

# **HYDROLOGY REPORT FOR AREA 2 @ SOMERSETT**

**PREPARED FOR:**

**SOMERSETT DEVELOPMENT, LLC  
100 W. LIBERTY, SUITE 990  
RENO, NEVADA 89501**

**PREPARED BY:**



## **Nimbus Engineers**

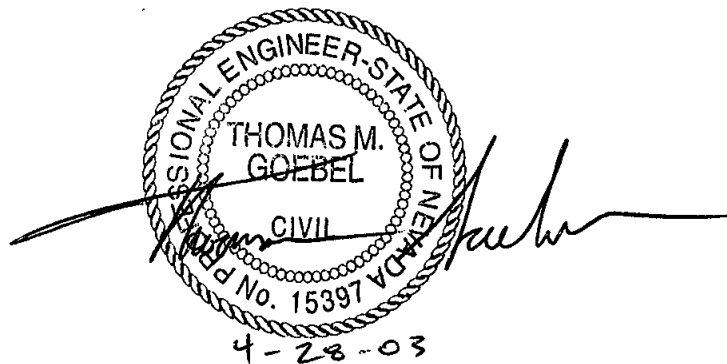
3785 Baker Ln., Suite 201 • Reno, NV 89509  
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***REVISED APRIL 2003***

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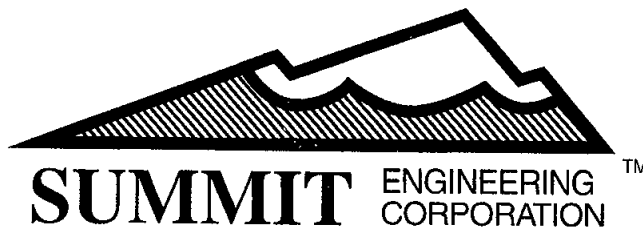
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*REVISED APRIL 2003*



April 29, 2003

Community Development  
City of Reno  
Sinclar St.  
Reno NV. 89801

RE: Area 2 Phase 1 (LDC03-00401)

Dear Chris:

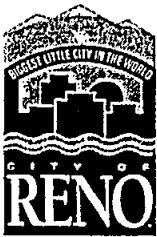
- 1) Old #1 The median was moved back to allow for a driveway full access to the lots 5 and 25.
- 2) Old#5 The radius labels for the cul-de-sacs were added to the plans C-5,6,7
- 3) Old#6 The curb type was changed on Bravo to Type 1 curb and gutter not rolled.
- 4) Old#7 The sidewalk along Evening Rock Trail is shown on Sheet C-10 along the match line with Sheet C-9
- 5) Old#8 The sidewalk along Charlie is extended the full length of the roadway and is shown on sheet C-11.
- 6) Old#9 The drainage is picked up in a swale within the golf course and discharges into a ditch behind lots 24, 25. The ditch conveys flows to a crossing with Evening Rock Trail. Ref. the revised hydro report.
- 7) Old# 10 The rockery walls were move to the lots they are retaining.
- 8) Old# 11 The easement for lot 70-storm drain was added to the plans.
- 9) Old# 12 The PILE easement is labeled on sheet C-13 along Common Area S.
- 10) Old# 13 The intersection shown on sheet C-12 is for the property to the south. Sheet C-7 shows easement for access across Somerset property.
- 11) Old# 15 Drainage along evening Rock Trail is addressed using proposed and existing facilities within Evening Rock Trail.

Sincerely

SUMMIT ENGINEERING CORPORATION

Thomas Hannum

5405 Mae Anne Avenue • Reno, Nevada 89523 • (775) 747-8550 FAX (775) 747-8559  
1421 E. Sunset Road, Suite 17 • Las Vegas, Nevada 89119 • (702) 252-3236 FAX (702) 252-3247  
607 South Fifth Street • Elko, Nevada 89801 • (775) 738-8058 FAX (775) 738-8267  
824 E. Aultman • Ely, Nevada 89301 • (775) 289-4445 FAX (775) 289-4043



# Community Development Department

## MEMORANDUM

*fix only 0 items*

Date: March 28, 2003  
To: Vern Kloos, AICP, Interim Planning Manager  
From: Keith Lockard, P.E., Senior Civil Engineer *see [signature]*  
Through: Robert M. Gottsacker, P.E., Engineering Manager, Development Services Division  
Subject: Application Review

This office has reviewed the following application scheduled for a Planning Commission or Board of Adjustment meeting, and offers the following comments and/or conditions:

LDC03-00401 (Somerset Area 2, Phase 1) – A request for: (1) a tentative map for 72 single family homes; and (2) a special use permit for cuts over 20 feet and fills over 10 feet. The project site is located at the terminus of Evening Rock Trail in Willow Ranch in a PUD zone.

