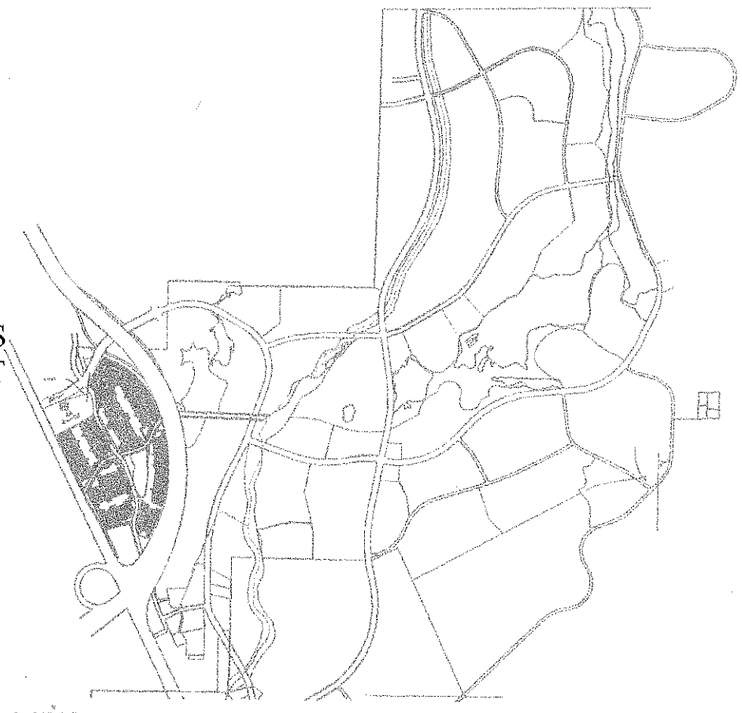
This report borrowed from Bill Gall of CD and scanned. The November 2002 section/tab seemed to have some missing pages (seemed to be missing pages 4 and 5 and plate 1). JAC 1-09

SOUTHEAST TRUCKEE MEADOWS

WASHOE COUNTY, NEVADA

FLOOD CONTROL MASTER PLAN



Prepared for:

NEVADA TRI-PARTNERS
1425 EAST GREG STREET
SPARKS, NEVADA 89431

NIMBUS JOB # 9301
May 1995 *

Nimbus Engineers
3710 Grant Dr., Reno, NV 89509 (702) 689-8630

* MASTER PLAN WITH AMENDMENTS COMPILED MARCH, 2005

SOUTHEAST TRUCKEE MEADOWS

WASHOE COUNTY, NEVADA

FLOOD CONTROL MASTER PLAN

PREPARED FOR:
NEVADA TRI-PARTNERS
1425 EAST GREG ST.
SPARKS, NEVADA 89431

NIMBUS JOB #9301
REVISED SEPTEMBER 1995

TABLE OF CONTENTS

TECHNICAL APPENDIX

LIST OF TABLES

*Pages A-4 through A-9 are included in Appendix A.

LIST OF FIGURES

Southeast Truckee Meadows Specific Plan
Master Flood Control Plan
Washoe County, Nevada

The South East Truckee Meadows Specific Plan was developed in order to provide a framework and guidance for future development within the area north of Geiger Grade bounded on the east by Mira Loma Road, the west by south Virginia Street and on the north by the Bella Vista Ranch and the proposed Whites Creek Meadows project. Included in the approval process was the requirement that a Flood Control Master Plan be prepared prior to approval of any tentative map within the planning area.

The Specific Plan condition which sets forth the plan requirements was approved by the Planning Commission September 7, 1993 as SETM 3.7E.

This flood control master plan will:

1. Quantify flows of major drainages which originate off-site.
2. Provide conceptual design of open channels systems.
3. Provide conceptual designs of bridges or major roadway structures for major roads.
4. Provide mitigation strategies for any increase in peak flows or volumes due to proposed development, such as detention volumes and energy dissipators.
5. Include analyses to support the plan which will be performed in accordance with currently accepted engineering practices.

This Master Flood Control Plan was prepared by Nimbus Engineers at the request of Nevada Tri-Partners. The plan has been developed to meet all of the requirements of the Planning Commission and still maintain flexibility for individual landowners as they develop their property.

1.0 INTRODUCTION

The Southeast Truckee Meadows Specific Plan area lies within the Steamboat Creek hydrologic basin. In addition to Steamboat Creek, the plan area is affected by flows from two branches of Whites Creek. This Flood Control Master Plan has been prepared to address the issues of incorporating the floodplains of these major streams into the overall development plans for the area.

In addition to Whites and Steamboat Creeks, the plan area is affected by flows from the Virginia Range. These flows have been concentrated at the eastern plan boundary by development. Within this document, these are called the Eastside Tributaries.

All development which is proposed to take place within the Southeast Truckee Meadows' Specific Plan Area will comply with this Flood Control master plan. If compliance is not feasible at the time of development, each development will provide either an amendment to this documentation for an amendment to the Master Plan, or interim on-site 10- and/or 100-year detention of the increase in peak flow due to the development as required by Washoe County. The purpose of the Master Plan is to provide a workable approach to stormwater and flood control for the area plan properties. Each property or area proposed for development within the plan will benefit from the regional facilities, most especially the regional detention basin and the major channel systems which are set forth on the Master Plan figure. It is envisioned that expenses toward the construction of the regional facilities will be appropriately assessed to parcels of the development in a future financing plan.

A phasing scheme and financing plan have not been developed at this point. It is assumed that these plans will be developed prior to major construction taking place within the plan area.

2.0 PHYSICAL DESCRIPTION OF THE STUDY AREA

Steamboat Creek

Steamboat Creek originates at Little Washoe Lake and flows in a northerly direction, through Pleasant Valley and the Truckee Meadows, and ultimately to the Truckee River. Before

reaching the proposed site, Steamboat is combined with Browns Creek, Galena Creek, and Bailey Canyon Creek as well as local contributing subbasins. These basins are vegetated mainly with pines and junipers in the upper elevations, and sagebrush and pastures in the lower areas. Including the East Side Drainages, more than 70 square miles contribute runoff to Steamboat Creek at the Plan Area.

The Steamboat Creek floodplain within the southerly portion of the study area is fairly well confined to the channel area and its overbanks. The floodplain has an average width of 300 +/- and the floodway is fairly narrow, 150 to 200 feet. The channel begins to lose definition near the southerly boundary of the Hunter-White parcel, also known as Whites Creek Meadows. At this point, Steamboat Creek low flows have been rerouted from their historic channel into a small stream which parallels the western boundary of the specific plan area. This channel serves as an irrigation facility. In periods of larger flows, the channel capacity is exceeded and flows travel in a northeasterly direction toward the eastern plan area boundary. The floodplain extends 1,400 ft. from the centerline of flow in some areas.

The floodplain largely coincides with the wetlands boundary. The system alignments will be retained in the development of the storm drainage and flood control systems. After consultation with the Army Corp of Engineers, a final configuration will be developed for Steamboat Creek flood control channels. It is envisioned that an earthform system which incorporates a pedestrian/bicycle trail will be used to confine the creek to its floodway. Provisions will also be made to control sediment deposition in the wetlands to the extent possible.

The Steamboat Creek flood control plan offers a largely undisturbed open space area. Within the stream corridor provisions will be made for wetland and wildlife preservation-enhancement as well as opportunities for recreational uses.

Whites Creek

Whites Creek is a tributary to Steamboat Creek. Two of the forks of Whites Creek enter the Plan Area at the westerly boundary. The remaining two forks flow in a northeasterly direction toward the Double Diamond Ranch. The Whites Creek flows enter the area of this study as shallow sheet flow and have broad poorly defined floodplains due to inadequate structures at South Virginia Street and little capacity within the stream channels.

New construction of the southerly extension of the I-580/US 395 freeway impacts the Whites Creek floodplains. The structures which convey flows beneath this portion of the freeway are large concrete boxes. The flows will be collected by an interceptor channel at the easterly edge of Virginia Street and be conveyed through the structure which concentrates the flow into a downstream channel.

Design criteria for the Whites Creek channel improvement in the interceptor channels will be in conjunction with the Whites Creek Basin Management Plan and with the discharges developed for that plan. Each channel will be designed to convey the NDOT design flow with freeboard sufficient to convey 3,000 cfs within the channel area. This applies to Whites Creek branches 3 and 4, which currently affect the Southeast Specific Plan area.

Whites Creek originates in the Sierra Nevada Range and flows to the east into Steamboat Creek (See Figure 2). Approximately 2 miles upstream of Virginia Street the watercourse diverges into four smaller channels. These channels travel east as shallow flow across South Virginia, then reunite and flow north towards the Double Diamond Ranch.

The contributing watershed extends to an elevation of over 10,600 feet. The diffluence is at an elevation of approximately 5,000 feet. The basin is vegetated mainly with pine trees and mahogany brush in the upper subbasins, and sagebrush, pasture, and residential areas in the lower subbasins. Approximately 16 square miles contribute runoff to the site.

East Side Tributaries

Several smaller watersheds drain the east side of the Virginia Range and flow across the proposed project mainly as shallow flow. The contributing area was broken into subbasins and labeled "A" through "F". These subbasins will be referred to as the East Side Tributaries. The subbasins range in elevation from 4460 feet at the proposed site to over 6400 feet. Vegetation consists mainly of sagebrush with increasing juniper brush in the southern subbasins.

The southern most basins flow through an existing development, known as the Virginia Foothills. An attempt to protect a portion of this subdivision was made by Washoe County by constructing a diversion channel for subbasin "E". This channel appears to have the capacity to contain the 100-Year flow from this subbasin, but it is questionable if it can

withstand the erosive forces from the high velocities that will accompany it. For this analysis, the assumption was made that the channel will convey the 100-Year flow, as it is a worst case condition.

3.0 HYDROLOGIC ANALYSES

The hydrologic analyses which were performed for this project were developed using the Corps of Engineers HEC-1 program for the major off site drainages. On site analysis which was conducted to size the collector channels for future development was performed with a modification of the rational method. A discharge per acre was developed for each of the development types proposed and those discharges were attributed to specific concentration points. To refine the HEC-1 model which was used to size the detention areas, the parameters of the on site basins were modified to develop new times of concentration and curve numbers.

Specific discussions of the model development and the parameters used can be found in the Technical Appendix "A" of this Master Plan.

4.0 HYDRAULIC ANALYSIS

Floodplain boundaries were developed for Whites Creek and Steamboat Creek using the COE hydraulic program HEC-2. One foot contour interval topography and field investigation were used to determine the floodplain limits. These limits vary from the current regulatory floodplains presented on the Washoe County Flood Insurance Rate Maps (FIRM). The regulatory limits were determined with approximate methods which have no available documentation. These limits may have been established using Manning's Equation, delineation of high water marks from a previous flood event, or delineated using aerial topography.

The channels for the proposed on site improvements were developed using the Dodson hydraulics program for trapezoidal channels. The program basically uses the Manning Equation. It is anticipated that these channels will be modified as suitable for each individual development to adapt to the configuration for the individual lot and street layout.

5.0 MASTER PLAN CONCEPT

The Master Plan Concept was developed during the preparation of the Specific Plan. The majority of the channels are proposed to be kept as earthen channels, with Steamboat Creek in the south one half of the project being left in its natural channel. In the northern portion of the plan area, low flows of Steamboat will remain in the small channel which parallels the western boundary. The higher flows, over about 2700 cfs will be diverted to the eastern section of the Damonte Ranch through a series of detention/retarding structures which will be incorporated into the wetlands and open space areas.

The Whites Creek branches on the western portion of the area will be conveyed through the grass lined shallow channels which will discharge into Steamboat Creek rather than sheet flow north through the Whites Creek Meadows project and on to the Double Diamond as they do presently. The detention retarding structure will be sized to attenuate the increased peak flows which would occur in Steamboat Creek with this diversion.

The channels which are proposed for the east side of the plan area will collect the Eastside Tributaries and the on site drainage and carry the majority of the flow north and through the wetlands open space area or directly to Steamboat Creek.

Several independent channel systems are proposed. These are labeled on the Master Plan drawing as the Northeast, East, Southeast, Curti and Northwest Systems. The Tahoe-Pyramid System is the channel/open space area which conveys the Steamboat high flows into the wetlands open space retarding basin. Selected channel cross sections are shown on Typical Cross Section sheets and their calculations can be found in the appendix.

The 100-year existing conditions hydrologic model indicates a flow of 7350 cfs in Steamboat Creek near the south boundary of Whites Creek Meadows Subdivision, where the flow split into the detention area is proposed. Under developed conditions, with two Whites Creek branches channelized and the increased on-site flows in the south area, the Steamboat Creek flow increases to 7970 cfs. After the flow is diverted and routed through the basins and conveyed on to the north property line, the total flow in the developed conditions becomes 7225 cfs as compared to the pre-development conditions discharge of 7850 cfs, without the Whites Creek flows. The total 10-year flow at the North property line also decreases in the

developed conditions (Refer to Appendix for Pre and Post-development conditions HEC-1 models).

The diversion structure in Steamboat Creek for diverting 5000 cfs of the Q_{100} through the wetlands consists of a earthen dam with 4-108" CMP culverts. The culverts pass approximately 3000 cfs of the total peak flow of 8000 cfs. A concrete or soil cement weir structure shall be constructed along the east side of Steamboat Creek as part of the structure.

The weir discharges into Detention Basin No. 1, which is a 189 ac-ft. detention basin between Tahoe-Pyramid Link and Steamboat Creek. The basin is located in a proposed park area. The basin discharges through 5 barrel conspan structure. Each barrel will be 20 feet wide; this basin reduces the peak flow to 4688 cfs. The Modified Puls method in HEC-1 was used to compute the outflow hydrograph.

Detention basin No. 3 is proposed in the wetlands area. A earthen levee adjacent to the wetland will be constructed at the Northern Wetland boundary to form the basin. The volume of Basin No. 3 is 186 ac-ft. The 100 year peak flow will be reduced to 4460 cfs as it exits the basin.

6.0 MASTER PLAN APPLICATION

As noted earlier and throughout the document, *this Master Plan is a plan and concept document*. The technical analysis which was performed for the document was done in sufficient detail to develop the peak flows for major off-site tributaries. The on-site hydrology has been done in keeping with the master planning effort; however, this should not be construed to mean that individual hydrologic and hydraulic analyses are not needed for development of individual properties. The technical analysis which supports this Master Plan is supported by methodologies which are currently acceptable to Washoe County and, in general, to the Truckee Meadows area.

The major components of this Master Plan have received enough analysis for preliminary design or conceptual design. It is not envisioned that any of the "regional" features of this project will be significantly modified. However, the structures which were used in the analysis are only one approach to the actual design which may be used in the ultimate

configuration. It will be the responsibility of the design engineer to utilize current standards of practice and to perform final analysis on any proposed improvements, prior to submitting plans or specifications for any of the improvements.

The reduction in peak flows will be accomplished by changing the timing when flow is delivered to the main channel. Under existing conditions, the Eastside Tributaries flow slowly overland and reach the Steamboat Creek while it is in high flow conditions. Under the fully developed conditions, those flows are conveyed to Steamboat and are through the system before the higher flows arrive in the plan area.

The design of the detention area allows for the incremental increase in capacity so that it can be built in stages. It is assumed that either the Curti Ranch or the western commercial pieces will be developed first. In that case, the developments must demonstrate the ability to detain peak flows on-site prior to discharging into Steamboat or the diversion to the detention basin will need to be built and it will need to be sized to detain the increase in flows which are specific to those developments. A number of possible additional scenarios can be developed by simple modification of the HEC-1 model to include the particular case which to be examined.

While it is not possible to set forth a phasing plan for the improvements set forth in this document, it is appropriate to note that the channelization and the efficient delivery of either or both of the branches of Whites Creek to Steamboat Creek would definitely require implementation of a portion of the regional detention facility. The requirement for other facilities is not quite so obvious. As noted earlier, each property within the specific plan area will benefit from the overall flood control improvements proposed with this master plan. A financing plan which will be developed as a separate document will set forth more straightforward guidelines.

The use of this Master Plan for guidance during preliminary final design is not intended to provide for deviation from Washoe County development standards, nor from sound engineering practices. The user of this document is cautioned to consult with Washoe County and to ascertain the applicability of the technical information contained herein for any specific project.

7.0 REFERENCES

1. Chow, Ven Te, Open Channel Hydraulics, 1959.

2. Federal Emergency Management Agency, Flood Insurance Study: Washoe County, Nevada, Unincorporated Areas, April 1990.

3. Federal Emergency Management Agency, Flood Insurance Rate Maps, Washoe County, Nevada, Panels 1463, 1464 and 1501.

4. Kennedy/Jenks, Concept Level Report, Washoe County Master Plan, Volume I and II, January 1991.

5. Nimbus Engineers, Feasibility Analysis for Huffaker Hills Detention Facility, February 1990.

6. U.S. Department of Agriculture, Soil Conservation Service, Soil survey of Washoe County Nevada, South Part, August 1983.

7. U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, Urban Hydrology for Small Watersheds, Technical Release 55, June 1986.

8. U.S. Department of Agriculture, Soil Conservation Service, SCS National Engineering Handbook, Section 4, Hydrology, March 1985.

9. U.S Department of the Army, Corps of Engineers Hydrologic Engineering Center, Computer Program 723-X6-LZ02A, HEC II Water Surface Profiles, May 1991.

10. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, Flood Hydrograph Package, HEC-1, September 1990.

11. U.S. Department of the Army, Corps of Engineers, Sacramento District, Floodplain Information, Southwest Foothills Streams (Evans, Thomas and Whites Creek & Skyline Wash): Reno, Nevada, June 1974.

References (cont.)

12. U.S. Department of the Army, Corps of Engineers, Sacramento District, Truckee River, California and Nevada, Hydrology, February 1980.

13. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, NOAA Atlas 2, Precipitation - Frequency Atlas of the Western United States, Volume VII - Nevada, 1973.

14. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Intervals 10, 20, and 40 feet: Mount Rose NE (1982) Steamboat (1982) Mount Rose NW (1982) Mount Rose (1982), Nevada.

15. U.S. Department of the Interior, Geological Survey, 15-Minute Series Topographic Maps, Scale 1:62,500, Contour Interval 40 feet: Mt. Rose (1950) and Virginia City (1950), Nevada.

16. U.S. Department of Transportation, Federal Highway Administration, Office of Engineering, Bridge Division, Hydraulic Branch, Hydraulic Charts for the Selection of Highway Culverts, Hydraulic Engineering Circular No. 5, June 1980.

TECHINICAL APPENDIX

TECHNICAL APPENDIX A

Much of the information in this report has been based on a previous feasibility study by Nimbus Engineers, for a detention facility at Huffaker Narrows (Reference 5). Whites Creek, Steamboat Creek, and the drainages on the east side of the project were analyzed in that study as contributing watercourses. Substantial revision was necessary to incorporate additional concentration points, and to include a higher level of detail in the analysis.

All other previous study by Nimbus is a submittal for a Conditional Letter of Map Revision for the Whites Creek Meadows development. This master plan utilizes the hydrologic and hydraulic analysis for Steamboat Creek and Whites Creek existing conditions. For further specific detail, the reader is referred to that document.

HYDROLOGIC ANALYSIS

Synthetic Modeling

The SCS methods were used in the Corps of Engineers hydrologic computer model (HEC-1) to estimate the 100-Year discharges for all the contributing areas. The 100-Year event is an event with a one percent chance of occurring in any given year.

The following parameters were used within the models to calculate runoff:

1) Basin area in square miles.

2) Runoff curve number, which is an estimate of how much rainfall will become runoff for a given basin. The number is based upon soil type, relative soil moisture content, impervious areas, vegetation type and cover density.

3) Rainfall depth, duration, and distribution.

4) Basin lag time, which is defined as the time from the center of mass of rainfall excess to the peak discharge, expressed in hours.

5) Hydrograph routing parameters.

TECHNICAL APPENDIX A

Much of the information in this report has been based on a previous feasibility study by Nimbus Engineers, for a detention facility at Huffaker Narrows (Reference 5). Whites Creek, Steamboat Creek, and the drainages on the east side of the project were analyzed in that study as contributing watercourses. Substantial revision was necessary to incorporate additional concentration points, and to include a higher level of detail in the analysis.

All other previous study by Nimbus is a submittal for a Conditional Letter of Map Revision for the Whites Creek Meadows development. This master plan utilizes the hydrologic and hydraulic analysis for Steamboat Creek and Whites Creek existing conditions. For further specific detail, the reader is referred to that document.

HYDROLOGIC ANALYSIS

Synthetic Modeling

The SCS methods were used in the Corps of Engineers hydrologic computer model (HEC-1) to estimate the 100-Year discharges for all the contributing areas. The 100-Year event is an event with a one percent chance of occurring in any given year.

The following parameters were used within the models to calculate runoff:

1) Basin area in square miles.

2) Runoff curve number, which is an estimate of how much rainfall will become runoff for a given basin. The number is based upon soil type, relative soil moisture content, impervious areas, vegetation type and cover density.

3) Rainfall depth, duration, and distribution.

4) Basin lag time, which is defined as the time from the center of mass of rainfall excess to the peak discharge, expressed in hours.

5) Hydrograph routing parameters.

Basin Area

The watershed boundaries were identified using USGS quadrangle maps (References 14 & 15) and field inspection. The area of each contributing drainage area was measured from the maps.

Curve Numbers

To estimate a curve number, the types of soil within the basin must be identified by a hydrologic group. Soils are classified by the SCS into four hydrologic soil groups; A, B, C and D. Group A soils have a rapid infiltration rate and include very porous soils such as sandy soils. Group D soils have a very slow infiltration rate which results in a larger percentage of the rainfall expressed as runoff. For this study, the soil groups determined in the Huffaker study were reevaluated with more detail, which resulted in a larger percentage of more porous soils, and consequently lower curve numbers.

Types of soils and their respective hydrologic groups were identified using the SCS Soil Survey for Washoe County (Reference 6).

Relative soil moisture content is described in the SCS methodology by a term identified as "antecedent moisture condition" (AMC). Three different relative conditions are described by the SCS: AMC I, II and III. AMC I is an extremely dry condition where soil moisture has been depleted and infiltration rates for the soil are near their maximum, and AMC III is a saturated condition. AMC II is an average condition. This condition is the standard for hydrologic analyses in the western states, and was used in selecting the appropriate table of curve numbers.

Vegetation and cover density for the drainage areas were determined from field inspection and United States Forest Service (USFS) color aerial photos.

Using the above mentioned information, curve numbers were selected using the tables in SCS TR-55 and NEH-4 (References 7 and 8). As a basin is typically comprised of multiple hydrologic soil groups, cover densities, and vegetative cover, a weighted average of these parameters was calculated to determine a composite curve number for each basin.

Rainfall

After discussions with Washoe County and the Nevada Department of Transportation, it was decided the Type II rainfall distributed over 24 hours would be used. This distribution is a dimensionless temporal distribution developed by the SCS using regional averages.

The 100-Year, 24 Hour point rainfall depths used in the HEC-1 models were obtained from NOAA Atlas 2, Volume VII - Nevada (Reference 13). An aerial reduction factor was applied to the rainfall depth based on the total watershed areas.

Basin Lag

Basin travel time, or time of concentration, is the time it takes for water to reach the outlet from the hydraulic most distant point in the basin. Travel times were developed using the Upland and curve number methods described in NEH-4. This method estimates flow velocity based on channel slope and ground cover.

Due to the variability of the channel characteristics, all travel times were calculated on a reach by reach analysis. The resulting travel times were then multiplied by the empirical factor of 0.6 (NEH-4) to obtain the subbasin lag time.

Routing

Channel routing and overland flow routing were performed mostly with the Muskingum method. The parameters for the reaches modeled with the Muskingum method were estimated using channel and overbank characteristics, lengths, slopes, and typical roughness. Manning's equation and the Upland Method were used to estimate flow velocity, and the guidelines included in the HEC-1 manual were used to estimate values for k, t, and x (Reference 10). The Muskingum Cunge method was used to route flows through proposed channel systems.

For Pleasant Valley, routing parameters were taken from a 1980 report prepared by the Corps of Engineers (COE). The COE had performed routing calibration for this area for the 1955 and 1963 flood events using actual gage data (Reference 12).

The following tables present selected basin parameters developed for all subbasins.

TABLE 1 EASTSIDE DRAINAGE SUMMARY OF DISCHARGES (EXISTING CONDITIONS)*	
Subbasin	100-Year Discharge CFS
WSA	556
WSB	301
WSC	765
WSD	853
WSE	733
WSF	356

*Eastside watersheds are further subdivided in proposed condition models to design collector channels along the Project boundary. No development is proposed outside of the Project boundary; therefore, proposed condition discharges are the same as the existing conditions. For discharge values of each basin, refer to HEC-1 models in Appendix D.

TABLE 2 STEAMBOAT CREEK SUMMARY OF DISCHARGES				
CONCENTRATION POINT	100-Year Discharge (cfs)		10-Year Discharge (cfs)	
	Existing Condition	Proposed Condition	Existing Condition	Proposed Condition
STEAMBOAT CREEK				
@ Gauge 349300	5072	5072	1872	1872
@ HWY 341	7318	7318	2799	2799
@ CP DS (Southern Damonte Property Line	7357	7543	2818	2866
@ CP DM (middle of Damonte Property)	7729	—	2976	—
@ CP CN (Northern Damonte Property Line)	7841	7225	3019	2988

* Refer to Figure 2 for watershed delineations.

TABLE 3
EXISTING CONDITION
WHITES CREEK
SUBBASIN PARAMETERS

Subbasin	Area sq. mi.	Curve Number	Lag Time hr.	100-Year, 24 Hour Rainfall in.
W1R	1.36	63	0.48	5.50
W2R	0.84	65	0.52	5.40
W3R	1.38	65	0.54	5.25
W4R	1.47	57	0.72	5.00
W5R	1.27	58	0.85	4.80
W6R	1.43	57	1.23	4.10
W7R	0.85	68	0.96	3.40
W8R	0.75	65	1.19	3.00
W9R	2.39	69	0.51	2.80
W10R	0.30	55	0.32	2.80
W11R	0.32	75	0.27	2.70
W12R	0.60	61	0.45	2.80
W13R	2.00	61	0.52	2.80
W14R	0.18	77	0.26	2.70
W15R	0.21	79	0.21	2.70
W16R	0.11	81	0.21	2.70
W17R	0.58	67	0.31	2.80
W18R	0.85	80	1.33	2.70
W19R	0.33	60	0.22	2.75
W20R	0.22	61	0.22	2.73

TABLE 4
EXISTING CONDITION
EASTSIDE DRAINAGE
SUBBASIN PARAMETERS

Subbasin	Area sq.mi.	Curve Number	Lag Time hr.	100-Year, 24 Hour Rainfall in.
WSA	1.35	79	0.37	2.80
WSB	0.53	76	0.11	2.80
WSC	2.67	79	0.65	2.80
WSD	2.52	78	0.45	2.80
WSE	2.61	78	0.60	2.80
WSF_1	0.775	77	0.24	2.80
WSF_2	0.6262	77	0.51	2.80

TABLE 5
EXISTING CONDITION
STEAMBOAT CREEK
SUBBASIN PARAMETERS

Subbasin	Area sq. mi.	Curve Number	Lag Time hr.	100-Year, 24 Hour Rainfall in. *
G1G2	8.0	70	1.9	4.89
G3	3.90	62	1.2	3.4
J1	6.4	58	1.3	3.51
15	4.2	61	1.7	4.10
30	16.7	77	1.8	2.80
35	15.3	80	2.2	2.95
40	2.5	77	1.1	2.77
S21R	1.67	77	1.78	2.78
S22R	1.09	76	1.25	2.74

TABLE 6
PROPOSED CONDITION
EASTSIDE DRAINAGE SUBBASIN PARAMETERS

Subbasin	Area sq. mi.	Curve Number	Lag Time hr.	100-Year, 24 Hour Rainfall in.
F_1	0.775	77	0.24	2.8
E_1	2.1	78	0.53	2.8
E_2	0.07	78	0.04	2.8
A	1.27	79	0.28	2.8
B_1	0.36	76	0.11	2.8
B_2	0.12	76	0.07	2.8
C	3.31	79	0.65	2.8
D_1	1.72	78	0.45	2.8
D_2	0.15	78	0.06	2.8

TABLE 7
PROPOSED CONDITION ON-SITE SUBBASIN PARAMETERS

Subbasin	Area sq. mi.	Curve Number	Lag Time hr.	100-Year, 24 Hour Rainfall in.
WS1	0.28	72	0.25	2.8
WS2	0.24	77	0.16	2.8
WS3	0.87	72	0.42	2.8
WS4	0.18	76	0.26	2.8
WS5	0.33	83	0.35	2.8
WS6	0.245	89	0.37	2.8
WS7	0.18	79	0.55	2.8
WS8	0.51	74	0.92	2.8
WS9	0.88	87	0.80	2.8

Proposed Condition Watershed parameters for Whites Creek, Galena Creek, Browns Creek, Jones Creek and Steamboat Creek subbasins are the same as existing conditions. Please refer to Tables 3 and 5.

STATISTICAL ANALYSIS

A statistical analysis was completed for peak flows on Steamboat Creek as a check for reasonableness. The USGS gage at Steamboat, Nevada (Gage No. 349300), was analyzed using a Log-Pearson Type III statistical distribution. In a 1980 report by the U.S. Army Corps of Engineers (COE) this gage was analyzed for peak flow, and for volume frequency curves. At the time of that analysis 17 years of gage data was available (1962-1978). The revised Nimbus analysis incorporated the COE data, and added the additional gage data since 1978, for a total of 30 years of record. Peak flows were gathered from the USGS Water Resources Data reports. Following the COE format, an "all events" analysis was done (differentiation between storm types was not attempted, i.e. spring snowmelt, winter rain, or thunderstorm).

Nimbus used the COE adopted skew for the gage (G = 0.6), as the adopted skew seems reasonable, and the volume-frequency curves support the value. Using only the station skew produces a low 100-Year peak flow, less than the largest recorded value (3600 cfs on February 17, 1986). With the adopted COE skew, the statistics indicate the 1986 event was approximately an 80 year recurrence interval storm, which appears reasonable for this creek.

The results of the COE and Nimbus peak values at the gage do not differ substantially, 4,640 cfs and 4,950 cfs, respectively. The increase is most likely due to the inclusion of the 1986 event. The largest peak flow on record prior to that event was 1000 cfs. The computed flow-frequency curve, and peak flows plotted using the Weibull Plotting Position are shown on Figure 4. The results from the synthetic modeling and the statistical analysis differ, but within reason, considering the different methodologies and their respective assumptions.

