate (only one pump operates at a time)
- Only one sump system operates at a time.
- Controls: Manual or automatic (level)
- Alarms: Auto dialer (or equivalent) for high sump level or pump malfunction

9.4.4.5 Leachate Forcemain

Leachate pumped from the sumps through the pump drop pipe will be carried to the Underground Storage Tank(s) (described in Section 9.4.5.2) through a dual-walled, manifold forcemain pipe system.

- Dual-walled HDPE
- Sized to accommodate cleaning (jetting)
- Cleanout access manholes spaced every 400 feet.

9.4.5 Leachate Storage

The following paragraphs describe storage requirements at various phases of landfill operation.

9.4.5.1 Storage during construction

Leachate and contact stormwater management and storage methods during construction will be the responsibility of the contractor.

9.4.5.2 Storage after construction

Collected leachate will be stored in one of two underground storage tanks.

- Double walled
- Fiberglass
- Storage capacity of 25,000 gallons / tank (50,000 gallons total)

9.4.6 Pretreatment

- Assume leachate pretreatment is not required (to be determined by Owner with MCES)
- Future treatment: Area reserved for potential future treatment

9.5 Discharge

Leachate from the storage tank will be pumped out using a submersible pump. Discharge flow will be metered.

- Primary discharge
    - MCES interceptor near Embassy Road
    - Dual-walled HDPE forcemain with cleanouts
    - Flowrate estimated at 160 gpm (to be confirmed with MCES)
- Secondary discharge
    - Truck loadout facility

10 Gas Management

10.1 Applicable Codes and Standards

- Minnesota Rule 7035, Solid Waste
- Minnesota Rule 7035.2815 Mixed Municipal Solid Waste Land Disposal Facilities

10.2 Deliverables

- Construction Drawings and Specifications

10.3 Design Requirements

- Design of systems to monitor, collect, transport and treat/flare gas from the Freeway Landfill

10.4 Landfill Gas

10.4.1 Gas Generation After Closure

Landfill Gas (LFG) is produced by the biological decomposition of the waste and other organic materials that will be disposed in the new lined Freeway Landfill. The LFG production typically begins within a year of waste placement in new cells. LFG is likely to occur prior to this as the waste is currently producing landfill gas in its current condition and it will be excavated and placed in the new lined cells during the new landfill construction. LFG may continue to produce LFG for decades after placement. Published LFG production rates vary from 0.0007 to 0.080 cubic meters of LFG per kilogram of waste burial per year under Guidance for Evaluating Landfill Gas Emissions from Closed Landfills or Abandoned Facilities, September 2005a, EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC.

10.4.2 Landfill Gas Quality Characteristics

LFG at the site is assumed to be similar to other municipal solid waste LFG, comprised primarily of methane, carbon dioxide and water vapor, with potential trace levels of volatile organic compounds.

10.4.3 LFG Collection (wells, header piping, wellheads, condensate collection, blower/flare)

Once Landfill operation has commenced, LFG will be collected by gas extraction wells and pulled under vacuum to the blower, allowing the removal of condensate prior to being burned in the flare.

10.4.3.1 Gas Extraction Wells

- The design of the gas extraction wells will consist of a series of vertical LFG extraction wells with perforated pipes that penetrate the waste to an elevation near the bottom of the landfill.
- The design standard is for well systems to be installed where the depth of the waste exceeds 40 feet in depth.
- Design of the LFG extraction wells require the estimation of the rate of LFG production and the radius of influence of the wells.
    - The radius of influence for LFG wells is typically in the range of 50 to 200 feet

    - Vacuum of 10 to 25 inches of water column is an assumed range of operation to seek a balance between maximizing zones of influence and minimizing air intrusion into the site.
    - Due to the nature of the mixed waste, the LFG recovery rates from individual wells will range, assumed to be from 10 to 50 cubic feet per minute.
- Gas well construction details
    - 36" diameter borehole
    - 8" diameter PVC well with slotted screen
    - Gravel pack in annular space
- Wells initially capped and dormant until flare is installed
- System should be active prior to final completion to relieve gas bubbles created during construction
- Modifications and additions to the LFG system after construction is to be expected to respond to the variability and age of the mixed waste at the Site.

10.4.3.2 Header Piping

Header piping is used for active systems to transport LFG from the collection wells to the flare. The header piping system is a matrix system, which allows LFG to be pulled from an individual well from more than one direction. This allows bypassing blockages that may occur in the header line. The system incorporates branches off of the main loop to allow collection of the LFG from regions of the landfill that are not adjacent to the loop. The purpose of the header system is:

1. To create sufficient vacuum and flow from each extraction well to collect the LFG and prevent off-site migration.
2. Move the LFG through the header system to the blower and flare.

The design of the header system includes the following components:

- HDPE piping, installed both above and below ground.
- Several branches with multiple extraction wells attached to each branch. Valves are used to control the amount of flow coming from the individual wells and branches.
- Minimal low points, with the flare at a relative low point to aid in the condensate collection within the header system.
- The header pipe will be buried to minimize the risk of damage to reduce the potential for damage, blockage due to condensate freezing in the pipes.
- The condensate collection points are located at the low points in the header piping system to prevent watering out of the pipe blocking the flow of the LFG.
    - Where possible the design has condensate dropping back into the waste though the use of drip backs, through the wellheads or sperate percolation drains where possible.
    - For areas where the piping is placed on the waste the minimum grade of 5% slope is used to minimize the potential for ponding due to localized differential settlement. There are minimum slopes for the header pipe according to the following criteria:
        - On the Landfill: 2% slope in the direction of the LFG flow and 4% on areas of opposite direction of the LFG flow.

        - Off the landfill: 1% slope in the direction of the LFG flow and 3% on areas of opposite direction of the LFG flow.
- The header piping is sized to provide the minimal head losses and additional capacity should additional extraction wells be required.
- Head loss is designed to be approximately 1-inch of water column pressure drop per 100 feet of pipe and approximately less than 10-inches water column loss for system.
- LFG velocity should be less than 40 feet per second when LFG and condensate are flowing concurrently and limited to 20 feet per second when the condensate flow is opposite that of the LFG to avoid the condensate blocking the flow of the LFG.

10.4.3.3 Wellheads

- Wellheads include control valves which allow for either increasing or decreasing the flow of LFG from the individual wells and have flexible connections to allow for differential settlement between the wells and the header pipes.
- Wellheads include sampling ports that allow monitoring LFG concentrations, temperature, velocity and pressure.

10.4.3.4 Condensate Collection

Condensate is formed from warm LFG cooling during transport to the flare. LFG is warm and saturated when extracted from the landfill. As the LFG travels through the header pipes, it cools, and it loses its moisture holding capacity.

- Condensate Generation
    - Function of LFG extraction volume, the vacuum or pressure being exerted on the LFG, and the magnitude of the temperature change.
    - The quantity of the LFG condensate varies throughout the year with the most typically occurring in the winter months.
- Condensate Knock-Out Sumps/Tanks
    - Installed at low points in system to prevent the header lines from watering out
    - Located within the flare station to prevent condensate from damaging the blower and other equipment located in the flare station.
    - Designed to promote the formation of liquid droplets and to separate these from the LFG flow.
    - Will require periodic pump out.
    - Inlet pipes designed at a lower elevation than the outlet pipe to force an upward change in the vapor stream that causes the liquid to condensate droplets to settle out to the bottom of the vessel.

10.4.3.5 Blower/Flare

A blower/flare station is designed to be composed of the elements listed below. Barr will coordinate with MPCA on design requirements; however, MPCA will contract directly with preferred blower/flare vendor (historically has been Perennial Energy LLC) to complete design package.

- Physical structure
    - Designed and constructed on area accessible by vehicles, protect from inclement weather and contain the basic equipment for the flare.
- Blower
    - Designed to operate under a range of conditions to account for changes in the LFG composition and flow rates. Applies the vacuum on the LFG collection system to discharge to the flare on the pressure side.
- Flare
    - The enclosed flare stack pulls or drafts air though its dampers and around the burner tips. The stack acts as a chimney, the height and diameter are determined during the design.
- Flame arrestor
    - The function of the flame arrestor is to prevent the propagation of the flame into the header pipes. A standby flame arrestor will be kept on-site for use during maintenance activities.
- Flow metering
    - The LFG flow rate information is the basis for controlling operation of the extraction and treatment system. It displays current and total gas flow.
- Piping and valves
    - Flexible connection is typically used at both the inlet and outlet sides of the blower to absorb vibrations during operation in order to prevent damage to piping and other components.
- Electrical controls at blower / flare
    - Designed to allow for controlled flaring of the LFG and to allow for automatic as well as manual control.
    - Includes gauges and gas detectors to monitor the flow and the explosive range of the LFG going through the flare.

11 Stormwater Management

11.1 Applicable Codes and Standards

- Lower Minnesota River Watershed District Rules
- City of Burnsville Street and Utility Design Details
- City of Burnsville Water Resources Management Plan
- Minnesota Pollution Control Agency Solid Waste Management Rules

11.2 Deliverables

- Construction Drawings and Specifications

11.3 Design Requirements

- Landfill: Collect and manage all stormwater that falls on the cover
- No increase in runoff rate for storm events listed in Section 11.5
- Surrounding area, including areas where waste has been removed: low lying area, shallow slope (0.5%), grade to drain, likely to flood and form wetlands in the future if not managed soon after project is completed

11.4 Existing Drainage Areas

- Existing drainage areas for the Site are shown on Figure 11-1
- Table below summarizes existing drainage areas, curve numbers, time of concentrations, and drainage direction for the Site
- Curve numbers selected based on predominant soil types of the cover soils acquired from the soil borings completed at the site.

