Appendix C – Development Standards

The City of Burnsville has developed specific requirements in this section that apply to development and redevelopment projects. These standards are intended to help achieve the water resource goals of the City's Water Resources Management Plan (WRMP) and help the City maintain compliance with the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit program and the related NPDES/SDS General Construction Stormwater Permit. This summary highlights important aspects of the requirements for storm water quality, discharge rate and volume control, wetland management and erosion control. This summary does not provide a complete listing of the requirements of this Plan or City Code. For a more detailed listing of requirements see the specific policies of the WRMP and the applicable City ordinances or consult with City staff on your specific project.

To accomplish these goals, it is important to the City to have consistent approaches to evaluating proposed development projects. Therefore, all hydrologic, hydraulic and water quality analyses must be prepared and submitted in a format that will allow for a timely and efficient review by City staff.

Project designers and/or developers are encouraged to schedule and complete a pre-design meeting with the City before any data will be accepted. The purpose of the meeting is to specifically address approvals and permits, pond requirements, trunk storm drain analysis, wetland impacts, water quality treatment, erosion control and discharge to lakes and sensitive wetland resources.

1) General

   a) Water quality treatment, volume control, water quantity and rate control requirements apply to any project which results in one-half acre or more of disturbed area or 5,000 square feet or more of new impervious area. For the purposes of these standards, the new impervious area shall be considered the cumulative new impervious area created after July 1, 2008.

   b) Projects conducting pavement reconstruction/rehabilitation only on existing impervious areas are exempt from rate, water quality, water quantity and volume control standards.

   c) Construction Site Erosion and Sediment Control standards apply to all projects.

   d) Additional requirements applicable to projects in Shoreland Areas are defined in City Code Section 10-8-10.

   e) Any project within a floodplain area requires a permit from the City and/or FEMA.

f) The owner shall submit the information listed in Section 10 of these Standards for review by the City.

g) Any project within the jurisdiction of the Vermillion River Watershed JPO that has obtained a variance from these standards by the City, must be reviewed and approved by the Vermillion River JPO.

2) Water Quality Treatment.

a) Infiltration / Volume Control Requirement:

1) For all new impervious portions of a project, a runoff volume of 1 inch must be treated in infiltration practices. The extent of infiltration / volume control practices required shall be determined using the worksheet in Appendix B.

2) For all redevelopment impervious portions of a project, a runoff volume of 0.5 inches must be treated in infiltration practices. The extent of infiltration / volume control practices required shall be determined using the worksheet in Appendix B.

3) For projects that have a combination of new and redevelopment, the treatment practices can be combined for the overall site, provided the overall combined treatment level meets or exceeds the levels above.

4) For projects in the Vermillion River Watershed, and that create one or more acre of new impervious surface, must control runoff volume for the 2-year, 24-hour storm event (2.75 inches) to the predevelopment volume.

b) Pollutant Removal Requirements. For projects that have met the infiltration/volume control requirements above, the pollutant removal requirements are considered to be met. For projects where infiltration is prohibited or restricted (see Items 3.a. and 3.b.), the following pollutant removal standards apply prior to reaching a downstream receiving water:

1) For new development portions of a site, provide treatment to remove 90% TSS and 60% TP as modeled on an annual basis.

2) For redevelopment portions of a site, provide treatment to remove 70% TSS and 30% TP as modeled on an annual basis.

3) For projects that have a combination of new and redevelopment, the treatment practices can be combined for the overall site, provided the overall combined treatment level meets or exceeds the levels above.

4) Design engineers and developers shall determine the pollutant removal efficiency of the BMP(s) incorporated into the site plan using the available industry standard models including P8 (and using a standard NURP particle size distribution for the analysis) or a comparable model approved by the City. As an alternative to preparing a site-specific

model, the development may provide a treatment volume (dead storage) of not less than 2.5 inches calculated over the contributing drainage area to the pond. For example, a 1-acre site that drains to a common treatment pond would be required to provide a dead storage volume of 0.21 acre-feet or 9,000 cubic feet.

3) Volume Control / Infiltration Practices.

a) Infiltration systems are prohibited:

1) Where industrial facilities are not authorized to infiltrate industrial stormwater under an NPDES/SDS Industrial Stormwater Permit issued by MPCA.

2) Where vehicle fueling and maintenance occur.

3) Where the bottom of the infiltration basin is less than 3 feet to bedrock or seasonally saturated soils.

4) Where high levels of contaminants in soil or groundwater will be mobilized by infiltration.

5) Within the areas designated as Very High Vulnerability and High Vulnerability within the Drinking Water Supply Management Area (DWSMA) identified in Figure C-1

b) The City restricts the use of infiltration systems in areas:

1) Low permeability soils (i.e., Hydrologic Soil Group D soils) or where a confining layer exists below the proposed basin.

2) Within 1,000 feet upgradient or 100 feet down gradient of active karst features.

3) Within the areas designated as: Moderate Vulnerability; and Low to Very Low Vulnerability within the Drinking Water Supply Management Area (DWSMA) identified in Figure C-1;

4) Where soil infiltration rates are more than 8.3 inches per hour.

;

c) For linear projects not meeting the exemption in Part 1.b., and where the lack of right-of-way precludes the installation of volume control practices that meet the requirements in Part 2 (Water Quality Treatment) and Part 3 (Volume Control/Infiltration Practices), the City may allow a lesser volume control on the construction site provided a reasonable attempt has been made to obtain right-of-way during the project planning process and:

1) The one or more of the prohibited or restricted site conditions listed above exists; and

2) The owner implements other practices (e.g., evapo-transpiration, reuse, conservation design, green roofs, etc.) on the construction site that may not fully meet the volume control requirements of Part 2 (Water Quality Treatment).

d) Infiltration practices must be designed to draw down to the bottom elevation of the practice within 48 hours. The maximum ponding depth shall be based on the soil infiltration rate determined from site-specific soils investigation data taken from the location of proposed

infiltration practices on the site. The soils investigation requirement may be waived for smaller residential property practices where the maximum ponding depth is one (1) foot or less.

e) Infiltration practices shall provide for pretreatment of the runoff. Examples of pretreatment include a mowed grass strip between a curb-cut and a small rain garden, a sump manhole or manufactured sediment trap prior to an infiltration basin and a sediment forebay as the first cell of a two-cell treatment system. Where the infiltration system captures only clean runoff (e.g., from a rooftop) pretreatment may not be required.

f) The design shall incorporate a diversion or other method to keep construction site sediment from entering the infiltration system prior to final stabilization of the entire contributing drainage area.

g) The design shall incorporate provisions that will prohibit construction equipment from compacting the soils where infiltration practices are proposed.

h) A plan for maintenance of the system must be submitted that identifies the maintenance activities and frequency of activities for each infiltration practice on the site.

4) Water Quantity / Flood Control.

a) The low building elevation shall be set to the higher of the following:

1) Where an effective Base Flood Elevation (BFE) has been established and is included in the City's FIRM, the low floor elevation adjacent to a surface water body shall be established in accordance with the City's Floodplain ordinance. The ordinance establishes the Regulatory Flood Protection Elevation (low floor elevation) at not less than one (1) foot above the BFE plus any increase due to encroachment of the floodway.

2) The low floor elevation shall be two (2) feet or more above the highest of the following:

(i) The 100-year/24-hour event as determined by a technical evaluation by a qualified engineer or hydrologist.

(ii) The 100-year/10-day runoff (snowmelt) event as determined by a technical evaluation by a qualified engineer or hydrologist.

b) An emergency overflow shall be incorporated into the site design at or above the BFE or modeled high water level to convey a 100-year discharge away from buildings to the next downstream water body. Existing, natural or man-made emergency overflows shall be analyzed as part of the design process. The lowest opening shall be at least 1.5 feet above the emergency overflow elevation of the adjacent water body, unless the analysis shows that adequate storage volume exists within the basin to provide a reasonable level of protection from potential flooding. Where a natural overflow does not exist, the designer shall consider the possibility of long duration events, such as multiple-year wet cycles and high runoff

volume events (e.g., snowmelt events that last for many weeks) when evaluating high water elevations and outlets from landlocked basins

c) Fill around a building or structure shall be above the BFE and extend a horizontal distance of at least 15 feet in all directions.

d) For underground parking structures with a low floor elevation below the high water level or emergency overflow elevation, the drainage system within the parking structure shall include anti-backflow devices and flood protected to minimize the impacts of high ground water levels during flood events.

e) Projects in the Vermillion River Watershed must not result in a net loss in floodplain storage.

f) For landlocked basins, where additional stormwater volume is proposed to be routed, consideration shall be given to the effects of increased flood levels on trees and vegetation and potential for erosion.

5) Rate Control.

a) Discharge rates leaving the site must not exceed the predevelopment rates for the 2, 10 and 100-year, critical duration (24-hour) storm events, using the updated Atlas 14 rainfall depths and antecedent moisture conditions 2 (AMC-2). The storm distribution shall be a NRCS Type II standard distribution until such time as the nested distribution for Atlas 14 based data becomes widely available in standard modeling software packages. Discharge rates leaving the site should be reduced from predevelopment rates where feasible. Predevelopment is defined as the conditions on the project site prior to the proposed improvements.

As an alternate to using the Type II storm distribution, designers may develop their own nested distribution using Atlas 14 data.

1) For projects in the Vermillion River Watershed, discharge rates leaving the site must not exceed the pre-development rates for the 1-year critical duration storm instead of, or in addition to, the 2-year event.

b) On-site rate controls may not be needed if downstream (regional) facilities can be shown to adequately detain/retain the runoff to existing conditions and in accordance with the rates established in Appendix D of this Plan. In this case, the developer or design engineer shall submit a technical evaluation completed by a qualified engineer or hydrologist which must be review and approved by the City Engineer.

c) Where a flow rate variance involves inter-community issues or significant water bodies, the regulatory jurisdiction shall have a review role. Any variances shall be reflected in subsequent plan submittals.

d) Project sites discharging directly to the Black Dog Fen must not increase the discharge rate from the site for the 1-year event.

e) For proposed outlets from landlocked basins, an analysis of the water quality and flooding impacts on intercommunity flows or any downstream strategic waterbodies shall be prior to construction of the outlet. If analyses indicate a potential adverse effect on water quality or increased flood potential, the city must notify the watershed organization prior to approving the outlet.