PLANNER: Cheryl Ryan, AICP, Senior Planner

NEIGHBORHOOD ADVISORY BOARD: Ward 5B - Northwest

APN NUMBERS: 038-360-48; 038-720-11; 038-360-47; 232-140-02; 038-370-04; 038-360-32

MEETING DATE: Planning Commission – May 7, 2003

### Comments:

*shorten Median* ①

1. Please resolve apparent driveway conflict with median in Bravo with lots 5 and 25.

*ok* 2

2. Street type 3 does not appear in handbook, nor does it meet normal Fire Department requirements.

*2*

3. This project as proposed appears to have significant design elements which require review and input from the Fire Department. Please contact Dave Mills at 334-2323 or 334-2552. THIS CASE TO BE HELD PENDING FIRE DEPARTMENT INPUT PRIOR TO PUBLIC MEETING.

*Fix*

4. Long cul-de-sacs also require Fire review and approval. Perhaps, Bravo and Alpha could be looped.

*fix* 5

5. Cul-de-sac radii missing sheet C-5, C-6 and C-7.

*fix* 6

6. Charlie labeled public and may not have rolled curb per the detail.

*Type 1 curb*

*Simply label PILE w/ leader*

*Grant PILE* (7.)

Sidewalk along Evening Rock Trail appears to meander off the right-of-way and outside the tentative map (C-9). This must be corrected.

*Grant PILE* (8.)

Sidewalk on Bravo must be extended to Evening Rock Trail. This shows on sheet C-11, but an easement is required which appears not to be shown on the tentative map.

*change drainage report clarify maintenance of golf structures* (9.)

Hole 9 golf course drainage appears to sheet into streets and lots on sheet C-10. Please account for this in cut-off swales or drainage easements and ditches/pipes.

*Fix* (10)

Rockery walls should be on the lot they are holding up. Sheet C-11.

*Fix* (11)

Storm drain easement missing on lot 70.

*Grant PILE* (12)

Easement required for sidewalk along Evening Rock Trail from Parcel S to Somerset Parkway.

*Show access* (13.)

Access to property to south from Evening Rock Trail is required per our approved tentative map.

14.

Access is necessary for Washoe County District Health Department for control over any open channel or detention pond associated with this application. Either a twelve foot paved vehicle or walking path access may be required depending on the extent of easements and topography.

*Drainage reports to show* (15.)

15.

Drainage along and across Evening Rock Trail does not appear to be addressed.

16.

THIS PROJECT AS SUBMITTED DOES NOT MEET MINIMUM CODE REQUIREMENTS AND REVISIONS SHOULD BE MADE PER COMMENTS ABOVE THREE WEEKS PRIOR TO PUBLIC HEARING BY PLANNING COMMISSION.

17.

Conditions will be offered, if needed, subsequent to the review of a revised application.

## **1.0 INTRODUCTION**

The following report presents the results of the hydrology analysis for Area 2 at Somerset. Area 2 is a proposed residential subdivision located within Section 10 Township 19 North, Range 18 East, and Section 35, Township 20 North, Range 18 East, Reno, Nevada (Figure 1). The property is bordered on the North, East, and West by other Somerset developments. The land to the immediate South is undeveloped and Mogul lies further South.

This site is steep with slopes often exceeding 10%. The ground cover consists of predominantly native grasses. According to FEMA's Flood Insurance Rate Maps (FIRM) the site lies in Zone X (unshaded), an area outside of the 500-year flood limits.

The "Updated Somerset Storm Drainage Master Plan, July 2002" was prepared by Nimbus Engineers, and analyzes the existing hydrologic condition and provides preliminary information about mitigation measures, i.e. detention basins for the entire Somerset PUD.

The purpose of this report is to analyze the hydrology produced with development of Area 2 and demonstrate compliance with the aforementioned drainage master plan.