Watershed	Drainage Area (Acres)	Curve Number	Time of Concentration (min)	Drainage Direction
Landfill – North	4.4	98	35	Minnesota River
	15.5	63		
	26.7	66		
Landfill – East	5.7	98	105	Wetlands prior to Minnesota River
	22.8	63		
	31.6	66		
Landfill – South	1.6	98	30	Kraemer Quarry
	1.3	63		
	14.6	66		
Landfill – West	2.5	98	30	Existing Quarry
	2.1	63		
	18.2	66		
Landfill – Total	**147.0**			
Dump – North	1.5	98	35	Wetlands
	6.0	53		
	21.2	65		
Dump – South	1.3	98	10	Allstate Self-Storage
	1.9	65		
Dump – Total	**31.9**			
Overall – Total	**178.9**			

11.5 Storm Events

- 1-year, 24-hour: 2.48 inches
- 2-year, 24 hour: 2.82 inches
- 10-year, 24-hour: 4.19 inches
- 100-year, 24 hour: 7.44 inches
- Source: NOAA Atlas 14, Volume 8, Version 2

11.6 Proposed Drainage Areas

- Proposed approximate drainage areas for the Site are shown on Figure 7-2
- Table below summarizes proposed approximate drainage areas, curve numbers, time of concentrations, and drainage direction for the Site
- Curve numbers were selected based on predominant soil types of the cover soils acquired from the soil borings completed at the site. It is assumed that the excavated cover soils will be used for the landfill cover soil, and the curve numbers will generally match the existing conditions. However, in response to comments provided by the Lower Minnesota River Watershed District, the curve numbers for soils above the liner were modified slightly using the maximum potential retention method from HydroCAD, which increase the curve numbers marginally.

Watershed	Approximate Drainage Area (Acres)	Curve Number	Time of Concentration (min)	Drainage Direction
Pond	2.2	100	20	Pond – Outlets to Minnesota River
	0.5	98		
	73.2	66		
Wetland	8.9	98	95	Wetland – Outlets to Minnesota River
	45.8	66		
Kraemer Quarry	1.2	98	5	Kraemer Quarry
	0.4	66		
West	2.5	98	35	Existing Quarry
	12.3	66		
Landfill – Total	**147.0**			
Dump - North	31.9	65	40	Wetlands
Dump – South	0	98	NA	Allstate Self-Storage
Dump – Total	**31.9**			
Overall – Total	**180.8**			

11.7 Collection and Conveyance (Run-off, Piping/Ditches)

- Drop structures: Downslope pipes
- Ditch slopes: 1% minimum
- Pipe materials:
    - On cover: HDPE
    - Conveyance around perimeter: RCP

- Pipe size:
    - 10-year
    - 15 inch diameter minimum
- Pipe slopes: 0.4%
- Manhole size: 4' minimum

11.8 Stormwater Pond

- Location: North side of landfill cover
- Live Storage Depth: 6 feet
- Bench Depth and slope: 1 foot depth, 10:1 slope
- Dead Storage Depth: 5 feet
- Size: Pond sized to hold the 100-year rainfall that lands on the landfill cover
- Lined: Clay Lined with existing clayey cover soils onsite
- Discharge location and rates: Discharges to the Minnesota River at rates lower or equal to existing conditions for the 1-year, 2-year, 10-year, and 100-year.

11.9 Dewatering

- Restrict contact water from mixing with non-contact water or running off Site
- Volume of Dewatering:
    - Assume quantity of leachate (aka contact water) collected during construction is minimal (i.e. contact water will primarily infiltrate into existing waste and negligible ponding will occur). See Section 9.4.2.
    - No temporary lined pond/tank required
- MCES permit (to be obtained by Owner) to utilize a temporary hookup (temporary pipeline to manhole or transported offsite via trucks)

12 Flood Protection/Perimeter Berm

12.1 Deliverables

- Construction Drawings and Specifications

12.2 Design Requirements

- During Construction:
  - Temporary berm around existing waste to prevent (to extent possible) river floods and/or lake floods from interacting with areas of waste handling during construction. Perimeter berms will consist of unexcavated waste areas combined with temporary soil berms constructed from on-site soils. Locations of/extents of perimeter berm will be updated as the multi-year construction progress. Soil berm material to be utilized for fill after waste removal is completed.
- After Construction:
  - Protect liner from river floods and/or lake floods, and provide access to landfill during flood events.

12.3 Impacts on Flood Levels on Minnesota River

- Existing HEC-RAS model:
  - Provided by USACE for Minnesota River as part of the Corps Water Management System (CWMS) National Implementation Effort, developed in 2016.
- During Construction Conditions HEC-RAS model:
  - Existing model modified to evaluate impact of proposed temporary grading on flood levels on the Minnesota River.
  - Model predicted no change in river elevations resulting from construction of temporary perimeter berm (No-Rise).
- After Construction Conditions:
  - Landfill perimeter/embankment to be outside of Floodway and thus no impacts on flood levels on the Minnesota River.

12.4 Freeway Landfill – Perimeter Berm (Permanent)

- Landfill perimeter/embankment: Outside of Floodway
- Crest Elevation: 720 ft (roughly 4 ft freeboard on 1% annual chance flood elevation)
  - See Section 2.3 for additional flood elevations.
  - There will be a 0.2% annual risk that river overtops the Perimeter Berm above elevation 720 ft.
  - See Section 14.5 for additional Perimeter Berm information.

12.5 Freeway Landfill – Temporary Flood Control Berm Geometry

- Existing Flood Control (make use of existing embankment of waste)

    - Materials: Existing Waste left in place
    - Inside slope: 2H:1V
    - Outside slope: existing landfill slope
    - Berm top width: 200 ft
- Constructed Temporary Flood Control Berm:
    - Materials: Common Fill
    - Inside slope: 3H:1V
    - Outside slope: 3H:1V
    - Berm top width: 20 ft
- Elevation: 718 ft (roughly 2 ft freeboard above 1% annual chance flood elevation):
    - See Section 2.3 for additional flood elevations.
    - There will be a risk that river overtops the flood control berm above elevation 718 ft.

12.6 Freeway Dump – Temporary Flood Control Berm Geometry

- Existing Flood Control (make use of existing embankment of waste):
    - Materials: Existing Waste left in place
    - Inside slope: 2H:1V
    - Outside slope: existing dump slope
    - Berm top width: 200 ft
- Constructed Temporary Flood Control Berm
    - Materials: Common Fill
    - Inside slope: 3H:1V
    - Outside slope: 3H:1V
    - Berm top width: 20 ft
- Elevation: 717 ft (roughly 2 feet freeboard above 1% annual chance flood elevation)
    - See Section 2.5 for additional flood elevations.
    - There will be a risk that river overtops the flood control berm above elevation 717 ft.

13 Restoration

13.1 Deliverables

- Construction Drawings and Specifications
    - Select Programs/Procedures within specifications:
        - Quality Control/Quality Assurance within specifications

13.2 Basis of Restoration

- New Landfill cover
    - Vegetated to create long-term stable site
    - Slopes as described in Section 8 (Cover)
- Surrounding Area
    - Low lying, shallow slope (0.5%), grade to drain,
    - Likely to flood and form wetlands in the future if not further altered or developed
        - Any future land use or development is outside of the scope of this project

13.3 Restoration Profile – Landfill Cover

- Turf establishment
- Topsoil, (respread, 6" minimum) (assumes existing onsite topsoil is adequate in quality and quantity)
- Common Fill, (6" minimum)
- Native soil/bedrock

13.4 Seeding, Planting, and Screening – Outside of Landfill Footprint

- Native seed mixes, no long-term mowing or maintenance of vegetation is assumed
- No pollinator seeding required
- No replacement of trees (trees preserved to extent possible)
- Screening
    - New lined Facility: No visual screening
    - Transfer Station: Partially replace screening berm around transfer station per original permit
        - Approximately 280,000 CY of material import required for screening berm replacement

14 Transportation/Site Access

14.1 Applicable Codes and Standards

- AASHTO pavement design methods
- Burnsville Street and Utility Design Details

14.2 Deliverables

- Construction Drawings and Specifications
    - Select Programs/Procedures within specifications:
        - Quality Control/Quality Assurance within specifications

14.3 Design Requirements

- Provide safe access to Site (during and after construction)
- Avoid or minimize wetland impacts
- Minimize length of road to minimize construction costs and impervious surfacing
- Minimize dust and traffic congestion on public roads (e.g., I-35W)

14.4 Site Access - General

- See figure 10-1 for overview of site access and transportation details
- Primary access to site is from I-35W/Black Dog Road (Landfill) and from I-35W/Cliff Road (Dump)
- Maintain uninterrupted access adjacent operations (during and after construction):
    - At the Landfill to:
        - Transfer station
        - Port Marilyn LLC (Salt Storage) to the north – contractor to coordinate with owner
        - Kraemer Quarry access road
    - At the Dump to:
        - Bike path
        - Allstate Self Storage facility
- Maintain access (after construction)
    - At the Landfill to:
        - Property Owner Quarry to the west (no access provided during construction)
- Provide access (after construction)
    - Landfill:
        - New Lined Facility
    - Dump: ramp down to restored dump area for vehicle access
- Fencing
    - Landfill:
        - Transfer Station: Replace fencing and gates around transfer station
        - New Lined Facility:
            - Perimeter Fence: New 6’ tall chain link perimeter fence and gates

        - Flare / Blower: New 8’ tall chain link perimeter fence (with slats) and gates
        - No barbed wire
    - Dump: replace fencing and gates at dump
- Paving
    - Existing roads to remain: replace in kind
        - Other than Embassy Road, assume no existing public roads will require repaving following construction