6) Special Waters and Wetlands.

a) Developments shall meet the requirements of the National Pollutant Discharge Elimination System (NPDES) permit program for all applicable requirements of the most recent permits including, but not limited to the following:

1) Sites discharging to Trout Stream #1, #4 or #7, must incorporate BMPs that address: runoff temperature requirements; maintain an undisturbed buffer zone of at least 100 feet between the project site and the trout stream; and cover exposed slopes that are steeper than 3:1 (H:V) within three days of the disturbance.

b) Horizontal vegetated buffer zones shall be established and/or maintained around existing wetlands and storm water treatment ponds. New development and redevelopment projects shall provide a buffer zone around wetlands in accordance with the requirements in the City's Wetland Protection and Management Plan. Storm water ponds with a permanent pool of water (i.e., wet ponds) shall have an average 20-foot buffer around the perimeter of the basin. The buffer shall extend form the normal water level to the top of the pond slope.

Wetland Classification	Permanent Buffer Strip Average Width (feet)	Minimum Permanent Buffer Zone Width (feet)	Percentage Native Vegetation
Protection	50	30	Entire
Improvement	35	25	Entire
Management	25	20	Majority
Management II	20	20	Majority

c) Water level fluctuations in wetlands shall be managed in accordance with the City's Comprehensive Wetland Protection and Management Plan. A rise (bounce) in elevation greater than 12 inches during a 10-year storm shall be avoided.

d) New discharge points to all wetlands and waters must include pretreatment. New direct discharges to Management II wetlands must have at least grit removal prior to discharge.

7) Design Computations.

a) All hydrologic data shall be completed using NRCS methodology; i.e. HydroCAD or TR20/TR55, XP-SWMM or a comparable, City approved method. Hydraulic calculations will be accepted in the rational method format or in commonly used software packages such as FHWA HY-8, Eagle Point or XP-SWMM or a compatible, City approved method. These computations shall be submitted to the City, upon request.

b) Rainfall amounts for hydrologic analysis shall be based on Atlas 14 data. Burnsville analyses shall use the values in the following table.

Rainfall Frequency	**Rainfall (Inches)**
2-Year / 24-Hour	2.9
10-Year / 24-Hour	4.3
100-Year / 24-Hour	7.5

The City may require designers to run additional modeling scenarios with rainfall depths greater than the 100-year event listed above. For example, modeling a 10-inch event or back-to-back 100-year events will allow the designer to evaluate the sensitivity of the system response to larger events relative to detention/retention area high water levels and emergency overflow paths. Designers are encouraged to run extreme event scenarios as part fo the initial site evaluation and design process.

c) Local storm sewer systems shall be designed for the 10-year storm event. The Rational Method shall be the preferred methodology for the design of local systems. Culvert crossings or storm systems in County or State right-of-way may have a design frequency which differs from the City's 10-year design storm. The designer shall contact each agency/unit of government to determine the appropriate design frequency for hydrologically-connected systems.

d) For culvert outlet velocities less than or equal to 4 fps, check shear stress to determine if vegetation or riprap will be adequate. If vegetation is used, temporary erosion control during and immediately follow construction shall be used until vegetation becomes established. For velocities greater than 4 fps, energy dissipaters shall be designed in accordance with MnDOT Design Criteria.

e) High water elevations for landlocked areas (basins where no outlet exists) shall be established by first estimating the normal or initial water surface elevation at the beginning of a rainfall or runoff event using a documented water budget, evidence of mottled soil, and/or an established ordinary high water level. The high water level analysis shall be based on runoff volume resulting from a 100-year/10-day runoff (7.2 inches and saturated or frozen soil conditions [CN=100]) and/or the runoff resulting from a 100-year back-to-back event. The high water elevation shall be the higher of these two conditions.

8) <u>Additional Pond and Infiltration System Design Criteria</u>. Newly constructed or expanded/modified ponds and basins shall be designed and constructed to meet the following:

a) Any storm water pond constructed within the prohibited infiltration zone in Figure C-1, must meet the following criteria:

1) The basin bottom and side walls shall be constructed by compacting at least a 1-foot thickness of soils having at least 20 percent fines (at least 20% passing a #200 sieve). The

bottom must have at least a 3-foot vertical separation to the seasonally-high groundwater elevation and/or bedrock.

2) If a 3 foot separation to bedrock or the seasonally-high groundwater elevation cannot be obtained, the basin bottom and sidewalls shall be constructed of materials and methods that are approved by the City Engineer. Possible liner materials may include compacted cohesive soils, geosynthetic materials, plastic liner, soil additives or other materials.

3) The seasonally-high groundwater elevation shall be determined by assessing soil mottling or soil coloration that indicates temporary saturation of the soil.

b) All ponds or basins shall:

1) If the pond will have a permanent pool of water, have an aquatic bench having a 10:1 (H:V) slope for the first 10 feet from the normal water level into the basin.

2) Have a 3:1 maximum slope (above the NWL and below the 10:1 bench, if a wet pond);

3) Maximize the separation between inlet and outlet points to prevent short-circuiting of storm flows;

4) Be made accessible for maintenance and not be entirely surrounded by steep slopes or retaining walls which limit the type of equipment that can be used for maintenance. Vehicle access lane(s) of at least 10 feet shall be provided, at a slope less than 15 percent from the access point on the street or parking area to the pond, to accommodate maintenance vehicles. Maintenance agreements will be required when the pond is not located on City property.

5) Have a skimming device designed to remove oils and floatable materials up to a five-year frequency event. The skimmer shall be set a minimum of 12 inches below the normal surface water elevation shall control the discharge velocity to 0.5 feet per second.

b) For wet ponds, an average 4 feet of permanent pool depth (dead storage depth) shall be provided. This constraint may not be feasible for small ponds (less than about 3 acre-feet in volume or less). In such cases, depths of 3-4 feet may be used. To prevent development of thermal stratification, loss of oxygen, and nutrient recycling from bottom sediments, the maximum depth of the permanent pool should be less than or equal to 10 feet.

c) Structural BMPs proposed as a stand-alone device or as part of the overall treatment system, shall be designed in accordance with standard engineering principles and practices.

9) <u>Construction Site Erosion and Sediment Control</u>.

a) The City's Erosion Control Ordinances shall be followed for all projects, including those not regulated under the NPDES construction permit. Requirements of the City Code include, but are not limited to, Code Sections: 4-1-4, 4-1-6, 4-8-3-2, 7-3-4, 10-7-23, 10-8-6, 10-8-8, 10-9-2.

b) Prior to the start of any excavation or land disturbing activity for the site, the owner or contractor must have in place and functional an approved method of erosion control. The

contractor must have received authorization from the City prior to commencing construction activities.

c) Development projects shall meet the requirements of the National Pollutant Discharge Elimination System (NPDES) construction permit program, including the requirement to prepare and follow a storm water pollution prevention plan (SWPPP). The owner shall submit proof of receipt and approval by MPCA of the permit application prior to commencing construction. A copy of the SWPPP prepared in accordance with the NPDES permit requirements, shall be submitted to the City if requested by the City Engineer. Site plans shall include:

1) Best management practices (BMPs) to minimize erosion.
2) BMPs to minimize the discharge of sediment and other pollutants.
3) BMPs for dewatering activities.
4) Site inspections and keeping records of rainfall events.
5) Maintenance of BMPs during construction.
6) Management of solid and hazardous wastes.
7) Final stabilization of the site including the use of perennial vegetation and/or other methods on all exposed soils.
8) Computations and documentation regarding the sizing and location of temporary sediment basins.

10) Storm Water Plan Submittals.

a) Property lines and delineation of lands under ownership of the project proposer.

b) Delineation of the subwatersheds contributing runoff from off-site, and proposed and existing subwatersheds on-site.

c) Location, alignment and elevation of proposed and existing stormwater facilities.

d) Delineation of existing on-site wetlands, shoreland and/or floodplain areas. Removal or disturbance of stream bank and shoreland vegetation should be avoided. The plan shall address how unavoidable disturbances to this vegetation will be mitigated.

e) Existing and proposed high water level elevations, 10-year and 100-year water elevations on-site.

f) Existing and proposed site contour elevations related to NGVD, 1929 datum.

g) Construction plans and specifications of all proposed stormwater management facilities.

h) Stormwater runoff volume and rate analyses for existing and proposed conditions.

i) All hydrologic and hydraulic computations completed to design the proposed stormwater quality management facilities. Computations shall include a summary of existing and proposed impervious areas.

j) Provision of outlots or easements for maintenance access to detention basins, constructed wetlands and other stormwater management facilities.

k) Maintenance agreement between developer and city which addresses sweeping, pond inspection, sediment removal and disposal, etc.

l) Inlets to detention basins, wetlands, etc., shown at or below the outlet elevation.

m) Identification of receiving water bodies (lakes, streams, wetlands, etc).

n) Documentation indicating conformance with this Plan.

Appendix D - Hydrologic System Information

The City of Burnsville developed this Water Resources Management Plan (WRMP) to analyze its water resources and to establish controls that help the City achieve their water resource management goals which are generally intended to reduce or minimize the future impacts of development on the City's natural and water resources and improve the quality of the City's resources.

Tabular data for the various water bodies and drainage areas in the City are provided in the tables which follow along with references to where more data may be available. Data is accompanied by Figure D-1 which illustrates the City's overall drainage system and the respective water resources. These data include results of modeling completed primarily in HydroCAD and XP-SWMM.