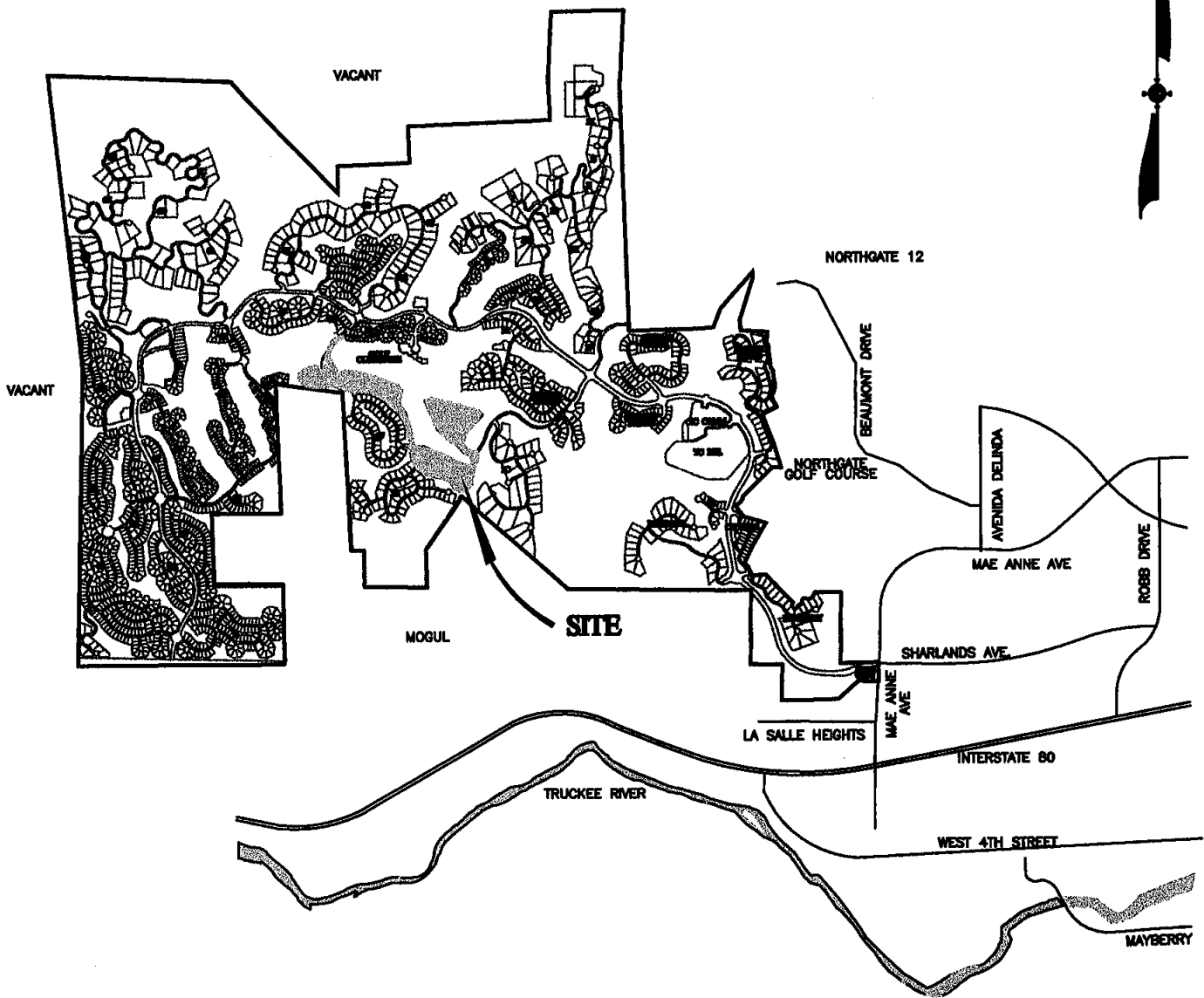
## **2.0 HYDROLOGY METHODOLOGY**

### Rational Method Analysis

The methodology and parameters used in the rational method analysis were obtained from the City of Reno Public Works Design Manual.

Runoff coefficients were appropriately chosen for the site in its developed condition from the City of Reno Public Works Design Manual.