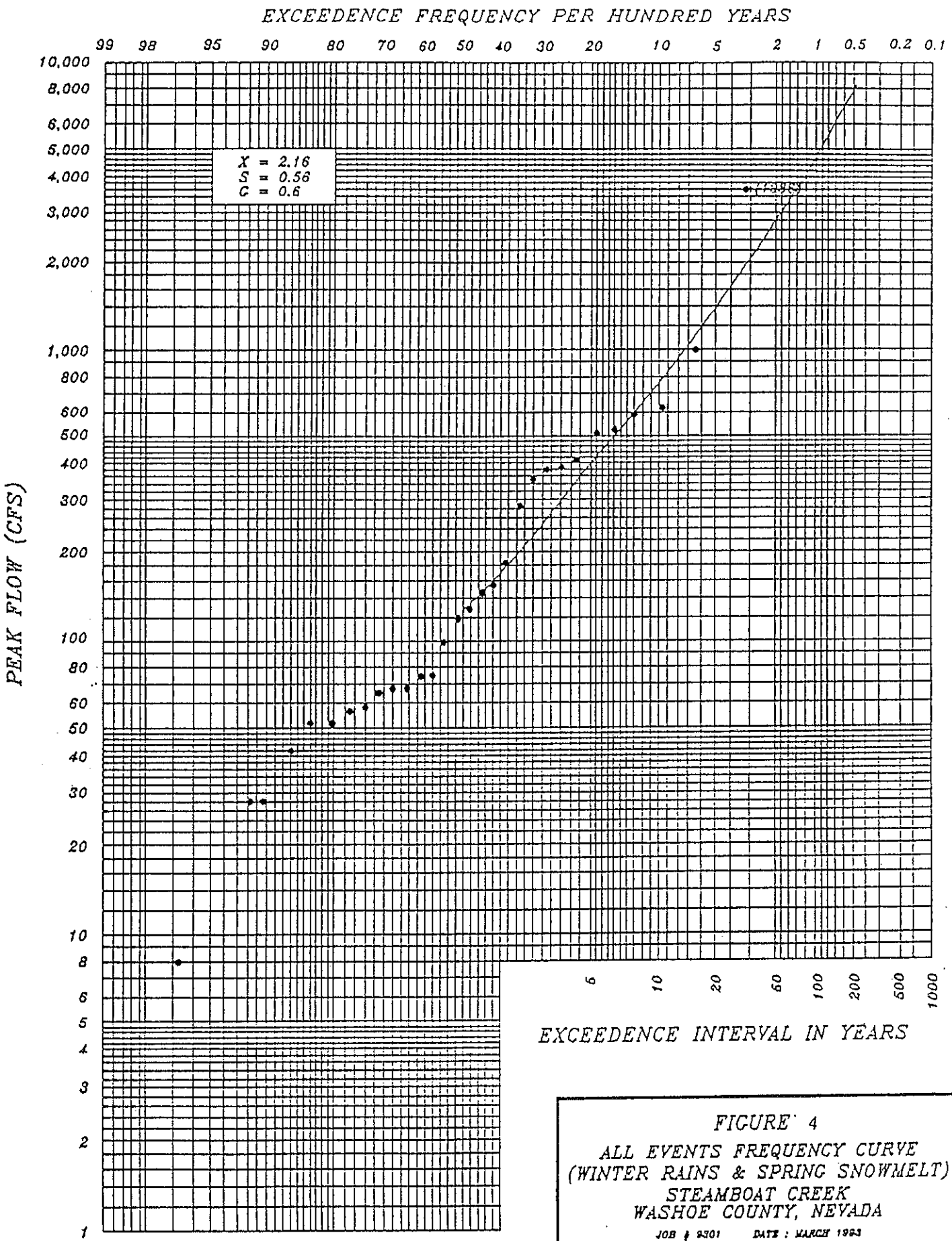


FIGURE 4

ALL EVENTS FREQUENCY CURVE
(WINTER RAINS & SPRING SNOWMELT)
STEAMBOAT CREEK
WASHOE COUNTY, NEVADA

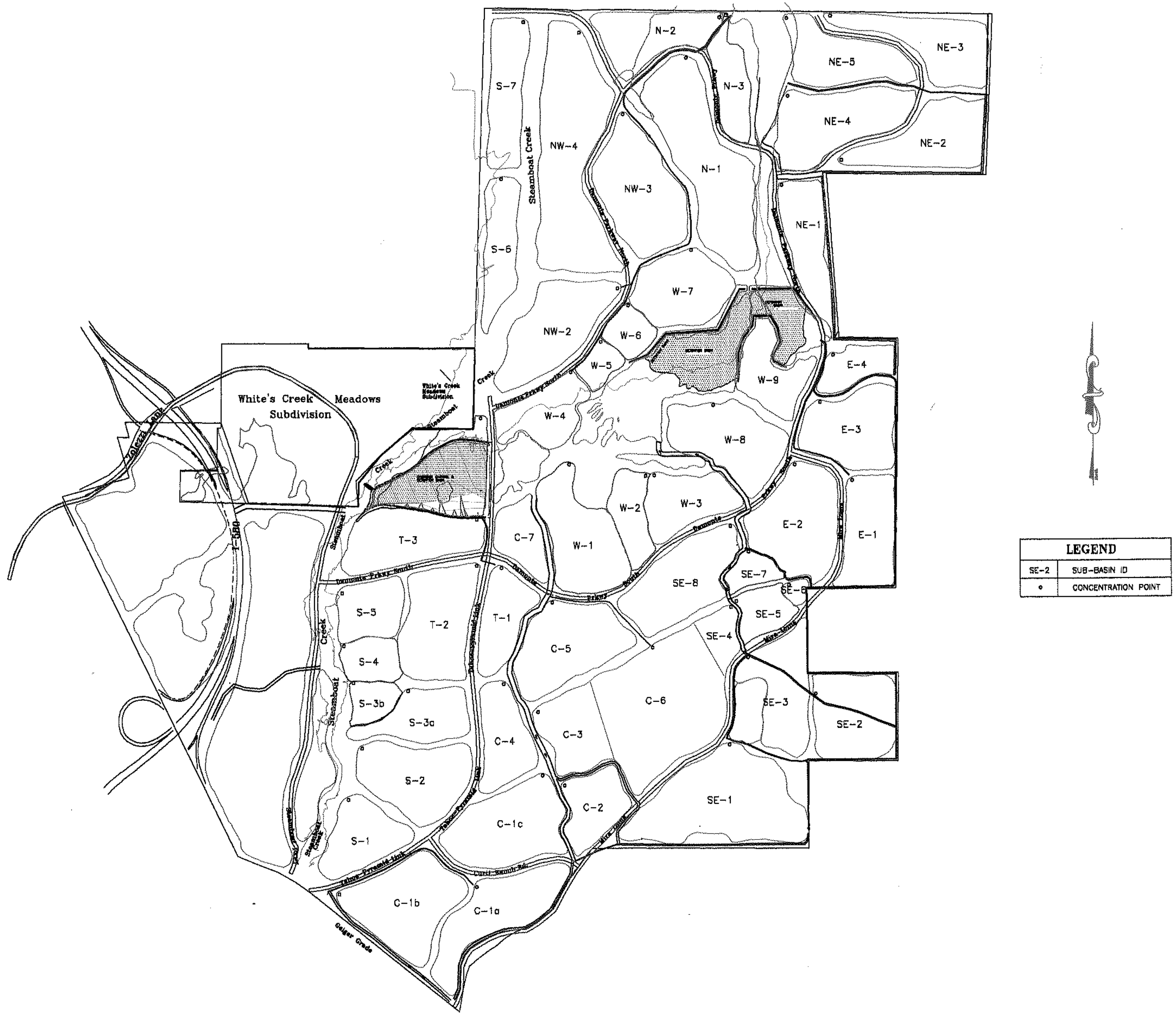
JOB # 9301 DATE : MARCH 1993

Nimbus Engineers

OTHER STUDIES

Many previous studies have been completed for Steamboat Creek and its tributaries near this area, but there is no real consensus of peak flows in this area. The analyses more commonly accepted are the values published in the Washoe County Flood Insurance Study (done by Tudor Engineers in 1980), and the report by the U.S. Army Corps of Engineers (COE), Truckee River Hydrology, completed in 1980 (Reference 12). The values published in the FIS for Steamboat Creek tributaries were developed using a regional regression equation. Many of the values resulting from this analysis appeared to be questionable, and have since been superseded by additional studies.

The analysis presented by the COE in 1980 appears to provide consistently reasonable results for this area. Unfortunately, the methods used in development of the report do not allow for simple modification and refinement. The report was generated focusing on the Standard Project Flood, and the Probable Maximum Flood. Usually, the 100 year recurrence interval is the design event and regulatory flow for projects in the Washoe County area. The COE report does provide flow-frequency curves, which include 100-Year peak flows, for many areas, but does not include 100-Year hydrograph information.

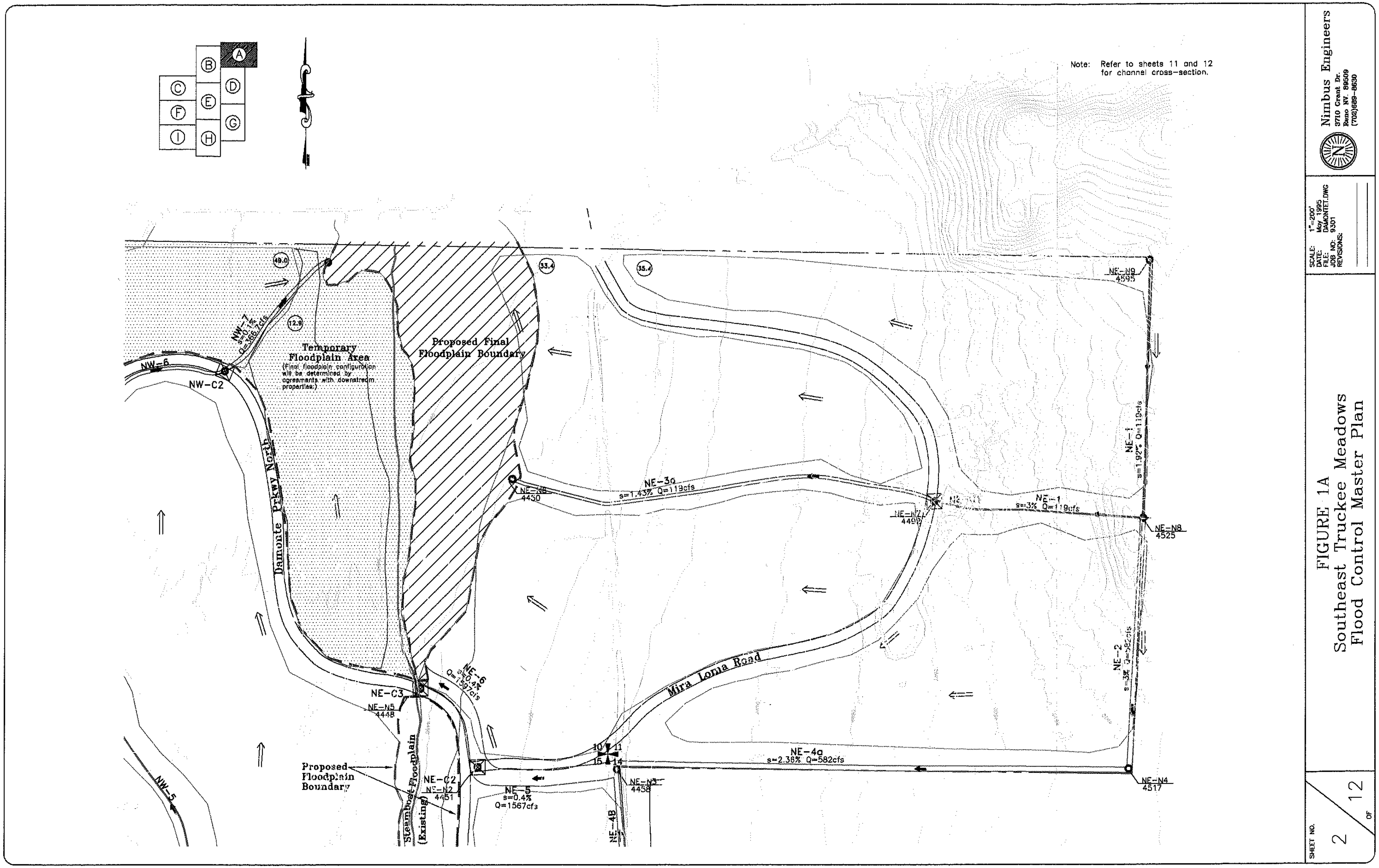


Nimbus Engineers
3710 Grant Dr.
Reno NV. 89509
(702)689-8630

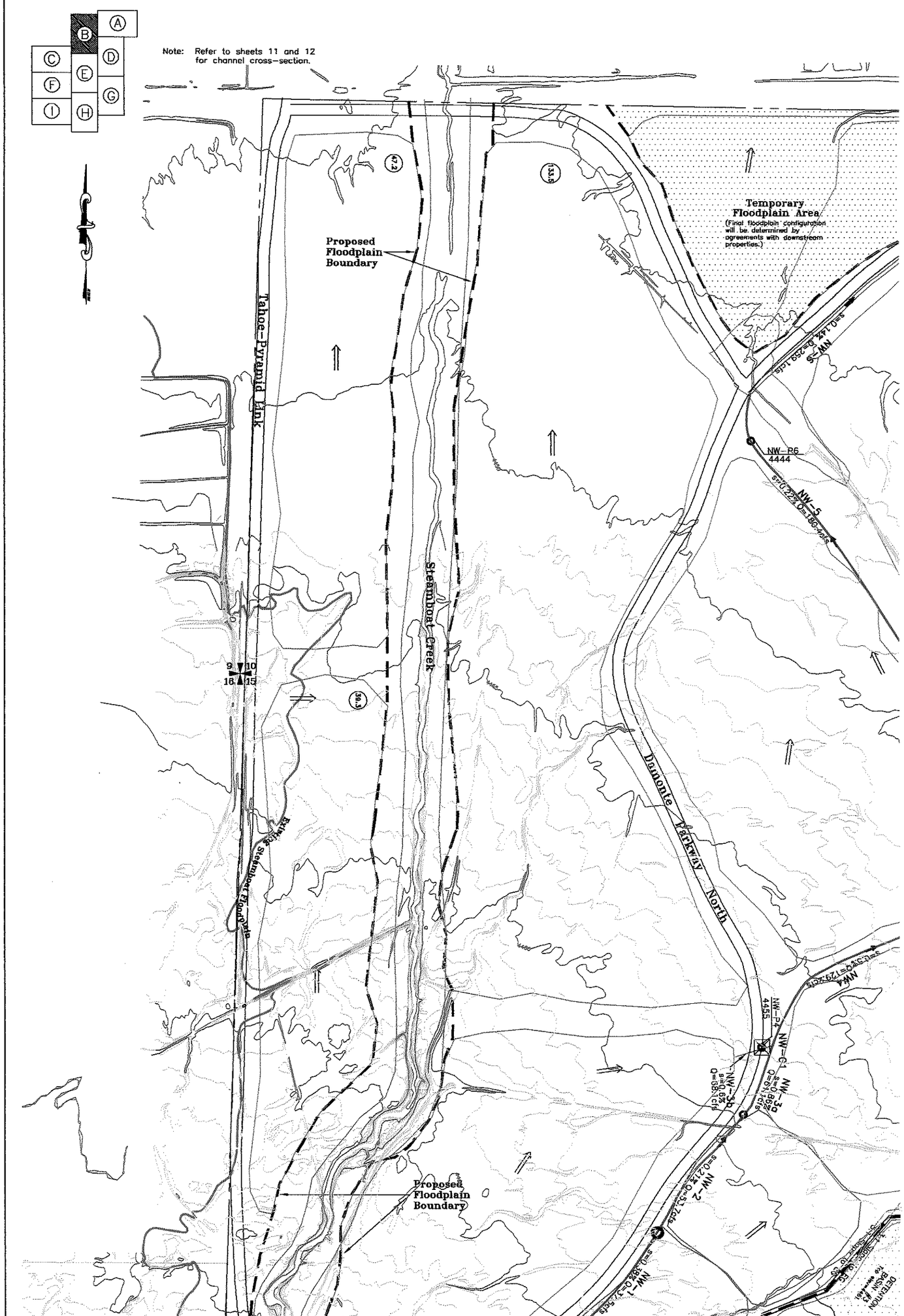
SCALE: N.T.S.
DATE: June 1995
FILE: AREAS.DWG
JOB NO.:
REVISIONS:

Onsite Watershed Areas

SHEET NO. 1



Note: Refer to sheets 11 and 12 for channel cross-section.
Temporary Floodplain Area
(Final floodplain configuration will be determined by agreements with downstream properties.)
Proposed Final Floodplain Boundary
Proposed Floodplain Boundary
Steamboat Floodplain (Existing)
Damonte Pkwy North
Mira Loma Road
NW-6
NW-C2
NW-7 s=0.1% Q=366.7cfs
NW-5
NE-C3
NE-N5 4448
NE-6 s=0.4% Q=1597cfs
NE-C2
NE-N2 4451
NE-5 s=0.4% Q=1567cfs
NE-4B
NE-N3 4458
NE-4a s=2.38% Q=582cfs
NE-N4 4517
NE-2 s=3% Q=582cfs
NE-N8 4525
NE-1 s=3% Q=119cfs
NE-1 s=1.92% Q=119cfs
NE-N9 4595
NE-3a s=1.43% Q=119cfs
NE-N6 4450
NE-N7 4493
FIGURE 1A
Southeast Truckee Meadows
Flood Control Master Plan
Nimbus Engineers
3710 Grant Dr.
Reno NV. 89509
(702)689-8630
SCALE: 1"=200'
DATE: May 1995
FILE: DAMONTE.DWG
JOB NO: 9301
REVISIONS:
SHEET NO. 2 OF 12
NOTE: Drawing rescaled to 1"=450 feet
February, 2005



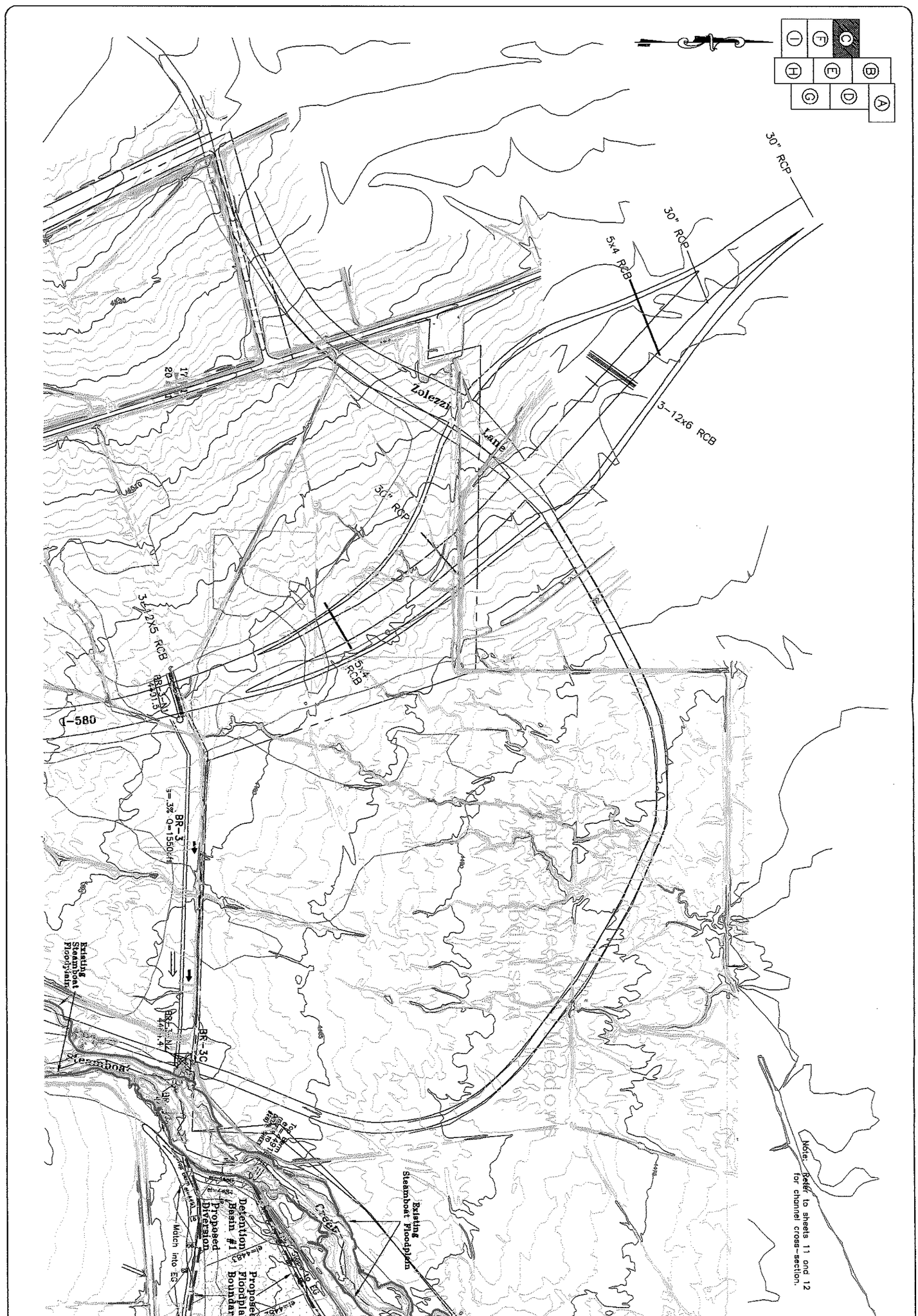
SHEET NO. 3 OF 12

FIGURE 1B
Southeast Truckee Meadows Flood Control Master Plan

SCALE: 1"=200'
DATE: May 1995
FILE: DAMONTET.DWG
JOB NO: 9301
REVISIONS:

Nimbus Engineers
3710 Grant Dr.
Reno NV. 89509
(702)689-8630

NOTE: Drawing rescaled to 1"=450 feet February, 2005



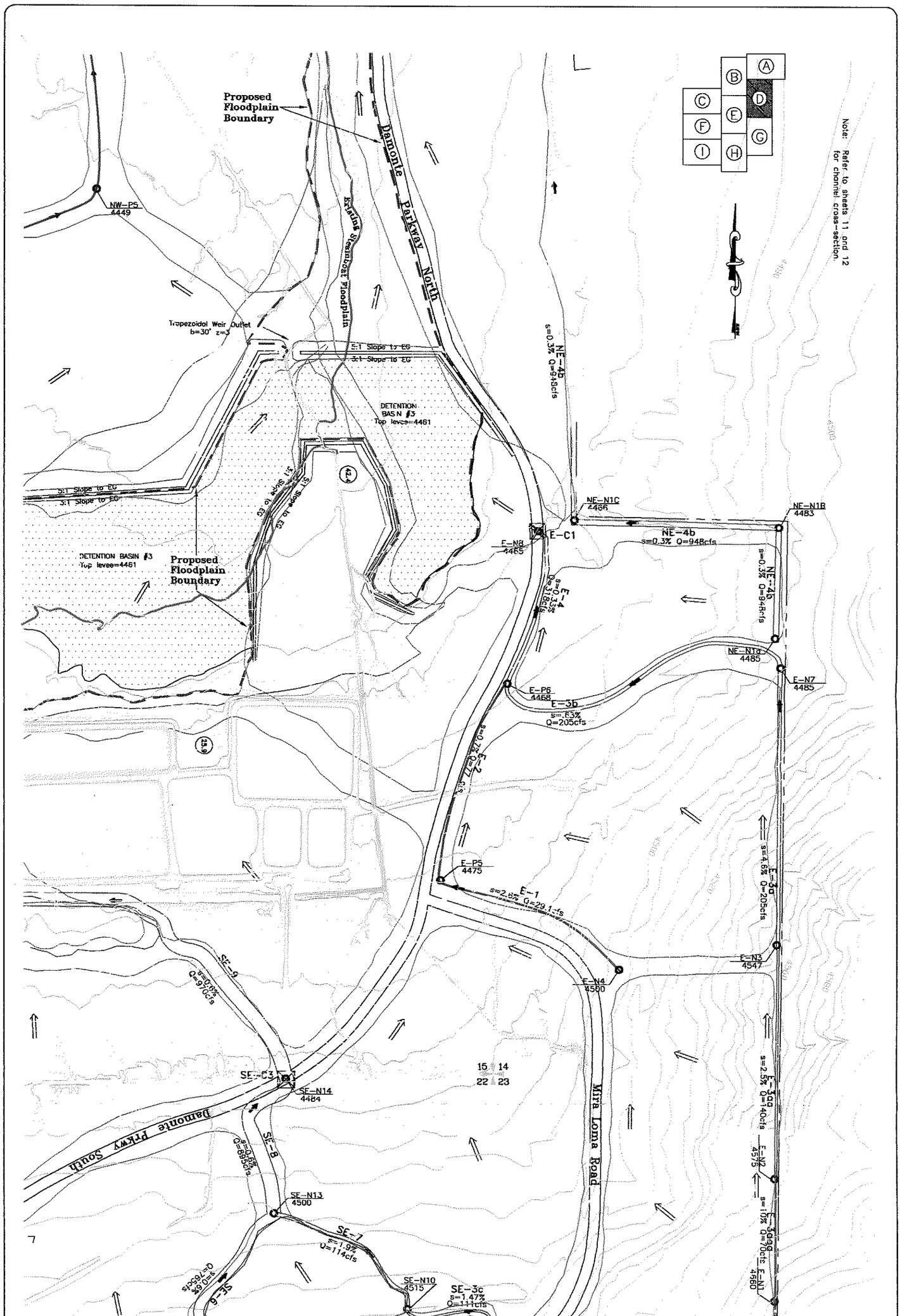
SHEET NO. 4 OF 12

FIGURE 1C
Southeast Truckee Meadows Flood Control Master Plan

SCALE: 1"=200'
DATE: May 1995
FILE: DAMONTET.DWG
JOB NO: 9301
REVISIONS:

Nimbus Engineers
3710 Grant Dr.
Reno NV. 89509
(702)688-8630

NOTE: Drawing rescaled to 1"=450 feet
February, 2005



SHEET NO. 5 OF 12

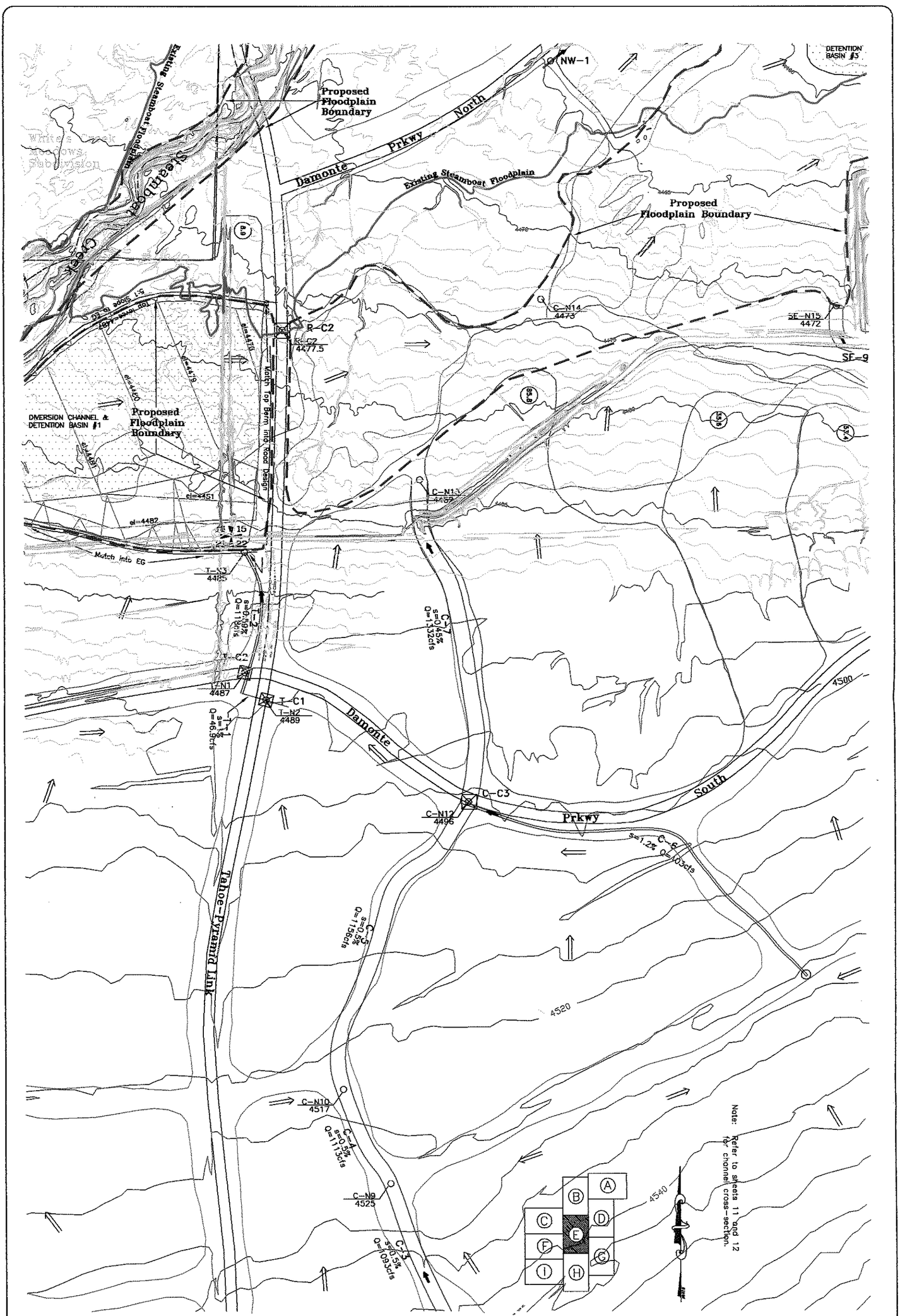
FIGURE 1D
Southeast Truckee Meadows Flood Control Master Plan

SCALE: 1"=200'
DATE: May 1995
FILE: DAMONTE1.DWG
JOB NO: 9301
REVISIONS:

Nimbus Engineers
3710 Grant Dr.
Reno NV. 89509
(702)689-8630

NOTE: Drawing rescaled to 1"=450 feet

February, 2005



SHEET NO. 6 OF 12

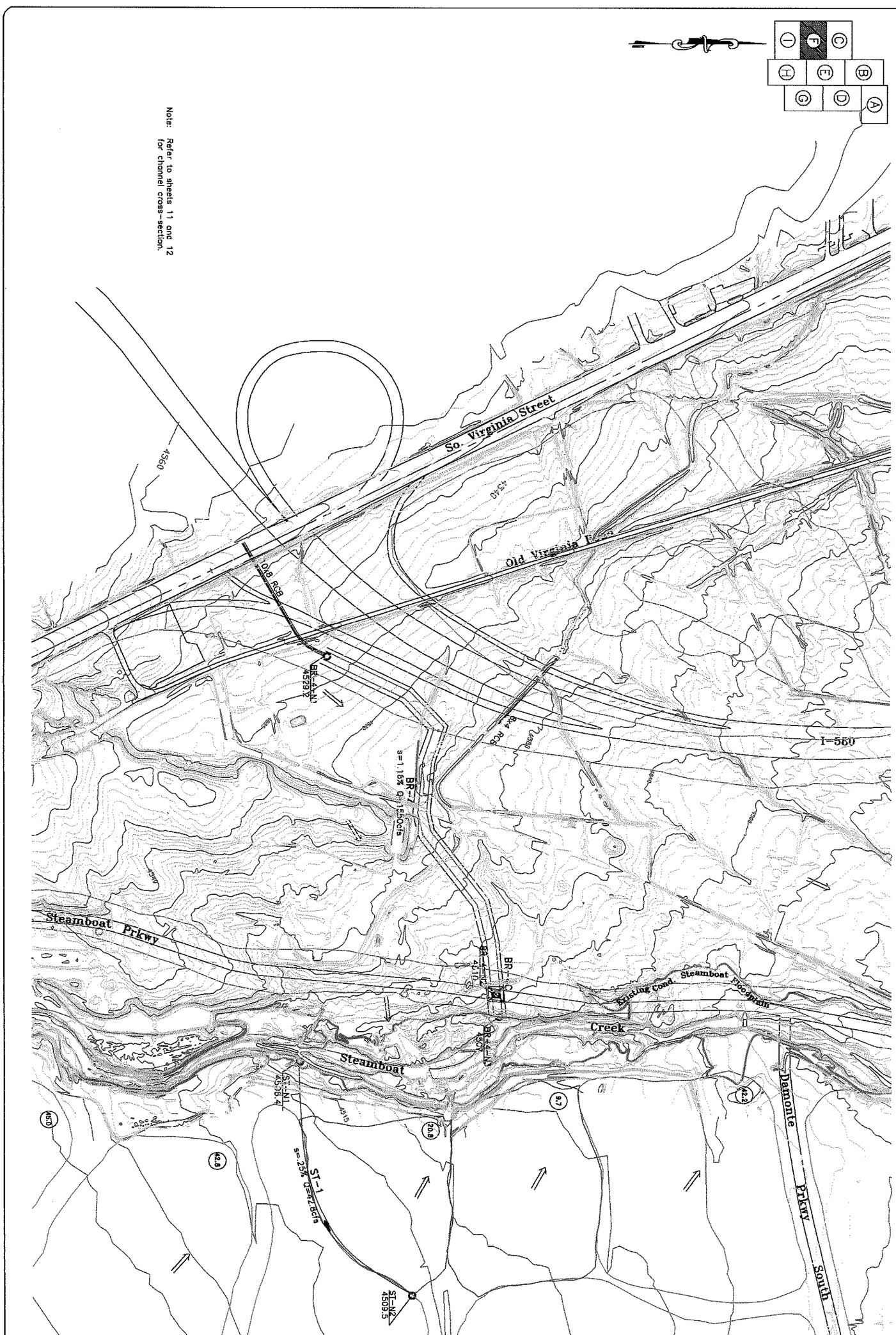
FIGURE 1E
Southeast Truckee Meadows Flood Control Master Plan

SCALE: 1"=200'
DATE: May 1995
FILE: DAMONTET.DWG
JOB NO: 9301
REVISIONS:

Nimbus Engineers
3710 Grant Dr.
Reno NV. 89509
(702)689-8630

NOTE: Drawing rescaled to 1"=450 feet

February, 2005



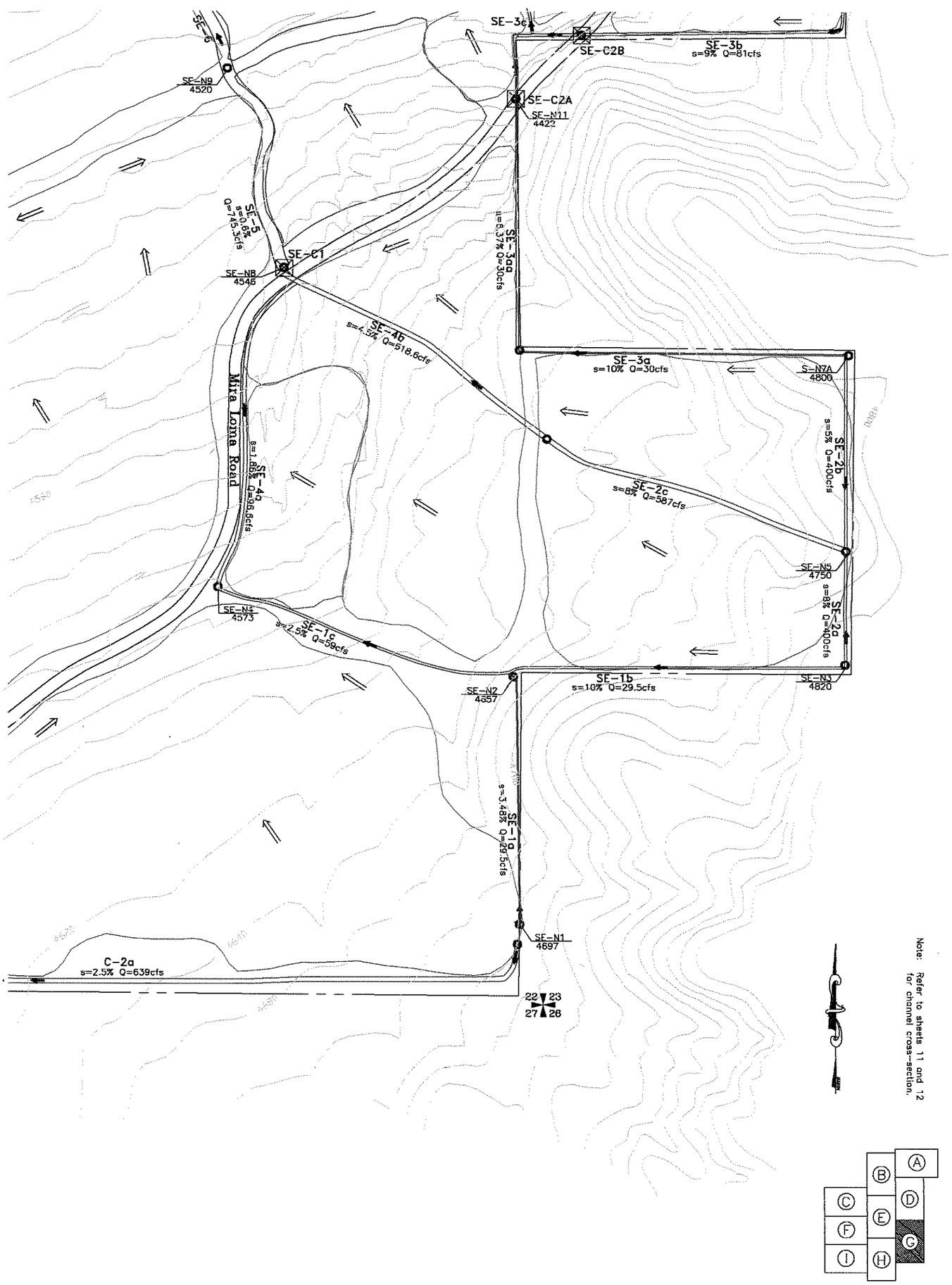
SHEET NO. 7 OF 12

FIGURE 1F
Southeast Truckee Meadows Flood Control Master Plan

SCALE: 1"=200'
DATE: May 1995
FILE: DAMONTET.DWG
JOB NO: 9301
REVISIONS:

Nimbus Engineers
3710 Grant Dr.
Reno NV. 89509
(702)689-8630

NOTE: Drawing rescaled to 1"=450 feet
February, 2005



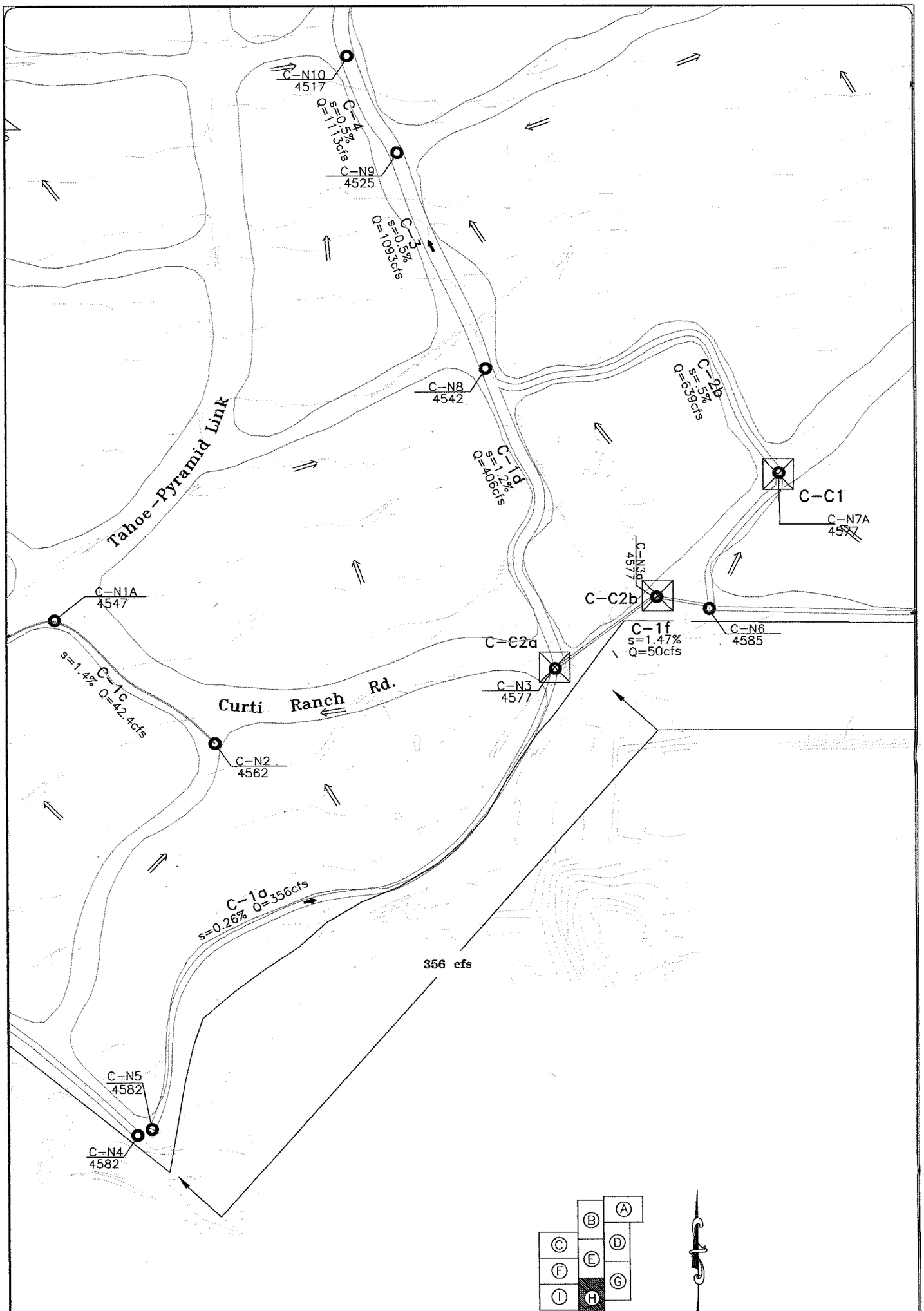
SHEET NO. 8 OF 12

FIGURE 1G
Southeast Truckee Meadows Flood Control Master Plan

SCALE: 1"=200'
DATE: May 1995
FILE: DAMONTET.DWG
JOB NO: 9301
REVISIONS:

Nimbus Engineers
3710 Grant Dr.
Reno NV. 89509
(702)689-8830

NOTE: Drawing rescaled to 1'=450 feet
February, 2005



SHEET NO. 9 OF 12

FIGURE 1H
Southeast Truckee Meadows Flood Control Master Plan

SCALE: 1"=200'
DATE: May 1995
FILE: DAMONTET.DWG
JOB NO: 9301
REVISIONS:

Nimbus Engineers
3710 Grant Dr.
Reno NV. 89509
(702)689-8630

NOTE: Drawing rescaled to 1"=450 feet
February, 2005

LOMR MARCH 2001

APPLICATION FOR LETTER OF MAP REVISION
(LOMR)

BRANCH 3 OF WHITES CREEK

HYDRAULIC ANALYSIS OF BRANCH 3

PREPARED FOR:
Nevada Tri-Partners

Nimbus Job No. 06750-0008
March, 2001

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

INTRODUCTION

This narrative has been prepared to accompany an application for a Letter of Map Revision (LOMR) for Branch 3 of Whites Creek. This stream reach is located in the southeast Truckee Meadows, south of Reno, Nevada (Figure 1) and is in an area that is undergoing urban development. The project is located in unincorporated Washoe County . Whites Creek is part of the lower Steamboat Creek drainage basin.

The project area is found on Panel 3186 of FIRM Number 32031C3178 E, Washoe County, Nevada, and Incorporated Areas. The initial flood plain boundaries presented on Flood Insurance Rate Maps (FIRM) were determined by approximate methods which have no available documentation. The boundaries were modified by a CLOMR in a document titled "Hydrologic and Hydraulic Analysis Whites Creek Meadows Subdivision" (Nimbus Engineers, October 1994), FEMA case number 95-09-133R. The present study covers only Branch 3 of Whites Creek from just downstream of South Virginia Street (U.S. 395) to Steamboat Creek.

Whites Creek originates in the Sierra Nevada Mountains and flows easterly to Steamboat Creek located in the Truckee Meadows. The Whites Creek watershed extends to an elevation of over 10,600 feet. The watershed is vegetated mainly with pine trees and mountain mahogany brush in the upper elevations an sagebrush with grass understory in the lower elevations. Approximately 2 miles upstream of South Virginia Street the watercourse diverges into four smaller channels. These channels have been named Whites Creek Branches 1 through 4. Before development began, these channels lost their definition and flowed across South Virginia Street and downstream farm land as sheet flow to Steamboat Creek. Urban development and construction of culverts under Highway I-580 have re-routed the channels and the sheet flow has been channelized. The subject of this study, Branch 3,passes under I-580 at Nevada Department of Transportation (NDOT) station "H" 535+33 through three 12 ft x 5 ft reinforced concrete box (RCB) culverts. They outlet near the southwest corner of Whites Creek Meadows Subdivision (Figure 2). Before construction of the channel, runoff then traveled as sheet flow eastward into Steamboat Creek.

The developed conditions for this LOMR take into account the constructed channel and related culverts in Branch 3. The general channel design consists of a base width of 80 feet and side slopes of 3:1. The channel is being lowered to the Steamboat Creek elevation through a series of drop structures and has varying channel slopes. The flow will pass under Steamboat Parkway through five 5 ft x 12 ft reinforced concrete box culverts (RCBs) just upstream of Steamboat Creek. As-built diagrams of the channel and culverts are shown in Appendix B. The existing conditions HEC-1 model is derived from the model used in the CLOMR application, but has been truncated at the Branch 3 confluence with Steamboat Creek, the downstream end of this study. This model is in Appendix C and a HEC-2 hydraulic analysis for developed conditions is presented in Appendix D. The existing FIRM is shown in

LOMR MARCH 2001

APPLICATION FOR LETTER OF MAP REVISION
(LOMR)

BRANCH 3 OF WHITES CREEK

HYDRAULIC ANALYSIS OF BRANCH 3

PREPARED FOR:
Nevada Tri-Partners

Nimbus Job No. 06750-0008
March, 2001

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

INTRODUCTION

This narrative has been prepared to accompany an application for a Letter of Map Revision (LOMR) for Branch 3 of Whites Creek. This stream reach is located in the southeast Truckee Meadows, south of Reno, Nevada (Figure 1) and is in an area that is undergoing urban development. The project is located in unincorporated Washoe County . Whites Creek is part of the lower Steamboat Creek drainage basin.

The project area is found on Panel 3186 of FIRM Number 32031C3178 E, Washoe County, Nevada, and Incorporated Areas. The initial flood plain boundaries presented on Flood Insurance Rate Maps (FIRM) were determined by approximate methods which have no available documentation. The boundaries were modified by a CLOMR in a document titled "Hydrologic and Hydraulic Analysis Whites Creek Meadows Subdivision" (Nimbus Engineers, October 1994), FEMA case number 95-09-133R. The present study covers only Branch 3 of Whites Creek from just downstream of South Virginia Street (U.S. 395) to Steamboat Creek.

Whites Creek originates in the Sierra Nevada Mountains and flows easterly to Steamboat Creek located in the Truckee Meadows. The Whites Creek watershed extends to an elevation of over 10,600 feet. The watershed is vegetated mainly with pine trees and mountain mahogany brush in the upper elevations an sagebrush with grass understory in the lower elevations. Approximately 2 miles upstream of South Virginia Street the watercourse diverges into four smaller channels. These channels have been named Whites Creek Branches 1 through 4. Before development began, these channels lost their definition and flowed across South Virginia Street and downstream farm land as sheet flow to Steamboat Creek. Urban development and construction of culverts under Highway I-580 have re-routed the channels and the sheet flow has been channelized. The subject of this study, Branch 3,passes under I-580 at Nevada Department of Transportation (NDOT) station "H" 535+33 through three 12 ft x 5 ft reinforced concrete box (RCB) culverts. They outlet near the southwest corner of Whites Creek Meadows Subdivision (Figure 2). Before construction of the channel, runoff then traveled as sheet flow eastward into Steamboat Creek.

The developed conditions for this LOMR take into account the constructed channel and related culverts in Branch 3. The general channel design consists of a base width of 80 feet and side slopes of 3:1. The channel is being lowered to the Steamboat Creek elevation through a series of drop structures and has varying channel slopes. The flow will pass under Steamboat Parkway through five 5 ft x 12 ft reinforced concrete box culverts (RCBs) just upstream of Steamboat Creek. As-built diagrams of the channel and culverts are shown in Appendix B. The existing conditions HEC-1 model is derived from the model used in the CLOMR application, but has been truncated at the Branch 3 confluence with Steamboat Creek, the downstream end of this study. This model is in Appendix C and a HEC-2 hydraulic analysis for developed conditions is presented in Appendix D. The existing FIRM is shown in

Figure 3. The revised Annotated FIRM is shown in Figure 4 and the developed conditions are shown in Figure 5. A watershed map (which is also the hydrologic workmap) is presented in Figure 6.

Please find the following attachments in support of of this LOMR request:

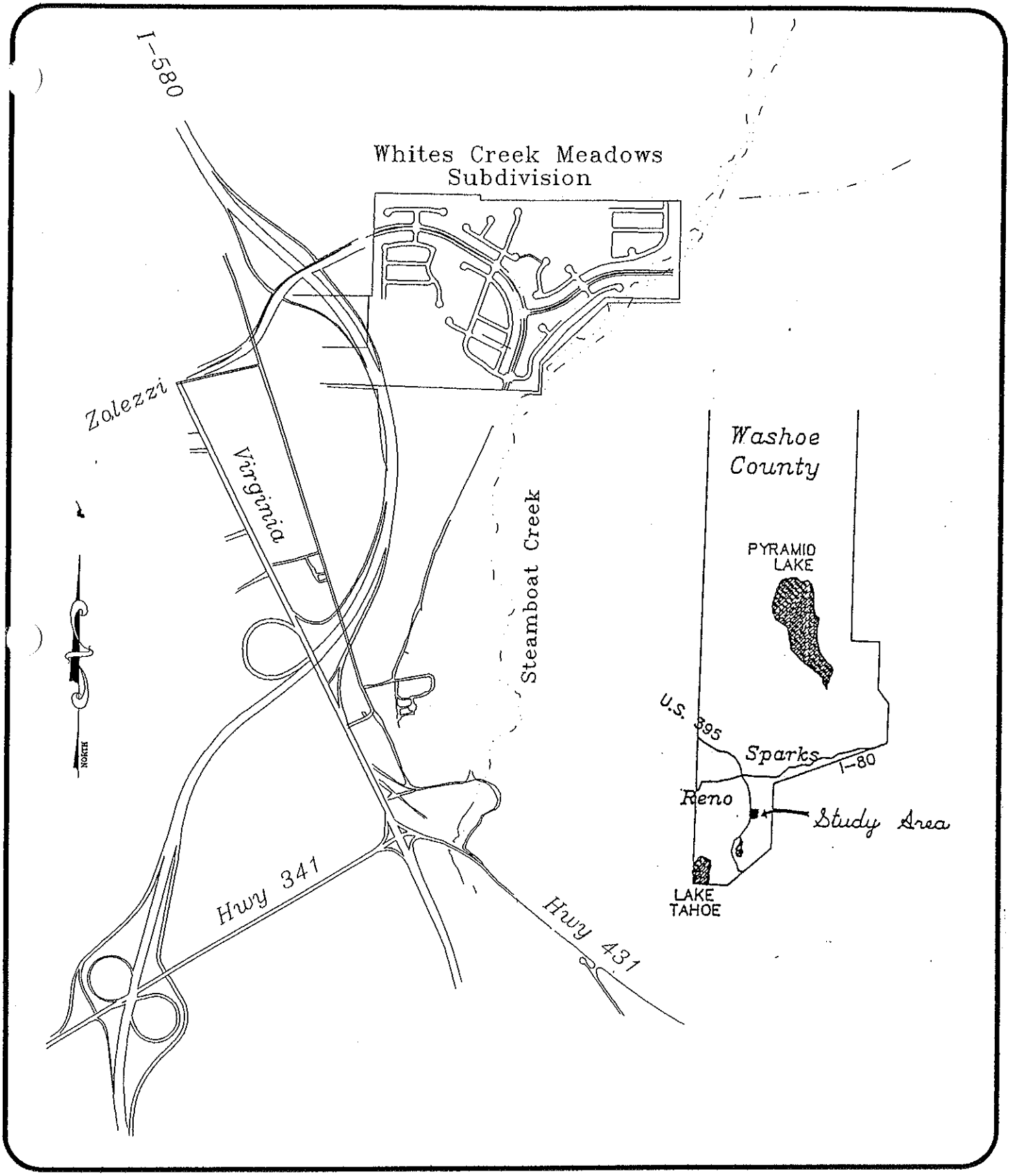
Appendix A Figures

- Figure 1 Vicinity Map
- Figure 2 Culvert Index Map
- Figure 3 Existing FIRM
- Figure 4 Annotated FIRM
- Figure 5 Proposed Conditions LOMR
- Figure 6 Watershed Map (Hydrologic Workmap)

Appendix B FEMA Forms and Attachments
Appendix C HEC-1 Model for Developed Conditions, file name BR3-LOMR.dat
Appendix D HEC-2 Model for Developed Conditions, file name 008LOMR.dat
Appendix E As-Built Hydraulic Workmap
Appendix F As-built Diagram for the Steamboat Parkway culverts
Appendix G Supporting Calculations for HEC-1 model
Appendix H Discs with the HEC-1 and HEC-2 models

APPENDIX A

FIGURES



Nimbus Engineers

Figure 1

Vicinity Map

LOMR MARCH 2001

APPLICATION FOR LETTER OF MAP REVISION
(LOMR)

BRANCH 3 OF WHITES CREEK

HYDRAULIC ANALYSIS OF BRANCH 3

PREPARED FOR:
Nevada Tri-Partners

Nimbus Job No. 06750-0008
March, 2001

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

INTRODUCTION

This narrative has been prepared to accompany an application for a Letter of Map Revision (LOMR) for Branch 3 of Whites Creek. This stream reach is located in the southeast Truckee Meadows, south of Reno, Nevada (Figure 1) and is in an area that is undergoing urban development. The project is located in unincorporated Washoe County . Whites Creek is part of the lower Steamboat Creek drainage basin.

The project area is found on Panel 3186 of FIRM Number 32031C3178 E, Washoe County, Nevada, and Incorporated Areas. The initial flood plain boundaries presented on Flood Insurance Rate Maps (FIRM) were determined by approximate methods which have no available documentation. The boundaries were modified by a CLOMR in a document titled "Hydrologic and Hydraulic Analysis Whites Creek Meadows Subdivision" (Nimbus Engineers, October 1994), FEMA case number 95-09-133R. The present study covers only Branch 3 of Whites Creek from just downstream of South Virginia Street (U.S. 395) to Steamboat Creek.

Whites Creek originates in the Sierra Nevada Mountains and flows easterly to Steamboat Creek located in the Truckee Meadows. The Whites Creek watershed extends to an elevation of over 10,600 feet. The watershed is vegetated mainly with pine trees and mountain mahogany brush in the upper elevations an sagebrush with grass understory in the lower elevations. Approximately 2 miles upstream of South Virginia Street the watercourse diverges into four smaller channels. These channels have been named Whites Creek Branches 1 through 4. Before development began, these channels lost their definition and flowed across South Virginia Street and downstream farm land as sheet flow to Steamboat Creek. Urban development and construction of culverts under Highway I-580 have re-routed the channels and the sheet flow has been channelized. The subject of this study, Branch 3,passes under I-580 at Nevada Department of Transportation (NDOT) station "H" 535+33 through three 12 ft x 5 ft reinforced concrete box (RCB) culverts. They outlet near the southwest corner of Whites Creek Meadows Subdivision (Figure 2). Before construction of the channel, runoff then traveled as sheet flow eastward into Steamboat Creek.

The developed conditions for this LOMR take into account the constructed channel and related culverts in Branch 3. The general channel design consists of a base width of 80 feet and side slopes of 3:1. The channel is being lowered to the Steamboat Creek elevation through a series of drop structures and has varying channel slopes. The flow will pass under Steamboat Parkway through five 5 ft x 12 ft reinforced concrete box culverts (RCBs) just upstream of Steamboat Creek. As-built diagrams of the channel and culverts are shown in Appendix B. The existing conditions HEC-1 model is derived from the model used in the CLOMR application, but has been truncated at the Branch 3 confluence with Steamboat Creek, the downstream end of this study. This model is in Appendix C and a HEC-2 hydraulic analysis for developed conditions is presented in Appendix D. The existing FIRM is shown in

Figure 3. The revised Annotated FIRM is shown in Figure 4 and the developed conditions are shown in Figure 5. A watershed map (which is also the hydrologic workmap) is presented in Figure 6.

Please find the following attachments in support of of this LOMR request:

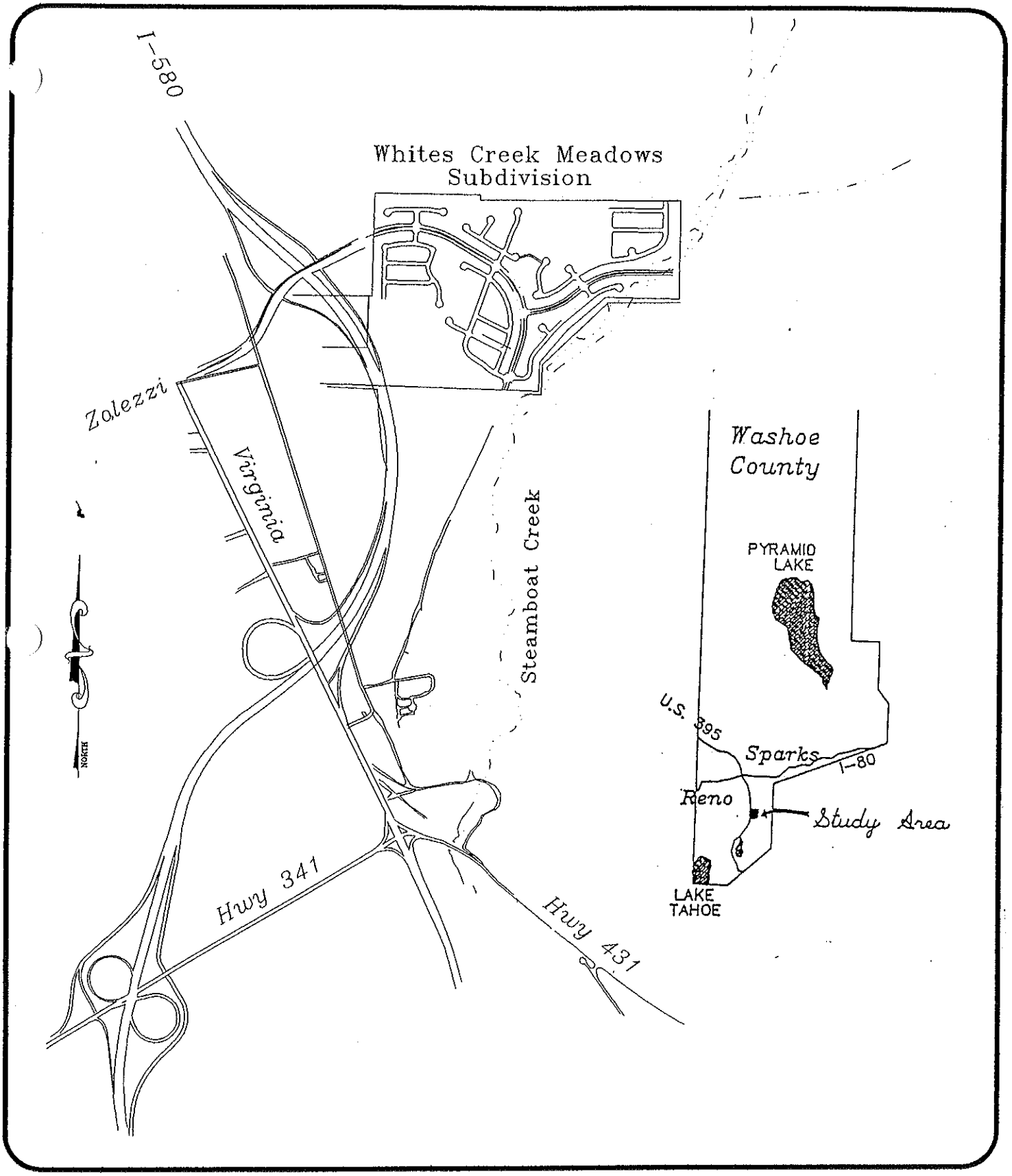
Appendix A Figures

- Figure 1 Vicinity Map
- Figure 2 Culvert Index Map
- Figure 3 Existing FIRM
- Figure 4 Annotated FIRM
- Figure 5 Proposed Conditions LOMR
- Figure 6 Watershed Map (Hydrologic Workmap)

Appendix B FEMA Forms and Attachments
Appendix C HEC-1 Model for Developed Conditions, file name BR3-LOMR.dat
Appendix D HEC-2 Model for Developed Conditions, file name 008LOMR.dat
Appendix E As-Built Hydraulic Workmap
Appendix F As-built Diagram for the Steamboat Parkway culverts
Appendix G Supporting Calculations for HEC-1 model
Appendix H Discs with the HEC-1 and HEC-2 models