The following descriptions correspond to the information presented in the hydrologic summary table for the 100-Year Design Storm Data at the end of Appendix D. The 10-Year Design Storm Data is has similar information and also provided. However, data for the 10-Year Design Storm is less complete and have not been updated as part of this 2008 Plan update.

Watershed and Subwatershed Name

Indicates area shown on the Subwatershed Map Figure D-1. these subheadings within the rows of the table distinguish between each major watershed unit and each subwatershed unit.

New Drainage Area and Old Drainage Area ID

These columns identify the unique drainage area ID for each row within the table. The new ID refers to the new drainage area IDs used in Figure D-1. The old IDs refer to what these areas were labled as in the 2002 WRMP (these will generally correspond to the IDs in the 10-Year Design Storm Tables). These areas are generally distinct units that drain directly to a particular pond or major drainage way. The subwatershed boundaries were generally determined using available contour mapping. The boundaries should be considered approximate, due to the limited availability or accuracy of the contour mapping and the possibility of alteration by new construction or storm sewer projects.

Water Body Common Name

The water body common name is listed for lakes and key water bodies.

Subwatershed Drainage Area

Drainage area in acres of the listed drainage area.

Surface Area at NWL

The water surface area at normal water level (in acres) is determined from contour mapping based on the elevation of the pond outlet structure, pump control elevation or a DNR established elevation.

Ratio of Water Body Area to Subwatershed Area

Determined by dividing pond surface area at NWL by the subwatershed drainage area and multiplying by 100. This ratio gives an indication of the potential for the pond to provide treatment to improve water quality. A ratio greater than 1% indicates good stormwater treatment potential if the pond is managed properly.

Outlet Description

The diameter of pipe or type of structure, if known, which provides an outlet for the pond or water body. This information should be used for planning purposes only and not for final design.

NWL

The normal water level of the pond is the lowest controlling elevation. It is usually taken as the invert of the outlet structure or the pump control elevation and is the elevation that the pond will drain down to after a rainfall event. The NWL does not reflect the lowest elevation that may be attained naturally by infiltration, evaporation or transpiration. The elevation is listed in National Geodetic Vertical Datum (NGVD).

Ordinary HWL

The OHWL listed represents the level reported in the DNR's Lake Finder database at www.dnr.state.mn.us for the water body listed in the comments column of the table. If noted by an *, the level is taken from the City's Planning Department database.

100-Year Event (6.0" Rainfall Event)

The 100-year event is also referred to as a rainfall event that has a 1% chance of occurrence in a given year. The information in this table was obtained from various hydrologic/hydraulic models that utilized the Soil Conservation Service TR20 Hydrograph Routing Procedure. The 100-year event assumed a 6.0 inch, Type II distribution, 24-hour duration rainfall event.

> Based on the 2013 updates to precipitation frequency data published in Atlas 14, the 100-year high water level data presented in these tables may require additional analysis by the City and/or owner prior to obtaining approvals. In general, the City will complete the updated modeling upon the initial contact with a project owner and provide the owner with updated high water level and low building elevation information.

<u>HWL</u>

The highest water level achieved in a pond as predicted by the above mentioned model for a 100-year event. The model assumes that the pond elevation is equal to the NWL at the beginning of the storm event. The HWL is affected by the accuracy of the data such as drainage area, storage capacity, outlet description and condition, and run-off factors. All of these factors should be reviewed when HWL is considered critical.

Regulatory BFE (FEMA)

The regulatory base flood elevation as defined in the most recent flood insurance study or flood insurance rate map. This number is only reported for water bodies that have a defined base flood elevation. The BFE may be more or less than the HWL listed in the previous column if more recent modeling was completed that has not yet been incorporated into an official map change by FEMA. These numbers will not change as a result of any additional analysis requested or required by the City to revaluate the effects of updated Atlas 14 precipitation data.

Bounce in Pond

The difference in elevation between the NWL and the HWL.

Storage

The volume of water stored in the pond between the NWL and the HWL.

Peak Outflow Rate

The maximum discharge rate from a pond through the outlet. This normally occurs when the pond is at the HWL and it assumes the full efficiency of the outlet structure.

Model

The model used in determining the HWL and BFE reported in the table. In most areas the model used was HydroCAD or XP-SWMM model. A small stream section downstream of the CAM Ram Wetland Complex was modeled with HEC-RAS as part of the Flood Insurance Rate Map update for that area completed in 2006.

Approximate Overflow Elevation

The elevation at which the pond would overland overflow if the storage capacity is exceeded. This approximate elevation was determined from contour mapping.

Existing Low Building Elevation

This elevation was determined from the “House-Print” on the contour mapping and does not indicate low-floor or basement elevations. These elevations should be considered approximate due to possible inaccuracies in the mapping and buildings that have been constructed after the mapping was completed.

Low Building Elevation

This elevation is determined based on the standards presented in Appendix C of this WRMP. This should be considered a planning level minimum elevation that is required by City standards. The developer should review the source and quality of data available and evaluate the low building elevation for each site directly to ensure a reasonable level of protection is provided.

Freeboard (LBLDG – HWL)

The difference between the low building and 100-year high water level elevations. A negative number indicates that the HWL is higher than the LBLDG. This dimension along with the comments

column is intended to highlight areas in the City that could experience problems with flooding. Actual low building elevations, and other pertinent hydrologic data,, should be field verified to determine the extent of the problems.

It should be noted that LBLDG elevation may be different elevation than the low floor elevation per City Ordinance.

Risk of Inundation

This column provides a relative risk of inundation of adjacent structures. The relative risk is not intended to take the place of detailed analyses to evaluate risk. Instead it is intended as an initial planning-level starting point. Almost any structure adjacent to a water body may have a risk of inundation during certain hydrologic events. The data is based on approximate overflow elevations and not on actual field conditions.

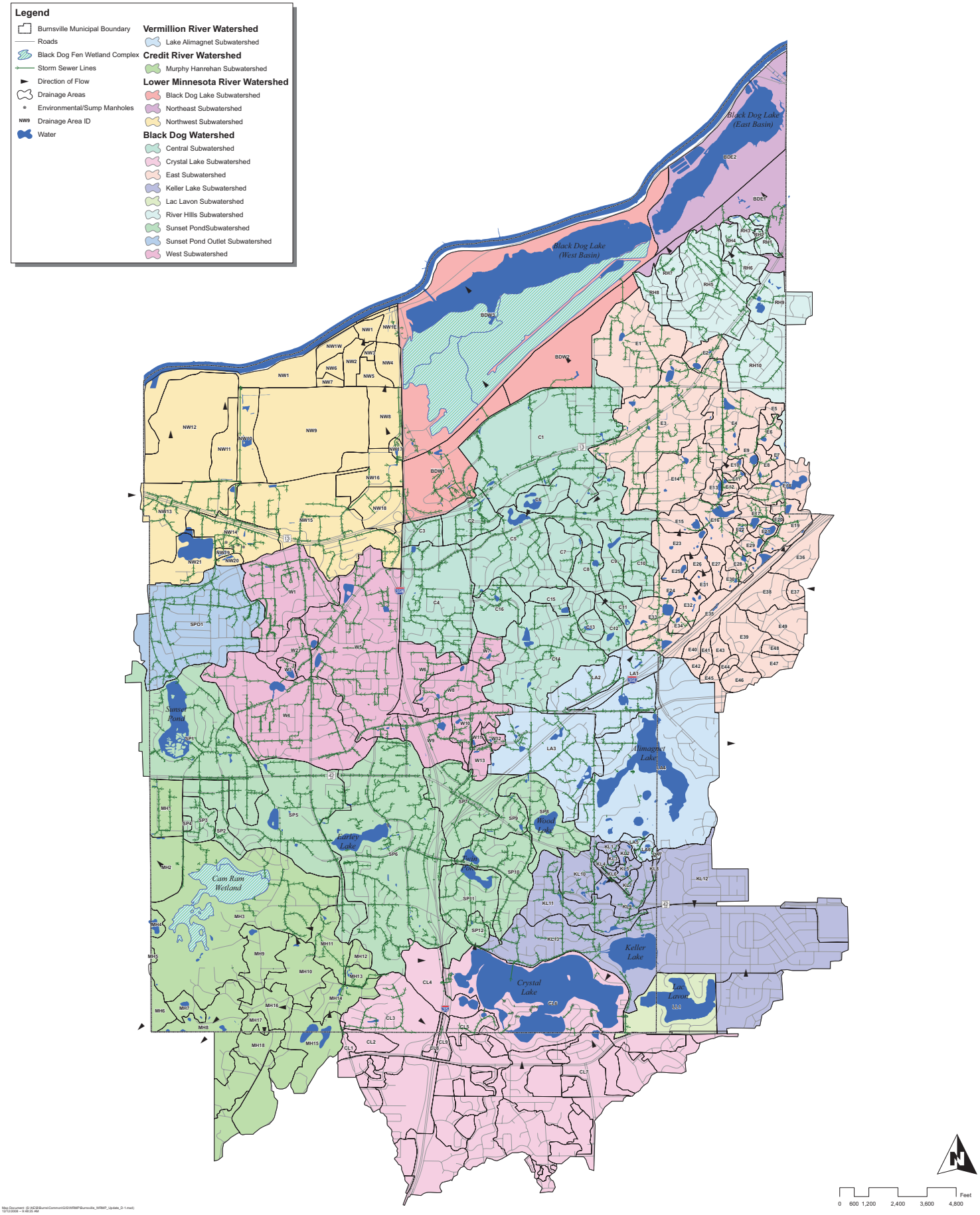
Relative Risk of Inundation

Distance Low Bldg. Elevation is Above the BFE or AOE (feet) (1)	**Base Flood Elevation (BFE) or 100-Year HWL**	**Approximate Overflow (AOE)**	**Overall Risk**
≤ 0	HIGH	HIGH	HIGH
0 to 1.5	MODERATE	HIGH	HIGH
1.5 to 2.0	MODERATE	LOW	MODERATE
2.0 or more	LOW	LOW	LOW

1. A value of zero means the low building elevation is at the same elevation of the BFE or EOF. A negative number means the elevation is below the BFE or EOF.