Times of concentration were calculated for the watersheds contributing to catch basins. In most instances a time of concentration of 10 minutes, the minimum per City of Reno Public Works Design Manual was used. A time of concentration of 10 minutes corresponds to 5- and 100-year rainfall intensities of 1.4 and 3.8 inches/hour, respectively (see Tables 1 and 2 and Appendix A).



Date: Mar. 2003

Sheet: 1 of 1

Nimbus Job #0307

FIGURE 1  
VICINITY MAP  
SOMERSETT

Reno

Washoe

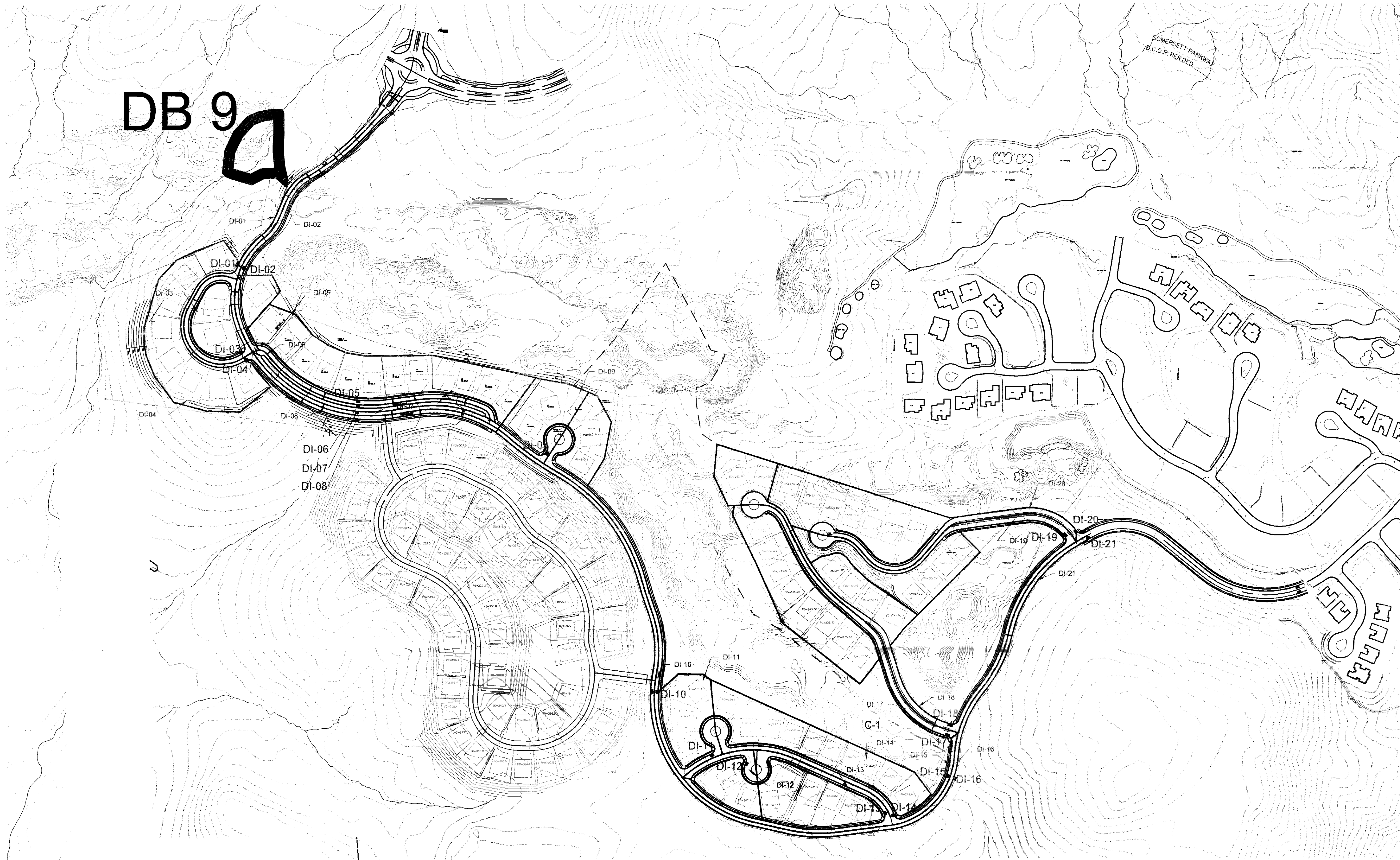
Nevada



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# DB 9



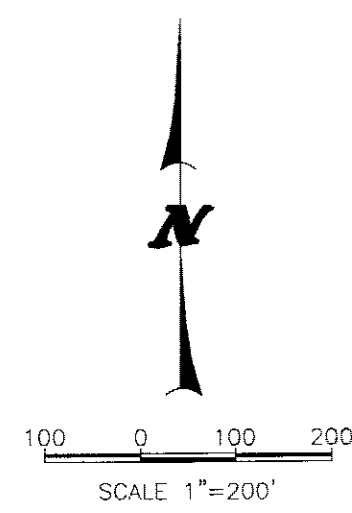
**CALCULATED RUNOFF FROM ONSITE WATERSHEDS AT SOMERSETT AREA 2**

| INLET NUMBER | AREA ACRES | Q 5yr cfs | Q 100yr cfs | DESTINATION |
|--------------|------------|-----------|-------------|-------------|
| DI-01        | 0.34       | 0.4       | 1.2         | DI-01       |
| DI-02        | 0.35       | 0.4       | 1.2         | DI-02       |
| DI-03        | 1.69       | 1.6       | 4.3         | DI-03       |
| DI-04        | 2.26       | 3.8       | 10.4        | DI-04       |
| DI-05        | 4.58       | 5.0       | 13.6        | DI-05       |
| DI-06        | 0.26       | 1.0       | 2.7         | DI-06       |
| DI-07        | 0.37       | 0.5       | 1.3         | DI-07       |
| DI-08        | 0.38       | 0.5       | 1.3         | DI-08       |
| DI-09        | 1.45       | 1.6       | 4.3         | DI-09       |
| DI-10        | 1.55       | 1.9       | 5.3         | DI-10       |
| DI-11        | 1.71       | 1.9       | 5.1         | DI-11       |
| DI-12        | 1.16       | 1.0       | 3.4         | DI-12       |

| INLET NUMBER | AREA ACRES | Q 5yr cfs | Q 100yr cfs | DESTINATION |
|--------------|------------|-----------|-------------|-------------|
| DI-13        | 2.41       | 2.6       | 7.2         | DI-13       |
| DI-14        | 3.38       | 3.7       | 10.0        | DI-14       |
| DI-15        | 0.50       | 0.6       | 1.7         | DI-15       |
| DI-16        | 0.76       | 1.0       | 2.6         | DI-16       |