APPENDIX A

FIGURES

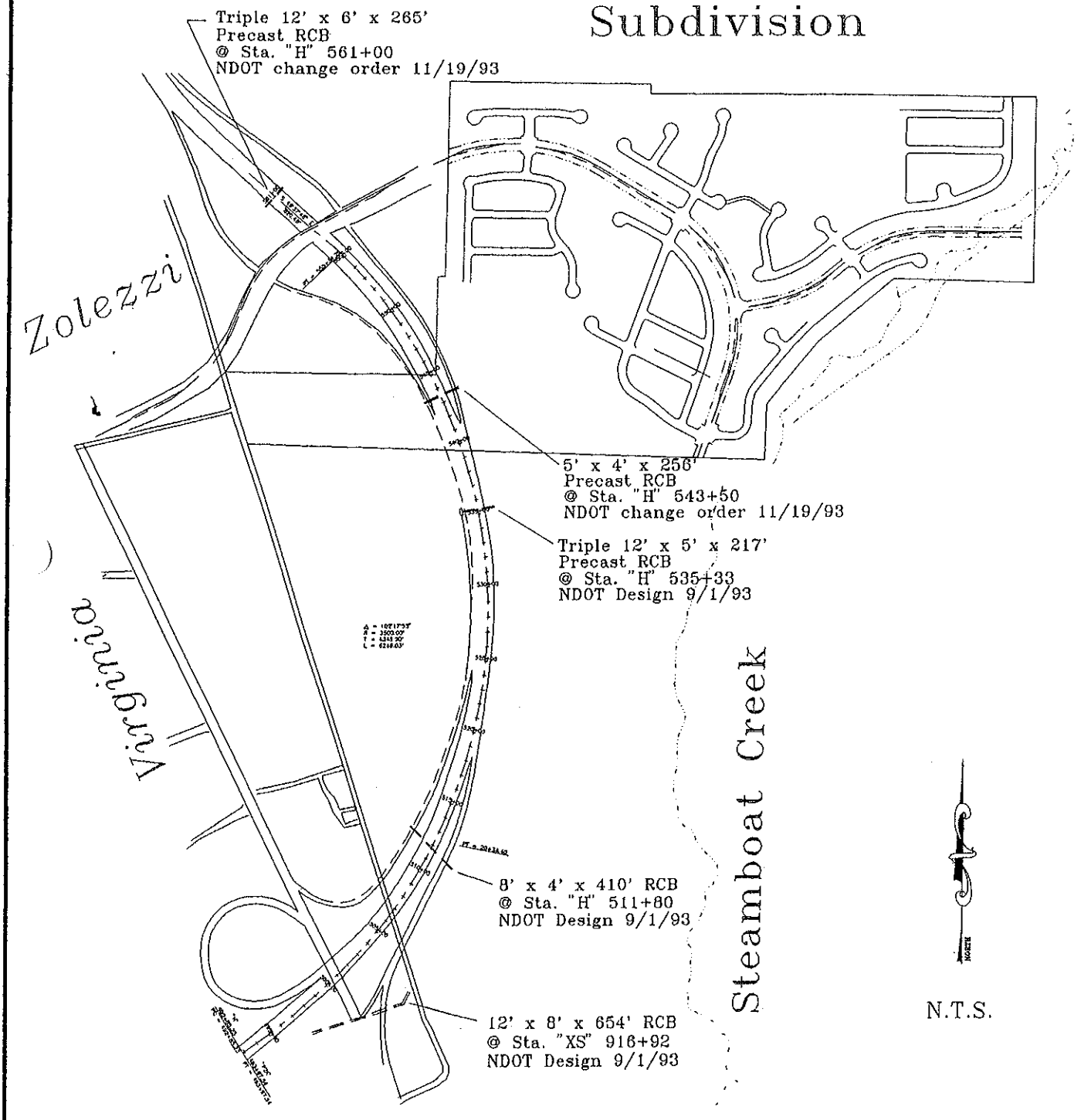


Nimbus Engineers

Figure 1

Vicinity Map

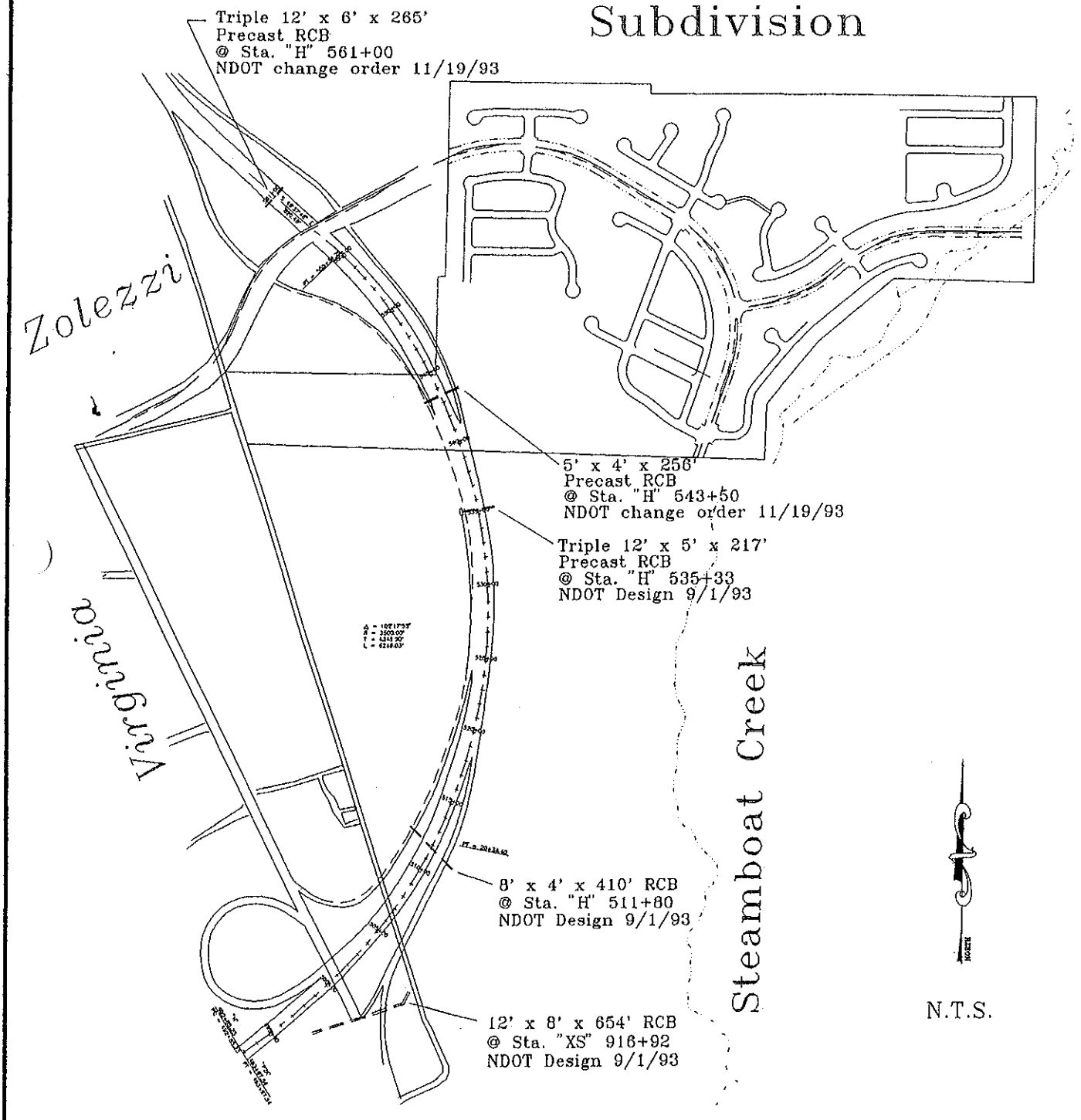
Whites Creek Meadows Subdivision



Nimbus Engineers

Figure 2
Culvert Index Map

Whites Creek Meadows Subdivision



Nimbus Engineers

Figure 2
Culvert Index Map

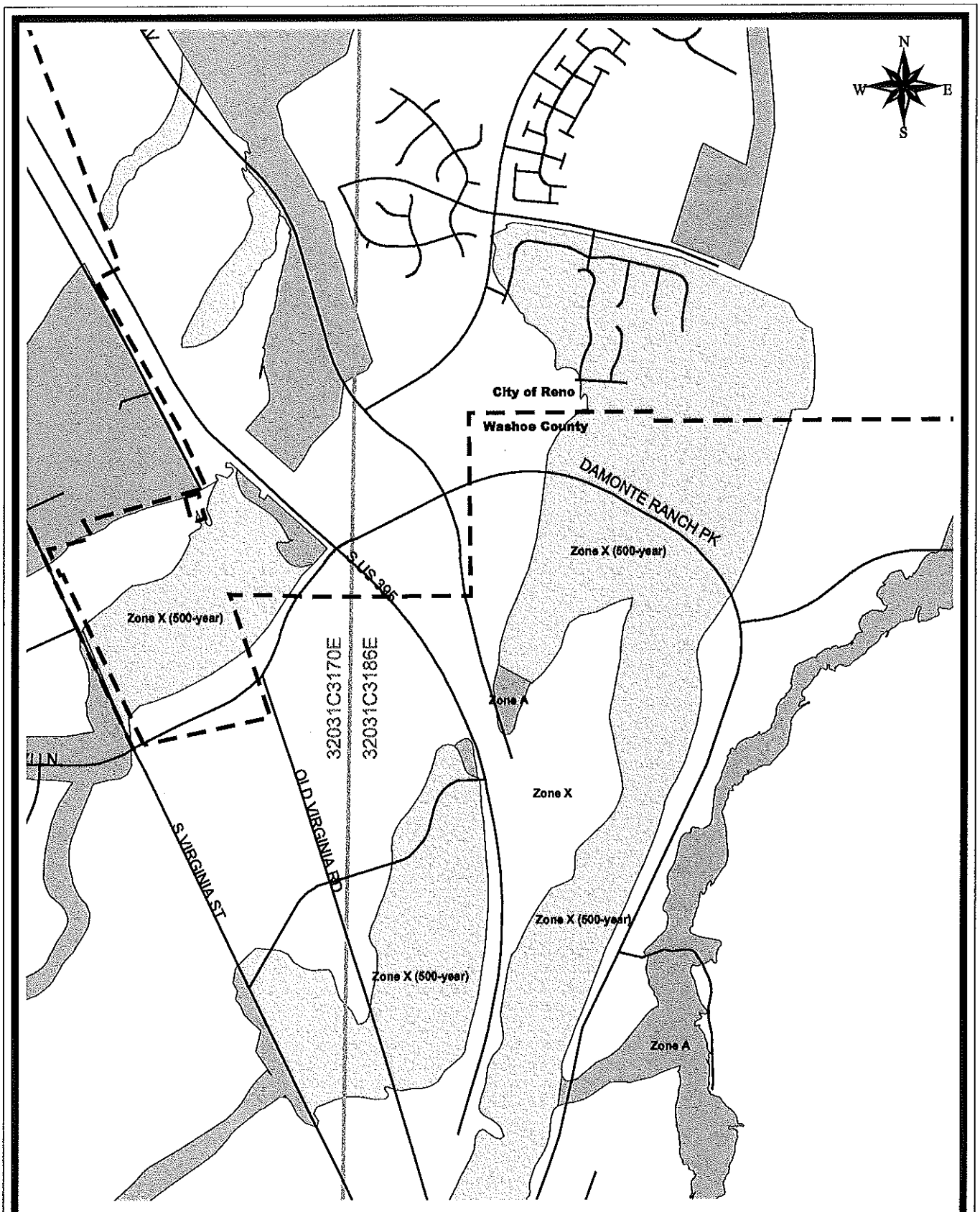


Figure 3

Existing FIRM

Nimbus Job No. 0008 *Date: March 2001*

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

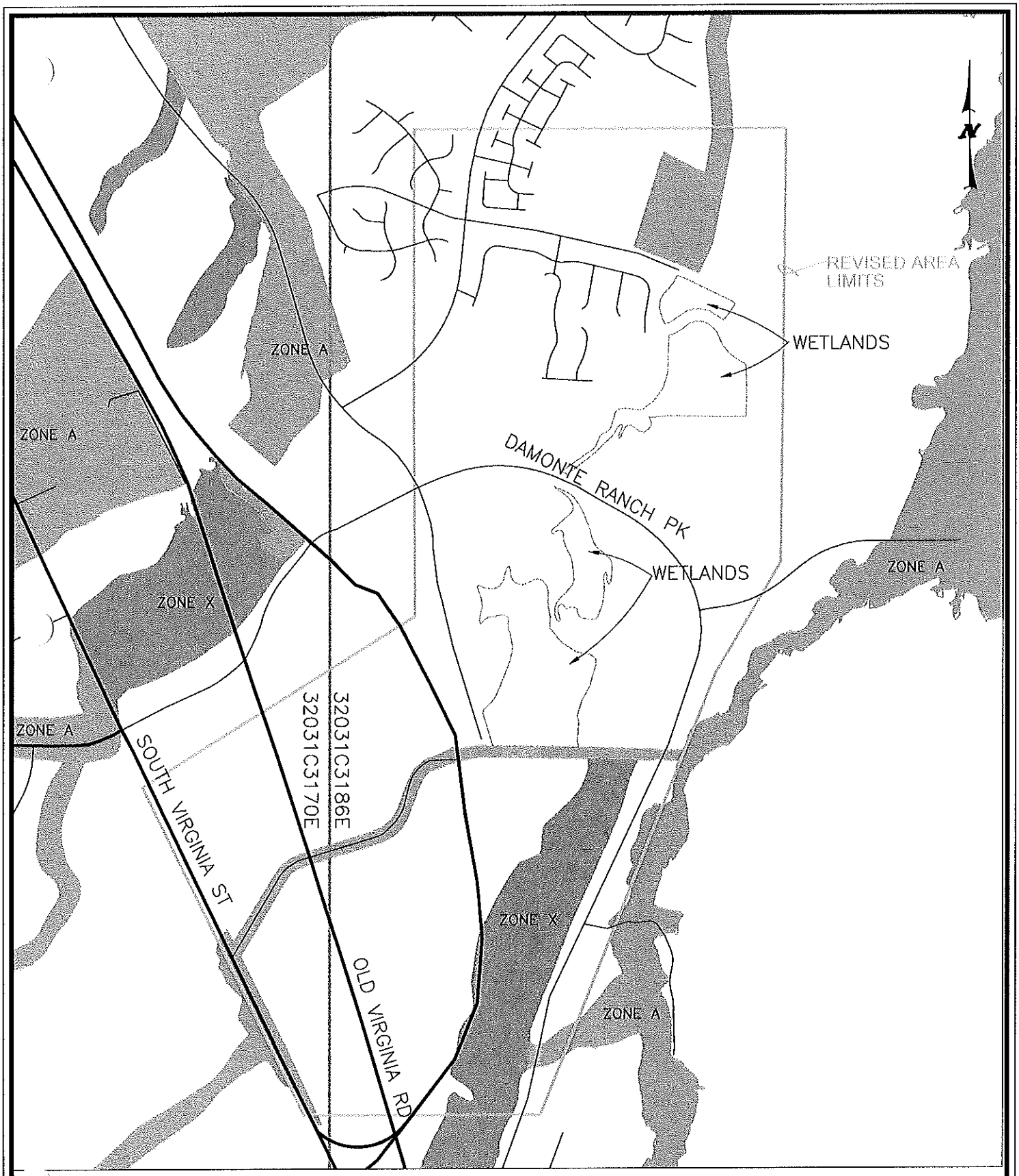


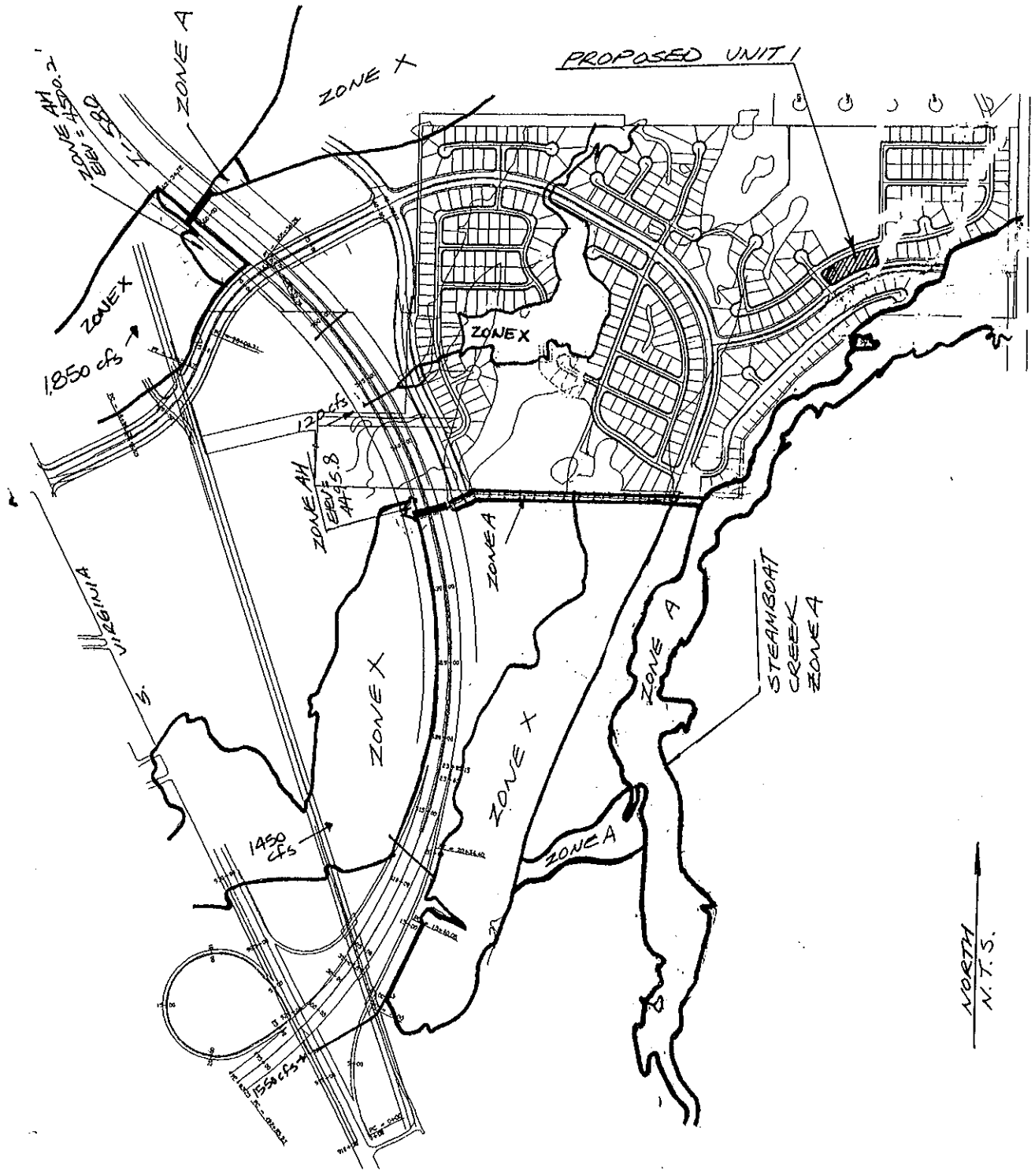
Figure 4

Annotated FIRM

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(776) 689-8630 • Fax (776) 689-8614
www.nimbusengineers.com

Nimbus Job #0008

Date: Jan. 2002



Nimbus Engineers

Figure 5
Proposed Conditions
LOMR

APPENDIX B

FEMA FORMS AND ATTACHMENTS

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

Public reporting burden for this form is estimated to average 2.13 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☒ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☐ Other Describe: _____

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☒ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☐ Other Describe: _____

Note: A photograph is not required, but is very helpful during review.

2. Flooding Source: Whites Creek Branch 3

3. Project Name/Identifier: Damonte Ranch Subdivision Whites Creek Branch 3 Flood Channels

4. FEMA zone designations affected: Zone X, Zone A
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
320019	Washoe County, Unincorporated Area	NV	320019	3186E	4/25/95
320019 320020	Washoe County, Unincorporated Area City of Reno	NV	320019 320019	3170E 3186E	4/25/95 4/25/95

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☒ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☒ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☒ No

Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☒ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☒ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the Damonte Ranch Subdivision Whites Creek Branch 3 Flood Channels
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☒ **Yes** ☐ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $4,000

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

Margaret F Bowker
Signature of Revision Requester

Margaret F. Bowker, P.E.
Printed Name and Title of Revision Requester

Nimbus Engineers
Company Name

Telephone No.: 775/689-8630 Date: 3/13/01

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

Signature of Community Official

Printed Name and Title of Community Official

Community Name

Telephone No.: Date:

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

Margaret F Bowker
Signature

Margaret F. Bowker, P.E.
Printed Name and Title of Revision Requester

Registr No. 5252 Expires (Date) 12/31/02 State NV

Type of License/Expertise: CIVIL

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☐ Hydrologic (3)	new or revised discharges
☒ Hydraulic (4)	new or revised water-surface elevations
☒ Mapping (5)	floodplain/floodway changes
☒ Channelization (6)	channel is modified
☒ Bridge/Culvert (7)	addition/revision of bridge/culvert
☐ Levee/Floodwall (8)	addition/revision of levee/floodwall
☐ Coastal (9)	new or revised coastal elevations
☐ Coastal Structures (10)	addition/revision of coastal structure
☐ Dam (11)	addition/revision of dam
☐ Alluvial Fan (12)	structures proposed on alluvial fan

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☒ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☒ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☒ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the Damonte Ranch Subdivision Whites Creek Branch 3 Flood Channels
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☒ Yes ☐ No ☐ N/A

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $4,000

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

Margaret F Bowker
Signature of Revision Requester

Margaret F. Bowker, P.E.
Printed Name and Title of Revision Requester

Nimbus Engineers
Company Name

Telephone No.: 775/689-8630 Date: 03-12-01

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

Signature of Community Official

STEVE VARELA, DIRECTOR OF PUBLIC WORKS/ CITY ENGINEER
Printed Name and Title of Community Official

CITY OF RENO
Community Name

Telephone No.: (775) 321-2215 Date: 05-30-01

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

Margaret F Bowker
Signature

Margaret F. Bowker, P.E.
Printed Name and Title of Revision Requester

Registr No. 5252 Expires (Date) 12/31/02 State NV

Type of License/Expertise: CIVIL

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☐ Hydrologic (3)	new or revised discharges
☒ Hydraulic (4)	new or revised water-surface elevations
☒ Mapping (5)	floodplain/floodway changes
☒ Channelization (6)	channel is modified
☒ Bridge/Culvert (7)	addition/revision of bridge/culvert
☐ Levee/Floodwall (8)	addition/revision of levee/floodwall
☐ Coastal (9)	new or revised coastal elevations
☐ Coastal Structures (10)	addition/revision of coastal structure
☐ Dam (11)	addition/revision of dam
☐ Alluvial Fan (12)	structures proposed on alluvial fan

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☒ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☒ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☒ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the Damonte Ranch Subdivision Whites Creek Branch 3 Flood Channels
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☒ Yes ☐ No ☐ N/A

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $4,000

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

Margaret F Bowker
Signature of Revision Requester

Margaret F. Bowker, P.E.
Printed Name and Title of Revision Requester

Nimbus Engineers
Company Name

Telephone No.: 775/689-8630 Date: 03-12-01

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

David T. Price
Signature of Community Official

David T. Price County Engineer
Printed Name and Title of Community Official

Washoe County
Community Name

(775) 328-2041 Date: 4/4/01
Telephone No.:

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

Margaret F Bowker
Signature

Margaret F. Bowker, P.E.
Printed Name and Title of Revision Requester

Registr No. 5252 Expires (Date) 12/31/02 State NV

Type of License/Expertise: CIVIL

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☐ Hydrologic (3)	new or revised discharges
☒ Hydraulic (4)	new or revised water-surface elevations
☒ Mapping (5)	floodplain/floodway changes
☒ Channelization (6)	channel is modified
☒ Bridge/Culvert (7)	addition/revision of bridge/culvert
☐ Levee/Floodwall (8)	addition/revision of levee/floodwall
☐ Coastal (9)	new or revised coastal elevations
☐ Coastal Structures (10)	addition/revision of coastal structure
☐ Dam (11)	addition/revision of dam
☐ Alluvial Fan (12)	structures proposed on alluvial fan

WHITES CREEK BRANCH 3 LOMR REQUEST
MT-2 FORM 1 ATTACHMENT

PART 2 - Community Names

- The study area is in an area of unincorporated Washoe County that is in the process of being annexed by the City of Reno. The area is not yet annexed by Reno but is considered to be in Reno's Sphere of Influence

PART 5 - Maintenance Responsibility

- An operation and maintenance plan for the Branch 3 Channel is attached

DAMONTE RANCH DRAINAGE DISTRICT
MASTER FLOOD CONTROL MAINTENANCE
AND OPERATION AGREEMENT

This Agreement is entered into on this 14th day of April, 1998, by and between the Damonte Ranch Drainage District, (DRDD), a Nevada non-profit corporation, and Washoe County, (County) a political subdivision of the State of Nevada.

RECITALS

1. SCOPE: The intent of this document shall set forth the maintenance and operation standards for those flood control facilities located within the Damonte Ranch Trade Center and as more specifically depicted in the Southeast Truckee Meadows Master Flood Control Plan.

2. FACILITY DESCRIPTION: The facilities to be maintained and operated under this agreement are as follows:

   2.1 The DRDD shall maintain and operate those grass lined channels, concrete drop structures and rock rip rap more specifically detailed on the improvement plans entitled Damonte Ranch Whites Creek Branch 3 Flood Control Channels, Sheets C1-C12, as prepared by Nimbus Engineers, dated August 1996, and on file in the Washoe County Engineer's Office.

   2.2 The County shall maintain and operate all drainage structures within all public right of ways.

   2.3 The DRDD reserves the right to expand the boundaries of these facilities from time to time, subject to the review and approval of those facility expansions by the Washoe County Engineer.

3. FUTURE MODIFICATIONS, REVIEW AND APPROVALS: Any proposed future modifications of these specific improvements must receive the review and approvals of both the DRDD and County prior to any activities occurring in these areas.

4. LEVEL OF MAINTENANCE:

   4.1 The minimum level of maintenance required for these facilities shall be as follows:

4.1.1 Woody plant species within the immediate channel flowlines will be removed annually.

4.1.2 Sedimentation deposits in excess of one foot in depth shall be removed from the channel. The removal shall conform to the original geometric section of the channel.

4.1.3 Any erosion in excess of one foot in depth shall be back-filled and compacted in conformance with the original geometric section of the channel.

4.1.4 Areas of the channels that have been disturbed for sediment removal or erosion backfill shall be immediately seeded with the same type vegetation that was originally specified and planted.

4.1.5 An inspection of the channel shall be performed following any storm event that produces channel flow depth in excess of three feet. Any sediment deposit or erosion observed as described in 4.1.2 and 4.1.3 shall be removed/restored as soon as the channel has dried sufficiently to allow maintenance equipment to operate within the channel in an efficient manner so as to minimize channel disturbances.

4.1.6 Should the degree of erosion or sedimentation be such that the channel integrity is compromised, following or during any storm event, such that the public health, safety and welfare is imperiled, remedial measures to restore the channel shall be taken immediately to keep the flows confined within the flood control facilities.

5. ADHERENCE TO LEVEL OF MAINTENANCE:

5.1 Primary maintenance responsibility for the master flood control drainage facilities shall rest with the DRDD.

5.2 Washoe County shall assume maintenance responsibility only if the DRDD fails to do so. Should Washoe County have to assume said maintenance responsibilities, the DRDD shall be required to be noticed and reimburse the County in accordance with the provisions of Section 7 and 8 herein.

6. FACILITY STATUS REPORT:

6.1 Within thirty (30) days of the annual anniversary of this Agreement, the DRDD shall retain a registered civil engineer to inspect the flood control

facilities and submit a written Facility Status Report to the County. The report shall address the status and adequacy of the maintenance of the flood control facilities in accordance with those provisions of Section 4 of this Agreement, as well as the adequacy of the current fee assessments to sustain the maintenance thereof.

7. NOTICES:

7.1 If the County determines the DRDD is not in compliance with the level of maintenance described in Section 4 of this Agreement, the County shall notify the DRDD of its findings in writing. The County shall provide DRDD thirty (30) calendar days to rectify any non-compliance findings as outlined in Section 4. If after thirty (30) days any non-compliance findings remain, the County may, upon 48 hours notice to the DRDD, enter on to the property and proceed with remedial measures consistent with those outlined in Section 4 to restore the level of maintenance of the master flood control facility. Any remedial measure enacted by Washoe County under the terms of this provision shall be subject to reimbursement to the County for its expenses by DRDD.

7.2. Should the County in its judgment, determine during a storm event that there is an immediate need for maintenance on the master drainage facility due to a direct threat to the public health, safety and welfare, as a direct result of non-compliance of the DRDD described in 7.1 above, the County may immediately enter and proceed with emergency measures to correct the situation without additional notice to DRDD. Any emergency measures enacted by Washoe County under the terms of this provision shall be subject to reimbursement.

8. REIMBURSEMENTS:

8.1 The County shall be entitled to be reimbursed for its actual expenses incurred as a result of its actions enacted under the terms and provisions of Sections 7.1 and 7.2 of this Agreement. In such an event the County shall invoice the DRDD for reimbursement of its expenses within 45 calendar days of incurrance of expenses, for payment by the DRDD within 30 days of receipt of the County invoice.

9. RESERVE ACCOUNT:

9.1 The DRDD shall establish and maintain, at a minimum, a reserve account for routine and emergency maintenance in the amount of $10,000. The DRDD shall provide evidence of the maintenance of this account to the

County in conjunction with the submission of the Facility Status Report (Section 6) of this Agreement.

9.2 The DRDD shall provide the County with a copy of the DRDD's official annual budget within 30 days of the beginning of the DRDD's fiscal year.

10. PERMITS, LICENSES AND OTHER RIGHTS:

10.1 The DRDD or its assigns shall be responsible for obtaining and maintaining all licenses, permits or other entitlement necessary or required to provide for the operation and maintenance of these flood control facilities.

10.2 In the event and to the extent any of the functions and/or obligations of the DRDD, as described herein, may be assumed by the County, or any other public or quasi-public agency or district designated by the County, including, without limitation, a general, local or special improvement district, or landscape maintenance district ("Agency/District"), the DRDD shall have the power and duty to delegate and transfer such functions and/or obligations such as, by way of example, and not of limitation, the maintenance of surface water drainage facilities and integral wetlands to such Agency/District.

10.3 Consistent with the foregoing, the County and/or such Agency/District shall assume, obtain and maintain all licenses, permits and other entitlements necessary or required to provide for the operation and maintenance of these facilities.

10.4 Further, consistent with the foregoing, all costs and expenses incurred to affect the assumption, conveyance and transfer of the functions and obligations of the DRDD to such Agency/District shall be borne entirely by the Agency/District.

11. ACCESS RIGHTS FOR INSPECTION:

11.1 It is expressly understood that the County shall have the same access rights to the master drainage facilities as those maintained by the DRDD for the purposes of inspection and maintenance as described in section 7, of the facilities.

12. ADDITIONAL AGREEMENT:

12.1 From the date of this Agreement forward, County agrees to assure that contributing upstream facilities shall be designed and constructed to applicable Washoe County Codes in place at the time of approval of the contributing upstream facilities.