14.5 Landfill Perimeter Road

- Access from southeast corner of landfill, follow Embassy Road to new entrance
- Geometry
    - Typical road width: 25 ft
    - Typical design vehicle:
        - Perimeter Road: Single unit-triple axle truck (jetting/vac truck)
        - Management Area/Access Ramp: Tanker with 48’ trailer (AASHTO WB62)
    - Typical design speed: 15 mph
    - Maximum profile slope
        - Perimeter Road: 0% (constant elevation around landfill)
        - Access Ramp: 5%
    - Minimum curve/bend radius: 200 ft (access ramp)
    - Minimum vertical curve length: 50 ft (access ramp)
    - Minimum K-value (vertical curve): 10 (access ramp)
    - Typical road slopes: 2%
    - Typical road slope direction: Mono-slope away from landfill
    - Typical roadside slopes: 3 horizontal: 1 vertical
    - Minimum road elevation: 720 ft (roughly 4 ft freeboard on 1% annual chance flood elevation)
- Paving:
    - 12 inch Gravel surfacing

14.6 Transfer Station Access Road

- Permanent access from northeast corner of landfill via Black Dog Road
- Temporary access will be required while material underneath current access is excavated and removed. Temporary access from southeast corner of landfill, follow Embassy Road.
- Geometry
    - Typical road width: 30 ft
    - Bypass lane: One 18 ft wide gravel bypass lane to accommodate one semitruck (permanent transfer station access road only)
    - Typical design vehicle: Semi-truck and garbage truck
    - Typical design speed: 30 mph (15 mph at transfer station connection)
    - Maximum profile slope: 5%

    - Minimum curve/bend radius: 250 ft (100 ft at transfer station connection)
    - Minimum vertical curve length: 90 ft
    - Minimum K-value (vertical curve): 19
    - Typical road slopes: 2% (4% maximum)
    - Typical road slope direction: Crowned
    - Typical roadside slopes: 3 horizontal: 1 vertical
    - Typical culvert design storm event: 10-yr, 24 hour: 4.19 inches (source: NOAA Atlas 14, Volume 8, Version 2)
    - Typical culvert material: RCP (18 inches diameter minimum)
    - Minimum road elevation: at or above Black Dog Road access
    - Minimum road elevation at transfer station connection: 720 ft, roughly 4 ft above 1% annual chance flood elevation: 716.2 ft (Source: Dakota County Flood Insurance Study, March 16, 2016)
- Paving:
    - Transfer Station Access Road (permanent): bituminous (match existing), match existing pavement thickness (existing thickness unknown), for bidding purposes use following for pavement design:
        - Burnsville Street and Utility Design Details
        - Assumed traffic: 450 haul trucks per day
            - 400 garbage trucks per day
            - 50 semi-trucks per day
            - 6 days per week
        - Design period: 20 years
        - Assumed CBR (California Bearing Ratio): 5% (conservative based on historical borings/well logs)
    - Temporary Transfer Station Access Road: gravel
        - Assumed traffic: 450 haul trucks per day
            - 400 garbage trucks per day
            - 50 semi-trucks per day
            - 6 days per week
        - Design period: 1 year (maintenance/regrading approximately every 2 months)
        - Assumed CBR (California Bearing Ratio): 5% (conservative based on historical borings/well logs)

14.7 Property Owner Quarry Access

- Access from southeast corner of landfill, follow Embassy Road to new entrance
- Geometry
    - Typical road width: 25 ft
    - Typical design vehicle: Dump truck and belly dump
    - Typical design speed: 30 mph (15 mph at intersections)
    - Maximum profile slope: 5%
    - Maximum quarry ramp slope: 12% (match existing slope)

- Minimum curve/bend radius: 100 ft (75 ft at intersection)
- Minimum vertical curve length: 90 ft
- Minimum K-value (vertical curve): 19
- Typical road slopes: 2% (4% maximum)
- Typical road slope direction: varies (mono-sloped and crowned)
- Typical roadside slopes: 3 horizontal: 1 vertical
- Typical culvert design storm event: 10-yr, 24 hour: 4.19 inches (source: NOAA Atlas 14, Volume 8, Version 2)
- Typical culvert material: RCP (18 inches diameter minimum)
- Minimum road elevation: at or above existing Embassy Road

- Paving:
  - Embassy Road: bituminous (limit dust)
    - Burnsville Street and Utility Design Details
    - Assumed traffic: 30 haul trucks per day (after construction)
    - Design period: 20 years
    - Assumed CBR (California Bearing Ratio): 5% (conservative based on historical borings/well logs)
  - Property Owner Quarry to the west: gravel, to replace existing gravel roads (existing thickness unknown)
    - Assumed traffic: 30 haul trucks per day (after construction)
    - Design period: 10 years (maintenance/regrading approximately yearly)
    - Assumed CBR (California Bearing Ratio): 5% (conservative based on historical borings/well logs)

14.8 Haul Route

- Landfill
  - Access from northeast corner of site via Black Dog Road or from southeast corner of landfill, follow Embassy Road, access 35W from Cliff Road
- Dump
  - Access from the southwest via Cliff Road frontage road/Cliff Road and 35W

15 Construction Staging, Sequencing, and Requirements

15.1 Applicable Codes and Standards

- OSHA excavation

15.2 Deliverables

- Construction Drawings and Specifications
    - Select Programs/Procedures within specifications:
        - Contingency Action Plan – Contractor to produce as submittal

15.3 Construction staging

- Temporary waste stockpile must remain within existing waste limit footprint
- Property Owner Quarry may be used as staging area
- Property Owner Quarry may be used as temporary stockpile of non-waste material

15.4 Construction Sequencing

- Contractor to develop schedule/sequencing plan
    - Design/specifications to include restrictions/requirements within the submittal requirements
    - Key considerations: duration requirements, stakeholder considerations, flood protection berm, trees, ongoing operations, access road guidelines, wetlands, traffic routes
- Double handling assumptions:
    - Cover Soils
        - 45% at Landfill
        - 15% at Dump
    - Waste
        - 33% at Landfill
        - 0% at Dump

15.5 Construction Requirements

- Maintenance of SWPPP
- Environmental Requirements
    - Odor control
    - Dust control
    - Vector controls
    - Blowing trash control
- Safety
    - HAZWOPER for on-site crews that may come in contact with waste; certain roles to be exempt (e.g., truck drivers)

16 Electrical

16.1 Applicable Codes and Standards

- National Electrical Manufacturers Association (NEMA) – Applicable Standards for Electrical Equipment
- National Fire Protection Association (NFPA) –
    - NFPA 70; National Electrical Code
    - NFPA 820; Fire Protection in Wastewater Treatment and Collection Facilities
- Underwriters Laboratories (UL) – Applicable Standards for Electrical Components and Equipment

16.2 Deliverables

- Construction Drawings and Specifications

16.3 Electrical Source

- The site is currently served by Xcel Energy. An overhead distribution line currently exists on the north side of Black Dog Road.
- An electric service panel or switchboard will be located in a new electrical building, which is anticipated to be located in the southeast corner of the site. The electrical building will also contain the main control panel for the site. From the electrical building, power distribution and communications will proceed out to the leachate well sites and the flare system.
- Standby power generation is not needed, since leachate may be stored on site during utility power interruptions, which are anticipated to be relatively few and brief given the location.

16.4 Pumping

- The landfill site is anticipated to be served by multiple leachate pumping wells. Each well will have two submersible pumps of under 1 horsepower each. Pump motors anticipated to be served at 480 Volts 3-phase, started and stopped with across-the-line NEMA Size 1 motor starters. Start-stop signals are anticipated to originate from submersible pressure transducers that start pumps based on leachate level. Controls anticipated to be housed in pad mounted NEMA 4X stainless steel control panel at each leachate well. Each leachate well will have heat-trace on the distribution piping as it rises near the surface where it will require freeze protection.
- The leachate is to be pumped to a central holding tank(s). Once enough leachate is collected, it will be pumped via force main to the MCES sanitary system. This pumping will be done on a periodic basis as the tank is filled.
- The control system main control panel will be located in the electrical building and will be utilized to monitor the system and provide setpoints for pumping levels and other parameters that may be necessary.
- The main control panel will be connected to a cellular wireless router to enable communication for external alarm and status monitoring of the system.

- The main control panel will monitor effluent flow to the MCES system via a magnetic flowmeter on the effluent line, located in a vault adjacent to the electrical building.

16.5 Lighting

- Pole-mounted lighting anticipated to consist of LED "shoe-box" style head mounted on 20' approximate height pole at each control panel location. The lights will be controlled by a photocell and occupancy sensor such that they are on only at night when the site is occupied.

16.6 Flare/Blower

- The flare/blower will be powered from the electrical building, along with auxiliary electrically powered equipment as required.

16.7 Storage Building

- The storage building near the electrical building will be provided with power for lighting and 120V convenience power. The building will not be heated or air conditioned.

17 References

Barr, 2019a. Focused Remedial Investigation Report, Freeway Landfill and Freeway Dump. Prepared for Minnesota Pollution Control Agency. October 2019.

Barr, 2019b. Focused Feasibility Study Report, Freeway Landfill and Freeway Dump. Prepared for Minnesota Pollution Control Agency. October 2019.

Barr, 2019c. Wetland Delineation Report, Freeway Landfill Project. Prepared for Minnesota Pollution Control Agency. October 2019.

Barr, 2020. DRAFT Technical Memorandum – Liner Selection Memorandum, Freeway Landfill and Freeway Dump. January 30, 2020.