Notes

This column provides miscellaneous notes relating to the drainage area.



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Subwatershed and Drainage Areas

Burnsville, Minnesota

Figure

D-1

Table D-1 Hydrologic Summary Data for the 100-Year Design Storm

New Drainage Area ID	Old Drainage Area ID	Water Body Common Name	Subwatershed Drainage Area (Acres)	Surface Area at NWL (Acres)	Water Body to Watershed Ratio	Approx. Outlet Size (inches)	NWL (NGVD)	Ordinary HWL DNR	100-Year Event (6.0" Rainfall Event) HWL (NGVD)	BFE (FEMA)	Bounce (ft)	Storage (acre/ft)	Peak Outflow Rate (cfs)	Model	Approximate Overflow Elevation	Approx. Existing Low Building Elevation (LBE)	Low / Minimum Building Elevation	Freeboard (LBE-HWL) (ft)	Risk of Inundation	Notes
BLACK DOG WATERSHED																				
LAC LAVON SUBWATERSHED																				
LL1	A8	Lac Lavon	176.8	2.2	1.2	no outlet	929.6	Not listed by DNR						XP-SWMM	948					DNR #19044600-P. NO OUTLET
KELLER LAKE SUBWATERSHED																				
KL12	A1		183.1	1.4	0.8	30	944.5		958.3		13.8	23.0	56.0	XP-SWMM	958	958	960.3	-0.3	High	Apple Valley runoff tributary to Burnsville
KL 1	A35		8.5	0.5	5.9	12	1008.0		1010.1		2.1	1.4	3.1	XP-SWMM	1014	1015	1012.1	4.9	High	Summit Oaks
KL 2	A39		10.3	0.4	3.9	12	994.0		996.9		2.9	1.3	5.1	XP-SWMM	1001	1006	998.9	9.1	Low	
KL 3	A36		4.7	0.3	6.3	12	1000.0		1003.9		3.9	0.9	3.6	XP-SWMM	1008	1006	1005.9	2.1	High	Summit Oaks
KL 4	A37		11.2		0.0	12	997.0		999.1		2.1	1.7	8.9	XP-SWMM	N/A		1001.1			Summit Oaks
KL 5	A40		11.9	1.0	8.4	12	978.7		980.1		1.4	4.5	1.7	XP-SWMM	981	986	982.1	5.9	Low	
KL 6	A38		4.5	0.1	2.2	12	990.0		997.0		7.0	1.5	9.8	XP-SWMM	1005	1016	999.0	19.0	Low	Summit Oaks
KL 7	A41		10.5	0.5	4.8	12	972.7		974.8		2.1	1.8	3.3	XP-SWMM	976	988	976.8	13.2	Low	
KL 8	A4		3.5	0.1	2.8	12	979.7		982.2		2.5	0.6	0.8	XP-SWMM	982		984.2			
KL 9	A46		62.4	1.0	1.6	18	954.0		962.2		8.2	14.0	28.5	XP-SWMM	963	988	964.2	25.8	Low	
KL10	A3		74.8	0.5	0.7	30	972.0		978.8		6.8	8.0	72.7	XP-SWMM	980	976	980.8	-2.8	High	
KL11	A6		150.2	2.9	1.9	42	944.5		950.7		6.2	27.3	105.1	XP-SWMM	952	951	952.7	0.3	High	
KL13	A7	Keller Lake	725.9	28.1	3.9	72	934.1	934.5	938.7	936.0	4.6	302.1	69.3	XP-SWMM	940	938.5	940.7	-0.2	High	DNR #19002500-P. Includes inflow from Apple Valley.
KL14	A2		112.9	2.7	2.4	12	952.0		958.0		6.0	22.0	6.2	XP-SWMM	958		960.0			Apple Valley runoff tributary to Burnsville
CRYSTAL LAKE SUBWATERSHED																				
CL3	A13		180.7	2.0	1.1	30	983.1		985.8		2.7	12.4	37.8	XP-SWMM	986.8		987.8			
CL4	A22		105.3	7.3	6.9	10' weir	936.7		938.4		1.7	9.3	55.7	XP-SWMM	940	1004	940.4	65.6	Low	Portion west of I-35 drains to directly to Buck Hill Bay
CL5	A23		27.6	1.6	5.8	15	938.0		940.8		2.8	3.6	8.1	XP-SWMM	944	950	942.8	9.2	Low	
CL6	A24	Crystal Lake	549.5	298.6	54.3	36	933.4	934.5	935.0	936.0	1.6	392.7	61.1	XP-SWMM	938	940	937.0	5.0	Low	DNR #19002700-P
SUNSET POND SUBWATERSHED																				
SPO1	NW1		402.6		0.0	No Data														Hydrocad nodes: 9106, 9107, 9110 - Sunset Pond Outlet. Includes a portion of Savage.
SP 1	A33	Sunset Pond	441.7	57.6	13.0	48	854.7	Not listed by DNR	856.5		1.8	229.3	44.9	XP-SWMM	860	860	858.5	3.5	High	Includes Sunset Pond. Includes a portion of Savage.
SP 2	A47		71.7	0.2	0.3	drop structure	863.5		876.6		13.1	0.8	230.8		880	880	878.6	3.4	High	TIF Development; Special drop structure outlet
SP 3	A48		46.5	0.2	0.4	12	880.0		888.2		8.2	4.9	45.6		885	884	890.2	-4.2	High	TIF Development
SP 4	A49		5.0	0.1	2.0	12	885.0		886.1		1.1	0.4	4.0		888	890	888.1	3.9	Low	TIF Development
SP 5	A32	Judicial Pond	372.9	5.3	1.4	48	892.0		898.7		6.7	52.3	86.2	XP-SWMM	900	920	900.7	21.3	Low	
SP 6	A31	Earley Lake	764.2	28.6	3.7	36	902.0	906.7	911.9	911.9	9.9	324.5	53.1	XP-SWMM	916	914	913.9	2.1	High	DNR #19003300-P
SP 7	A27		180.2	0.7	0.4	10' weir	921.0		923.9		2.9	26.8	316.5	XP-SWMM	928		925.9			
SP 8	A28	Wood Park Pond	145.0	14.2	9.8	18	1001.0	998.8	1003.4		2.4	37.2	6.6	XP-SWMM	1012	1010	1005.4	6.6	High	DNR #19002400-W
SP 9	A29		53.4	2.9	5.4	12	1009.0		1010.6		1.6	13.7	4.0	XP-SWMM	1011	1018	1012.6	7.4	Low	
SP10	A30	North Twin	159.8	4.7	2.9	36	914.5		923.8	923.8	9.3	141.7	79.9	XP-SWMM	926	930	925.8	6.2	Low	DNR #19002800-W
SP11	A26	South Twin	151.1	8.7	5.8	36	917.0		923.5	923.5	6.5	141.7	79.9	XP-SWMM	926	926	925.5	2.5	High	DNR #19002800-W
SP12	A25		23.5	0.3	1.3	27	932.7		941.0		8.3	3.5	61.4	XP-SWMM	936	946	943.0	5.0	Low	
WEST SUBWATERSHED																				
W 2	B11		67.7	1.4	2.1	36	867.7		875.1		7.4	7.0	68.1	HydroCAD	877	878	877.1	2.9	High	
W 3	B9		13.6	2.2	16.2	21	882.0		892.0		10.0	97.9	22.0	HydroCAD	890	891	894.0	-1.0	High	Equalizes with Pond B10
W 4	B10		438.5	4.9	1.1	21	882.0		892.0		10.0	97.9	22.0	HydroCAD	890		894.0			Equalizes with Pond B9
W 5	B12		493.6	4.8	1.0	60	845.3		858.2		12.9	97.5	325.3	HydroCAD	855	854	860.2	-4.2	High	
W 6	B2		96.7	0.4	0.4	30" force main	945.6		952.3		6.7	10.7	45.0	HydroCAD	954	958	954.3	5.7	Low	
W 7	B1		37.6	0.7	1.9	12	979.5		983.9		4.4	6.3	6.4	HydroCAD	986	990	985.9	6.1	Low	
W 8	B3		106.0	0.5	0.5	30" force main	940.0		956.3		16.3	30.3	45.0	HydroCAD	954	960	958.3	3.7	Low	
W 9	B8		92.9	2.0	2.2	30	948.0		979.2		31.2	34.0	79.3	HydroCAD	976	990	981.2	10.9	Low	
W10	B7		63.2	0.8	1.3	21	969.0		977.5		8.5	11.7	29.9	HydroCAD	978	996	979.5	18.5	Low	
W11	B6		7.3	0.5	6.8	30	1009.2		1011.4		2.2	1.9	21.3	HydroCAD	1012		1013.4			
W12	B4		14.2	0.5	3.5	18	1035.0		1035.0		0.0	0.5	14.3	HydroCAD	1042	1051	1037.0	16.0	Low	
W13	B5		26.6	0.4	1.5	24	1017.0		1021.1		4.1	1.9	26.7	HydroCAD	1023	1046	1023.1	24.9	Low	
CENTRAL SUBWATERSHED																				
C 1	G1		251.0		0.0	no ponding									N/A					
C 2	D13		80.4		0.0	no ponding									N/A					
C 3	C2		39.7		0.0	no ponding									N/A					
C 4	C1		289.9	0.7	0.2	18	840.0		858.9		18.9	38.7	45.8	HydroCAD	859	864	860.9	5.1	Low	
C 5	D12		374.7	6.7	1.8	48	865.0		873.8		8.8	98.3	84.5	HydroCAD	870	878	875.8	4.2	Low	Equalizes with Pond D12
C 6	D11		50.9	7.6	14.9		869.8								870	876				Equalizes with Pond D12
C 7	D8		53.7	1.5	2.8	6	957.1		962.6		5.5	11.5	2.2	HydroCAD	961	971	964.6	8.4	Low	
C 8	D9		45.1		0.0	no outlet														NO OUTLET Proposed outlet to D10
C 9	D10		71.8	2.0	2.8	15	970.0		977.5		7.5	24.2	15.4	HydroCAD	978	976	979.5	-1.5	High	
C10	D1		64.9	0.1	0.2	12	964.9		1000.8		35.9	7.9	20.1	HydroCAD	999	998	1002.8	-2.8	High	
C11	D2		27.5	1.9	6.9	24	1014.2		1016.4		2.2	3.4	16.6	HydroCAD	1028	1022	1018.4	5.6	High	
C12	D3		42.9	2.7	6.3	18	1002.4		1006.8		4.4	8.3	16.2	HydroCAD	1017	1018	1008.8	11.2	High	
C13	D4		24.2	1.0	4.1	12	989.0		998.3		9.3	14.1	8.4	HydroCAD	999	1000	1000.3	1.7	High	
C14	D6		318.9	4.4	1.4	24	963.0		974.0		11.0	65.5	47.9	HydroCAD	974	972	976.0	-2.0	High	
C15	D5		31.0	1.4	4.5	12	968.0		971.1		3.1	3.6	23.1	HydroCAD	978	976	973.1	4.9	High	
C16	D7		82.6	1.1	1.3	36	959.5		965.0		5.5	22.8	55.7	HydroCAD	961	962	967.0	-3.0	High	