DAMONTE RANCH DRAINAGE DISTRICT,
a Nevada non-profit corporation

By its Board of Directors:

DI LORETO SOUTH TRUCKEE MEADOWS, INC.,
a Nevada corporation

By:_____
Perry M. Di Loreto, President

BDM DEVELOPMENT
a Nevada limited liability company

By:_____
Craig Dutton, Managing Member

STEAMBOAT CREEK DEVELOPMENT, INC.,
a Nevada corporation

By:_____
Robert E. Lewis, President

" COUNTY "

COUNTY OF WASHOE, NEVADA

By:_____
Chairman

Attest:_____

STATE OF NEVADA)
) SS
COUNTY OF WASHOE)

This instrument was acknowledged before me on 4-30-98,
by [illegible]
as [illegible]
of [illegible]

KATHLEEN A. ZEISER
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 92-3396-2 - EXPIRES JULY 17, 2000

[illegible]
(Signature of notarial officer)

Notary
(Title and Rank)

(My commission expires: 7-17-00)

STATE OF NEVADA)
) SS
COUNTY OF WASHOE)

This instrument was acknowledged before me on 4-30-98,
by Craig Dutton
as Managing Member
of BDM Development

KARIN KREMERS
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 93-1820-2 - EXPIRES JULY 25, 2001

Karin Kremers
(Signature of notarial officer)

notary
(Title and Rank)

(My commission expires: 7-25-01)

STATE OF NEVADA)
) SS
COUNTY OF WASHOE)

This instrument was acknowledged before me on 4-30-98,
by [illegible]
as [illegible]
of [illegible]

KATHLEEN A. ZEISER
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 92-0396-2 - EXPIRES JULY 17, 2000

[illegible]
(Signature of notarial officer)

Notary
(Title and Rank)

(My commission expires: 7-17-00)

STATE OF NEVADA)
) SS
COUNTY OF WASHOE)

This instrument was acknowledged before me on 4-30-98,
by [illegible]
as [illegible]
of [illegible]

KATHLEEN A. ZEISER
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 92-0396-2 - EXPIRES JULY 17, 2000

[illegible]
(Signature of notarial officer)

Notary
(Title and Rank)

(My commission expires: 7-17-00)

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Washoe County Unincorporated, City of Reno

Flooding Source: Whites Creek Branch 3

Project Name/Identifier: Damonte Ranch Subdivision Whites Creek Branch 3 Flood Channels

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☐ Improved data ☒ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☒ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☒ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☒ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☒ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☒ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
Diffluence of Whites Creek Branches 1,2,3 &4	9.35	N/A	3220
-----	-----	-----	-----
-----	-----	-----	-----

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		HEC-1	
	Version:	4.1		4.1	
	Date:	June, 1998		June 1998	
2.	Source of rainfall depth:	-----		NOAA Atlas	
3.	Source of rainfall distribution:	-----		SCS Type II	
4.	Rainfall duration:	-----		24 hours	
5.	Areal adjustment to precipitation (%):	-----		-----	
6.	Maximum overland flow length	-----		-----	
7.	Hydrograph development method:	-----		SCS Unit	
8.	Loss rate method:	-----		SCS Curve Number	
	Source of soils information:	-----		SCS Soil Survey	
	Source of land use information:	-----		N/A	
9.	Channel routing method:	-----		Muskingum	
10.	Reservoir routing:	☐ Yes	☐ No	☐ Yes	☒ No
11.	Baseflow considerations:	☐ Yes	☐ No	☐ Yes	☒ No

If Yes, explain below how baseflow was determined:

N/A

12.	Snowmelt considerations:	☐ Yes	☐ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☐ No	☐ Yes	☒ No

If Yes, explain below how calibration was performed

14.	Future land use condition:	☐ Yes	☐ No	☐ Yes	☒ No

If Yes, explain why below

-----

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

WHITES CREEK BRANCH 3 LOMR REQUEST
MT-2 FORM 3 ATTACHMENT

PART 1- Reason for new Hydrologic Analysis

- Runoff that formerly traveled as overland flow is now collected by a culvert and then conveyed by a newly constructed channel to Steamboat Creek

PART 3 - Approval of Analysis

- The study was approved by Washoe County and the City of Reno in FEMA case number 95-09-133R. See also signature section on page 2 of Form 1.

9. INITIAL REVIEW FEE

18. The minimum initial review fee for the appropriate request category has been included. ☒ Yes ☐ No

Initial fee amount: $ _____

METHOD OF PAYMENT (Check one box)

☐ PAYMENT ENCLOSED ☐ VISA ☐ MASTERCARD

Check or money order only.
Make payable to
National Flood Insurance Program

CARD NUMBER

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

EXP. Date

_____ Signature

or

19. This request is for a project that is for public benefit and is intended to reduce the flood hazard to existing development in identified flood hazard areas as opposed to planned floodplain development. ☐ Yes ☒ No

or

20. This request is to correct an error or to include the effects of natural changes within the areas of special flood hazards. ☐ Yes ☑ No

Note: I understand that my signature indicates that all information submitted in support of this request is correct.

Margaret J Bowker
Signature of Revision Requester

Margaret Bowker
Printed Name and Title of Revision Requester

Nimbus Engineers
Company Name

11/17/94
Date

Note: Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.

David T. Price
Signature of Community Official

David T. Price
Printed Name and Title of Community Official
Washoe County Engineer

Washoe County
Community Name

11/23/94
Date

Does this request impact any other communities? ☐ Yes ☒ No

If yes, attach letters from all affected jurisdictions acknowledging revision request and approving changes to floodway, if applicable.

Note: Although a photograph of physical changes is not required, it may be helpful for FEMA's review.

9. INITIAL REVIEW FEE

18. The minimum initial review fee for the appropriate request category has been included. ☒ Yes ☐ No

Initial fee amount: $ _____

METHOD OF PAYMENT (Check one box)

☐ PAYMENT ENCLOSED ☐ VISA ☐ MASTERCARD

Check or money order only.
Make payable to
National Flood Insurance Program

CARD NUMBER

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

EXP. Date

_____ Signature

or

19. This request is for a project that is for public benefit and is intended to reduce the flood hazard to existing development in identified flood hazard areas as opposed to planned floodplain development. ☐ Yes ☒ No

or

20. This request is to correct an error or to include the effects of natural changes within the areas of special flood hazards. ☐ Yes ☑ No

Note: I understand that my signature indicates that all information submitted in support of this request is correct.

Margaret J Bowker
Signature of Revision Requester

Margaret Bowker
Printed Name and Title of Revision Requester

Nimbus Engineers
Company Name

11/17/94
Date

Note: Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.

_____
Signature of Community Official

Steve Varela, City Engineer/Maint. Dir
Printed Name and Title of Community Official

City of Reno, Nv.
Community Name

11/22/94
Date

Does this request impact any other communities? ☐ Yes ☒ No

If yes, attach letters from all affected jurisdictions acknowledging revision request and approving changes to floodway, if applicable.

Note: Although a photograph of physical changes is not required, it may be helpful for FEMA's review.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Washoe County, Unincorporated Area

Flooding Source: Whites Creek Branch 3

Project Name/Identifier: Damonte Ranch Subdivision Whites Creek Branch 3 Flood Channels

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Confluence with Steamboat Creek

Upstream Limit: South Virginia Street (U.S. 395)

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

Hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Correctly Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☒ **Natural** **File Name** BR3-LOMR ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☒ **Natural** **File Name** 008LOMR.dat ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

Other – Please attach a sheet describing all other models submitted along with the file names. ☐ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☒ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. **Profile Transition**

   a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

   Downstream End _____ within _____ (feet) Upstream End _____ within N/A (feet)
   Cross-Section # *Cross-Section #*

   b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

   Downstream End _____ within _____ (feet) Upstream End _____ within N/A (feet)
   Cross-Section # *Cross-Section #*

   c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

   Downstream End _____ within _____ (feet) Upstream End _____ within N/A (feet)
   Cross-Section # *Cross-Section #*

2. **Profile Checklist (check box if information has been provided on profile)**

   The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

   ☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

   ☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

   ☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

   ☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

   *All recurrence intervals in the effective study must also be profiled.

   Floodway Data Table

   Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

   Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

WHITES CREEK BRANCH 3 LOMR REQUEST
MT-2 FORM 4 ATTACHMENT

PART 2 - Models Submitted

- Hard copies of the existing and proposed conditions models are presented in Appendix B. The existing conditions HEC-1 model is the same as that presented in the CLOMR Application for FEMA case number 95-09-133R truncated at the end of the study area for this project. Electronic copies are also attached.

PART 3- Starting Water Surface Elevation

- The starting water surface elevations were determined using normal depth for a slope of 0.003 upstream and 0.002 downstream.

PART 4 - Results

- Critical Depth was present in the model and is reasonable because of the slopes in the channel. The steep slopes necessitated using a sloping drop structure.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE / COASTAL MAPPING**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Washoe County, Unincorporated Area

Flooding Source: Whites Creek Branch 3

Project Name/Identifier: Damonte Ranch Subdivision Whites Creek Branch 3 Flood Channels

This is a ☒ Manual ☐ Digital submission. *Digital map submissions may be used to update digital FIRMs (DFIRMs). For updating DFIRMs, these submissions must be coordinated with FEMA Headquarters as far in advance as possible.*

1. MAPPING CHANGES

1. A topographic workmap must be submitted showing the following information (check N/A when not applicable):

a. Revised approximate 100-year floodplain boundaries (Zone A)	☐ Yes	☒ No	☐ N/A
b. Revised detailed 100- and 500-year floodplain boundaries.	☐ Yes	☒ No	☐ N/A
c. Revised floodway boundaries	☐ Yes	☒ No	☐ N/A
d. Location and alignment of all cross sections with stationing control indicated.	☒ Yes	☐ No	☐ N/A
e. Stream alignments, road alignments and dam alignments.	☒ Yes	☐ No	☐ N/A
f. Current community boundaries.	☐ Yes	☒ No	☐ N/A
Effective 100- year floodplain and floodway boundaries from FIRM/FBFM reduced or enlarged to the scale of the topographic workmap	☐ Yes	☒ No	☐ N/A
h. Tie-ins between the effective and revised 100-, 500-year and floodway boundaries	☐ Yes	☒ No	☐ N/A
i. The requester's property boundaries and community easements	☐ Yes	☒ No	☐ N/A
j. The signed certification of a registered professional engineer	☒ Yes	☐ No	☐ N/A
k. Location and description of reference marks	☐ Yes	☒ No	☐ N/A
l. Vertical datum (example: NGVD, NAVD)	☒ Yes	☐ No	☐ N/A
m. Coastal zone designations tie into adjacent areas not being revised	☐ Yes	☐ No	☒ N/A
n. Location and alignment of all coastal transects used to revise the coastal analyze	☐ Yes	☐ No	☒ N/A
o. V-zone has been delineated to extend landward to the heel of the primary frontal dune	☐ Yes	☐ No	☒ N/A

If any items are marked No or N/A please attach an explanation.

2. What is the source and date of the updated topographic information (example: orthophoto maps, July 1985; filed survey, May 1979, beach profile, June 1987 etc.)? Orthophoto maps, June 1996

3. What is the scale and contour interval of the following workmaps?

Effective FIS Scale 1" = 200' Contour Interval 1'

Revision Request Scale 1" = 50' Contour Interval 1'

NOTE: Revised topographic information must be of equal or greater detail than effective.

4. Attach an annotated FIRM/FBFM at the scale of the effective FIRM/FBFM showing the revised 100- and 500-year floodplain and the floodway boundaries and how they tie into those shown on the effective FIRM/FBFM downstream and upstream of the revisions or adjacent to the area of revision for coastal studies. **FIRM/FBFM attached?** ☒ **Yes** ☐ **No**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. EARTH FILL PLACEMENT

1. The fill is: ☐ Existing ☐ Proposed

2. Has fill been/will be placed in the regulatory floodway? ☐ Yes ☐ No
If Yes, please attach completed Riverine Hydraulic Analysis Form (Form 4).

3. Has fill been/will be placed in floodway fringe (*area between the floodway and 100-year floodplain boundaries*)? ☐ Yes ☐ No

If Yes, then complete A, B, C, and D below.

a. Are fill slopes for granular materials steeper than one vertical on one-and-one-half horizontal? ☐ Yes ☐ No

If Yes, justify steeper slopes .....

b. Is adequate erosion protection provided for fill slopes exposed to moving flood waters? (*Slopes exposed to flows with velocities of up to 5 feet per second (fps) during the 100-year flood must, at a minimum, be protected by a cover of grass, vines, weeds, or similar vegetation; slopes exposed to flows with velocities greater than 5 fps during the 100-year flood must, at a minimum, be protected by stone or rock riprap.)*

☐ Yes ☐ No

If No, describe erosion protection provided .....

c. Has all fill placed in revised 100-year floodplain been compacted to 95 percent of the maximum density obtainable with the Standard Proctor Test Method or acceptable equivalent method? ☐ Yes ☐ No

d. Can structures conceivably be constructed on the fill at any time in the future? ☐ Yes ☐ No

If Yes, attach certification of fill compaction (item 3c. above) by the community's NFIP permit official, a registered professional engineer, or an accredited soils engineer in accordance with Subparagraph 65.5(a)(6) of the NFIP regulations.

Fill certification attached ☐ **Yes** ☐ **No**

4. Has fill been/will be placed in a V zone? ☐ Yes ☒ No

If Yes, is the fill protected from erosion by a flood control structure such as a revetment or seawall?

☐ Yes ☐ No

If Yes, attach the Coastal Structures Form (Form 10).

WHITES CREEK BRANCH 3 LOMR REQUEST
MT-2 FORM 5 ATTACHMENT

PART 1 - Mapping Changes

- 1. A hydrologic work map is included. The following items were checked No or N/A on Form 5:

a. The revised 100-year floodplain boundaries are shown on the existing and annotated FIRM.
b. The revised floodplain boundaries are shown on the annotated FIRM.
c. There are no floodways shown on the existing FIRM.
f. The community boundaries are shown on the existing and annotated FIRM.
g. The floodplains are shown on the annotated FIRM.
h. Tie-ins are shown on the annotated FIRM.
i. The property boundaries are shown on the annotated FIRM.
k. No reference marks were located in the area of interest.
m. The effective floodplain is not associated with a coastal zone.
n. The effective floodplain is not associated with a coastal zone.
o. The effective floodplain is not associated with a coastal zone.

- 4. An annotated FIRM is shown as Figure 4 in the report.

FEDERAL EMERGENCY MANAGEMENT AGENCY **CHANNELIZATION**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1.75 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Washoe County, Unincorporated Area, City of Reno

Flooding Source: Whites Creek Branch 3

Project Name/Identifier: Damonte Ranch Subdivision Whites Creek Branch 3 Flood Channels

1. REACH TO BE REVISED

Describe the limits of the revision **OR** submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☐ Yes

Downstream Limit: Confluence with Steamboat Creek

Upstream Limit: South Virginia Street (U.S. 395)

2. CHANNEL DESCRIPTION

Attach the following information about the channel (check box if information has been provided):

☒ Description of the inlet and outlet

☒ Description of the shape of the channel *(both cross sectional and planimetric configuration)* and its lining *(channel bottom and sides)*:

3. ACCESSORY STRUCTURES

The channelization includes:

☐ Levees *(Attach Levee/Floodwall System Analysis Form - Form 8)*
☒ Drop structures
☐ Superelevated sections
☐ Transitions in cross sectional geometry
☐ Debris basin/detention basin
☐ Energy dissipater
☐ Other (Describe):

4. DRAWING CHECKLIST

Attach the plans of the channelization certified by a registered professional engineer. The plan detail and information should include (check box if information has been provided):

☒ Channel alignment and locations of inlet, outlet, and accessory structures

☒ Channel lining

☒ Typical cross sections and profiles of channel banks and invert

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

5. HYDRAULIC CONSIDERATIONS

1. The channel was designed to carry 3000 (cfs) and/or the 100-year flood.

2. The design elevation in the channel based on:

- ☒ Subcritical flow
- ☐ Critical flow
- ☐ Supercritical flow
- ☐ Energy grade line

3. **If there is the potential for a hydraulic jump at the following locations, check the box(es) that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.**

Inlet to channel?	☒ Yes
Outlet of channel?	☐ Yes
At Drop Structures?	☐ Yes
At Transitions?	☐ Yes
Other locations?	☐ Yes

Explanation Attached? ☒ **Yes** ☐ **No** ☐ **N/A**

6. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood water-surface elevations, then provide the following information **(Check the box if provided):**

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

WHITES CREEK BRANCH 3 LOMR REQUEST
MT-2 FORM 6 ATTACHMENT

PART 2 - Channel Description

- A description of the channel is provided in the as-built drawings in Appendix E The inlet has rip-rap at the floor of the triple 12' x 5' box culverts under I-580. At its outlet, the channel spills into Steamboat Creek protected by rip rap. The basic channel design is trapezoidal, with an 80 foot wide base, 3:1 side slopes and varying channel slopes. The channel lining is natural grass.

PART 4 - Drawing Checklist

- The channel alignment and locations of inlet, outlet and accessory structures are shown on the as-built drawings.
- Typical cross-sections and profiles channel banks and inverts are shown on the as-built drawings.

PART 5 - Hydraulic Considerations

- 3. The potential for a hydraulic jump is controlled by rip-rap at the entrance to the channel.

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Washoe County, Unincorporated Area, City of Reno

Flooding Source: Whites Creek Branch 3

Project Name/Identifier: Damonte Ranch Subdivision Whites Creek Branch 3

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Steamboat Parkway

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   12+41

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-2 with special culvert

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ Yes ☐ No ☒ N/A

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Low Chord Elevations - Upstream and Downstream
- ☐ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☐ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

WHITES CREEK BRANCH 3 LOMR REQUEST
MT-2 FORM 7 ATTACHMENT

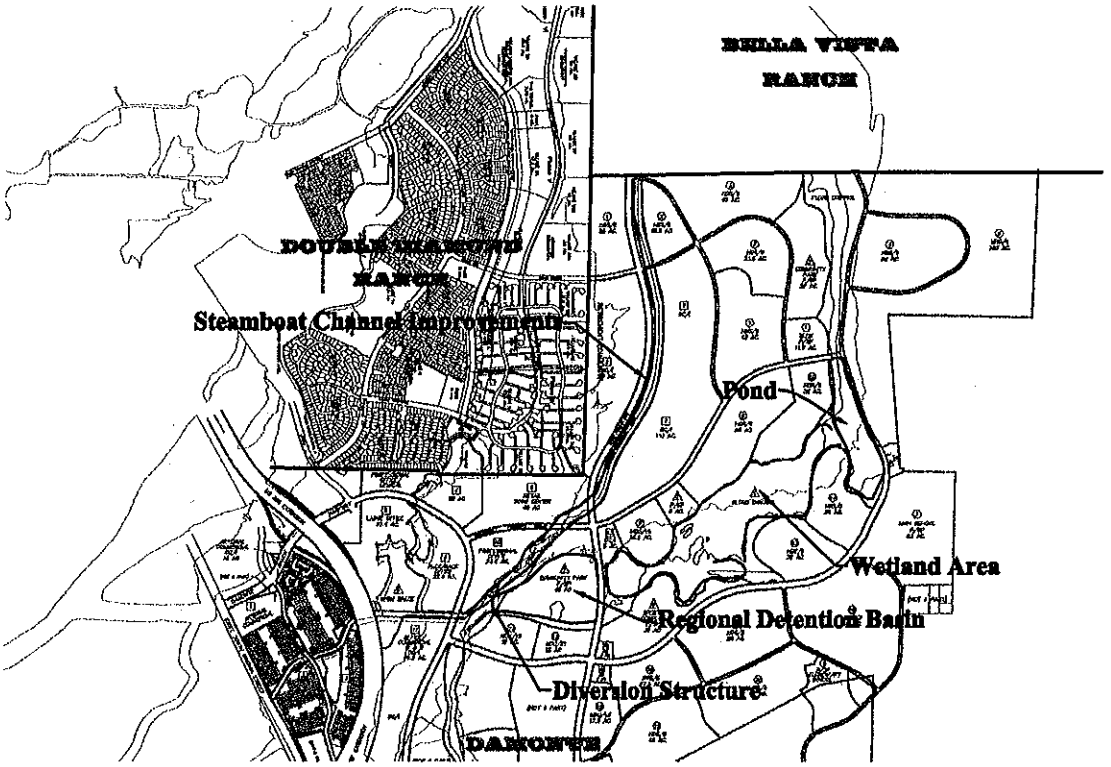
PART 2 - Drawing Checklist

- The culvert details are shown in Appendix F.

DECEMBER 2001

Application for Approval of Plans and Specifications for the Construction of a Dam

Damonte Ranch
Regional Flood Control Improvements



Prepared for:

Nevada Tri-Partners

Nimbus Job No. 0128
December 2001

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

Nimbus Engineers

November 28, 2001

State of Nevada
Department of Conservation and Natural Resources
Division of Water Resources
123 W. Nye Lane
Carson City, NV 89710

Attn: Michael Anderson, Dam Permit Section

Dear Mike:

We are submitting this dam permit package on behalf of the Nevada Tri-Partners. Please find the following information enclosed:

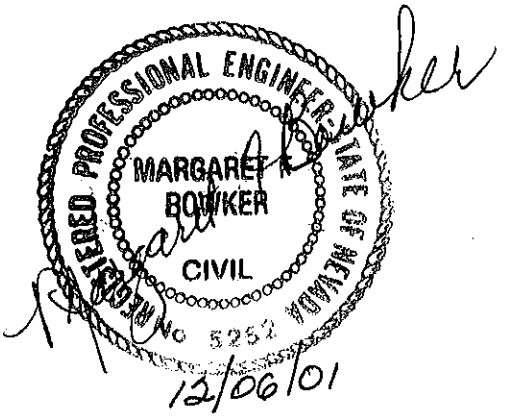
Section 1. Application for Approval of the Plans and Specifications for the Construction, Reconstruction or Alteration of a Dam; Appendix D form noting the supporting documentation included in this submittal; $500 filing fee
Section 2. Report – Damonte Ranch, Probable Maximum Precipitation Analysis by Nimbus Engineers
Section 3. Construction Drawing Set – Sheets 1 – 9
Section 4. Geotechnical Report by Black Eagle Consulting, Inc.
Section 5. Decommissioning of the CDB Sewage Treatment Ponds

If you have questions, please feel free to call us at any time.

Sincerely,
NIMBUS ENGINEERS

Margaret Bowker

Margaret Bowker, P.E.
President



3785 Baker Lane, #201 • Reno, Nevada 89509 • (775) 689-8630 • Fax (775) 689-8614 • nimbus@nimbusengineers.com

STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION WATER RESOURCES

Application No. J545 Filed December 12, 2001

APPLICANT MUST NOT FILL IN ABOVE BLANKS

APPLICATION FOR APPROVAL OF THE PLANS AND SPECIFICATIONS FOR THE CONSTRUCTION, RECONSTRUCTION OR ALTERATION OF A DAM

This Application Involves in No Way the Right to Appropriate Water
To secure the right to appropriate water, application should be made to the State Engineer on forms which will be furnished upon request.

I, Margaret Bowker (Name of applicant) of Nimbus Engineers, 3785 Baker Lane, #201, Reno, NV 89509 (Address), hereby make application for the approval of the Plans and specification of the Construction (Construction, reconstruction, alteration) of the Damonte Ranch Flood Control Facilities (Name of dam) dam.

The owner of the proposed dam is the Nevada Tri-Partners (Limited Partnership) (Name of owner) of c/o DiLoreto Construction, 500 Damonte Pkwy, Ste 703, Reno (Address) State of Nevada (89511)

If the owner is a corporation, give name and address of president and secretary —

Owner: Louis G. Damonte, C/O DiLoreto Construction, 500 Damonte Pkwy, Ste 703, Reno, Nevada 89511

Owner: Perry DiLoreto, C/O DiLoreto Construction, 500 Damonte Pkwy, Ste 703, Reno, Nevada 89511

The applicant is acting for the owner in the legal capacity of Consultant (Agent, Lessee, Trustee, etc.)

Location of Dam

1. The source of water to be ~~stored~~ detained is Steamboat Creek (Name of stream or underground) which is a tributary of the Truckee River (Stream),

and the proposed dam to be located within the NW ¼, SW ¼, Sec. 15

T. 18 N., R. 20 E., M.D.B.&M. in Washoe County, Nevada.

Description and Dimensions of Dam

(If for an alteration, the data given below is for the altered dam)

2. Type of dam See attached matrix for items 2 - 18 (Concrete arch or gravity, earth, rockfill, etc) 3. Length of crest _____ ft.

4. Height stream bed to spillway crest _____ ft. 5. Height foundation to spillway crest _____ ft.

6. Freeboard _____ ft. (Spillway crest to top) 7. Thickness at top _____ ft. 8. Thickness at bottom _____ ft.

9. Slope upstream* _____ (*This information to be supplied for earth or rockfill dams) 10. Slope downstream* _____ 11. Upstream facing _____ (Concrete or rock paving, etc.)

12. Amount of material in dam _____ (Approximate) cu. yds. 13. Estimated Cost $_____

14. Spillway data _____ (Type, Capacity, etc.)

15. Outlet data _____ (Type, capacity, etc.)

16. Elevation of crest of dam _____ (Approximate elevation to be given if true elevation not available) above _____ datum

17. Area of reservoir at spill way level _____ acres. 18. Capacity of reservoir _____ ac. ft.

$500 filing fee must accompany this application

General Information

19. State the **purpose** of the dam Flood water diversion & detention only
Diversion only; storage only; storage and diversion; debris storage, etc.

20. State the **use** that is to be made of water None
municipal, domestic, irrigation, power, mining and milling, recreation, or stockwatering

21. Engineers Nimbus Engineers, 3785 Baker Lane, # 201, Reno, Nevada 89509
Name and address of Engineers preparing plans
Odyssey Engineering, Inc., 895 Roberta Lane, Sparks, Nevada 89431

22. If the proposed dam is to be built under Federal supervision, state what department has jurisdiction

N/A

23. The maps, plans and specifications accompanying this application are a part thereof.

[Signed] Margaret F Bunker
Applicant

this 18 day of December, 2001

APPROVAL OF APPLICATION NO _____, INCLUDING THE PLANS AND SPECIFICATIONS

This Is to Certify That Application No. _____, Including the plans and specifications for the _____ dam has been examined and the same is hereby _____ approved, subject to the following conditions:

Witness my hand and seal this _____ day of _____, 20_____

_____
State Engineer

0-3888 CR446

FILE IN TRIPLICATE

Description and Dimensions of Dam (Items 2 - 18) -- Matrix for Damonte Ranch Flood Control Facilities

	Description	Diversion Structure	Detention Basin 1	Wetlands	Pond #4
2	Type of Dam	Earth	Earth	Earth	Earth
3	Length of Crest (feet)	240	100	65	NA
4	Height Stream Bed to Spillway Crest (feet)	9	4	2	NA
5	Height Foundation to Spillway Crest (feet)	9	4	2	NA
6	Freeboard (feet)	1.6	1	2.5	0.4
7	Thickness at Top (feet)	10	10	10	NA
8	Thickness at Bottom (feet)	34.25	22.78	18.7	NA
9	Slope Upstream	2:1	10:1	5:1	NA
10	Slope Downstream	2:1	3:1	3:1	NA
11	Upstream Facing	Concrete	Class 150 Riprap	Concrete	Concrete
12	Amount of Material in Dam (cubic yards)	291 (Total cubic yards for entire flood control facility)			
13	Estimated Cost ($)	$615,000 (Total estimated cost for flood control facility)			
14	Spillway Data	Broad-crested Weir, 240 ft in width, 4485 ft crest height	Cipolletti Weir, 100 ft in width, 4477 ft crest height	Trapezoidal Weir, 65 ft in width, 4454 ft crest height	NA
15	Outlet Data	5 - 108 inch RCP	1 - 36 inch RCP	NA	5 - 4 ft x 12 ft box culverts
16	Elevation of Crest of Dam (feet)	4490.5	4485	4465	4459
17	Area of Reservoir at Spillway Level (acres)	3.63	35.5	10.4	NA
18	Capacity of Reservoir (acre-feet)	14.96	365	303.91	68.43

APPENDIX D

NEVADA DIVISION OF WATER RESOURCES
ENGINEERING REVIEW OF DAMS:
DESIGN, PLANS, AND SPECIFICATIONS

I. GENERAL PLAN

__X__ VICINITY/LOCATION MAP
__X__ PLAN VIEW OF WATERSHED BOUNDARY AND DOWNSTREAM HAZARD
__X__ DRAINAGE BASIN AREA 85 SQ MILES
_____ TOPOGRAPHY MAP
__X__ PLAN VIEW OF DAM AND RESERVOIR AREA
__X__ RESERVIOR STORAGE CAPACITY MULTI-STRUCTURE – SEE ATTACHED
_____ SURVEY TIE TO AND FROM SECTION CORNER
__X__ CROSS SECTION OF EMBANKMENT, AXIS AND MAXIMUM SECTION

- __X__ ELEVATIONS OF DAM CREST AND EMERGENCY SPILLWAY CREST
- __X__ ELEVATIONS OF MAXIMUM WATER LEVEL IN RESERVOIR
- _____ ELEVATION OF MAXIMUM FLOW LINE IN CHANNEL
- _____ LOCATION AND DIMENSIONS OF CORE
- __X__ SLOPES OF UPSTREAM AND DOWNSTREAM FACES
- __X__ DETAILS OF EROSION PROTECTION
- _____ DIMENSIONS AND LOCATIONS OF PERVIOUS, SEMI-PERVIOUS AND IMPERVIOUS MATERIALS
- _____ DIMENSIONS AND LOCATIONS OF DRAINAGE FACILITIES, INCLUDING FILTERS

__X__ RESERVOIR AREA/CAPACITY CURVE
__X__ DISCHARGE CURVE FOR OUTLET/SPILLWAY

II. DETAILS AND SECTIONS

__X__ SPILLWAY PLAN VIEW AND CROSS SECTION
__X__ OUTLET PIPE PLAN VIEW AND CROSS SECTION
__X__ INLET

- __X__ STRUCTURAL
- _____ TRASH RACK
- _____ GATE STEM
- _____ VENT PIPE
- __X__ EROSION PROTECTION

__X__ OUTLET ELEVATIONS AND GRADES
_____ IMPACT BASIN POSITIONS AND CONSTRUCTION DETAILS
_____ VALVE/GATE
_____ TOE DRAIN
_____ PIEZOMETERS
_____ CUT OFF COLLARS, SPACING DEMENSIONS, CONSTRUCTION DETAILS

II. BASIS OF DESIGN

A. HYDROLOGY

__X__ DRAINAGE AREA DESCRIBED
__X__ STORM RECURRENCE INTERVAL USED FOR DESIGN 100-YEAR (1%)
__X__ RUNOFF CALCULATION METHOD USED SCS CURVE NUMBER
__X__ FLOOD ROUTING METHOD USED MUSKINGUM, MUSKINGUM-CUNGE, KINEMATIC WAVE
__X__ FREEBOARD 3 FT

B. FOUNDATION

__X__ GEOTECHNICAL REPORT

__X__ SURFACE CONDITIONS
_____ SHEAR STRENGHT
_____ PERMEABILITY
__X__ GRAIN SIZE DISTRIBUTION AND CLASSIFICATION
_____ POSSIBLE GEOLOGICAL HAZARDS

__X__ BORINGS/TEST PIT LOGS

__X__ LOCATIONS ON PLANS
__X__ TOTAL DEPTH
__X__ STRATIGRAPHY WITH ELEVATIONS OF DIFFERENT FORMATIONS

_____ SEEPAGE ANALYSIS
_____ STRENGHT OF MATERIALS PROPOSED FOR USE AS FOUNDATION
__X__ DEPTH TO GROUND WATER

DAMONTE RANCH

Probable Maximum Precipitation Analysis
Diversion Structure & Regional Detention Facilities Proposed in the Application for Conditional Letter of Map Revision (CLOMR)

City of Reno, Washoe County, Nevada

PREPARED FOR:

Nevada Tri-Partners

Nimbus Job No. 0128
November 2001

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

The Damonte Ranch is located in the southeast Truckee Meadows, south of Reno, Nevada (Figure 1) and is in the process of being developed. The primary source of flooding in this area is Steamboat Creek.