Figures

Parcel Boundary

County Boundary

N

0 500 1,000

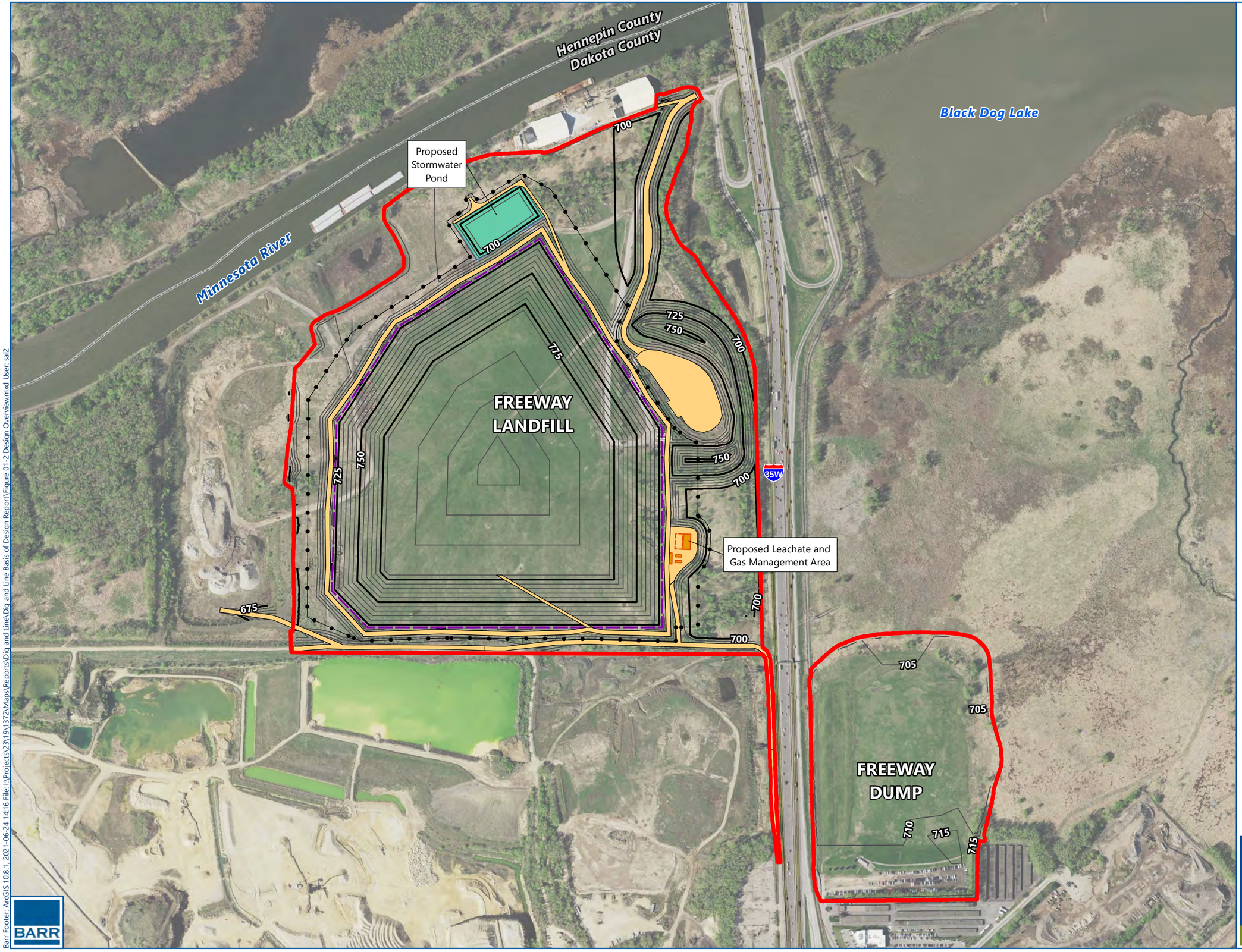
Feet

SITE OVERVIEW

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 1-1

BARR



Construction Limits (Approx)
Proposed Building
Proposed Fence
Proposed Impervious Surfaces
Proposed Liner Extent
Fence

Proposed Contours

25-foot Contour
5-foot Contour
County Boundary

N

0 500 1,000
Feet

DESIGN OVERVIEW
Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 1-2

BARR

Hennepin County
Dakota County
Minnesota River
Black Dog Lake
FREEWAY LANDFILL
FREEWAY DUMP
35W
680
660
655
650
645
640
635
630
620
615
605
610
625
665
670
675
690
695
700
705

Construction Limits (Approx)
Groundwater Contours Under Current Conditions (Kraemer Pumping), River at Normal Level
Proposed Building
Proposed Fence
Proposed Impervious Surfaces
Stormwater Management Area (as needed)
County Boundary

N

0 500 1,000
Feet

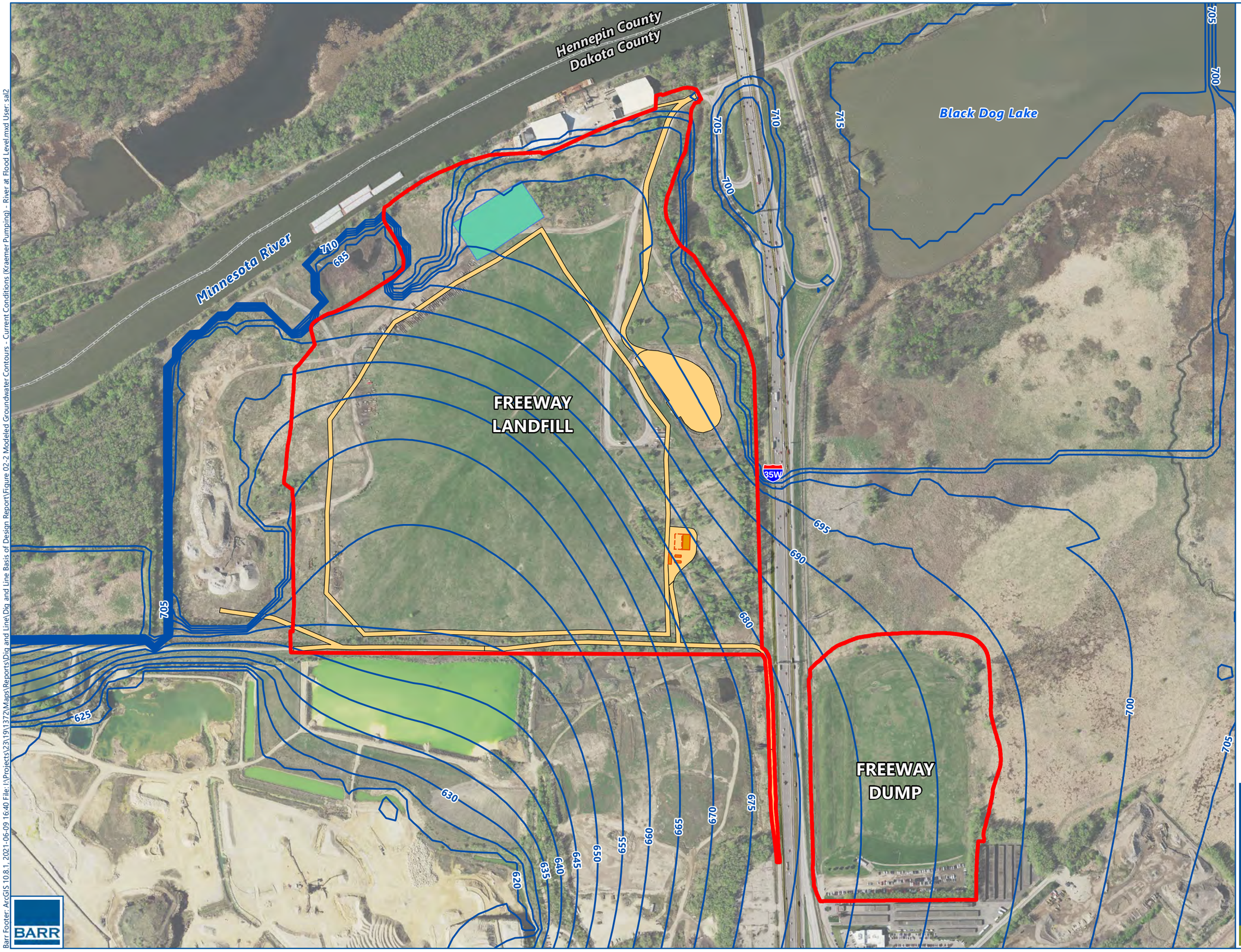
GROUNDWATER CONTOURS UNDER CURRENT CONDITIONS (KRAEMER PUMPING), RIVER AT NORMAL LEVEL

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 2-1

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-09 16:37 File: I:\Projects\23\19\1372\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure 02-1 Modeled Groundwater Contours - Current Conditions (Kraemer Pumping) - River at Normal Level.mxd User: sal2



Construction Limits (Approx)

Groundwater Contours Under Current Conditions (Kraemer Pumping), River at Flood Level

Proposed Building

Proposed Fence

Proposed Impervious Surfaces

Stormwater Management Area (as needed)