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New Drainage Area ID	Old Drainage Area ID	Water Body Common Name	Subwatershed Drainage Area (Acres)	Surface Area at NWL (Acres)	Water Body to Watershed Ratio	Approx. Outlet Size (inches)	NWL (NGVD)	Ordinary HWL DNR	100-Year Event (6.0" Rainfall Event) HWL (NGVD)	BFE (FEMA)	Bounce (ft)	Storage (acre/ft)	Peak Outflow Rate (cfs)	Model	Approximate Overflow Elevation	Approx. Existing Low Building Elevation (LBE)	Low / Minimum Building Elevation	Freeboard (LBE-HWL) (ft)	Risk of Inundation	Notes
BLACK DOG WATERSHED																				
EAST SUBWATERSHED																				
E 1	E48		195.6	1.4	0.7	36	853.2		865.1		11.9	39.4	109.7		867	863	867.1	-2.1	High	
E 2	E46		35.9	1.5	4.2	18	879.0		897.5		18.5	167.8	23.2	HydroCAD	903	901	899.5	3.5	High	Equalizes with Pond E47
E 3	E47		347.2	3.3	1.0	18	879.0		897.5		18.5	167.8	23.2	HydroCAD	903	901	899.5	3.5	High	Equalizes with Pond E46
E 4	E44		121.3	2.6	2.1	24	925.0		932.5		27.4	28.0	36.9		933	932	934.5	-0.5	High	
E 5	E25		11.7	0.1	0.9	12	953.0		957.5		4.5	1.3	7.5	HydroCAD	962	968	959.5	10.5	Low	
E 6	E26		23.6	1.1	4.7	12	953.0		957.0		4.0	5.3	7.1	HydroCAD	962	968	959.0	11.0	Low	
E 7	E28A		9.2	0.1	1.1	18	935.5		942.0		6.5	0.5	12.6	HydroCAD	968	970	944.0	28.0	Low	
E 8	E27		24.3		0.0	no ponding														
E 9	E28		30.9	2.1	6.8	18	958.0		961.0		3.0	65.6	18.2	HydroCAD	946	948	963.0	-13.0	Moderate	Equalizes with ponds E23 and E24
E10	E43		15.0	1.3	8.7	15	935.5		938.6		3.0	7.0	9.1	HydroCAD	940	942	940.6	3.5	Low	Equalizes with Pond E40, E41, and E42
E11	E42		8.8	0.5	5.7	18	935.5		938.5		3.0	0.6	11.8	HydroCAD	940	944	940.5	5.5	Low	Equalizes with Pond E40, E41, and E43
E12	E41		10.4	0.6	5.8	21	935.8		938.8		3.0	4.8	10.6	HydroCAD	939.6	942	940.8	3.2	Low	Equalizes with Pond E40, E42, and E43
E13	E40		23.7	2.0	8.4	18	935.2		938.5		3.3	9.9	11.2		938	948	940.5	9.5	Low	Equalizes with Pond E41, E42, and E43
E14	E45		138.3	1.2	0.9	21	924.4		930.7		6.3	21.8	18.0	HydroCAD	931	932	932.7	1.3	High	
E15	E38		34.4	3.6	10.5		957.1		959.2		2.1	7.0	4.4	HydroCAD	962	966	961.2	6.8	Low	Equalizes with Pond E37
E16	E39		67.2	5.1	7.6	18	944.0		946.9		2.9	15.4	12.4	HydroCAD	948	952	948.9	5.1	Low	
E17	E21		32.5	2.3	7.1	36	935.0		939.1		-4.1	2.5	54.9		940	940	941.1	0.9	High	6" and 12" force mains
E18	E24		76.7	8.6	11.2	21	936.7		940.3		3.7				962	944	942.3	3.7	High	Equalizes with ponds E23 and E28
E19	E23		56.4	1.7	3.0	42	938.5		944.4		5.9	6.4	57.4		942	946	946.4	1.6	Moderate	Equalizes with ponds E24 and E28
E20	E22		3.2	0.8	24.8	42	946.0		948.5		2.5	3.3	40.3		949		950.5			
E21	E19		12.5	3.1	24.8	12	933.0		937.4		4.4	6.5	4.5		935	950	939.4	12.6	Low	
E22	E20		12.9	1.0	7.8	12	935.0		938.2		3.2	1.6	6.2	HydroCAD	939	936	940.2	-2.2	High	
E23	E37		53.5	1.4	2.6		957.1		959.2		2.1	7.0	4.4	HydroCAD	962		961.2			Equalizes with Pond E38
E24	E30		31.5	1.5	4.8	12	988.0		990.6		2.6	7.0	4.2	HydroCAD	992	1014	992.6	23.4	Low	
E25	E36		15.0		0.0	no outlet			976.5			1.7	3.6	HydroCAD			978.5			NO OUTLET; Proposed to outlet into E34
E26	E34		18.3	0.8	4.4	12	968.0		970.2		2.2	2.9	4.0	HydroCAD	970		972.2			
E27	E35		21.9		0.0	no outlet														NO OUTLET; Proposed to outlet into E34
E28	E17		25.7	0.9	3.5	12	945.0		949.3		4.3	6.0	2.7		948	950	951.3	0.7	Moderate	
E29	E18		18.5	1.1	6.0	15	935.0		937.5		2.5	2.7	7.5	HydroCAD	938	942	939.5	4.5	Low	
E30	E16		13.7	0.6	4.4	12	960.0		961.2		1.2	1.8	1.6	HydroCAD	962	966	963.2	4.8	Low	
E31	E33		17.4	0.9	5.2	12	969.0		970.8		1.8	2.3	4.0	HydroCAD	976		972.8			
E32	E32		27.1	1.1	4.1	12	971.0		973.3		2.3	8.9	3.7	HydroCAD	976		975.3			
E33	E29		59.6	4.3	7.2	12	989.5		992.1		2.6	12.6	3.7		1002	1006	994.1	13.9	Low	
E34	E31		13.2	0.9	6.8	12	992.0		992.7		0.7	2.3	1.8	HydroCAD	996	1002	994.7	9.3	Low	
E35	E15		114.8	3.0	2.6	24	943.1	.....	946.1		3.0	10.6	16.6	HydroCAD	950	952	948.1	5.9	Low	Includes inflow from 35E/Apple Valley.
E36	E14		69.2	0.3	0.4	12	943.0		963.8		20.8	13.3	6.6		958	958	965.8	-5.8	High	Watershed in Apple Valley -runoff tributary to Burnsville
E37	E12		10.4		0.0															Watershed in Apple Valley -runoff tributary to Burnsville
E38	E13		61.6	2.0	3.2	12	947.2		950.7		3.5	7.6	3.9		956	956	952.7	5.3	High	Watershed in Apple Valley -runoff tributary to Burnsville
E39	E10		73.1	8.4	11.5	12" force main	968.0		972.4		4.4	33.2	7.0		974	974	974.4	1.6	High	Watershed in Apple Valley -runoff tributary to Burnsville
E40	E3		13.6	1.6	11.8	12" force main	948.0		958.9		10.9	5.8	0.5		958	956	960.9	-2.9	High	Watershed in Apple Valley -runoff tributary to Burnsville
E41	E11		18.6	0.8	4.3	12	965.9		968.1		2.2	24.5	3.5		974	974	970.1	5.9	High	Watershed in Apple Valley -runoff tributary to Burnsville
E42	E1		10.6	0.3	2.8	12	984.0		986.0		2.0	1.4	4.0		990	988	988.0	2.0	High	Watershed in Apple Valley -runoff tributary to Burnsville
E43	E4		17.0	4.3	25.2	12	967.0		970.0		3.0	2.7	4.6	HydroCAD	978	976	972.0	6.0	High	Watershed in Apple Valley -runoff tributary to Burnsville
E44	E8		9.4	1.6	17.0	12	1008.0		1012.7		4.7	1.0	6.0		1012	1014	1014.7	1.3	Moderate	Watershed in Apple Valley -runoff tributary to Burnsville
E45	E2		22.2	5.2	23.4	12" force main	1016.0		1018.6		2.6	5.5	0.5	HydroCAD	1022	1020	1020.6	1.4	High	Watershed in Apple Valley -runoff tributary to Burnsville
E46	E9		26.7	1.1	4.1	12	1009.7		1020.5		10.8	4.9	2.7	HydroCAD	1022	1024	1022.5	3.5	Low	Watershed in Apple Valley -runoff tributary to Burnsville
E47	E5		29.3	1.2	4.1	12	1005.5		1012.4		6.9	4.4	6.1		1012	1014	1014.4	1.6	Moderate	Watershed in Apple Valley -runoff tributary to Burnsville
E48	E6		16.8	13.2	78.4	12	1002.8		1004.7		1.9	4.9	6.1		1006	1006	1006.7	1.3	High	Watershed in Apple Valley -runoff tributary to Burnsville
E49	E7		67.6	2.3	3.4	18	996.5		1003.8		7.3	10.4	13.8		1002	1004	1005.8	0.2	Moderate	Watershed in Apple Valley -runoff tributary to Burnsville
RIVER HILLS SUBWATERSHED																				
RH 1	L1		24.8	0.5	2.0	18	797.6		800.5		2.9	0.1	12.1	HydroCAD	801.5	808	802.5	7.5	Low	
RH 2	L2		3.3	0.1	3.0	12	797.0		799.0		2.0	0.2	4.6	HydroCAD	805	809	801.0	10.0	Low	
RH 3	L3		17.5	0.4	2.3	12	748.0		758.0		10.0	10.0	11.7		763	764	760.0	6.0	High	
RH 4	L5		27.1	0.0	0.0	21	746.8								755	793				
RH 5	F3		256.0		0.0	no ponding									N/A					
RH 6	L4		38.6		0.0	18	795.2								812	818				
RH 7	F4		35.0		0.0	no ponding									N/A					
RH 8	F5		91.0		0.0	no ponding									N/A					
RH 9	F2		95.9	3.1	3.2	12	872.0		873.8		1.8	20.1	5.9	XPSWMM	877	880	875.8	6.2	Low	Includes inflow form Eagan.
RH10	F1		171.0	2.9	1.7	18	892.0		899.3		7.3	30.2	22.8	XPSWMM	901	902	901.3	2.7	High	