An application for a Conditional Letter of Map Revision (CLOMR) for proposed development conditions was submitted to the Federal Emergency Management Association (FEMA) in March of 2001 (Nimbus, 2001) and accepted by FEMA in October of 2001. The purpose of the CLOMR was to document the affects of the following proposed structures on the existing floodplain maps:

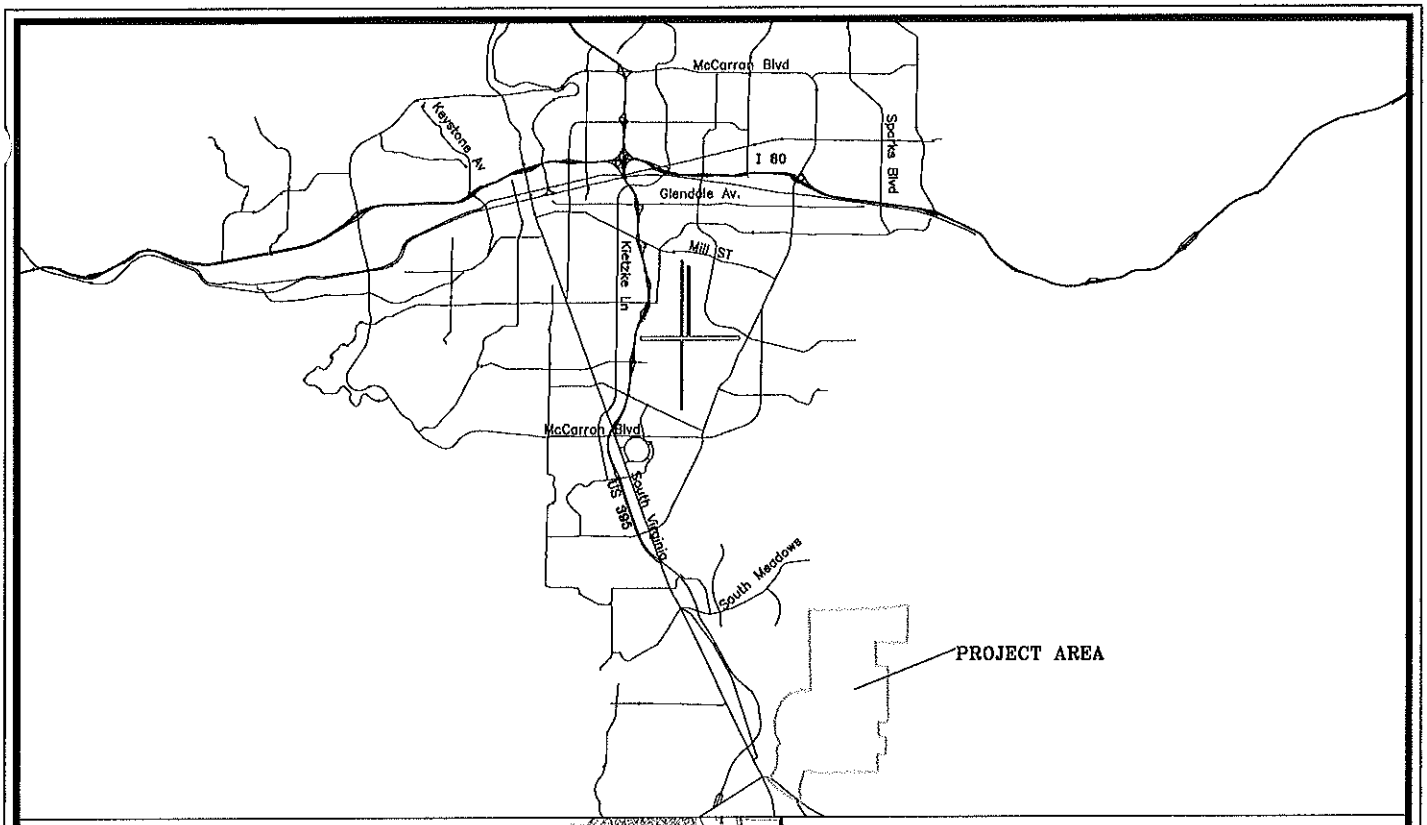
- The Steamboat Creek Diversion Structure
- Regional Detention Basin
- Flood Control Ponds and Wetlands
- Channelizing Steamboat Creek through the Damonte Ranch Development
- Re-distributing the channelized flow as sheet flow at the northern end of the Damonte Ranch

The proposed facilities operate as follows: The Diversion Structure divides the Steamboat Creek Flood waters. The 100 year event, about 8000 cfs, is divided about equally with 50% flowing north through culverts to the Steamboat Creek low flow channel and 50% being diverted eastward over a weir into regional flood control facilities. The first of these is the Regional Detention Basin which is one of two primary peak reduction facilities. From here, the flow goes into the Wetlands Detention Basin, the second peak reduction facility. The flow from the Wetlands is discharged over a weir to Pond #4, which directs the flow northward toward culverts under Steamboat Parkway. As requested by Nevada Division of Water Resources, this report presents a hypothetical probable maximum precipitation (PMP) storm event over the entire Steamboat Creek watershed to characterize the flow rates and water surface elevations for the regional detention facilities. The following facilities were evaluated: Steamboat Creek Diversion Structure, Regional Detention Basin (Basin 1), Wetlands Detention Basin, and Pond #4.

PRECIPITATION ANALYSIS

Probable maximum precipitation (PMP) is defined by the American Meteorological Society as: "the theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage basin at a particular time of year" (U.S. Department of Commerce, 1977). The 1977 joint report by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and the U.S. Department of Army, Corps of Engineers, entitled *Probable Maximum Precipitation Estimates, Colorado River and Great Basin Drainages (U.S. Department of Commerce, 1977)*, outlines the approach that was used for estimating the PMP for this area. This approach is based on an estimate of the general-storm PMP for a specific drainage for a given month. The PMP depth for this area was computed for both January and October based

on the outlined stepwise procedure (supporting calculations are included in Appendix C). The PMP depth for both months was determined to be 7.1 inches for a 24-hour period, the highest value for any month.



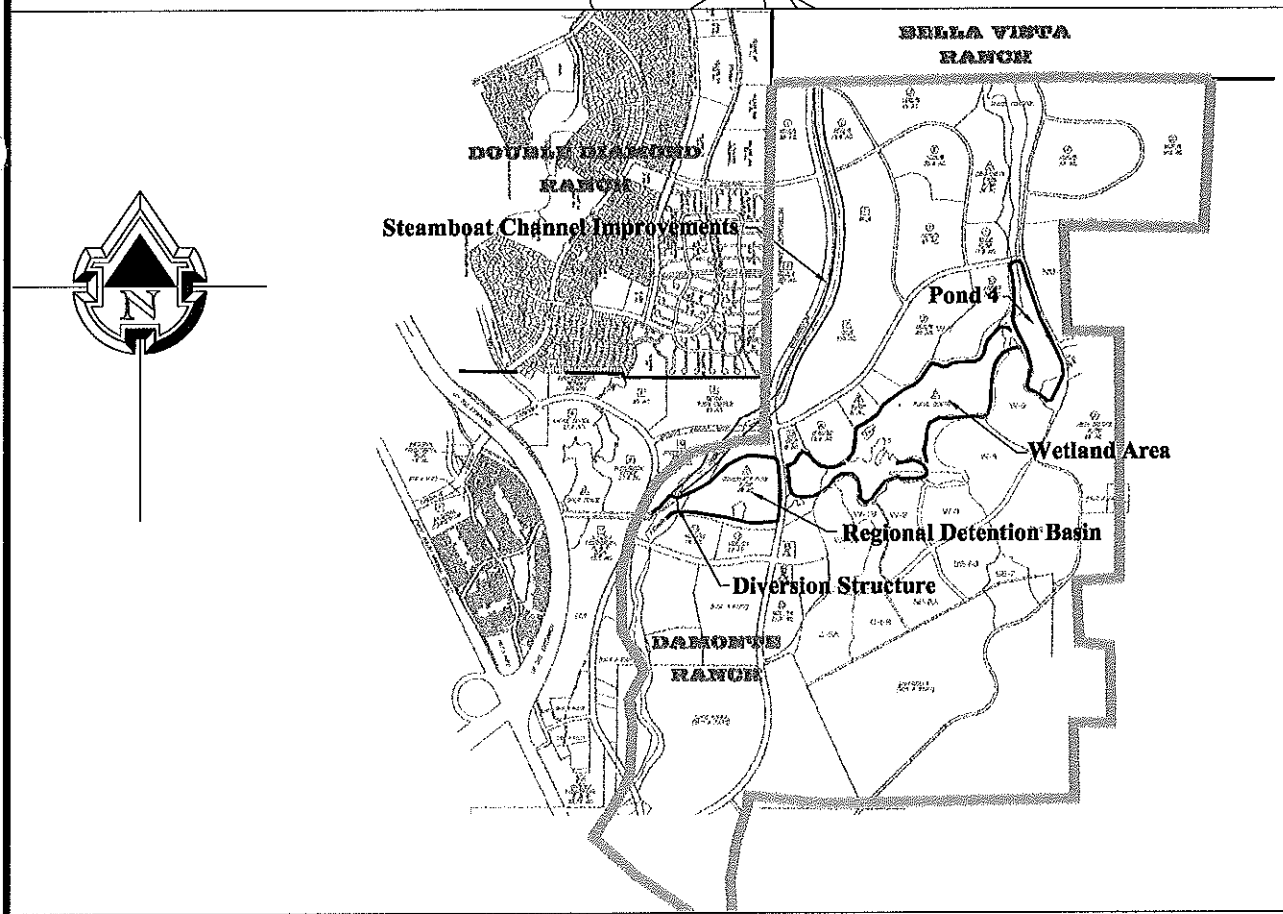


Figure 1
Vicinity Map

Nimbus Job #0128

Date: Nov. 2001

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

HYDROLOGIC & HYDRAULIC ANALYSES

The hydrologic analyses for this project were developed using the HEC-1 Flood Hydrograph Model (U.S. Army Corps of Engineer, 1998). The calculated PMP storm depth was first run to determine the model's predicted maximum flows. A Type II storm distribution was used in the HEC-1 modeling for this watershed and is consistent with the methodology employed in earlier investigations and reports. This storm distribution is considered to be conservative for this region. Hydrologic input parameters for the post-development conditions are discussed in depth in the *Application for Conditional Letter of Map Revision, Damonte Ranch/Double Diamond Ranch Regional Flood Control Improvements (Nimbus, 2001).* A general watershed map is included for reference (Figure 2).

The area of interest begins at the Diversion Structure (HEC-1 model point DIVSTR) on Steamboat Creek at the proposed flood control facilities on the Damonte Ranch (Figure 1). Modeling of the PMP showed a total flow in Steamboat Creek at the diversion structure of approximately 32,100 cfs. Hydraulic modeling of Steamboat Creek using the HEC-RAS River Analysis System (U.S. Army Corps of Engineers, 2001) showed that the channel, in its natural state, will not carry the entire flow calculated by HEC-1 using the PMP depth, and consequently, overtopping of the channel would result in some overland flow. In order to determine the flow that might reach the flood detention facilities during a probable maximum flood event, flow rates were tested in the model to determine the expected carrying capacity of the channel. Some 10,000 – 12,000 cfs or approximately 35% of the PMF volume appears to be the maximum channel capacity. The 10,000 cfs flow rate appeared to be the maximum that could be contained in the channel at the cross-sections upstream of the Diversion Structure.

In order to show the effects of this flow rate on the flood detention facilities, an iterative process was used in the HEC-1 model to determine a rainfall amount that produced approximately 10,000 cfs at the diversion structure. The HEC-1 modeling results for the PMP and the model used to produce the 10,000 cfs at the diversion structure are included in Appendix A. The HEC-RAS model results and the channel cross-sections upstream and downstream of the diversion structure are included in Appendix B.

Legend

- Watershed Boundaries
- Double Diamond Watershed Boundary
- Damonte Ranch Boundary
- Combine Points
- Routing

Note: Detailed watershed routing and combine points for Double Diamond are shown in:

Nimbus Engineers, Hydrologic and Hydraulic Analysis, Double Diamond Ranch, Phase I, Application for Letter of Map Revision (LOMR), August 1996 (FEMA Case No. 96-09-1083P)

Nimbus Engineers, Addendum to the Hydrologic and Hydraulic Analyses, Double Diamond Ranch, April 2000.

Nimbus Engineers, Hydrologic and Hydraulic Analysis, South Meadows Parkway and Central Channel, Double Diamond Ranch, Reno, Nevada, November 2000.

Nimbus Engineers, Application for Conditional Letter of Map Revision (CLOMR), Damonte Ranch/Double Diamond Ranch Regional Flood Control Improvements, March 2001.

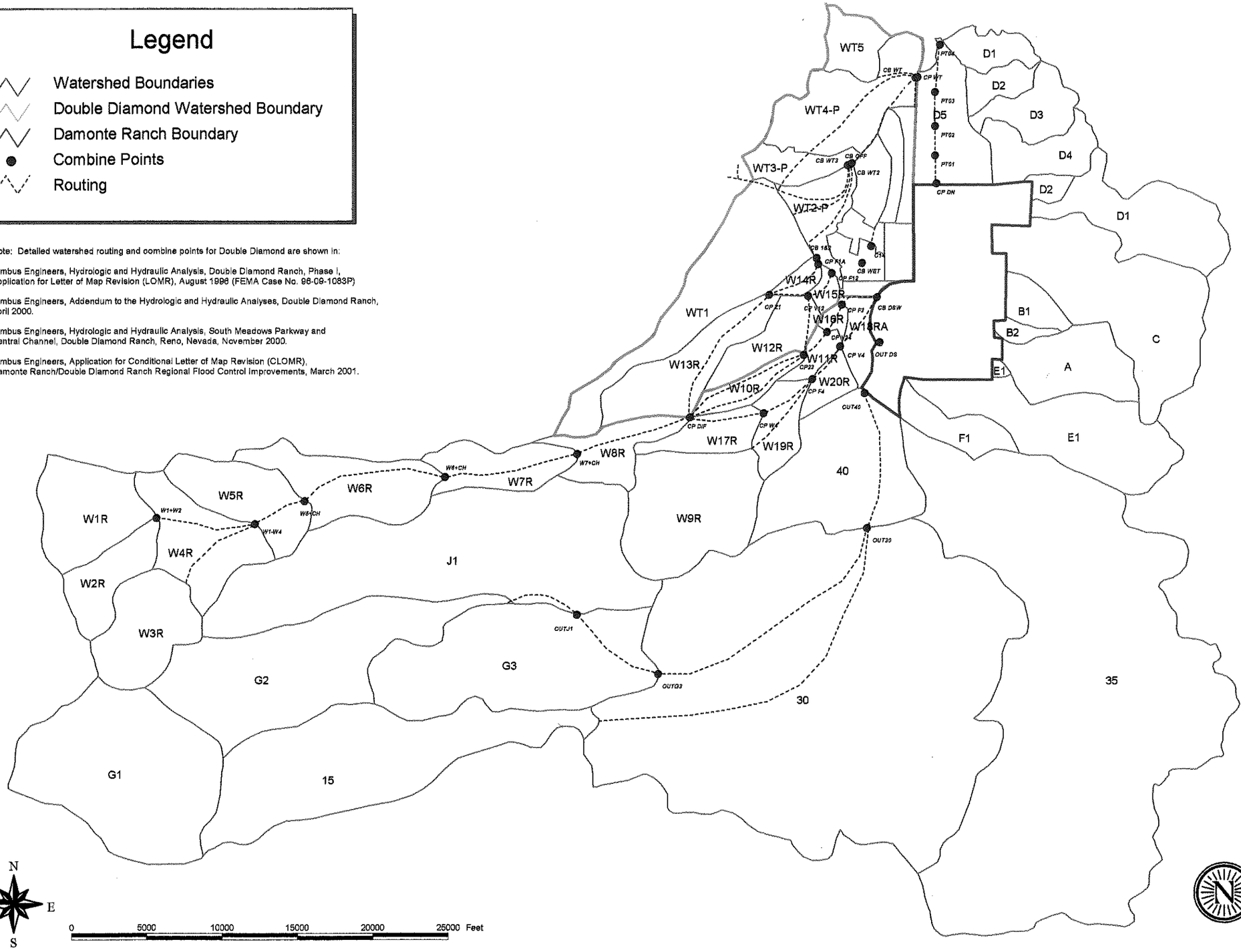


Figure 2

Proposed Conditions Watershed Map

Nimbus Job No. 0128

Date: November 2001

Nimbus Engineers

3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

MODELING RESULTS

The table below shows the flow rates, peak water stage, and lowest berm elevation by structure for the flood control facilities on Damonte Ranch.

	Model Designator	Flow Rate (cfs)	Peak Stage (ft)	Lowest Elevation in Flood Control System at Structure (ft)
Diversion Structure	DIVSTR	10,181	4488.9	4490.5
Detention Basin #1	BAS1	5,137	4484	4485
Wetlands	RS DT2	6,278	4462.5	4465
Pond #4	POND4	5,846	4458.6	4459

The peak flow rate at the Diversion Structure is 10,181 cfs. Of that amount, 5704 cfs is diverted into the regional flood control facilities on the Damonte Ranch and the remaining 4477 cfs continues through the culverts and into the low-flow Steamboat Creek channel. The weir height at the Diversion Structure is 4485 feet and the elevation of the ground above the culverts and around the Diversion Structure is 4490.5 feet (Sheets 3 & 4 of the Regional Flood Control Improvements Design Plans). Based on a modeled peak water surface elevation (WSEL) of 4488.9 feet at the Diversion Structure, no additional flow is anticipated to overtop the culverts and continue in the Steamboat Creek channel.

The lowest height of the berm around Detention Basin #1 is 4485 ft (Sheets 3, 4, & 5 of the Regional Flood Control Improvements Design Plans). Based on a modeled peak stage of 4484 feet for this basin, no floodwaters should overtop Detention Basin #1.

Downstream of Detention Basin #1, the minimum elevation of the berm around the Wetlands is 4465 feet (Sheets 8 & 9 of the Regional Flood Control Improvements Design Plans). The peak WSEL in the Wetlands is predicted to be 4462.5 feet based on the model. No floodwaters should overtop the Wetlands berm.

The final flood control structure in the series is Pond #4 (Sheets 8 & 9 of the Regional Flood Control Improvements Design Plans). The lowest elevation of the berm around Pond #4 is 4459 feet and is located above the culverts at Steamboat Parkway. The HEC-1 model is predicting a peak WSEL of 4458.6 feet. This is expected to create no overtopping hazard.

As a worst case scenario, the HEC-1 model was run with a precipitation depth that resulted in a flow of 12,000 cfs at the Diversion Structure. The peak WSEL at the Diversion Structure was 4489.68 feet with no anticipated overtopping. The peak WSEL predicted for Detention Basin #1 was 4485.55 feet. This is approximately 0.5 feet above the lowest bermed elevation in the structure and some overtopping of the berm in that

area might be anticipated. The velocity of the water flowing over the berm is approximately 6 ft/sec (Appendix C – Supporting Calculations). The maximum fill depth at the low point in the berm is 9 feet with an upstream slope of 5:1 and the downstream slope of 10:1. The berm will have a 10-foot wide compacted dirt roadway along the entire length for maintenance to the basin. All bermed areas will receive fill that is stripped, scarified to a depth of 6 inches, moisture conditioned, and compacted to 95 percent relative compaction as determined by the geotechnical report (Black Eagle Consulting, 2001). Slopes will be revegetated with a mixture of grasses, native shrubs, and flowers as recommended in the revegetation note (Sheet 7 of the Regional Flood Control Improvements Design Plans). No large trees will be planted on the berms.

Beyond Detention Basin #1, the peak WSEL, under this worst case scenario, in the Wetlands is 4464.5 feet with no expected overtopping. The model does predict that Pond #4 will have a peak WSEL of 4461.6 feet. It is anticipated that the majority of the high water in a PMF will top the berm at Detention Basin #1 therefore creating a significantly lower water surface elevation in Pond #4 than predicted by the model. Should overtopping of the culverts at Steamboat Parkway actually occur, the flow would be over a paved roadway and then into the channel. It would not create any additional threat to structures and would pose no major problems for the roadway structure.

Figures 3, 5, 7, and 9 show the storage versus elevation rating curves for the four (4) flood control structures on Damonte Ranch (Diversion Structure, Detention Basin #1, Wetlands, and Pond #4) and figures 4, 6, 8, and 10 show the discharge versus elevation curves for these same structures.

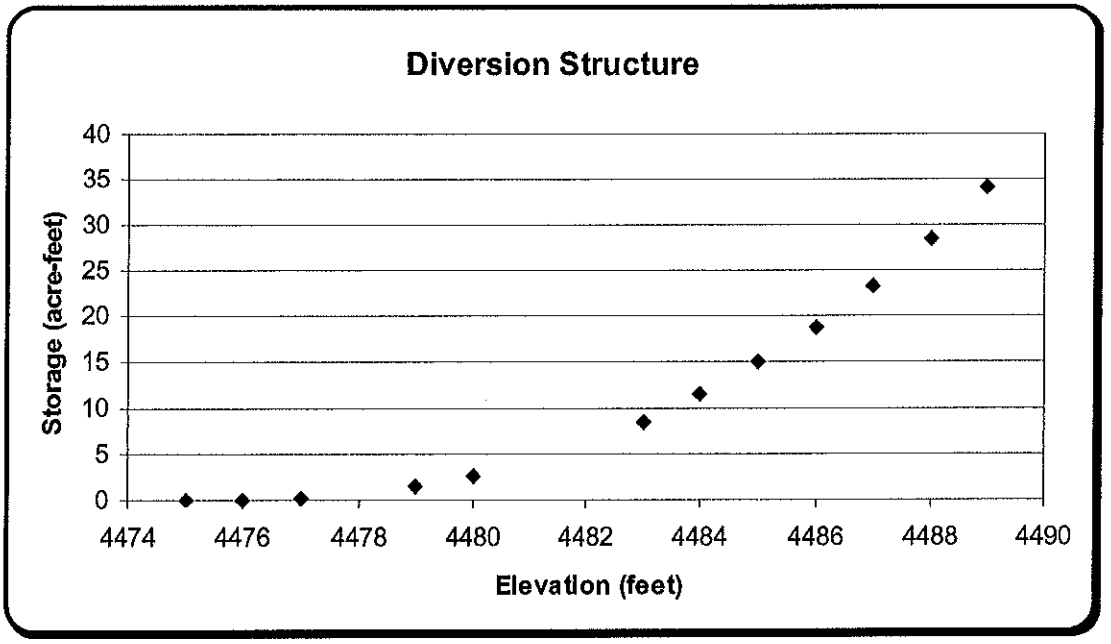


Figure 3. Diversion Structure – Storage vs Elevation Rating Curve

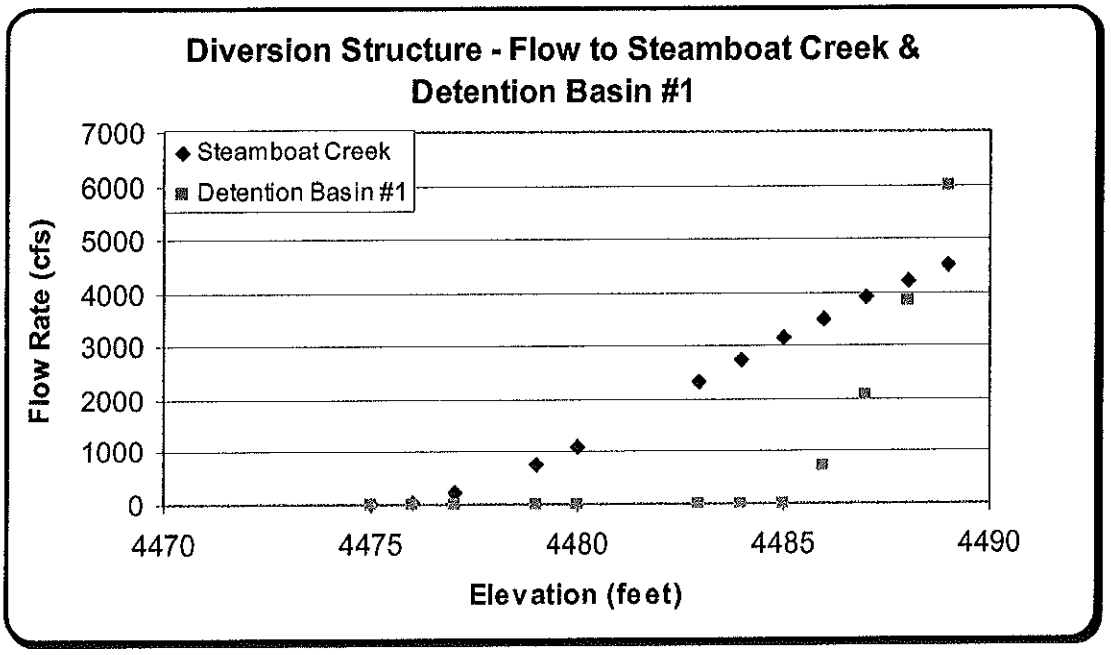


Figure 4. Diversion Structure – Discharge to Steamboat Creek and Diversion Structure versus Elevation Rating Curve