| DI-17        | 3.77       | 4.1       | 11.2        | DI-17       |
| DI-18        | 2.87       | 3.1       | 8.5         | DI-18       |
| DI-19        | 2.45       | 2.7       | 7.3         | DI-19       |
| DI-20        | 1.14       | 1.2       | 3.4         | DI-20       |
| DI-21        | 0.18       | 0.2       | 0.6         | DI-21       |
| C-1          | 19.6       | 7.0       | 19.0        | CULVERT     |

**LEGEND**

- DI-09 DROP INLET LOCATION AND DESIGNATION
- DI-12 ONSITE WATERSHED DESIGNATION
- ONSITE WATERSHED OUTLINE
- - - CULVERT WATERSHED OUTLINE
- - - APPROXIMATE LOCATION OF PROPOSED DRAINAGE DITCH



| Revisions: | Date: | References: |
|------------|-------|-------------|
|            |       |             |
|            |       |             |
|            |       |             |
|            |       |             |
|            |       |             |
|            |       |             |

| Scale:       | 1" = 200' |
|--------------|-----------|
| Date:        | 02/03     |
| File Name:   | PLATE1    |
| Drawn By:    | TAD       |
| Designed By: | DW/TG     |

| Scale:       | 1" = 200' |
|--------------|-----------|
| Date:        | 02/03     |
| File Name:   | PLATE1    |
| Drawn By:    | TAD       |
| Designed By: | DW/TG     |

**PLATE 1**  
**STORM DRAINAGE**  
**SOMERSETT**  
**AREA 2**  
 Washoe County Nevada



### **3.0 STREET CAPACITY**

The flow depth at the gutter and the gutter spread were calculated by using a program called Irregular Section Analysis Program (ISAP) (David Dust Enterprises). ISAP uses Mannings Equation to calculate the flow depth of irregular channels. The streets have adequate capacity such that no flows in the 5-year flow will inundate the halfway mark of the travel way, measured from the curb. In the 100-year event, all of the street flows are within the right of way. (Ref. Appendix B)

### **4.0 PROPOSED HYDROLOGY**

Detention pond 9 lies to the northwest of the portion of Area 2 covered by this report. It will be built in Phase 3 of Somerset. It does not affect any of the facilities described in this report.