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CREDIT RIVER WATERSHED																				
MURPHY HANREHAN SUBWATERSHED																				
MH 1	J10		72.7		0.0	no ponding									N/A					
MH2	J9					channel								XPSWMM						Outflow to Savage. See LOMR Data
MH 3	J8		63.1	0.1	0.2	grate	915.3								920	918				
MH 3	J9	Cam Ram Wetland	706.7	70.1	9.9	channel	858.0		864.8	865.0	6.8	38.3	2.9	XPSWMM	N/A		866.8			Cam Ram outlet to west into Scott County. See LOMR data.
MH 6	K4		31.5	1.0	3.2	12	998.0		1001.0	1001.0	3.0	4.4	4.3		1002		1003.0			Outflow to Scott Co.
MH 7	J11		28.4		0.0	no ponding														
MH 8	K3		83.2		0.0	no ponding									N/A					Outflow to Lakeville.
MH 9	J7		83.6		0.0	12	942.0		946.8		4.8	1.5	3.7	XPSWMM	946	950	948.8	3.2	Low	Wildwood Pond
MH10	J6		92.2	1.0	1.1	30	940.0								950	958				
MH11	J5		74.9	0.3	0.4	42	950.0		954.5		4.5	14.6	8.1	XPSWMM	945	980	956.5	25.5	Low	
MH12	J4		22.5	1.9	8.4	18	982.0		998.8		16.8	2.3	9.8	XPSWMM	998	1014	1000.8	15.2	Low	
MH13	J3		15.9		0.0															
MH14	J2		58.6	0.6	1.0	12	1002.0		1008.0		6.0	7.9	6.3	XPSWMM	1004	1024	1010.0	16.0	Low	
MH15	J1	Horseshoe Lake	49.8	14.6	29.3	12	990.0	990.0*	995.5		5.5	14.3	1.2	XPSWMM	1016		997.5			Includes Horsehoe Lake - DNR #19003200-P. Proposed storm sewer to be constructed and routed to J2.
MH16	K1		53.0		0.0	no ponding									N/A					
MH17	K2		15.5		0.0	no ponding									N/A					Outflow to Lakeville.
LOWER MINNESOTA RIVER WATERSHED																				
NORTHWEST SUBWATERSHED																				
NW 1	NW16		17.3		0.0	No Data														Hydrocad node: 5016
NW 2	NW12		29.9		0.0	No Data														Hydrocad node: 5012
NW 3	NW14		7.1		0.0	No Data														Hydrocad node: 5014
NW 4	NW15		36.3		0.0	No Data														Hydrocad node:5015
NW 5	NW13		25.6		0.0	No Data														Hydrocad node:5013
NW 6	NW11		18.5		0.0	No Data														Hydrocad node:5011
NW 7	NW10		10.7		0.0	No Data														Hydrocad node: 5010
NW 8	NW5		75.5		0.0	No Data														Hydrocad node: 5005
NW 9	NW6		363.3		0.0	No Data														Future Quarry Lake subwatershed
NW10	NW7		78.1		0.0	No Data														Hydrocad node:5007 - Outlets to NW Subwatershed of LMRWD
NW11	NW8		62.4		0.0	No Data														Landfill
NW12	NW9		282.9		0.0	No Data														Landfill - Outlets to NW Subwatershed of LMRWD
NW13	NW2		162.1		0.0	No Data														Hydrocad node: 102. Inflow from Savage.
NW15	NW3		590.2		0.0	No Data														Hydrocad nodes:9124, 9126, 9127, 9128, 9129
NW16	NW4		93.4		0.0	No Data														Hydrocad node: 5001
NW17	NW5A		9.3		0.0	No Data														Hydrocad node:5002
NW18	NW4A		76.6		0.0	No Data														Hydrocad node:5000
NW19	NW1B		5.6		0.0	No Data														Hydrocad node: 9101
NW20	NW1A		10.4		0.0	No Data														Hydrocad node:9100
NW21	NW1C		95.9		0.0	No Data														Hydrocad node:9105
BLACK DOG LAKE WEST SUBWATERSHED																				
BDW1						No Data														
BDW2						No Data														
BDW3						No Data														
BLACK DOG LAKE EAST SUBWATERSHED																				
BDE1						No Data														
BDE2						No Data														
VERMILLION RIVER WATERSHED																				
LAKE ALIMAGNET SUBWATERSHED																				
LA 1	H4		67.4		0.0	no ponding														
LA 2	H3		177.2	3.2	1.8	no ponding														
LA3	H2		297.2	10.3	3.5	18	958.0		962.8		4.8	102.0	8.4		960	972	964.8	9.2	Low	Watershed drains to east through Apple Valley
LA4	H1	Lake Alimagnet	701.1	112.0	16.0	30	954.5	954.8	957.1	959.0	2.6	217.5	75.2		958	968	960.0	10.9	Low	DNR # 19002100-P. Outflow to Apple Valley via lift station.
LA5	A43		9.3	0.2	2.2	12	1006.0		1009.5		3.5	1.6	7.0		1015		1011.5			Lift station - Pumped to Lk Alimagnet Watershed
LA6	A42		14.3	1.6	11.2	15	1010.0		1011.3		1.3	2.3	5.7	HydroCAD	1018		1013.3			Drains to A43 then pumped to Lk Alimagnet watershed
LA7	A45		2.4	0.1	4.2	12	1003.0		1008.5		5.5	0.3	2.3	HydroCAD	981		1010.5			Drains to A42 to A43 then pumped to Lk Alimagnet wtrsd

ATLAS 14 UPDATE - Based on updates to precipitation frequency data published in Atlas 14, the 100-year high water level data presented in these tables may require additional analysis by the City and/or owner prior to obtaining approvals. In general, the City will complete the updated modeling upon the initial contact with a project owner and provide the owner with updated high water level and low building elevation information.

Table D-1. 10-Year Design Storm: Hydrologic Information for the City of Burnsville