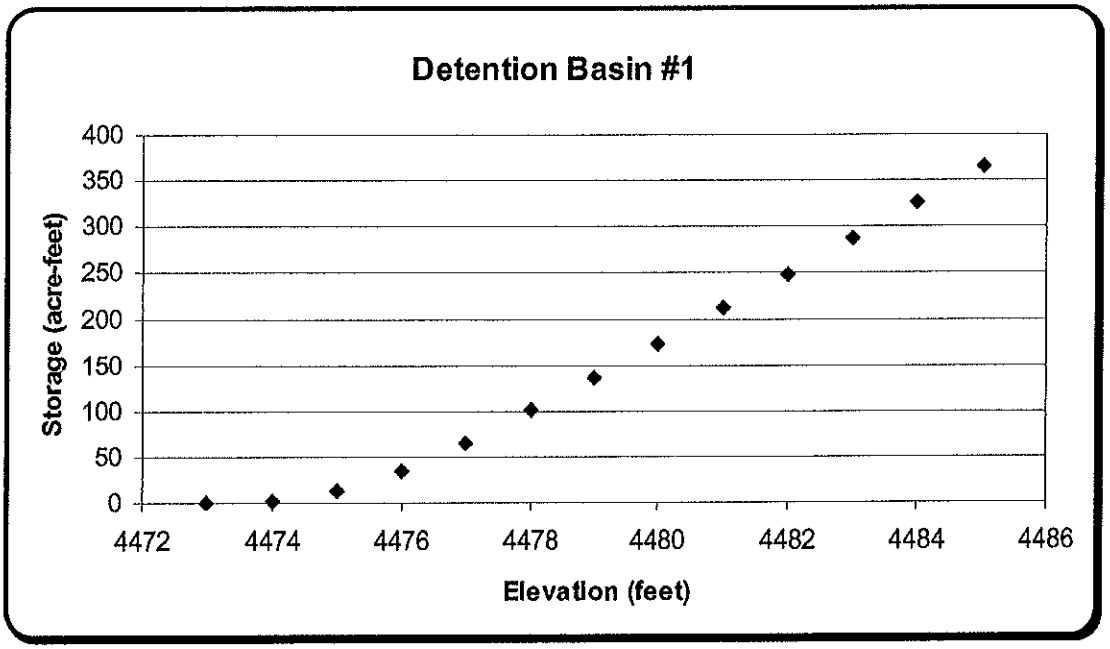


Figure 5. Detention Basin #1 – Storage vs Elevation Rating Curve

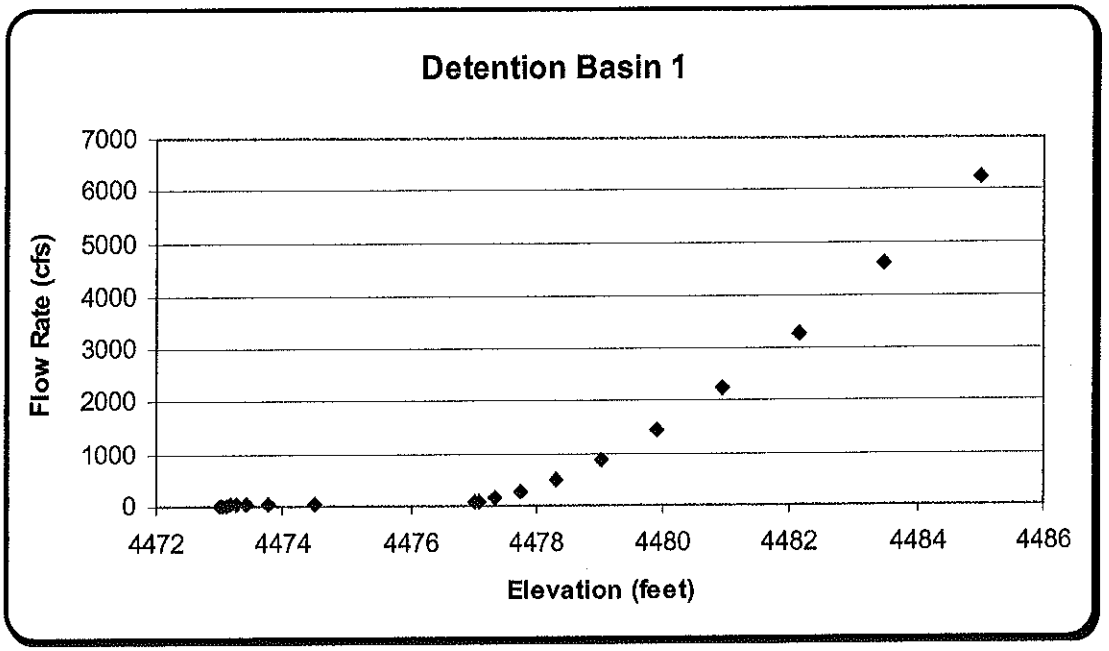


Figure 6. Detention Basin #1 – Discharge vs Elevation Rating Curve

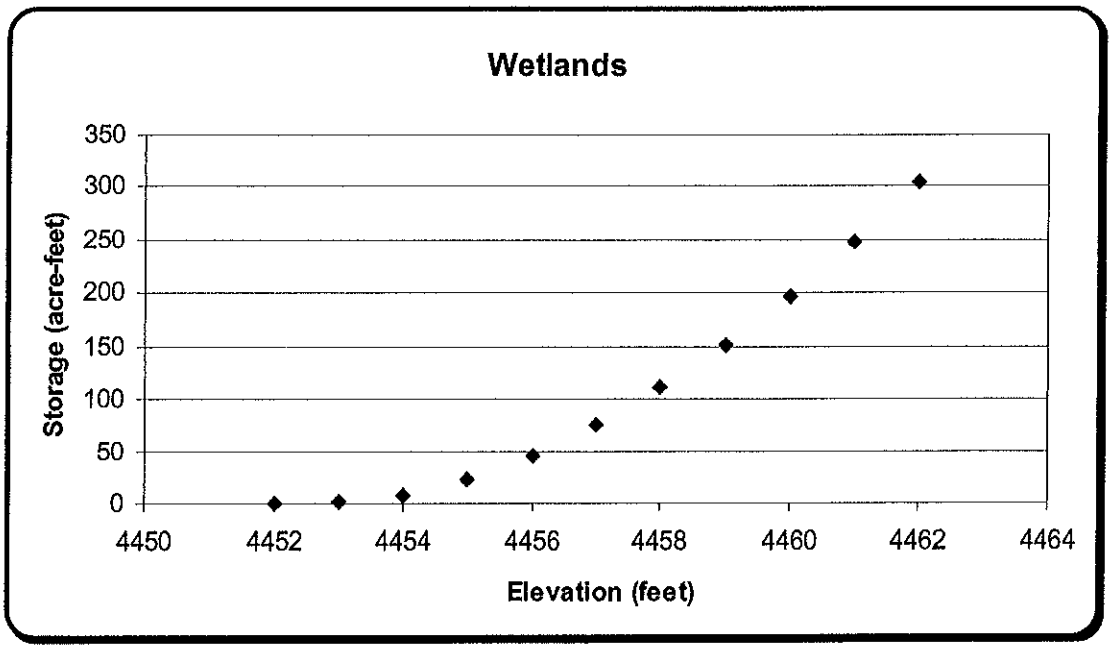


Figure 7. Wetlands – Storage vs Elevation Rating Curve

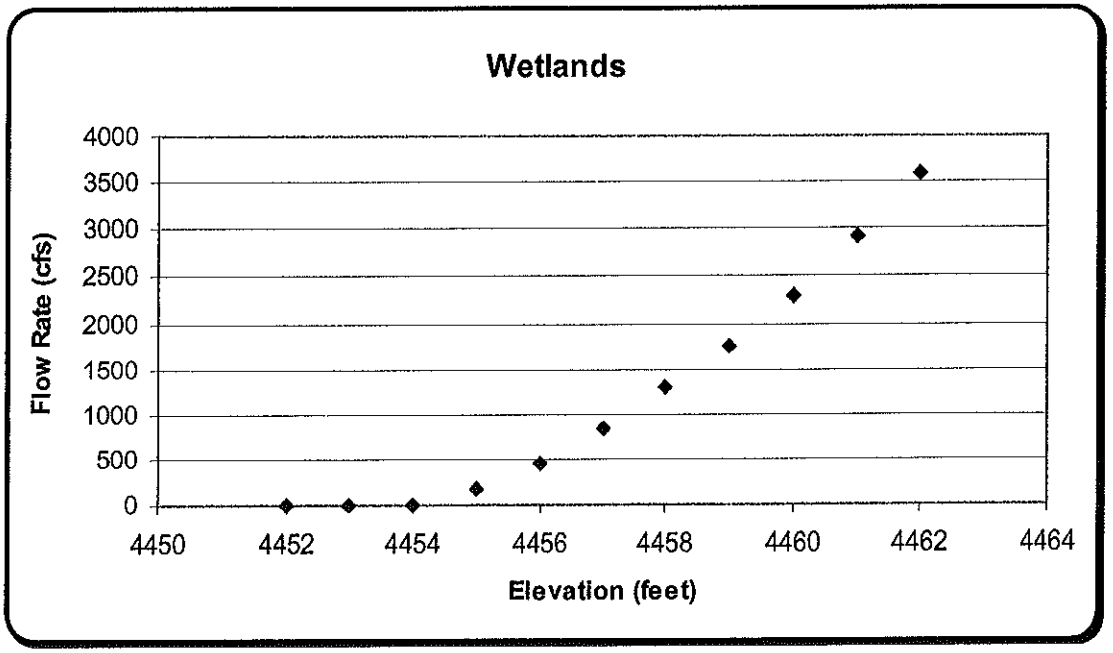


Figure 8. Wetlands – Discharge vs Elevation Rating Curve

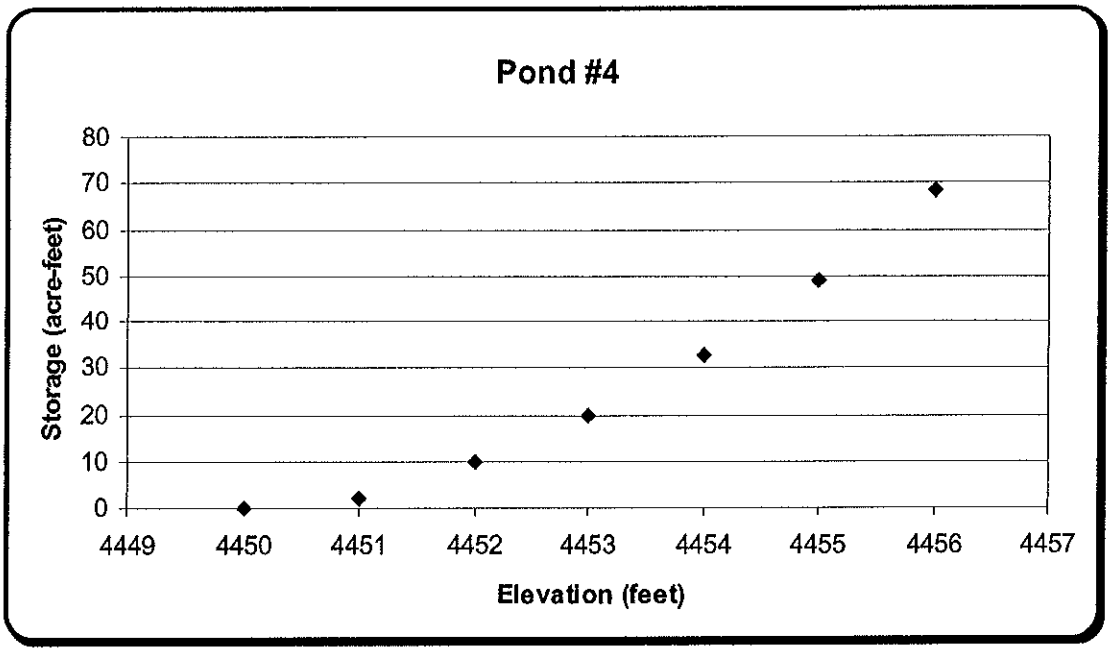


Figure 9. Pond #4 – Storage vs Elevation Rating Curve

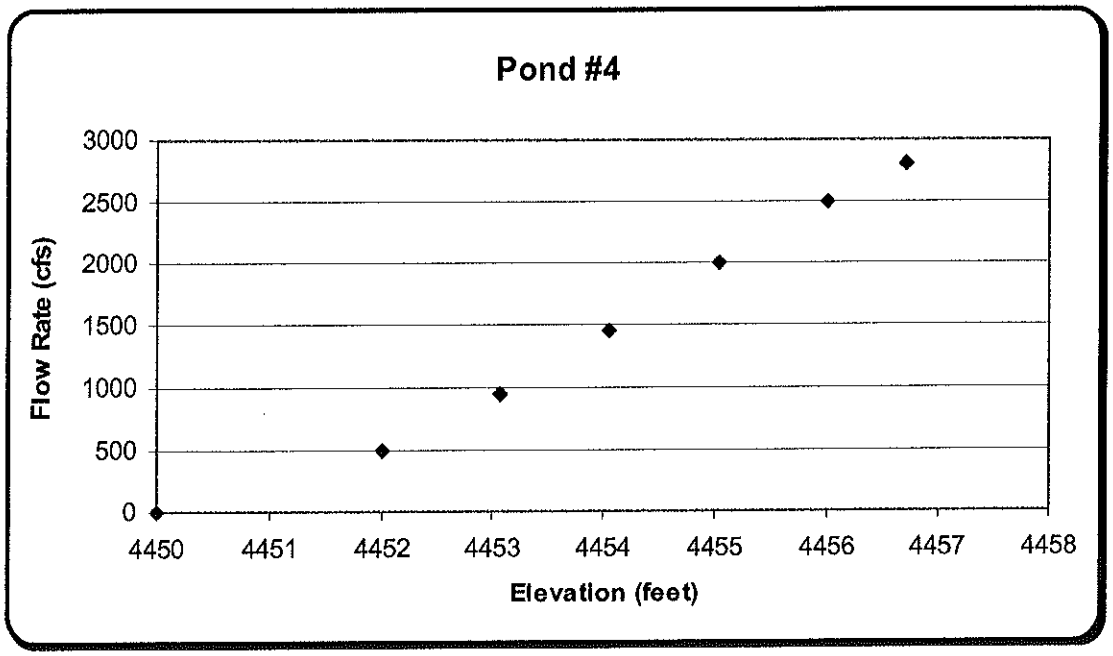


Figure 10. Pond #4 – Discharge vs Elevation Rating Curve

REFERENCES

Bureau of Reclamation (BOR), Design of Small Dams, U.S. Department of Interior, A Water Resource Technical Publication, 1977.

Black Eagle Consulting, Inc., Detention Basin Levee Design and Construction Criteria, Damonte Ranch, May, 2001.

Nimbus Engineers, Whites Creek Detention Facility Feasibility Study, June 1993.

Nimbus Engineers, Hydrologic and Hydraulic Analysis, Whites Creek Meadows Subdivision, Application for Conditional Letter of Map Revision (CLOMR), October 1994.

Nimbus Engineers, Hydrologic and Hydraulic Analysis South Meadows/Double Diamond Ranch, February 1995.

Nimbus Engineers, Southeast Truckee Meadows Flood Control Master Plan, May 1995

Nimbus Engineers, Hydrologic and Hydraulic Analysis, Double Diamond Ranch, Phase I, Application for Letter of Map Revision (LOMR), August 1996 (FEMA Case No. 96-09-1083P)

Nimbus Engineers, Addendum to the Hydrologic and Hydraulic Analyses, Double Diamond Ranch, April 2000.

Nimbus Engineers, Hydrologic and Hydraulic Analysis, South Meadows Parkway and Central Channel, Double Diamond Ranch, Reno, Nevada, November 2000.

Nimbus Engineers, Application for Letter of Map Revision, Branch 3 of Whites Creek, Hydraulic Analysis of Branch 3, March 2001 (FEMA Case No. 01-09-588P).

Nimbus Engineers, Application for Conditional Letter of Map Revision, Damonte Ranch/Double Diamond Ranch Regional Flood Control Improvements, March 2001 (FEMA Case No. 01-09-589R).

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1: Flood Hydrograph Package, Version 4.1, June 1998.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System, Version 3.0.1, March 2001.

U.S. Department of Agriculture, Soil Conservation Service, SCS National Engineering Handbook, Section 4 - Hydrology, March 1985.

U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Washoe

County, Nevada, South Part, August 1983.

U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, Urban Hydrology for Small Watersheds, Technical Release 55, June 1986.

U.S. Department of the Army, Corps of Engineers, Sacramento District, Truckee River, California and Nevada, Hydrology, February 1980.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2, Water Surface Profiles, Version 4.6.2, May 1991.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration and U.S. Department of Army, Corps of Engineers, Probable Maximum Precipitation Estimates, Colorado River and Great Basin Drainages, Hydrometerological Report No. 49, September 1977.

U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Map, Mount Rose NE Quadrangle, Scale 1:24000, Contour Interval 20 Feet, 1994.

Washoe County, Hydrologic Criteria and Drainage Design Manual, Final Draft Report, December 2, 1996.

Washoe County, Hydrologic Criteria and Drainage Design Manual, June 1997.

Washoe County, Nevada, Department of Water Resources, Southern Washoe County, Precipitation Frequency of the United States, NOAA Atlas 14, Volume 1 – Semi-arid Southwestern United States (Map), April 1997.

NOVEMBER 2002

Southeast Truckee Meadows Flood Control Master Plan Addendum

Southeast Damonte Ranch

Prepared for:

Nevada Tri-Partners

November 2002

Job No. 0214

Nimbus Engineers

3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

Table of Contents

Table of Figures

Figure Page

List of Plates

Plate Page

List of Tables

Appendices

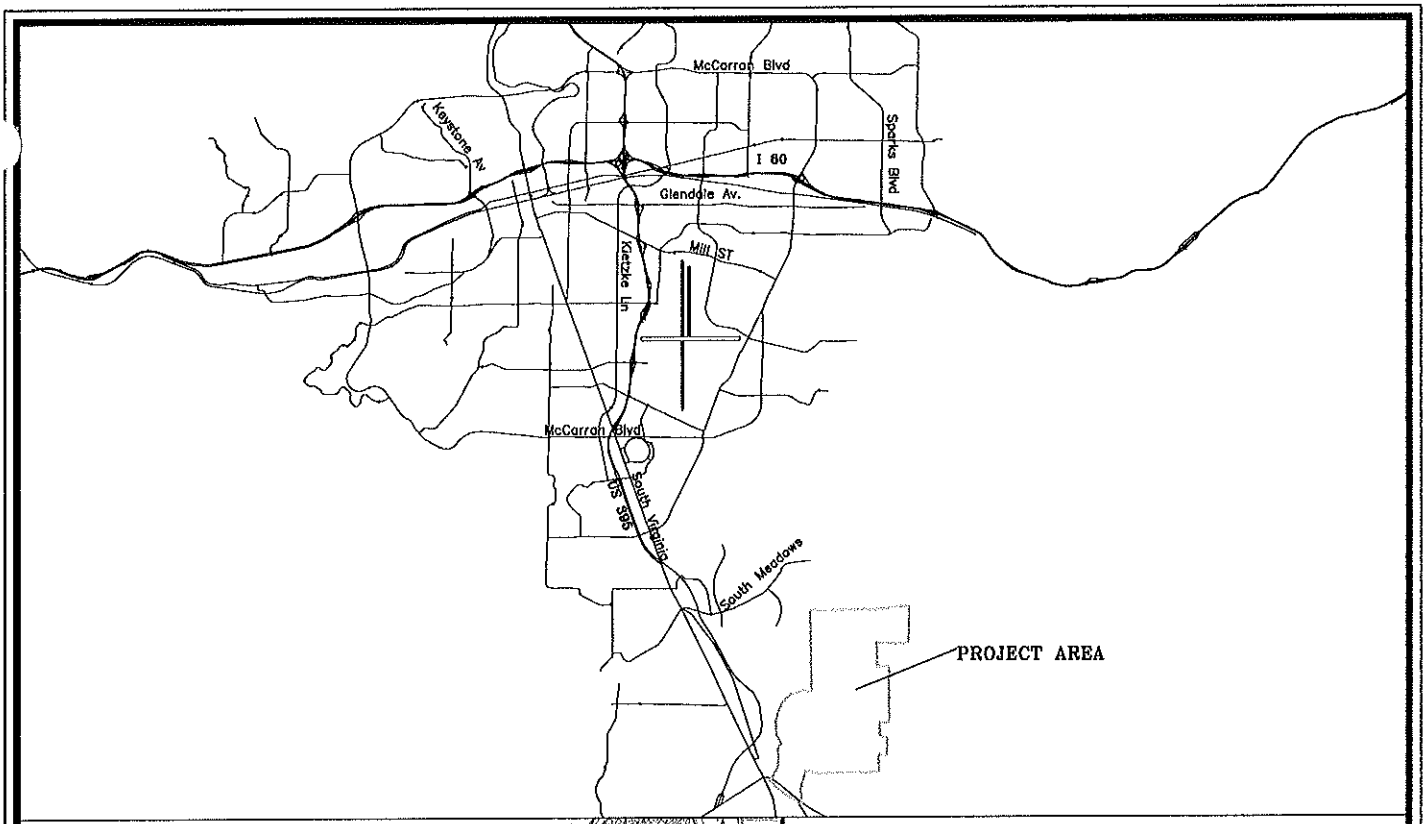
1.0 Introduction

The Southeast Truckee Meadows Flood Control Master Plan was originally prepared for the Nevada Tri-Partners in May 1995 (Nimbus, 1995). This plan was developed in order to provide a general framework for the future development within the area north of Geiger Grade referred to as the Damonte Ranch. This area is bounded on the east by Mira Loma Road, the west by Old Highway 395 / South Virginia Street, and on the north by the Bella Vista Ranch and the Double Diamond Ranch development. Figure 1 shows a vicinity map for this area.

The Southeast Truckee Meadows Specific Plan area lies within the Steamboat Creek hydrologic basin. In addition to Steamboat Creek, flows from two branches of Whites Creek and flows from the Virginia Range affect this area. Regional detention facilities and major channel systems provide conveyance and control of 100-year storm waters. A Conditional Letter of Map Revision (CLOMR) for the Damonte Ranch/Double Diamond Ranch Regional Flood Control Improvements (FEMA Case No. 01-09-589R) (Nimbus, 2001) was approved by FEMA in October of 2001.

A number of hydrology and hydraulic analysis reports are available for this area and the surrounding development. These reports are listed in the reference section.

The Southeast Damonte Ranch is located within the watersheds surrounding the new flood control detention facilities on Damonte Ranch. Damonte Ranch is a medium- to high-density single family residential development with lot sizes generally less than 1/8 acre. This is in general agreement with the original Specific Plan used to develop the Master Flood Control Plan.



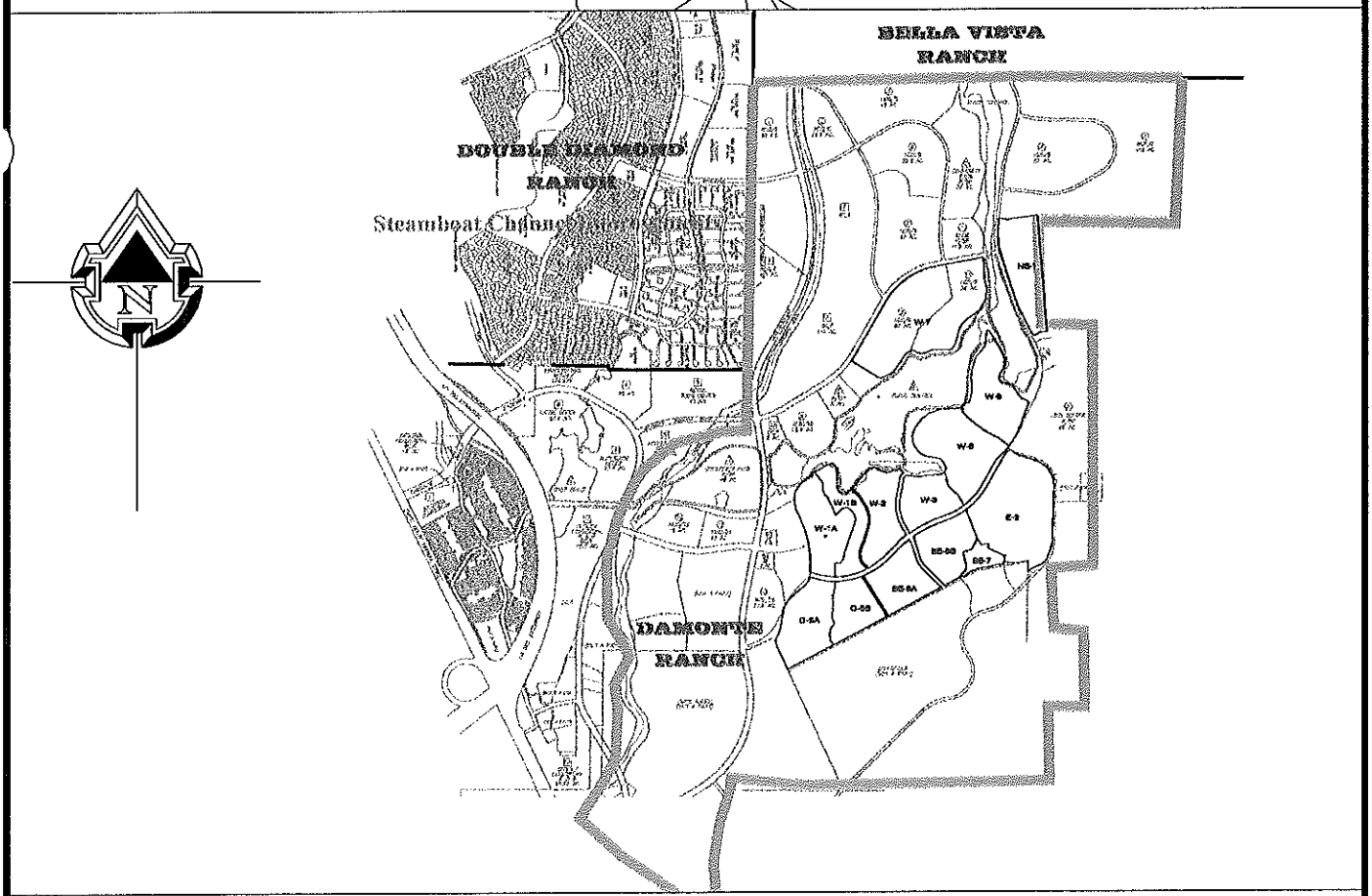


Figure 1
Vicinity Map

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

Nimbus Job #0214

Date: Nov. 2002

2.0 Hydrologic Analyses for Southeast Damonte Ranch

The SCS methods were originally used to develop the on-site parameters used in the HEC-1 (U.S. Army Corps of Engineers, 1998) hydrologic modeling for the Southeast Truckee Meadows. The watershed boundaries for the Southeast Damonte Ranch were modified only slightly in this study from the original proposed watersheds. Watershed areas were adjusted to agree with the new layout. Figure 2 shows the watershed map for the region and Figure 3 shows the original proposed development on-site watersheds. Plate 1 shows the up-dated developed conditions on-site watersheds used in the new HEC-1 model.

Curve numbers originally developed for this area as a part of the Southeast Truckee Meadows Flood Control Master Plan were used in both the original and the new proposed conditions hydrologic models. Any changes based on development type are reflected in the percent impervious area. The average percent impervious area for the new Southeast Damonte Ranch was determined based upon the criteria in Table 702 of the Washoe County, Hydrologic Criteria and Drainage Design Manual (Washoe County, 1996). This parameter was adjusted in the model to agree with the estimated percent impervious area by watershed. Developed conditions used to estimate percent impervious were 1/8 and ¼ acre lots, neighborhood areas, and parks and golf courses. Table 1 shows the watersheds modified by division or simply by hydrologic parameters in the HEC-1 model.

Table 1. HEC-1 watershed parameters.

Original HEC-1 model – PSTMWHIT.DAT					Updated HEC-1 Model – 214DMNTE.DAT				
Watershed	Area (mi^2)	CN	% Imp	Lag Time (hr)	Watershed	Area (mi^2)	CN	% Imp	Lag Time (hr)
C-5	0.068	70	63	0.20	C-5A	0.046	70	65	0.20
					C-5B	0.029	70	65	0.20
C-7	0.026	81	70	0.16	C-7	0.025	81	70	0.16
T-1	0.036	74	68	0.20	T-1	0.034	74	68	0.20
W-1	0.065	81	65	0.22	W-1A	0.044	81	65	0.22
					W-1B	0.027	81	65	0.22
W-2	0.027	73	5	0.18	W-2	0.039	73	5	0.18
W-3	0.04	73	70	0.18	W-3	0.031	73	65	0.18
W-8	0.063	81	63	0.19	W-8	0.062	81	65	0.19
W-9	0.041	81	64	0.19	W-9	0.048	81	65	0.19
E-2	0.07	74	38	0.21	E-2	0.09	74	38	0.21
SE-7	0.01	76	65	0.14	SE-7	0.01	76	65	0.14
SE-8	0.065	78	64	0.22	SE-8A	0.035	78	65	0.22
					SE-8B	0.036	78	65	0.22
W-6	0.017	77	5	0.15	NA				
W-7	0.053	76	70	0.17	W-7	0.11	76	65	0.3
NE-1	0.044	63	34	0.24	NE-1	0.05	63	38	0.24
N-1	0.104	76	68	0.29	N-1	0.081	76	68	0.29
NW-3	0.076	73	65	0.22	NW-3	0.069	73	65	0.22

Explanation

- Watershed Boundaries
- Damonte Watershed Boundary
- Combine Points
- Routing

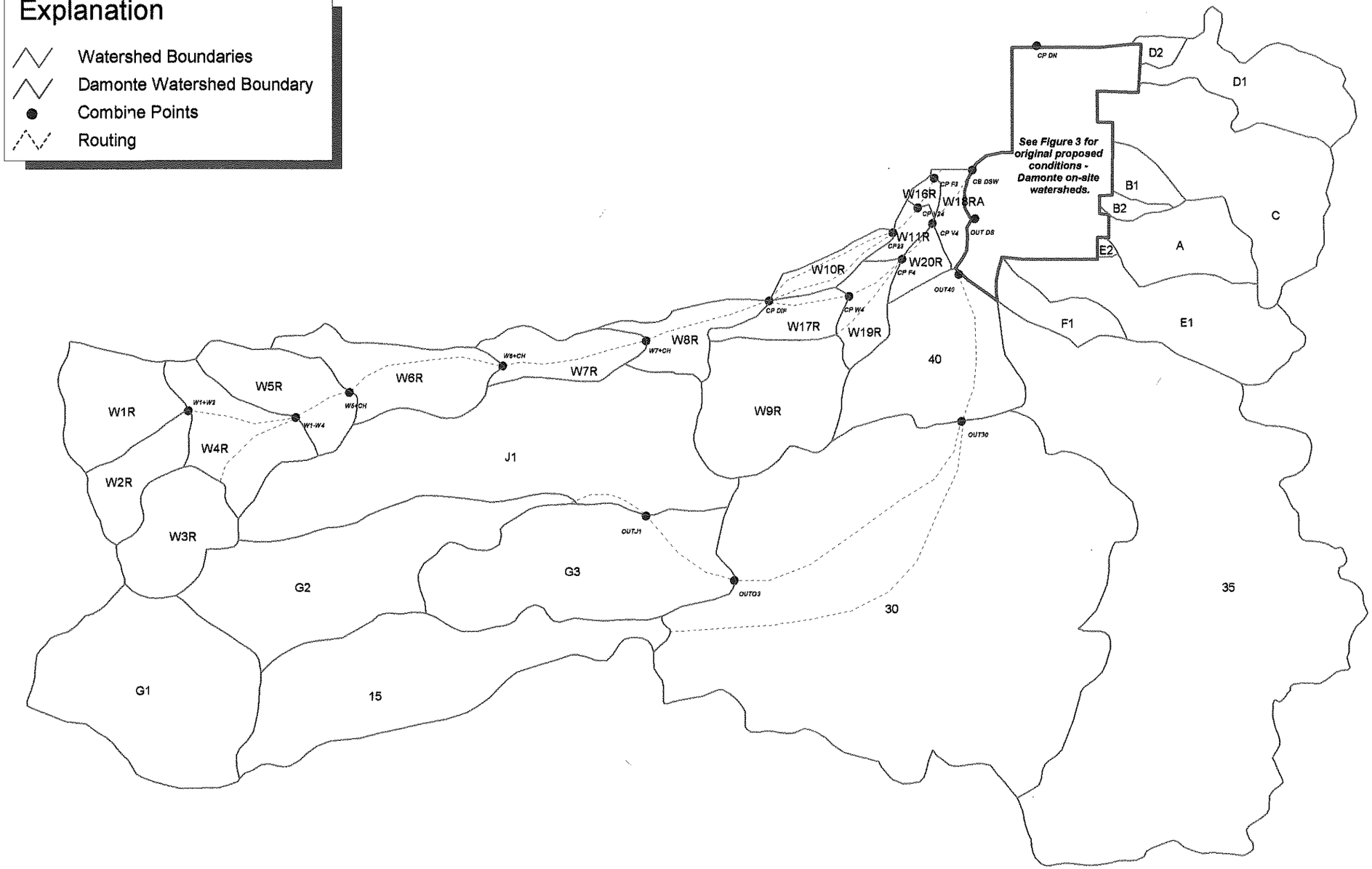


Figure 2

Off-site
Watershed Map

Nimbus Job No. 0214

Date: April 2002

N
W E
S

0 5000 10000 15000 20000 25000 Feet

Nimbus Engineers

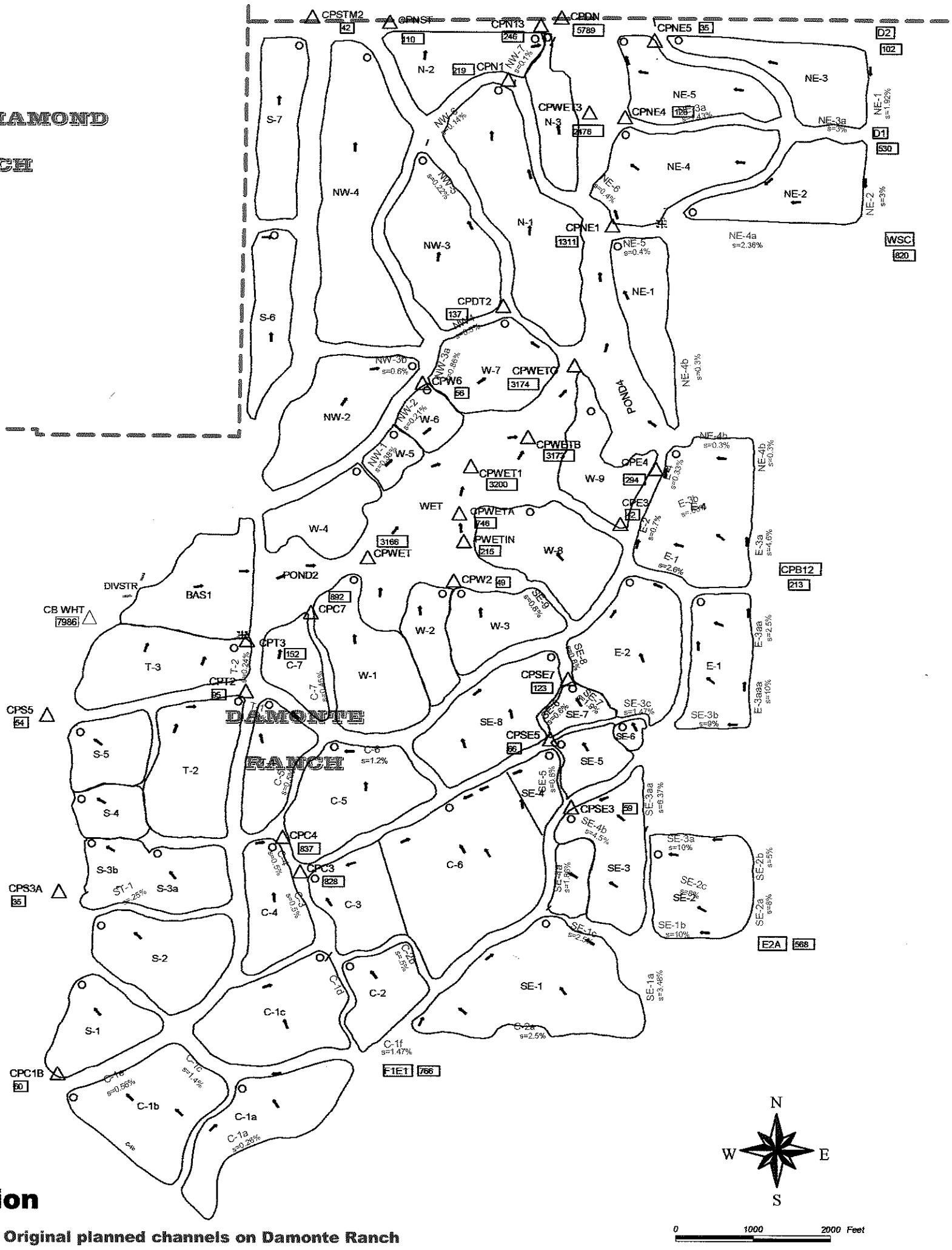
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

DOUBLE DIAMOND

RANCH

BELLA VISTA

RANCH



Explanation

C-7 s=0.45% **Original planned channels on Damonte Ranch**

C-7 s=0.45% **Channels to be re-routed**

Figure 3
Damonte Ranch
On-Site Watershed Map (1995)
(Flow rates shown for 100-year event)

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

Nimbus Job No. 0214

Date: May 2002

Plate 1 – Post-development map for Southeast Damonte Ranch

Lag times for all of the new and modified watersheds were reviewed and found to be comparable with those in the Southeast Truckee Meadows Flood Control Master Plan. Therefore, with the exception of watershed W-7 which was combined with W-6 under proposed conditions, the original lag times calculated for the Southeast Truckee Meadows Flood Control Master Plan were maintained. The calculations are shown in Appendix C.