Culverts and channel crossings through the golf course area east of Area 2 were sized in an earlier report (Nimbus 2003). The sites listed as GC09, GC10 and GC11 are the ones closest to Area 2. The flow from the golf course is being collected in a ditch and conveyed southeasterly to a 24-inch culvert underneath Evening Rock Trail. The 5- and 100-year flow rates are summarized in Table 1.

### **5.0 CONCLUSION**

As designed, the storm drain will perpetuate the entire 5-year and 100-year flows from this site.

**TABLE 1. CALCULATE RUNOFF FROM WATERSHEDS AT SOMERSETT AREA 2**

| AREA NUMBER | AREA ACRES | T <sub>c</sub> MINUTES | C    | I, 5yr in/hr | I, 100yr in/hr | Q, 5 yr cfs | Q, 100 yr cfs |
|-------------|------------|------------------------|------|--------------|----------------|-------------|---------------|
| DI-01       | 0.34       | 10                     | 0.9  | 1.4          | 3.8            | 0.4         | 1.2           |
| DI-02       | 0.35       | 10                     | 0.9  | 1.4          | 3.8            | 0.4         | 1.2           |
| DI-03       | 1.44       | 10                     | 0.78 | 1.4          | 3.8            | 1.6         | 4.3           |
| DI-04       | 3.50       | 10                     | 0.78 | 1.4          | 3.8            | 3.8         | 10.4          |
| DI-05       | 4.58       | 10                     | 0.78 | 1.4          | 3.8            | 5.0         | 13.6          |
| DI-06       | 0.78       | 10                     | 0.9  | 1.4          | 3.8            | 1.0         | 2.7           |
| DI-07       | 0.37       | 10                     | 0.9  | 1.4          | 3.8            | 0.5         | 1.3           |
| DI-08       | 0.38       | 10                     | 0.9  | 1.4          | 3.8            | 0.5         | 1.3           |
| DI-09       | 1.45       | 10                     | 0.78 | 1.4          | 3.8            | 1.6         | 4.3           |
| DI-10       | 1.55       | 10                     | 0.9  | 1.4          | 3.8            | 1.9         | 5.3           |
| DI-11       | 1.71       | 10                     | 0.78 | 1.4          | 3.8            | 1.9         | 5.1           |
| DI-12       | 1.16       | 10                     | 0.78 | 1.1          | 3.8            | 1.0         | 3.4           |
| DI-13       | 2.41       | 10                     | 0.78 | 1.4          | 3.8            | 2.6         | 7.2           |
| DI-14       | 3.38       | 10                     | 0.78 | 1.4          | 3.8            | 3.7         | 10.0          |
| DI-15       | 0.50       | 10                     | 0.9  | 1.4          | 3.8            | 0.6         | 1.7           |
| DI-16       | 0.76       | 10                     | 0.9  | 1.4          | 3.8            | 1.0         | 2.6           |
| DI-17       | 3.77       | 10                     | 0.78 | 1.4          | 3.8            | 4.1         | 11.2          |
| DI-18       | 2.87       | 10                     | 0.78 | 1.4          | 3.8            | 3.1         | 8.5           |
| DI-19       | 2.45       | 10                     | 0.78 | 1.4          | 3.8            | 2.7         | 7.3           |
| DI-20       | 1.14       | 10                     | 0.78 | 1.4          | 3.8            | 1.2         | 3.4           |
| DI-21       | 0.18       | 10                     | 0.9  | 1.4          | 3.8            | 0.2         | 0.6           |
| C-1         | 19.6       | 10                     | 0.25 | 1.4          | 3.8            | 7           | 19            |

NOTE: C values and rainfall intensities were obtained from the City of Reno Public Works Department Design Manual.  
Rational Method Equation:  $Q=CiA$

**APPENDIX A**

**SUPPORTING DOCUMENTS**

**AND**

**CALCULATIONS**

3. The Rational Method:

a. The design flow for the Rational Method is expressed as:

$$Q = CiA,$$

where:

Q = peak rate of runoff, cubic feet per second

C = runoff coefficient

i = average rainfall intensity, inches per hour

A = watershed area, acres

b. The following listed runoff coefficients, depending on future use, shall be used:

NOTE: A "build up" C valve may be required in special conditions such as very small lots with large houses or duplexes.