County Boundary

N

0 500 1,000

Feet

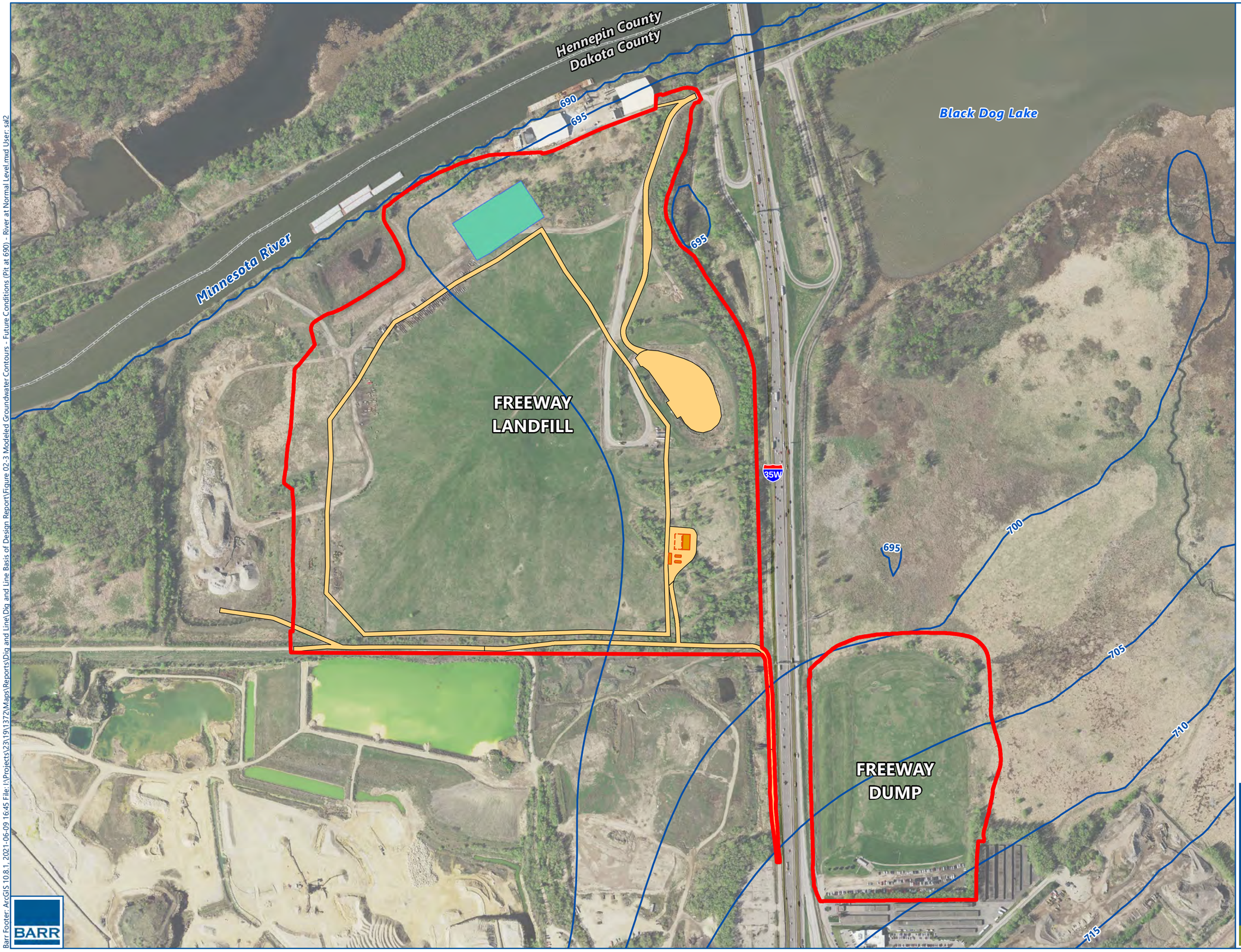
GROUNDWATER CONTOURS UNDER CURRENT CONDITIONS (KRAEMER PUMPING), RIVER AT FLOOD LEVEL

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 2-2

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-09 16:40 File: I:\Projects\23\1912\72\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure 02-2 Modeled Groundwater Contours - Current Conditions (Kraemer Pumping) - River at Flood Level.mxd User: sal2



Construction Limits (Approx)

Groundwater Contours Under Future Conditions (Pit at 690), River at Normal Level

Proposed Building

Proposed Fence

Proposed Impervious Surfaces

Stormwater Management Area (as needed)

County Boundary

N

0 500 1,000

Feet

GROUNDWATER CONTOURS UNDER FUTURE CONDITIONS (PIT AT 690), RIVER AT NORMAL LEVEL

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 2-3

Hennepin County
Dakota County
Minnesota River
Black Dog Lake
FREEWAY
LANDFILL
FREEWAY
DUMP
35W
695
700
705
710
715

Construction Limits (Approx)
Groundwater Contours Under Future Conditions (Pit at 690), River at Flood Level
Proposed Building
Proposed Fence
Proposed Impervious Surfaces
Stormwater Management Area (as needed)
County Boundary

N

0 500 1,000
Feet

GROUNDWATER CONTOURS UNDER FUTURE CONDITIONS (PIT AT 690), RIVER AT FLOOD LEVEL

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 2-4

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-09 16:47 File: I:\Projects\23\19\1372\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure 02-4 Modeled Groundwater Contours - Future Conditions (Pit at 690) - River at Flood Level.mxd User: sal2

Hennepin County
Dakota County
Minnesota River
W Black Dog Rd
Embassy Rd
Cliff Rd
121st St W
35W

037-020280001012
PORT MARILYN LLC
ROW (MnDOT)
Preliminary Drainage Easement (exact location and size to be determined)
037-021560000040
037-021560000050
037-021560000010
037-021560000030
037-021560000060
037-021560001010
ROW (MnDOT)
037-021560002010
037-021560002020
037-021560000020
ROW (Undefined)
037-028349001010
NORTHERN STATES POWER CO
037-020341026020
UNITED STATES OF AMERICA
037-020341038010
Less than 10' ROW (MnDOT) Temporary Access

Imagery Source: Dakota County, 2018

Inferred Waste Extent
Permanent Access
Temporary Access, Freeway Site Owner
Temporary Access, Other Properties
Permanent Easement
Subject Parcels

PIN	Permanent Access	Temporary Access
037-020280001012	Easement	✓
037-020341026020		✓
037-020341038010		✓
037-021560000010		✓
037-021560000020	✓	✓
037-021560000030	Easement	✓
037-021560000040	Easement	✓
037-021560000050	Easement	✓
037-021560000060	✓	✓
037-021560001010	✓	✓
037-021560002010	✓	✓
037-021560002020		✓
037-028349001010		✓
Right Of Way (ROW)		✓

* Parcel data based on Dakota County GIS (official property boundary survey pending)

** Utility easements may also be required

N

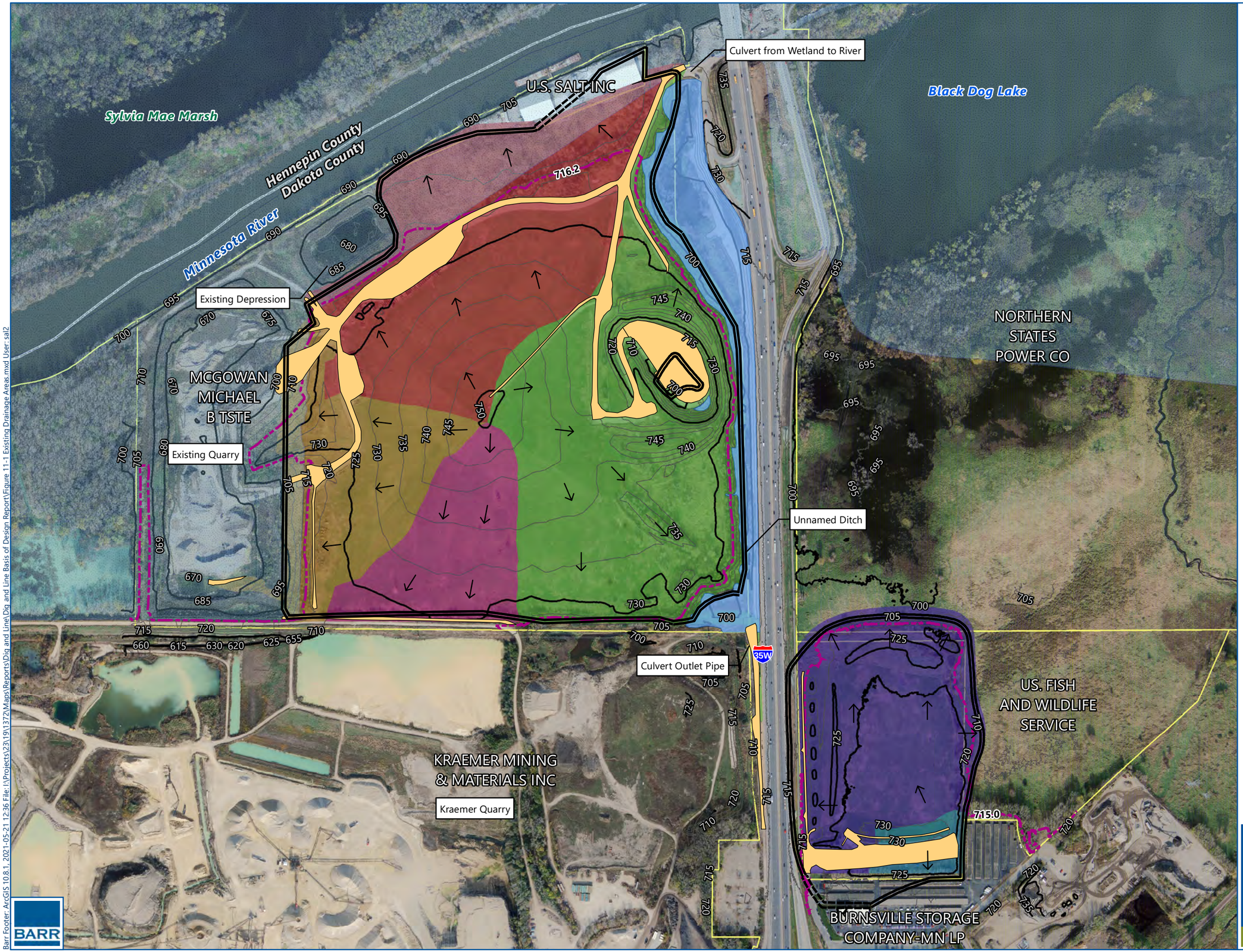
0 250 500
Feet

PARCEL IMPACTS DURING AND AFTER PROJECT
Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 3-1