Subwatershed Name	Subwatershed Drainage Area (Acres)	Pond Surface Area at NWL (Acres)	Ratio of Pond Area to Subwatershed Area (%)	Ratio >1%	Outlet Description (inches)	NWL (NGVD)	Ordinary HWL (NGVD)	10-Year Event (4.2" Rainfall Event) HWL (NGVD)	Bounce (ft)	Storage (acre/ft)	Peak Outflow Rate (cfs)	Approximate Overflow Elevation	Existing Low Building Elevation	Notes	Freeboard (LBLDG-HWL) (ft)	Comments
A1	183.1	1.4	0.8	NO	30	944.5		957.0	12.5	7.4	55.7	958	958	Apple Valley runoff tributary to Burnsville	1.0	B G
A2	112.9	2.7	2.4	YES	12	952.0		955.0	3.0	10.5	4.8	958		Apple Valley runoff tributary to Burnsville		
A3	74.8	0.5	0.7	NO	30	972.0		978.5	6.5	4.0	54.2	980	976		-2.5	E G
A4	3.5	0.1	2.8	YES	12	979.7		980.0	0.3	0.3	0.3	982				
A6	150.2	2.9	1.9	YES	42	944.5		949.4	4.9	13.3	81.6	952	951		1.6	C F
A7	725.9	28.1	3.9	YES	72	934.3	934.5	937.2	2.9	181.7	28.4	940	939	Includes Keller Lake - DNR #19002500-P.	1.8	B D G
A8	176.8	2.2	1.2	YES	no outlet							948		Includes Lac Lavon - DNR #19044600-P. NO OUTLET		
A13	180.7	2.0	1.1	NO	30	983.1		984.9	1.8	5.0	16.5	986.8				
A22	105.3	7.3			10' weir	936.7		937.6	0.9	4.4	36.8	940	1004	Portion west of I-35 drains to directly to Buck Hill Bay	66.4	A F
A23	27.6	1.6	5.8	YES	15	938.0		939.5	1.5	1.7	5.5	944	950		10.5	A D
A24	549.5	298.6	54.3	YES	36	933.4	934.5	934.3	0.9	239.1	38.2	938	940	Includes Crystal Lake - DNR #19002700-P.	5.7	A D G
A25	23.5	0.3	1.3	YES	27	932.7		937.9	5.2	2.2	38.2	936	946		8.1	A D
A26	151.1	8.7	5.8	YES	36	914.5		919.0	4.5	71.5	59.2	926	926	Includes Twin Lakes - DNR #19002800-W. Equalizes with Pond A30	7.0	A D
A27	180.2	0.7	0.4	NO	10' weir	921.0		924.4	3.4	18.5	172.3	928				
A28	145.0	14.2	9.8	YES	18	1001.0	998.8	1002.5	1.5	21.6	3.6	1012	1010	Includes Wood Park Pond - DNR #19002400-W.	7.5	A D
A29	53.4	2.9	5.4	YES	12	1009.0		1010.5	1.5	7.4	3.8	1011	1018		7.5	A
A30	159.8	4.7	2.9	YES	36	914.5		919.0	4.5	71.5	59.2	926	930	Equalizes with Pond A26	11.0	A D G
A31	764.2	28.6	3.7	YES	36	905.0	906.7	911.1	6.1	202.2	38.5	916	914	Includes Earley Lake - DNR #19003300-P.	2.9	B G
A32	372.9	5.3	1.4	YES	48	893.0		896.6	3.6	24.3	59.7	900	920		23.4	A
A33	441.7	57.6	13.0	YES	48	851.0	850.0*	852.7	1.7	108.9	35.9	860	860	Includes Sunset Pond	7.3	A D
A35	8.5	0.5	5.9	YES	12	1008.0		1008.8	0.8	0.8	1.9	1014	1015	Summit Oaks	6.2	A D
A36	4.7	0.3	6.3	YES	12	1000.0		1001.1	1.1	0.4	2.4	1008	1006	Summit Oaks	4.9	A D
A37	11.2				12	997.0		1000.0	3.0	1.0	6.2	N/A		Summit Oaks		
A38	4.5	0.1	2.2	YES	12	990.0		995.4	5.4	0.7	7.1	1005	1016	Summit Oaks	20.6	A D
A39	10.3	0.4	3.9	YES	12	994.0		995.5	1.5	0.6	3.8	1001	1006		10.5	A D
A40	11.9	1.0	8.4	YES	12	978.7		979.9	1.2	2.1	1.7	981	986		6.1	A
A41	10.5	0.5	4.8	YES	12	972.7		973.9	1.2	0.9	2.5	976	988		14.1	A
A42	14.3	1.6	11.2	YES	15	1010.0		1010.8	0.8	1.2	13.7	1018		Drains to A43 then pumped to Lk Alimagnet watershed		D
A43	9.3	0.2	2.2	YES	12	1006.0		1007.7	1.7	0.7	4.2	1015		Lift station - Pumped to Lk Alimagnet Watershed		D
A45	2.4	0.1	4.2	YES	12	979.9		980.4	0.5	0.2	1.1	981		Drains to A42 to A43 then pumped to Lk Alimagnet wtrsd		
A46	62.4	1.0	1.6	YES	18	954.0		961.0	7.0	7.9	21.3	963	988		27.0	A
A47	71.7	0.2	0.3	NO	drop structure	863.5		868.6	5.1	0.0	179.6	880	880	TIF Development; Special drop structure outlet	11.4	A D
A48	46.5	0.2	0.4	NO	12	880.0		884.1	4.1	2.2	40.2	885	884	TIF Development	-0.1	B G
A49	5.0	0.1	2.0	YES	12	885.0		885.6	0.6	0.2	4.0	888	890	TIF Development	4.4	A
B1	37.6	0.7	1.9	YES	12	979.5		981.8	2.3	3.2	4.3	986	990		8.2	A
B2	96.7	0.4	0.4	NO	30" force main	945.6		949.2	3.6	4.3	45.0	954	958		8.8	A
B3	106.0	0.5	0.5	NO	30" force main	940.0		952.8	12.8	14.7	45.0	954	960		7.2	A
B4	14.2	0.5	3.5	YES	18	1035.0		1036.3	1.3	0.2	6.5	1042	1051		14.7	A D
B5	26.6	0.4	1.5	NO	24	1017.0		1018.8	1.8	0.7	13.7	1023	1046		27.2	A
B6	7.3	0.5	6.8	YES	30	1009.2		1010.4	1.2	0.9	7.6	1012				
B7	63.2	0.8	1.3	YES	21	969.0		975.6	6.6	5.4	25.9	978	996		20.4	A
B8	92.9	2.0	2.2	YES	30	948.0		956.9	8.9	24.1	65.2	976	990		33.1	A D
B9	13.6	2.2	16.2	YES	21	882.0		887.8	5.8	49.7	16.1	890	891	Equalizes with Pond B10	3.2	C
B10	438.5	4.9	1.1	YES	21	882.0		887.8	5.8	49.7	16.1	890		Equalizes with Pond B9		G
B11	67.7	1.4	2.1	YES	36	867.7		871.0	3.3	3.5	46.0	877	878		7.0	C D F
B12	493.6	4.8	1.0	YES	60	845.3		854.2	8.9	48.6	226.2	855	854		-0.2	E F G
C1	289.9	0.7	0.2	NO	18	840.0		852.7	12.7	18.2	26.1	859	864		11.3	A F
C2	39.7				no ponding							N/A				
D1	64.9	0.1	0.2	NO	12	994.0		998.8	4.8	3.5	19.8	999	998		-0.8	E F G
D2	27.5	1.9	6.9	YES	24	1014.2		1015.8	1.6	1.7	11.1	1028	1022		6.2	A D
D3	42.9	2.7	6.3	YES	18	1002.4		1005.0	2.6	3.8	11.7	1017	1018		13.0	A D
D4	24.2	1.0	4.1	YES	12	989.0		994.6	5.6	6.8	6.5	999	1000		5.4	B C F
D5	31.0	1.4	4.5	YES	12	968.5		969.9	1.4	1.9	12.0	978	976		6.1	A D
D6	318.9	4.4	1.4	YES	24	963.0		968.7	5.7	34.2	32.8	974	972		3.3	E
D7	82.6	1.1	1.3	YES	36	959.5		963.3	3.8	16.1	36.1	961	962		-1.3	C F
D8	53.7	1.5	2.8	YES	6	957.1		961.2	4.1	5.6	1.8	961	971		9.8	A F
D9	45.1				no outlet									NO OUTLET Proposed outlet to D10		

Table D-1. 10-Year Design Storm: Hydrologic Information for the City of Burnsville