RUNOFF COEFFICIENTS "C"

| <u>Land Use Type</u>                   | <u>Runoff Coefficient "C"</u> |
|--|-------------------------------|
| Rural . . . . .                        | 0.25-0.35                     |
| Single Family Residential . . . . .    | 0.45-0.60                     |
| Multi-Residential . . . . .            | 0.60-0.70                     |
| Neighborhood Commercial . . . . .      | 0.85                          |
| Community Commercial . . . . .         | 0.85                          |
| Tourist Commercial . . . . .           | 0.85                          |
| Office . . . . .                       | 0.85                          |
| Manufacturing . . . . .                | 0.85-0.90                     |
| Distribution and Warehousing . . . . . | 0.85-0.90                     |

|   |           |
|---|-----------|
| Public Facility . . . . .   | 0.50-0.85 |
| Pavement and Concrete Surfaces . . . . .  | 0.90-0.95 |
| Park . . . . .  | 0.25      |
| Open Space (0-5% grade - vegetated) . . . . .                                     | 0.20-0.30 |
| Open Space (0-5% grade - no vegetation) . . . . .                                 | 0.30-0.40 |
| Open Space . . . . .<br>(5-15% grade - vegetated or unvegetated)                  | 0.40-0.50 |
| Open Space . . . . .<br>(Over 15% grade - sparsely vegetated, rock or clay soils) | 0.40-0.60 |

- c. The rainfall intensity curve shall be used for determining the average intensity. The time of concentration, with a minimum build up time of 10 minutes is expressed as:

$$tc_1 = 10 \text{ or } \frac{L}{V \times 60}, \text{ whichever is greater}$$

where:

- $tc_1$  = time of concentration at initial inlet, minutes
- $L$  = length from uppermost point of watershed inlet, feet
- $V$  = channel or overland velocity, feet per second

Given the time of concentration at a design point, the time of concentration at the next design point is determined by adding travel time, expressed as:

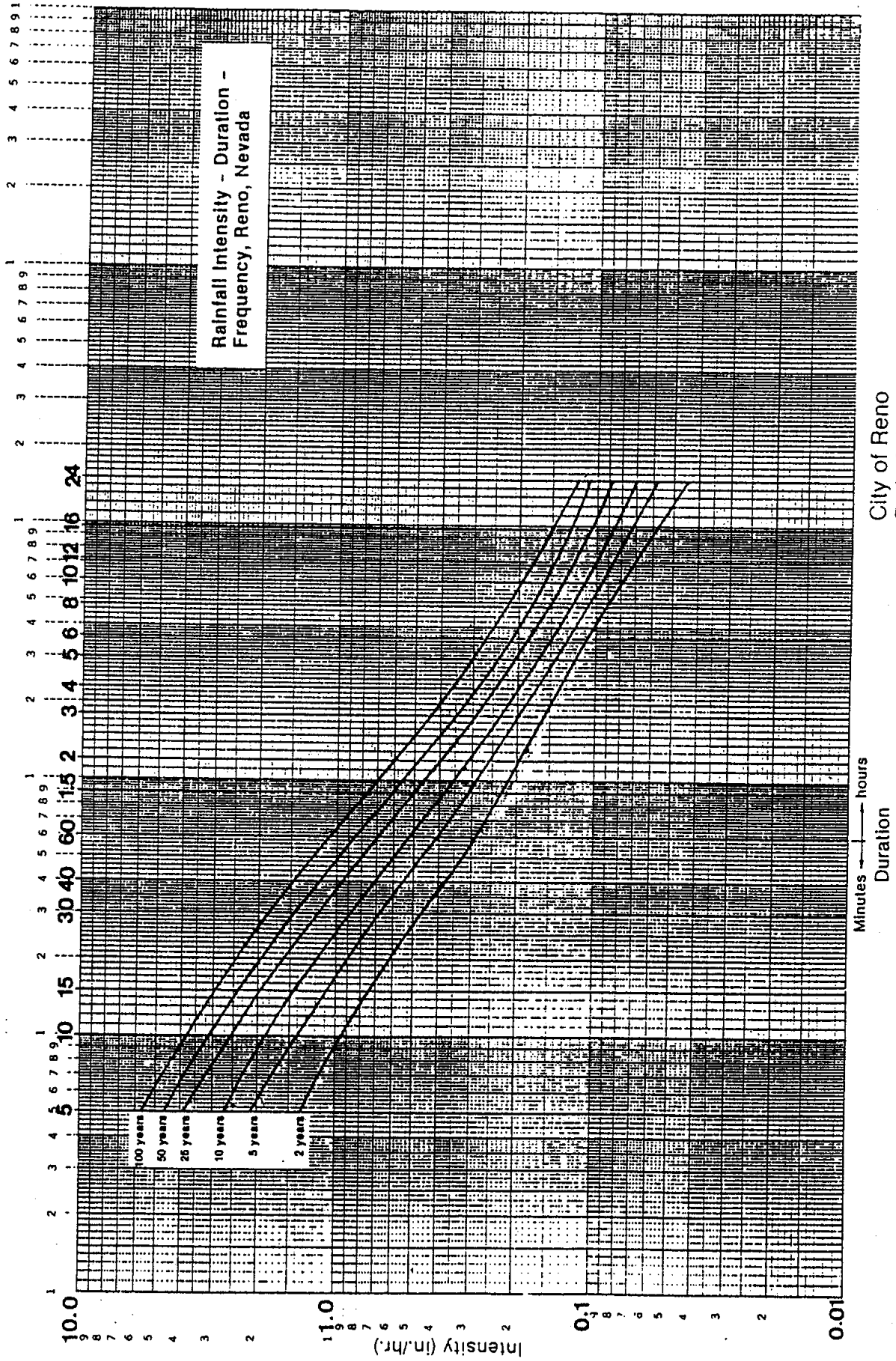
$$t = \frac{L}{V \times 60}$$

where:

- $t$  = travel time, minutes
- $L$  = length of channel or conduit between design points, feet
- $V$  = channel or conduit velocity, feet per second

4. Minimum design velocity shall be 3 feet per second for storm drains.

# RAINFALL INTENSITY CHART



City of Reno  
**Rainfall Intensity - Duration - Frequency  
 Curves for General Reno Area**  
 Based on Rainfall Data from Cannon Airport Gauging Station

**APPENDIX B**  
**STREET CAPACITIES**



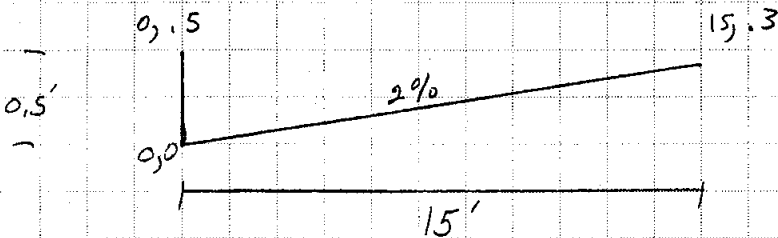
# Nimbus Engineers

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Mail: P.O. Box 10220 • Reno, NV 89510  
(775) 689-8630

JOB 0307  
SHEET NO. 1 OF \_\_\_\_\_  
CALCULATED BY dlw DATE 3/17/03  
CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_  
SCALE \_\_\_\_\_

## TYPICAL STREETS

Calculate capacity of streets using  $\frac{1}{2}$  sections and Irregular Section Analysis Program (ISAP, David Dust Ent)



$$n = .016$$

Street slope = 0.5% (minimum in Area 2)

| Slope | Flow Elev. ft | $Q, \frac{1}{2}$ street | $Q, \text{total street}$ |
|-------|---------------|-------------------------|--------------------------|
| .5%   | .3            | 4.1 cfs                 | 8.2 cfs                  |
| 1%    | .3            | 5.8                     | 11.6                     |
| 3%    | .3            | 10.1                    | 20.2                     |

The areas of maximum flow (DI 5, DI 14, DI 17) all have street slopes  $\geq 3\%$  and flows  $< 20$  cfs. See plate 1.