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-10 15:00 File: I:\Projects\23\19\1372\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure 03-1 Parcel Impacts During and After Project.mxd User: sal2



EXISTING DRAINAGE AREAS
Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 11-1

Proposed Contours

- 25-foot Contour
- 5-foot Contour
- Proposed Impervious Surfaces
- Floodway
- Wetlands (Post-Project)

Proposed Drainage Areas

- Dump to North
- Landfill to East (Drains to River)
- Landfill to Minnesota River via Stormwater Pond
- Landfill to West
- Proposed Floodplain
- Existing Floodplain
- Construction Limits (Approx)
- Parcel Boundary
- County Boundary

N

0 250 500

Feet

PROPOSED CONDITIONS - PERMANENT

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 11-2

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-10 15:56 File: I:\Projects\23\19\1372\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure 11-2 Proposed Drainage Areas.mxd User: sal2

General Traffic Sequencing Plan

- Landfill construction traffic and Transfer Station traffic will initially use the existing North Entrance.
- During excavation of waste below the existing Transfer Station access road, construction and Transfer Station traffic will use the proposed South Entrance.
- After the waste has been excavated, a new permanent Transfer Station access road will be constructed. At that point, Transfer Station traffic will use the new access road and construction traffic may use either the North or South entrance.
- At the completion of the project, landfill access will be via the South Entrance. The quarry to the west of the landfill will also be accessed via the South Entrance.
- Dump construction traffic during and post-construction will be via the existing Dump Entrance.

Hennepin County
Dakota County
Minnesota
Black Dog Lake
FREEWAY LANDFILL
FREEWAY DUMP
35W
North Entrance (Existing)
Permanent Transfer Station Access Road
Permanent Embankment Road
Temporary Transfer Station Access Road
South Entrance (Proposed)
Permanent Quarry Access
Dump Entrance (Existing)
675
700
705
710
715
725
750
775

Site Entrances
Construction Limits (Approx)
Proposed Building
Proposed Fence

Proposed Contours

25-foot Contour
5-foot Contour
County Boundary

N

0 500 1,000
Feet

TRANSPORTATION & SITE ACCESS
Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 14-1

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-10 16:29 File: I:\Projects\23\19\372\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure 14-1 Transportation and Site Access.mxd User: sal2

Appendices

Appendix A

Groundwater Elevation Simulations

resourceful. naturally.
engineering and environmental consultants

BARR

Technical Memorandum

To: Project File
From: Eric Lund, Dan Fetter, Evan Christianson – Barr Engineering Company
Subject: Predicted Groundwater Elevations in Vicinity of Freeway Landfill at Varying Kraemer Quarry Pit Lake Elevations
Date: June 2021
Project: 23191372

The purpose of this memorandum is to introduce a series of groundwater contour figures that are included as Appendix A of the *Freeway Landfill and Dump Closure – Dig and Line Design Basis Report* (DBR). The DBR also includes a series of figures that present the predicted groundwater elevations that were used as the design basis for selecting the liner elevation and designing the proposed landfill. The design basis scenario is based on a surface water elevation of 690 in the future pit lake that would form after dewatering ceases in the Kraemer aggregate mine. The selection of elevation 690 was based on a series of stakeholder discussions that occurred at the time that Barr initially developed the groundwater model for the Site area. The stakeholder discussions have been on-going throughout Barr's design process and a formally documented decision for the future pit lake elevation has not occurred, so there remains the potential that other future pit lake elevations could be considered by the stakeholders. In order to inform the stakeholder's on-going discussions of this topic, additional figures were prepared to present a range of predicted groundwater elevations at various pit lake elevations and river stages, both at the proposed landfill and in the surrounding area. The following scenarios are included in the series:

Scenario	Pit Lake Elevation[1]	River Level[2]
1	680	Normal
2	680	Flood
3	690	Normal
4	690	Flood
5	700	Normal
6	700	Flood

1 - Elevations selected to provide a reasonable bracket of potential elevations. No consideration was given to potential impact on the Freeway Landfill project or other properties in the surrounding area.

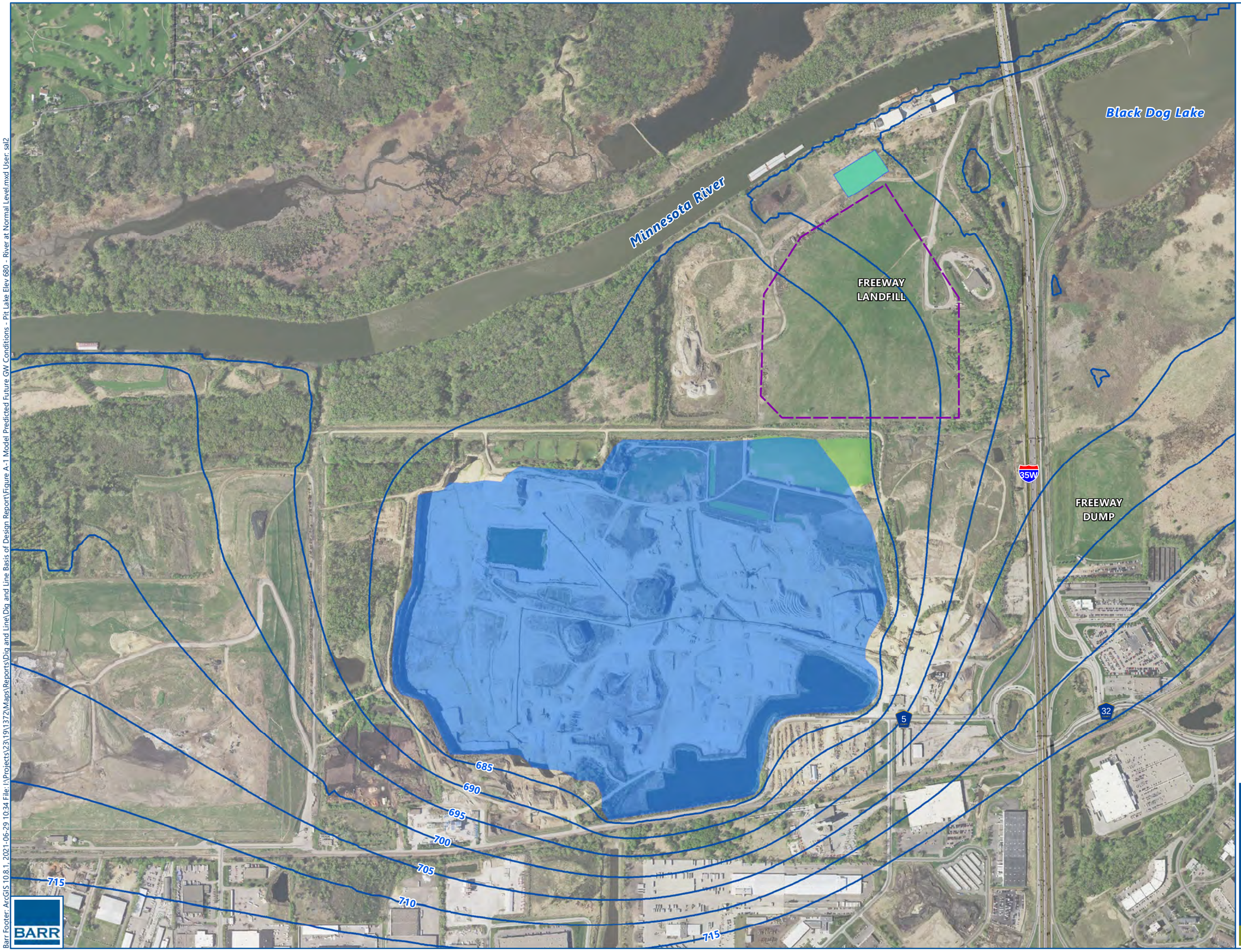
2 – Normal River Level is defined as Elevation 689.1 feet, which is the median observed over the period 1988 – 2015 at the Minnesota River at Savage gage. Flood River Level is defined as the peak of the 100-year flood event of 716 feet (FEMA, 2011).

The model that was used to develop these figures was adapted from the original Barr modeling efforts in 2015 (Barr 2015a and Barr 2015b), which was updated in 2020 as design progressed to more accurately represent existing and future surface water features following Freeway landfill reconstruction and pit lake formation (e.g., river, wetlands, and low-lying areas adjacent to the Freeway Dump and around the remediated Freeway Landfill). The model also assumes the size of the future pit lake is based on the current footprint of the Kraemer Quarry (i.e., does not consider potential expansion). It is important to acknowledge that various parties are relying on predicted groundwater elevations in the area, for varying reasons and utilizing potentially different sets of assumptions. Therefore, there may be some relatively minor discrepancies between model outputs based on those differing assumptions or purposes, and it is anticipated that modeling predictions and updates will likely continue as the stakeholders advance their projects. As noted earlier, this series of figures is intended to provide stakeholders with a range of predicted groundwater elevations based on a range of scenarios to assist with the on-going stakeholder coordination efforts.