Subwatershed Name	Subwatershed Drainage Area (Acres)	Pond Surface Area at NWL (Acres)	Ratio of Pond Area to Subwatershed Area (%)	Ratio >1%	Outlet Description (inches)	NWL (NGVD)	Ordinary HWL (NGVD)	10-Year Event (4.2" Rainfall Event) HWL (NGVD)	Bounce (ft)	Storage (acre/ft)	Peak Outflow Rate (cfs)	Approximate Overflow Elevation	Existing Low Building Elevation	Notes	Freeboard (LBLDG-HWL) (ft)	Comments
D10	71.8	2.0	2.8	YES	15	970.0		974.7	4.7	12.7	12.0	978	976		1.3	E
D11	50.9	7.6	14.9	YES		869.8						870	876	Equalizes with Pond D12		F
D12	374.7	6.7	1.8	YES	48	865.0		870.7	5.7	44.6	63.2	870	878	Equalizes with Pond D12	7.3	A F
D13	80.4				no ponding							N/A				
E1	10.6	0.3	2.8	YES	12	984.0		985.3	1.3	0.7	3.4	990	988	Watershed in Apple Valley -runoff tributary to Burnsville	2.7	B D
E2	22.2	5.2	23.4	YES	12" force main	1016.0		1017.4	1.4	2.8	0.5	1022	1020	Watershed in Apple Valley -runoff tributary to Burnsville	2.6	B D
E3	13.6	1.6	11.8	YES	12" force main	948.0		954.4	6.4	3.0	0.5	958	956	Watershed in Apple Valley -runoff tributary to Burnsville	1.6	E
E4	17.0	4.3	25.2	YES	12	967.0		968.5	1.5	1.3	3.7	978	976	Watershed in Apple Valley -runoff tributary to Burnsville	7.5	A D
E5	29.3	1.2	4.1	YES	12	1005.5		1008.8	3.3	2.1	4.7	1012	1014	Watershed in Apple Valley -runoff tributary to Burnsville	5.2	B
E6	16.8	13.2	78.4	YES	12	1002.8		1004.1	1.3	3.4	3.9	1006	1006	Watershed in Apple Valley -runoff tributary to Burnsville	1.9	B G
E7	67.6	2.3	3.4	YES	18	996.5		999.1	2.6	4.6	11.4	1002	1004	Watershed in Apple Valley -runoff tributary to Burnsville	4.9	B
E8	9.4	1.6	17.0	YES	12	1008.0		1010.6	2.6	0.5	4.6	1012	1014	Watershed in Apple Valley -runoff tributary to Burnsville	3.4	B
E9	26.7	1.1	4.1	YES	12	1009.7		1015.9	6.2	2.5	2.1	1022	1024	Watershed in Apple Valley -runoff tributary to Burnsville	8.1	A
E10	73.1	8.4	11.5	YES	12" force main	968.0		970.1	2.1	13.7	7.0	974	974	Watershed in Apple Valley -runoff tributary to Burnsville	3.9	B
E11	18.6	0.8	4.3	YES	12	965.9		967.6	1.7	21.0	3.4	974	974	Watershed in Apple Valley -runoff tributary to Burnsville	6.4	A D
E12	10.4													Watershed in Apple Valley -runoff tributary to Burnsville		
E13	61.6	2.0	3.2	YES	12	947.2		948.5	1.3	2.2	3.4	956	956	Watershed in Apple Valley -runoff tributary to Burnsville	7.5	A D
E14	69.2	0.3	0.4	NO	12	943.0		954.5	11.5	6.7	4.8	958	958	Watershed in Apple Valley -runoff tributary to Burnsville	3.5	
E15	114.8	3.0	2.6	YES	24	943.1	…..	944.6	1.5	5.2	5.7	950	952		7.4	C D
E16	13.7	0.6	4.4	YES	12	960.0		960.8	0.8	0.9	0.8	962	966		5.2	A
E17	25.7	0.9	3.5	YES	12	945.0		947.2	2.2	2.9	1.9	948	950		2.8	B
E18	18.5	1.1	6.0	YES	15	935.0		936.6	1.6	1.3	5.7	938	942		5.4	A
E19	12.5	3.1	24.8	YES	12	933.0		935.2	2.2	3.8	2.9	935	950		14.8	A
E20	12.9	1.0	7.8	YES	12	935.0		937.3	2.3	0.8	5.1	939	936		-1.3	E
E21	32.5	2.3	7.1	YES	36	935.0		937.8	-2.8	1.2	38.3	940	940	6" and 12" force mains	2.2	B D
E22	3.2	0.8	24.8	YES	42	946.0		947.7	1.7	2.2	21.2	949				
E23	56.4	1.7	3.0	YES	42	938.7		940.6	1.9	3.8	21.1	942	946	Equalizes with ponds E24 and E28	5.4	A
E24	76.7	8.6	11.2	YES	21	936.6						962	944	Equalizes with ponds E23 and E28		
E25	11.7	0.1	0.9	NO	12	953.0		956.0	3.0	0.6	6.0	962	968		12.0	A D
E26	23.6	1.1	4.7	YES	12	953.0		955.3	2.3	2.7	5.0	962	968		12.7	A D
E27	24.3				no ponding											
E28A	9.2	0.1	1.1	YES	18	958.0		959.8	1.8	0.2	8.9	968	970		10.2	A D
E28	30.9	2.1	6.8	YES	18	935.0		939.0	4.0	30.6	12.4	946	948	Equalizes with ponds E23 and E24	9.0	A D G
E29	59.6	4.3	7.2	YES	12	989.5		990.8	1.3	6.2	3.2	1002	1006		15.2	A D
E30	31.5	1.5	4.8	YES	12	988.0		989.7	1.7	3.5	3.9	992	1014		24.3	A
E31	13.2	0.9	6.8	YES	12	992.0		992.4	0.4	1.3	0.7	996	1002		9.6	A D
E32	27.1	1.1	4.1	YES	12	971.0		972.4	1.4	4.6	3.4	976				G
E33	17.4	0.9	5.2	YES	12	969.0		970.3	1.3	1.4	3.3	976				D G
E34	18.3	0.8	4.4	YES	12	968.0		969.3	1.3	1.4	3.3	970				C F
E35	21.9				no outlet									NO OUTLET; Proposed to outlet into E34		
E36	15.0				no outlet			975.8		0.8	1.9			NO OUTLET; Proposed to outlet into E34		
E37	53.5	1.4	2.6	YES		957.1		958.5	1.4	4.9	3.1	962		Equalizes with Pond E38		D
E38	34.4	3.6	10.5	YES		957.1		958.5	1.4	4.9	3.1	962	966	Equalizes with Pond E37	7.5	A
E39	67.2	5.1	7.6	YES	18	944.0		945.5	1.5	8.7	7.6	948	952		6.5	A D C
E40	23.7	2.0	8.4	YES	18	935.2		937.2	2.0	6.2	6.1	938	948	Equalizes with Pond E41, E42, and E43	10.8	A D
E41	10.4	0.6	5.8	YES	21	935.8		937.5	1.7	2.5	6.0	939.6	942	Equalizes with Pond E40, E42, and E43	4.5	A D
E42	8.8	0.5	5.7	YES	18	935.5		937.3	1.8	0.3	7.3	940	944	Equalizes with Pond E40, E41, and E43	6.7	A
E43	15.0	1.3	8.7	YES	15	935.5		937.1	1.6	2.2	5.8	940	942	Equalizes with Pond E40, E41, and E42	4.9	A D G
E44	121.3	2.6	2.1	YES	24	925.0		929.5	27.4	15.2	25.6	933	932		2.5	B D G
E45	138.3	1.2	0.9	NO	21	924.4		928.7	4.3	9.7	17.5	931	932		3.3	B
E46	35.9	1.5	4.2	YES	18	879.0		892.2	13.2	86.9	19.7	903	901	Equalizes with Pond E47	8.8	A D F
E47	347.2	3.3	1.0	NO	18	879.0		892.2	13.2	86.9	19.7	903	901	Equalizes with Pond E46	8.8	A D G
E48	195.6	1.4	0.7	NO	36	853.2		862.2	9.0	22.7	93.0	867	863		0.8	F F
F1	171.0	2.9	1.7	YES	18	892.0		896.7	4.7	15.1	16.8	901	902		5.3	B
F2	95.9	3.1	3.2	YES	12	873.0		876.3	3.3	9.7	5.4	877	880		3.7	B D
F3	256.0				no ponding							N/A				
F4	35.0				no ponding							N/A				
F5	91.0				no ponding							N/A				

Table D-1. 10-Year Design Storm: Hydrologic Information for the City of Burnsville

Subwatershed Name	Subwatershed Drainage Area (Acres)	Pond Surface Area at NWL (Acres)	Ratio of Pond Area to Subwatershed Area (%)	Ratio >1%	Outlet Description (inches)	NWL (NGVD)	Ordinary HWL (NGVD)	10-Year Event (4.2" Rainfall Event) HWL (NGVD)	Bounce (ft)	Storage (acre/ft)	Peak Outflow Rate (cfs)	Approximate Overflow Elevation	Existing Low Building Elevation	Notes	Freeboard (LBLDG-HWL) (ft)	Comments
G1	251.0				no ponding							N/A				
H1	701.1	112.0	16.0	YES	30	954.5	954.8	956.0	1.5	117.0	72.0	958	968	Includes Lake Alimagnet - DNR # 19002100-P. Additional drainage area from Apple Valley	12.0	A
H2	297.2	10.3	3.5	YES	18	958.0		959.6	1.6	47.4	7.0	960	972	Watershed drains to east through Apple Valley	12.4	A D
H3	177.2	3.2	1.8	YES	no ponding											
H4	67.4				no ponding											
J1	49.8	14.6	29.3	YES	12	988.0	990.0*	988.3	0.3	8.5	0.5	990		Includes Horsehoe Lake - DNR #19003200-P. Proposed storm sewer to be constructed and routed to J2.		D
J2	58.6	0.6	1.0	NO	12	981.0		983.3	2.3	3.4	4.1	990	1024		40.7	A D
J3	15.9															
J4	22.5	1.9	8.4	YES	18	910.0		911.2	1.2	1.2	5.6	916	1014		102.8	A D
J5	74.9	0.3	0.4	NO	42	943.5		943.5	0.0	10.5	0.0	945	980		36.5	A D
J6	92.2	1.0	1.1	YES	30	940.0						950	958			A
J7	83.6				12	940.0		940.7	0.7	0.7	1.6	946	950	Wildwood Pond	9.3	A D
J8	63.1	0.1	0.2	YES	grate	915.3						920	918			B
J9	706.7	70.1	9.9	YES	channel	858.0		858.2	0.2	15.3	1.2	N/A		Cam Ram outlet to west into Scott County		
J10	72.7				no ponding							N/A				
J11	28.4				no ponding											
K1	53.0				no ponding							N/A				
K2	15.5				no ponding							N/A				
K3	83.2				no ponding							N/A				
K4	31.5	1.0	3.2	YES	12	998.0		999.9	1.9	1.9	4.0	1002				
L1	24.8	0.5	2.0	YES	18	797.6		799.0	1.4	0.0	6.9	801.5	808		9.0	A
L2	3.3	0.1	3.0	YES	12	797.0		798.0	1.0	0.1	2.6	805	809		11.0	A D
L3	17.5	0.4	2.3	NO	12	748.0		754.2	6.2	4.3	9.1	763	764		9.8	A D F
L4	38.6				18	795.2						812	818			
L5	27.1	0.0	0.0	NO	21	746.8						755	793			
NW1	402.6				No Data									Hydrocad nodes: 9106, 9107, 9110		
NW1A	10.4				No Data									Hydrocad node:9100		
NW1B	5.6				No Data									Hydrocad node: 9101		
NW1C	95.9				No Data									Hydrocad node:9105		
NW2	162.1				No Data									Hydrocad node: 102		
NW3	590.2				No Data									Hydrocad nodes:9124, 9126, 9127, 9128, 9129		
NW4	93.4				No Data									Hydrocad node: 5001		
NW4A	76.6				No Data									Hydrocad node:5000		
NW5	75.5				No Data									Hydrocad node: 5005		
NW5A	9.3				No Data									Hydrocad node:5002		
NW6	363.3				No Data									Future Quarry Lake subwatershed		
NW7	78.1				No Data									Hydrocad node:5007 - Outlets to NW Subwatershed of LMRWD		
NW8	62.4				No Data									Landfill		
NW9	282.9				No Data									Landfill - Outlets to NW Subwatershed of LMRWD		
NW10	10.7				No Data									Hydrocad node: 5010		
NW11	18.5				No Data									Hydrocad node:5011		
NW12	29.9				No Data									Hydrocad node: 5012		
NW13	25.6				No Data									Hydrocad node:5013		
NW14	7.1				No Data									Hydrocad node: 5014		
NW15	36.3				No Data									Hydrocad node:5015		
NW16	17.3				No Data									Hydrocad node: 5016		