References

Barr 2015a. Simulations of Future Kraemer Quarry Pit-Lake Stage and Rise of the Water Table at the Freeway Landfill. Technical Memorandum to Steve Albrecht, Burnsville. May 22, 2015

Barr 2015b. Groundwater Transport Simulations for Future Conditions at Freeway Landfill. Technical Memorandum to Mark Umholtz and Doug Day, MPCA. September 30, 2015



Proposed Freeway Landfill

Modeled Groundwater Elevation Contour

Future Kramer Quarry Pit Lake

Stormwater Management Area (as needed)

N

0 800 1,600

Feet

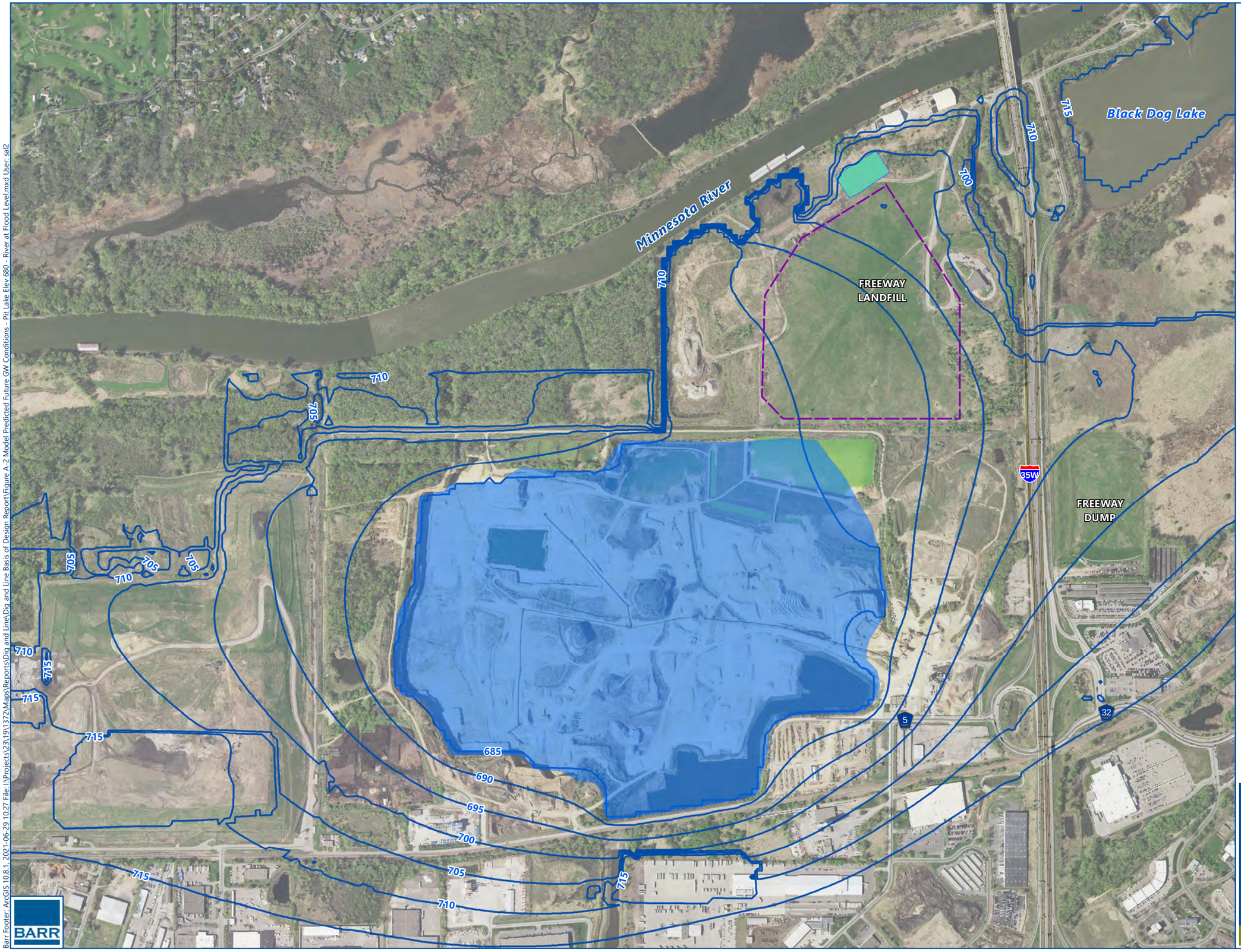
MODEL PREDICTED FUTURE GROUNDWATER CONDITIONS PIT LAKE AT ELEVATION 680, RIVER AT NORMAL LEVEL

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE A-1

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-29 10:34 File: I:\Projects\23\19\1372\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure A-1 Model Predicted Future GW Conditions - Pit Lake Elev 680 - River at Normal Level.mxd User: sal2



Proposed Freeway Landfill

Modeled Groundwater Elevation Contour

Future Kramer Quarry Pit Lake

Stormwater Management Area (as needed)

N

0 800 1,600

Feet

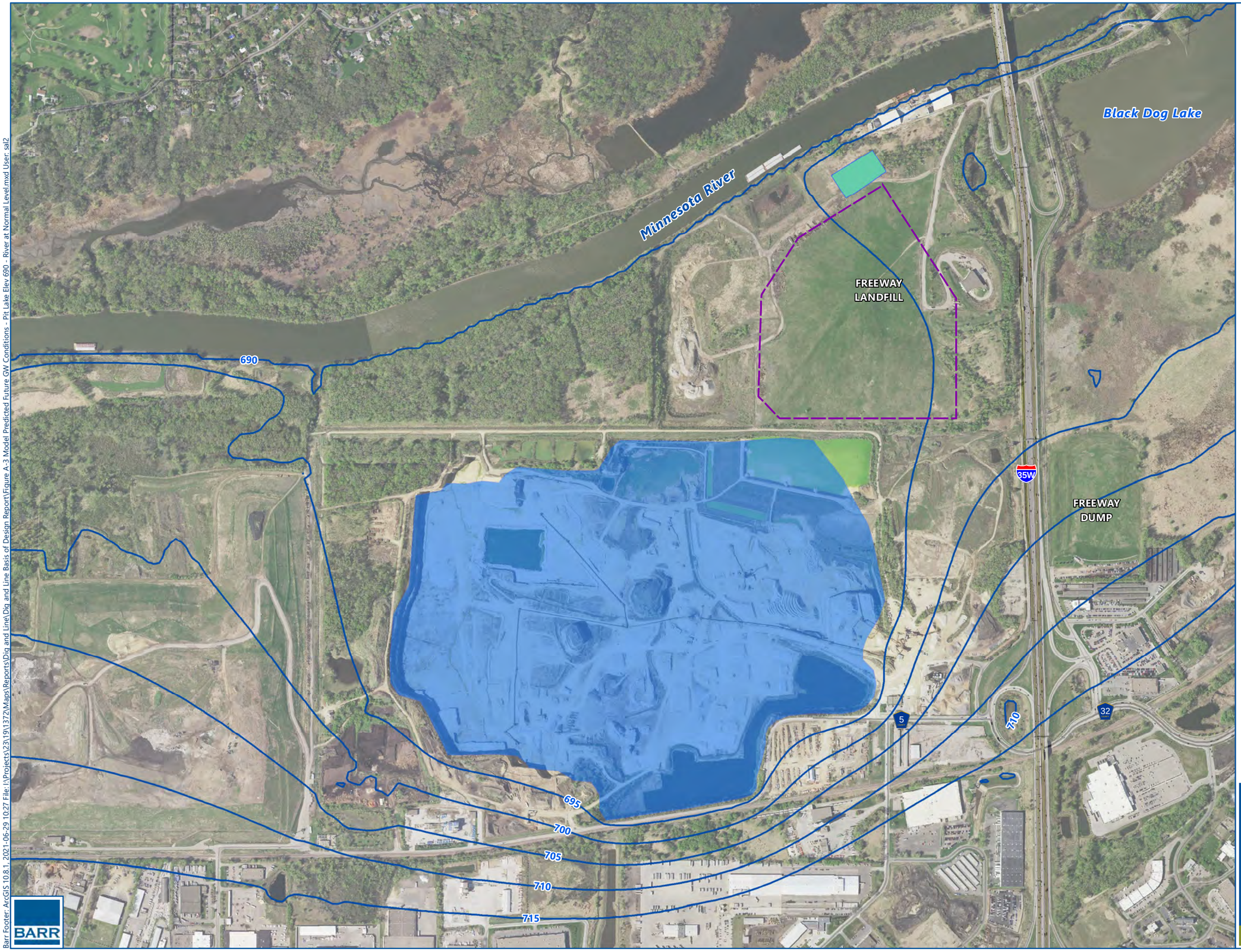
MODEL PREDICTED FUTURE GROUNDWATER CONDITIONS PIT LAKE AT ELEVATION 680, RIVER AT FLOOD LEVEL

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE A-2

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-29 10:27 File: I:\Projects\23\19\1372\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure A-2 Model Predicted Future GW Conditions - Pit Lake Elev 680 - River at Flood Level.mxd User: sal2



Proposed Freeway Landfill

Modeled Groundwater Elevation Contour

Future Kramer Quarry Pit Lake

Stormwater Management Area (as needed)

N

0 800 1,600

Feet

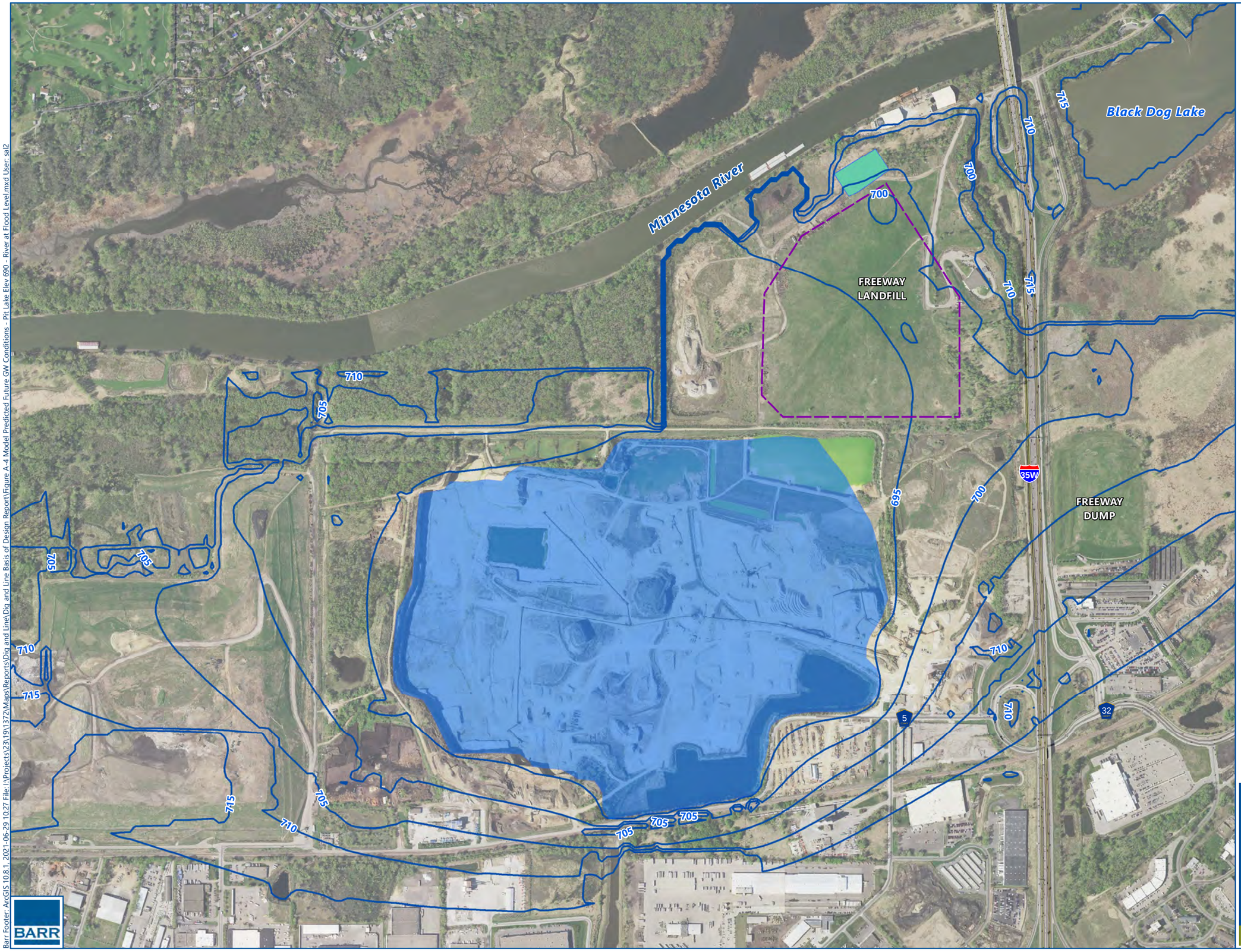
MODEL PREDICTED FUTURE GROUNDWATER CONDITIONS PIT LAKE AT ELEVATION 690, RIVER AT NORMAL LEVEL

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE A-3

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-29 10:27 File: I:\Projects\23\19\1372\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure A-3 Model Predicted Future GW Conditions - Pit Lake Elev 690 - River at Normal Level.mxd User: sal2



Proposed Freeway Landfill

Modeled Groundwater Elevation Contour

Future Kramer Quarry Pit Lake

Stormwater Management Area (as needed)

N

0 800 1,600

Feet

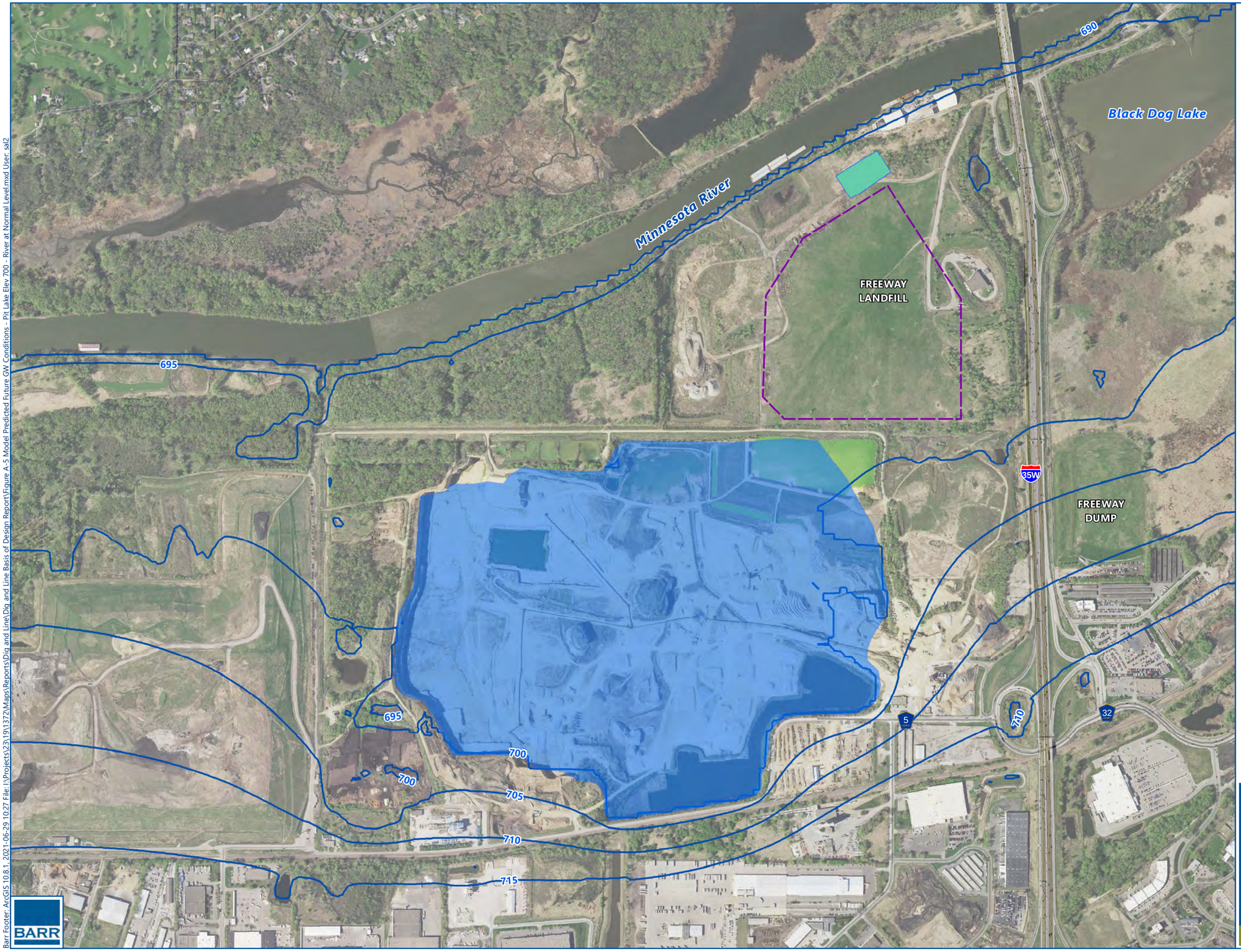
MODEL PREDICTED FUTURE GROUNDWATER CONDITIONS PIT LAKE AT ELEVATION 690, RIVER AT FLOOD LEVEL

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE A-4

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-29 10:27 File: I:\Projects\23\19\1372\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure A-4 Model Predicted Future GW Conditions - Pit Lake Elev 690 - River at Flood Level.mxd User: sal2



Proposed Freeway Landfill

Modeled Groundwater Elevation Contour

Future Kramer Quarry Pit Lake

Stormwater Management Area (as needed)

MODEL PREDICTED FUTURE GROUNDWATER CONDITIONS PIT LAKE AT ELEVATION 700, RIVER AT NORMAL LEVEL

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE A-5

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-29 10:27 File: I:\Projects\23\19\1372\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure A-5 Model Predicted Future GW Conditions - Pit Lake Elev 700 - River at Normal Level.mxd User: sal2

Proposed Freeway Landfill

Modeled Groundwater Elevation Contour

Future Kramer Quarry Pit Lake

Stormwater Management Area (as needed)

Minnesota River

Black Dog Lake

FREEWAY LANDFILL

FREEWAY DUMP

700

705

710

715

695

35W

5

32

N

0 800 1,600

Feet

MODEL PREDICTED FUTURE GROUNDWATER CONDITIONS PIT LAKE AT ELEVATION 700, RIVER AT FLOOD LEVEL

Dig and Line Basis of Design Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE A-6

BARR

Barr Footer: ArcGIS 10.8.1, 2021-06-29 10:26 File: I:\Projects\23\19\1372\Maps\Reports\Dig and Line\Dig and Line Basis of Design Report\Figure A-6 Model Predicted Future GW Conditions - Pit Lake Elev 700 - River at Flood Level.mxd User: sal2