3.0 Hydraulic Analyses for Channel and Culvert Designs

Watershed flows are routed through a series of proposed drainage channels within the on-site development. Slight changes to the layout of the Southeast Damonte Ranch required that drainage channels C-6, SE-7, SE-8, SE-9, E-1 and E-2 be removed and replaced with drainage channels C-5B, W-1B, SE-8A, and W-3 (see Plate 1). Channels C-5 and C-7 will be relocated slightly to the west to accommodate the larger size of watersheds C-5A and W-1A.

Conceptual designs have been developed for the channels and their culverts at the road crossings within the Southeast Damonte Ranch. Channels are planned to be of moderate slope with natural vegetation and pedestrian walkways alongside. Where natural channel slopes are such that average velocities exceed 5 fps, drop structures have been incorporated into the model to reduce channel slopes and lower the average flow velocities to less than 5 fps. Those models are included in Appendix B. Note, however, that the original plans for channels with average channel velocities in excess of 5 fps show riprap for the channel bottom and sides. Table 2 summarizes the proposed channel design and Table 3 summarizes the proposed culvert sizing to convey the 100-year, 24-hours peak flows for the new channels and culverts within the Southeast Damonte Ranch. For reference the location of these channels and culverts are shown on Plate 1 using the model designations.

- Channel C-4 begins at the southwest corner of the Southeast Damonte Ranch. It is planned as a 45-ft wide channel with 3:1 side slopes and will convey flows from the watersheds to the south of the development (Plate 1: F1E1, C-1C, C-2, and C-3). The approximate Q_{100} peak flow for this segment of channel is 840 cfs (at Combine Point CPC4 in the model and on Plate 1). The natural slope of this channel is 0.013 ft/ft. In order to reduce the average channel velocity to less than 5 fps, two (2) 2-ft drop structures spaced at approximate 200-ft intervals are proposed for this section of channel. Channel C-4 ends along the west side of the Southeast Damonte Ranch where channel C-5 begins.

- Channel C-5 begins along the west side of the Southeast Damonte Ranch. It is planned as a 45-ft wide channel with 3:1 side slopes and will convey flows from the watersheds C-4 and C-5A as well as the flow in channel C-4. The approximate Q_{100} peak flow for this segment of channel is 840 cfs (at Combine Point C-C5A in the model and on Plate 1). The natural slope of this channel is 0.009 ft/ft. In order to reduce the average channel velocity to less than 5 fps, four (4) 2-ft drop structures spaced at approximate 400-ft intervals are proposed for this section of channel to develop an effective slope of 0.005 ft/ft. Channel C-5 conveys floodwaters to the culverts under Damonte Parkway South at crossing C-C5A. The modeled culverts at this crossing are three (3) 10' x 4' RCBs.

- Channel C-7 starts at the outlet of the culverts at C-C5A and continues to the Damonte flood control facilities. It is also planned as a 45-ft bottom width channel with 3:1 side slopes and will convey flows from watersheds C-7 and W-1A in addition to the flow coming from channel C-5. The approximate Q_{100} peak flow for this segment of the channel is 860 cfs (at Combine Point CPC7 in the model and on Plate 1). The natural slope of this channel section is 0.014 ft/ft. In order to maintain average channel velocities below 5 fps, six (6) 2-ft and one (1) 3-ft drop structures spaced at approximate 250-ft intervals are proposed for this section of channel. This channel will discharge to the Damonte flood control facilities and will be dispersed and returned to sheetflow as it leaves the channel.

- Channel C-5B passes between the Southeast Damonte Ranch watersheds C-5B and SE-8A. Overland flows from watershed C-6 will be collected at the back of the lots along watersheds C-5B and SE-8A in a temporary collector channel and conveyed to channel C-5B. The Q_{100} peak flow from watershed C-6 is approximately 35 cfs. A simplified cross-section for a 5-ft bottom width collector channel is included in Appendix B with the model for channel C-5B. Flows from watersheds C-6 and C-5B (Plate 1) will be conveyed through channel C-5B. As these are relatively small Q_{100} peak flows, approximately 55 cfs (at Combine Point C-C5B in the model and on Plate 1), a 5-ft bottom width channel with 3:1 side slopes is proposed. The natural slope of this channel is 0.018 ft/ft. The peak flow rates, however, are such that this channel geometry passes the flows and maintains the average channel velocity below 5 fps without the need for drop structures. Channel C-5B conveys floodwaters to the culverts below Damonte Parkway South at road crossing C-C5B. The modeled culverts at C-C5B are two (2) 36" RCPs.

- Channel W-1B starts at the outlet of the culvert at C-C5B and continues to the Damonte flood control facilities. This channel section is also planned as a 5-ft bottom width channel with 3:1 side slopes and will convey the flow from channel C-5B and watershed W-1B – approximate Q_{100} peak flow of 80 cfs (at Combine Point CPW1B in the model and on Plate 1). The natural slope of this channel is 0.018 ft/ft. Modeling of the proposed channel shows no need to provide any drop structures for energy dissipation as the average channel velocities remain below 5 fps. This channel will discharge to the Damonte flood control facilities and will be dispersed and returned to sheetflow as it leaves the channel.

- Channel SE-8A passes between the Southeast Damonte Ranch watersheds SE-8A and SE-8B. It is planned as a 45-ft wide channel with 3:1 side slopes and will convey flows from the watersheds to the south and east of the development (Plate 1: E2A, SE-1, SE-2, SE-3, SE-4, SE-5, SE-6, SE-7, SE-8A, SE-8B and E-2). The approximate Q_{100} peak flow for this segment of channel is 640 cfs (at Combine Point CSE-8A in the model and on Plate 1). The natural slope of this channel is 0.022 ft/ft. In order to reduce the average channel velocity to less than 5 fps, seven (7) 2-ft drop structures spaced at approximate 150-ft intervals are proposed for this section of channel. Channel SE-8A conveys floodwater to the culverts below Damonte

Parkway South at road crossing CSE-8A. The culverts at CSE-8A are three (3) 10' x 4' RCBs.

A simplified cross-section for the collection channel for the flows from watersheds E-2, SE-6, and SE-7 is included in Appendix B with the model for channel SE-8A. This temporary section of collector channel will pick up and carry a Q_{100} peak flow of approximately 70 cfs. This collector channel will flow into a larger collector channel at the back of the lots on watershed SE-8B. A simplified cross-section for this section of channel is also included in Appendix B with the model for channel SE-8A. This section of collector channel will convey the flows from watersheds E2A, SE-1, SE-2, SE-3, SE-4 and the flow from the smaller collector channel to the east. The ground slope in this area is minimal and therefore no drop structures are planned in the collector channels.

- Channel W-3 starts at the outlet of the culverts at CSE-8A and continues to the Damonte flood control facilities. It is also planned as a 45-ft bottom width channel with 3:1 side slopes and will convey flows from watersheds W-2 and W-3 in addition to the flow coming from channel CSE-8A. The approximate Q_{100} peak flow for this segment of the channel is 650 cfs (at Combine Point CPW2 in the model and on Plate 1). The natural slope of this channel section is 0.016 ft/ft. In order to maintain average channel velocities below 5 fps, six (6) 2-ft drop structures spaced at approximate 250-ft intervals are proposed for this section of channel. This channel will discharge to the Damonte flood control facilities and will be dispersed and returned to sheetflow as it leaves the channel.

The Southeast Damonte Ranch watersheds W-7, W-8, W-9, and NE-1 will discharge to the Damonte flood control facilities and associated drainage network via on-site storm drainage pipes.

Table 2. Summary of proposed channel design.

Channel	Approx. Length (feet)	Channel Bottom Width (ft)	Uniform Side Slopes	Natural Slope (ft/ft)	Design Slope (ft/ft)	Manning 'n'	Q_{100} Peak Flow (cfs)	Average Velocity (fps)
C-4	600	45	3:1	0.013	0.006	0.045	840	5.0
C-5	1443	45	3:1	0.009	0.005	0.045	840	4.6
C-7	1767	45	3:1	0.014	0.006	0.045	860	5.0
C5-B	882	5	3:1	0.018	0.018	0.045	55	4.25
W1-B	1683	5	3:1	0.018	0.018	0.045	80	4.5
SE-8A	1106	45	3:1	0.022	0.008	0.045	640	4.9
W-3	1208	45	3:1	0.016	0.008	0.045	650	4.9

Table 3. Summary of proposed culvert design.

Culvert Designator	RCB/RCP Size	Number of Boxes/Pipes	Peak Flow (cfs)	Outlet Velocity (fps)
C-C5A	10' x 4'	3	840	14.77
C-C5B	36"	2	55	7.8
C-SE8A	10' x 4'	3	640	11.76

4.0 Summary of Findings

1. The Southeast Damonte Ranch follows the general land use plan upon which the Southeast Truckee Meadows Flood Control Master Plan is based.

2. The HEC-1 hydrologic modeling of the proposed Southeast Damonte Ranch shows that the water surface elevations within the Damonte flood control facilities for the 100-year event remain essentially the same as the original design and will have no adverse affects. The flood detention facilities, as designed in the original Southeast Truckee Meadows Flood Control Master Plan, are adequate in capacity to convey and mitigate peak flows from fully developed upstream areas without negatively impacting downstream properties. Table 4 summarizes the peak flow and stage for each of the flood control structures based on the CLOMR approved for the Damonte Ranch and on modeling results contained in this report.

   Table 4. Summary of peak flows and stage for the Damonte flood control facilities.

Structure	Model Designator	CLOMR		This Report	
		Peak Flow (cfs)	Peak Stage (ft)	Peak Flow (cfs)	Peak Stage (ft)
Detention Basin #1	BAS 1	3246	4482.12	3246	4482.12
Wetlands	RS DT2	2531	4460.38	2524	4460.37
Pond 4	POND4	2434	4455.88	2446	4455.91
Damonte North Property Line	CPDN	5789		5754	

3. Conveyance channels and culverts at roadway crossings have been sized to carry the 100-year, 24-hour peak flows.

5.0 References

Jeff Codega Planning/Design, Inc., Southeast Truckee Meadows Specific Plan, May 1993.

Nimbus Engineers, Whites Creek Detention Facility Feasibility Study, June 1993.

Nimbus Engineers, Hydrologic and Hydraulic Analysis, Whites Creek Meadows Subdivision, Application for Conditional Letter of Map Revision (CLOMR), October 1994.

Nimbus Engineers, Hydrologic and Hydraulic Analysis South Meadows/Double Diamond Ranch, February 1995.

Nimbus Engineers, Southeast Truckee Meadows Flood Control Master Plan, May 1995

Nimbus Engineers, Hydrologic and Hydraulic Analysis, Double Diamond Ranch, Phase I, Application for Letter of Map Revision (LOMR), August 1996 (FEMA Case No. 96-09-1083P)

Nimbus Engineers, Addendum to the Hydrologic and Hydraulic Analyses, Double Diamond Ranch, April 2000.

Nimbus Engineers, Hydrologic and Hydraulic Analysis, South Meadows Parkway and Central Channel, Double Diamond Ranch, Reno, Nevada, November 2000.

Nimbus Engineers, Application for Letter of Map Revision, Branch 3 of Whites Creek, Hydraulic Analysis of Branch 3, March 2001 (FEMA Case No. 01-09-588P).

Nimbus Engineers, Application for Conditional Letter of Map Revision, Damonte Ranch/Double Diamond Ranch Regional Flood Control Improvements, March 2001 (FEMA Case No. 01-09-589R).

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1: Flood Hydrograph Package, Version 4.1, June 1998.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System, Version 3.0.1, March 2001.

U.S. Department of Agriculture, Soil Conservation Service, SCS National Engineering Handbook, Section 4 - Hydrology, March 1985.

U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Washoe County, Nevada, South Part, August 1983.

U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, Urban Hydrology for Small Watersheds, Technical Release 55, June 1986.

U.S. Department of the Army, Corps of Engineers, Sacramento District, Truckee River, California and Nevada, Hydrology, February 1980.

U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Map, Mount Rose NE Quadrangle, Scale 1:24000, Contour Interval 20 Feet, 1994.

Washoe County, Hydrologic Criteria and Drainage Design Manual, Final Draft Report, December 2, 1996.

Washoe County, Hydrologic Criteria and Drainage Design Manual, June 1997.

Washoe County, Nevada, Department of Water Resources, Southern Washoe County, Precipitation Frequency of the United States, NOAA Atlas 14, Volume 1 – Semi-arid Southwestern United States (Map), April 1997.

MAY 2004

SOUTHEAST TRUCKEE MEADOWS FLOOD CONTROL MASTER PLAN UPDATE

Prepared For:

Nevada Tri-Partners
and
Lewis Operating Corp.

Nimbus Job No. 03940-0409
May 2004

Nimbus Engineers

3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

SOUTHEAST TRUCKEE MEADOWS
FLOOD CONTROL MASTER PLAN UPDATE

1.0 INTRODUCTION

The Southeast Truckee Meadows Flood Control Master plan was developed by Nimbus Engineers in the period from 1993 to 1995, and was finalized in May of 1995. The purpose of the plan was to:

1. *Quantify flows of major drainages which originate off-site.*
2. *Provide conceptual design of open channel systems.*
3. *Provide conceptual designs of bridges or major roadway structures for major roads*
4. *Provide mitigation strategies for any increase in peak flows or volumes due to proposed development, such as detention basins and energy dissipaters.*
5. *Include analyses to support the plan which will be performed on accordance with currently accepted engineering practices.*

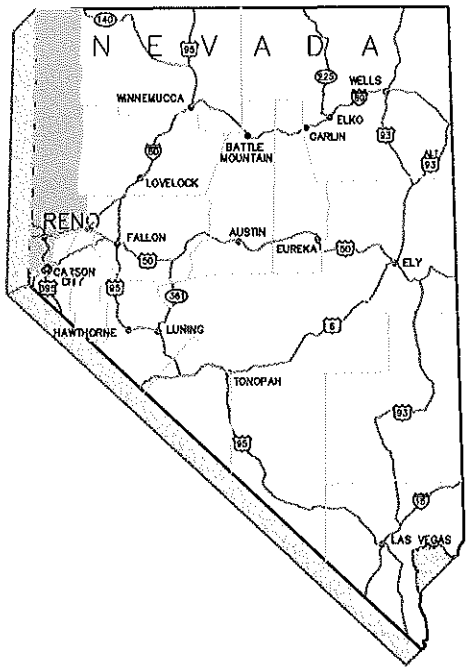
The boundaries for the original plan are shown in Figure 1.

This update has a twofold purpose, first to enlarge the boundaries of the area covered by the master plan to include the approximately 160 acres at the north west corner formerly known as Whites Creek Meadows and to present hydrologic and hydraulic information to simulate the current (May 2004) conditions on the project, as well as the ultimate conditions. The South East Truckee Meadows Specific Plan was previously amended to include this parcel as Damonte Ranch, Phase II.

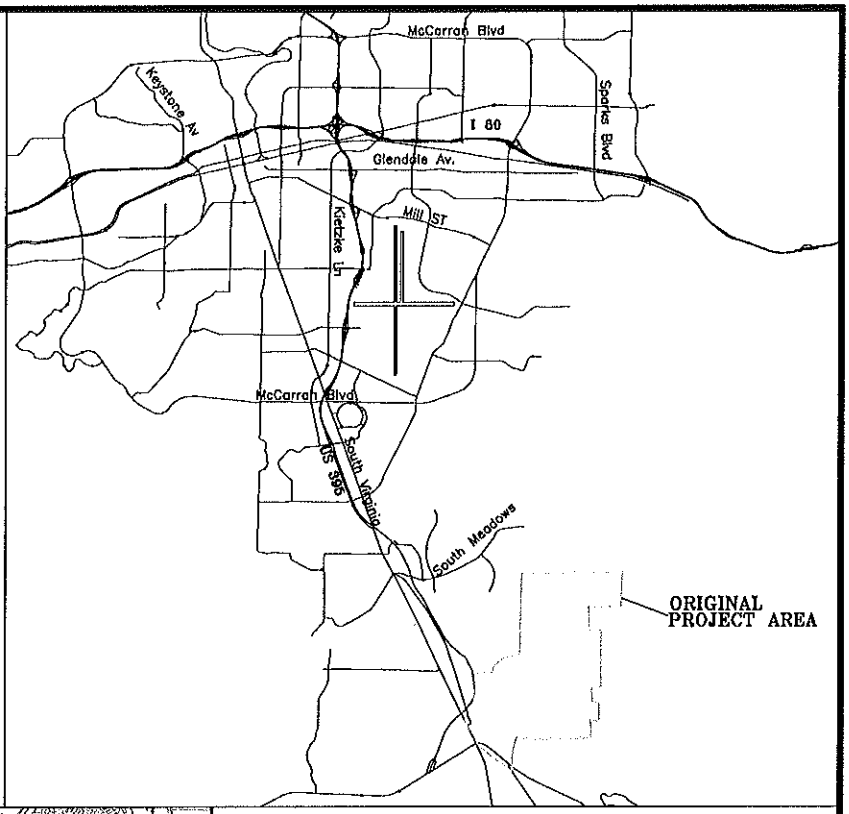
1.1 Previous Studies

As noted earlier, Nimbus Engineers prepared a Master Flood Control Plan for the area covered by the Southeast Truckee Meadows Specific Plan in May 1995. In addition to the Master Plan a number of studies have been prepared and approved. The two which bear most importantly on the current status of the South East Truckee Meadows are:

- *Application for Letter of Map Revision for Branch 3 of Whites Creek,* Nimbus Engineers, March, 2001.
- *Application for Conditional Letter of Map Revision for Damonte Ranch and Double Diamond Ranch,* Nimbus Engineers, September, 2001.



STATE OF NEVADA
N.T.S.



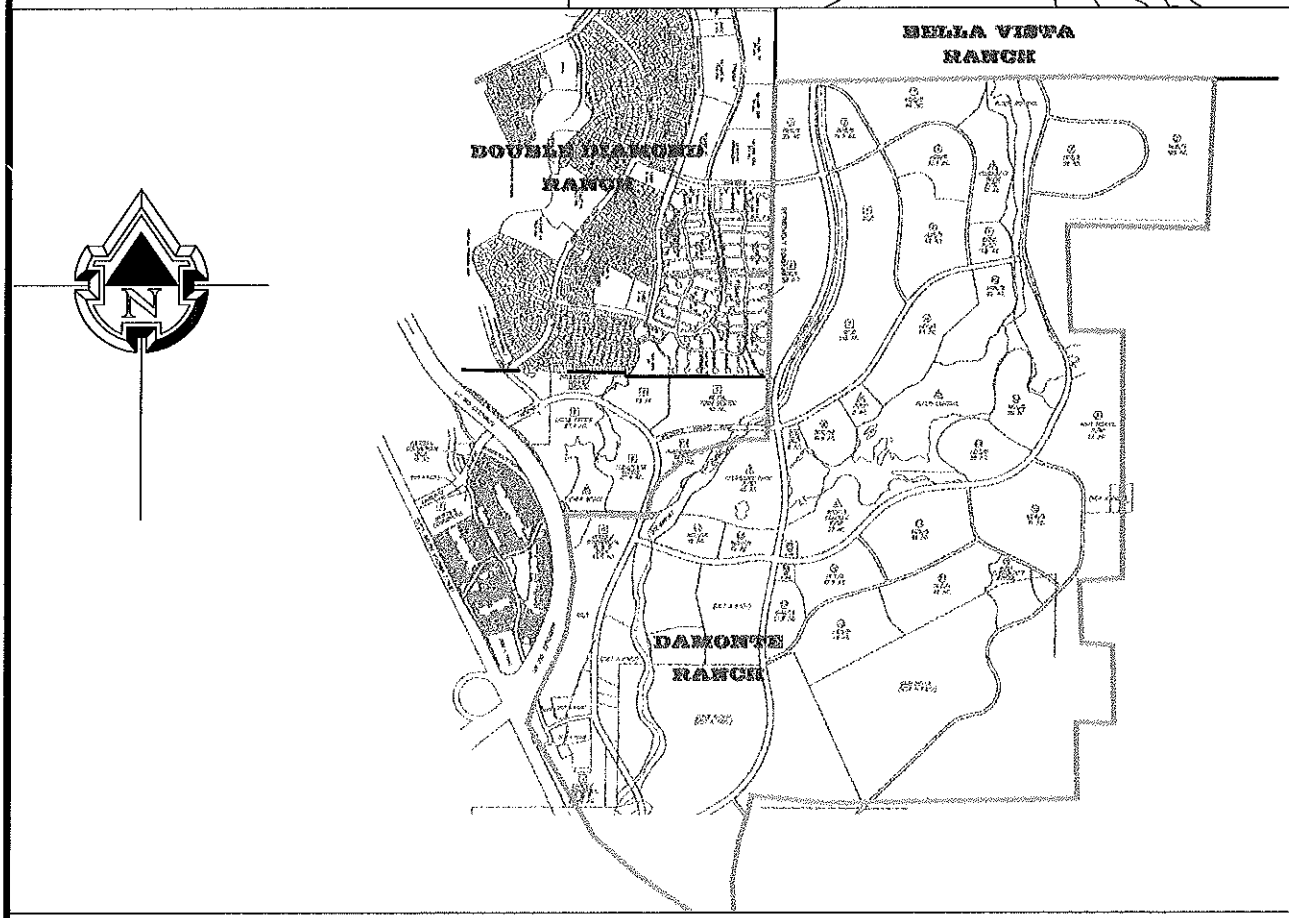


Figure 1
Vicinity Map

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

Nimbus Job #0409

Date: May 2004

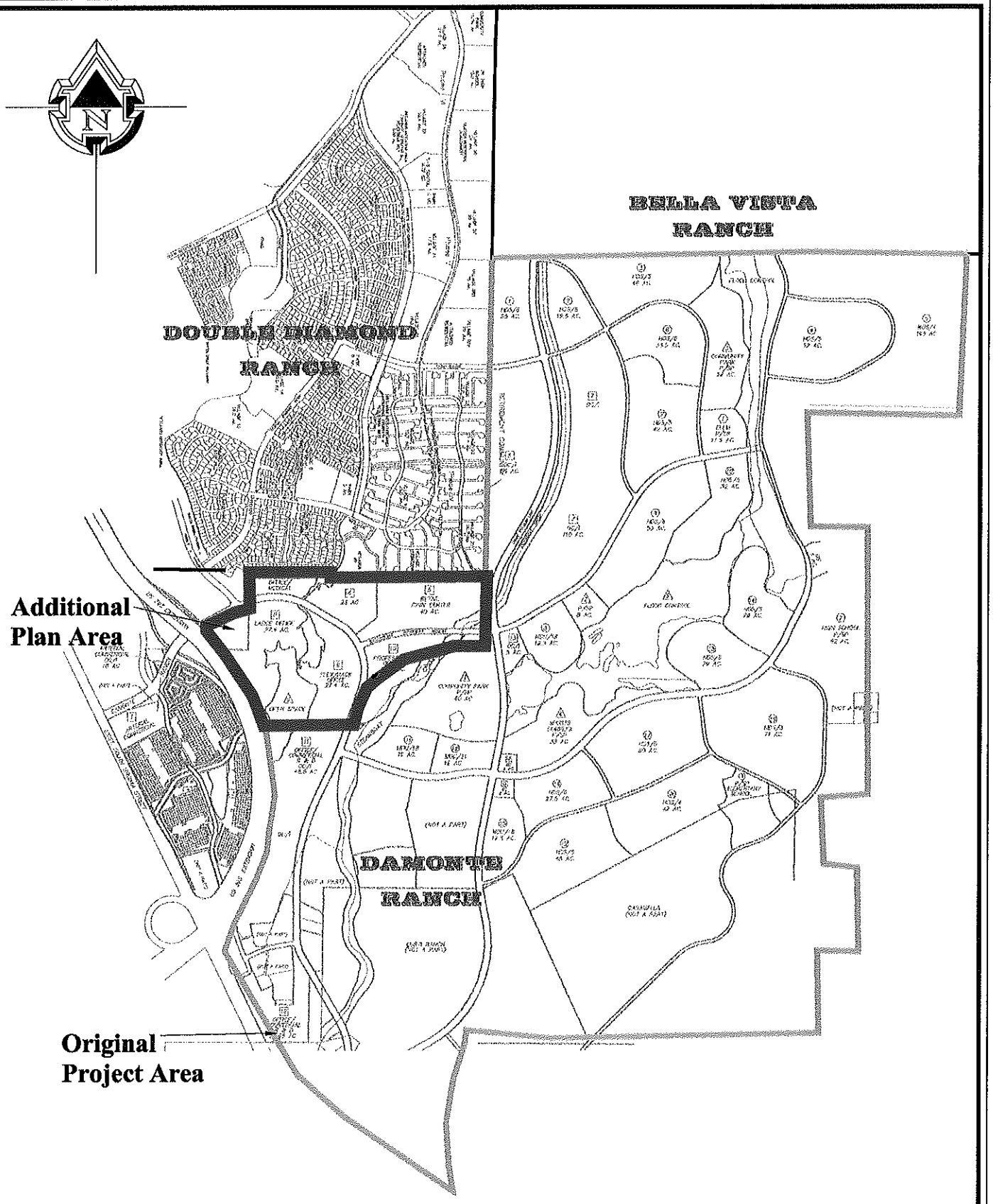


Figure 2
Plan Boundary

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

Nimbus Job #0409

Date: May 2004

1.2 Completed Improvements

The following features for regional mitigation have been constructed:

1. Whites Creek Branch Three Channel
2. Steamboat Creek Bridge and limited channel improvements
3. Steamboat Creek Diversion Structure and Weir
4. Regional Detention Basins 1, 2, and 3
5. Damonte Ranch Parkway and associated drainage structures

The construction of the Whites Creek Branch 3 channel entirely removed the Whites Creek 100 year floodplain from the Damonte Ranch Phase II parcel. The drainage which remained on the parcel flowed northerly toward the Double Diamond Ranch. This flow drains to a wetlands area and from there to the Double Diamond Central Channel. Earlier agreements with the developers of the Double Diamond Ranch limited this flow, in the proposed condition, to 300 cfs.

1.3 Purpose of This Update

This update has been prepared to evaluate the impacts of the proposed commercial and industrial development of Damonte Ranch Phase II upon peak flows in Steamboat Creek and the Double Diamond Central Channel. Regional Improvements which have been constructed on the early phases of the Damonte Ranch were designed to mitigate both of the impacts. These improvements are shown on Figure 3. This update will presents a new hydrologic model which will be used for future analyses regarding proposals for development on the Damonte Ranch.

* BRANCH 4 Channel not yet constructed 8/9/05

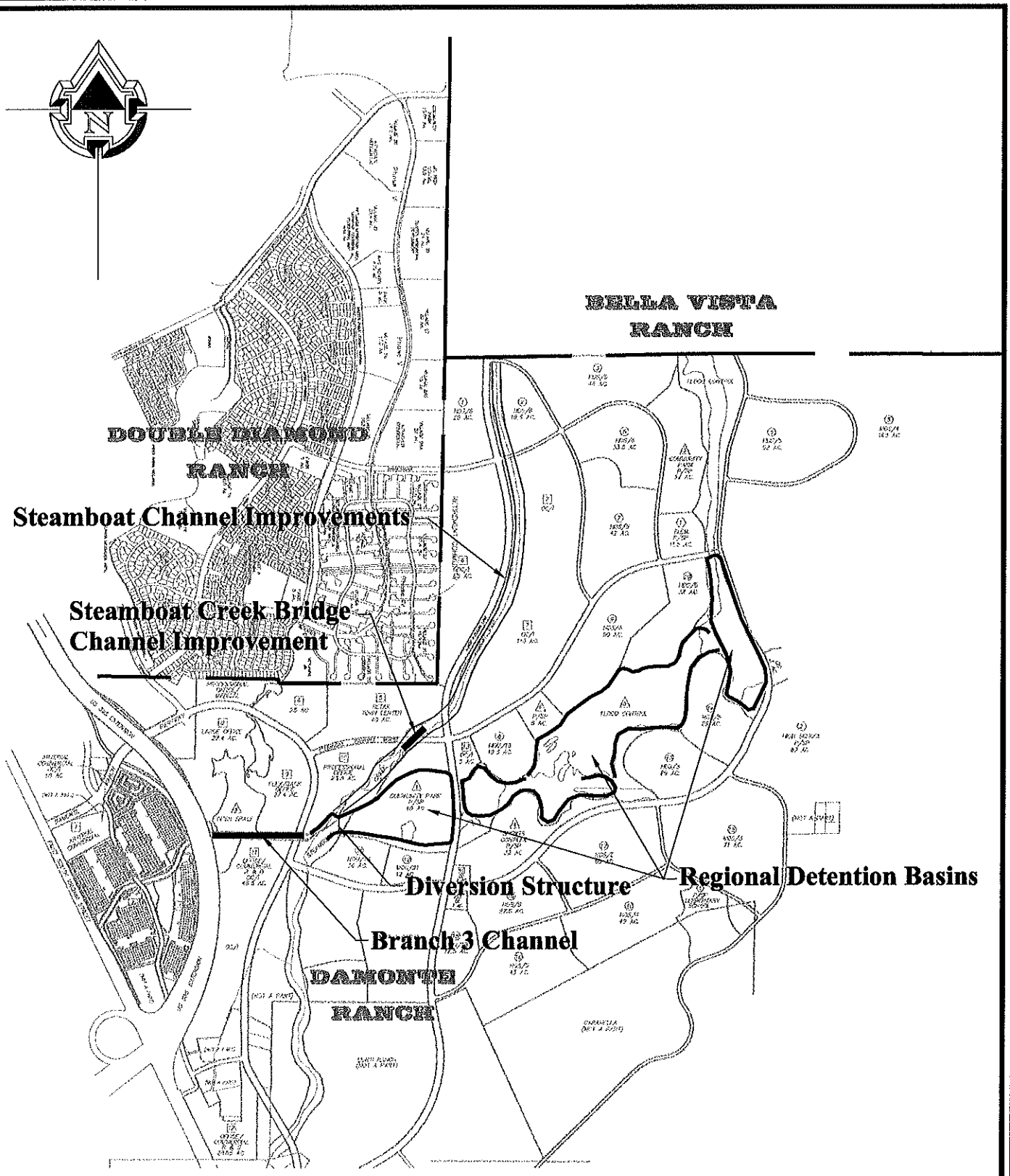


Figure 3
Constructed Improvements

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

Nimbus Job #0409

Date: May 2004

2.0 HYDROLOGIC ANALYSIS

In order to assess the impacts of the entire proposed development of Damonte Ranch Phase II, the hydrologic models from the regional Application for Conditional Letter of Map Revision CLOMR of the Damonte and Double Diamond Ranches were used. These models were reviewed and approved by the City of Reno and by the Federal Emergency Management Agency (FEMA). The model EXIST. 0409 (030.CLOMR) was used to simulate existing conditions. The model 0409.CLOMR is the original 0030.CLOMR modified to split watershed W18B into the two post-development watersheds HD and W18RB which will represent the ultimate post-development condition. See Figure 4.

Watershed HD will now be routed directly into Steamboat Creek just upstream of the diversion structure in Steamboat Creek. This structure directs high flows in Steamboat Creek into regional detention facilities east of the stream. For a more in-depth discussion of the hydrologic modeling methods and the hydraulics of the channels and diversion structures the reader is referred to the original Flood Control Master Plan and the Application for Map Revision cited earlier.

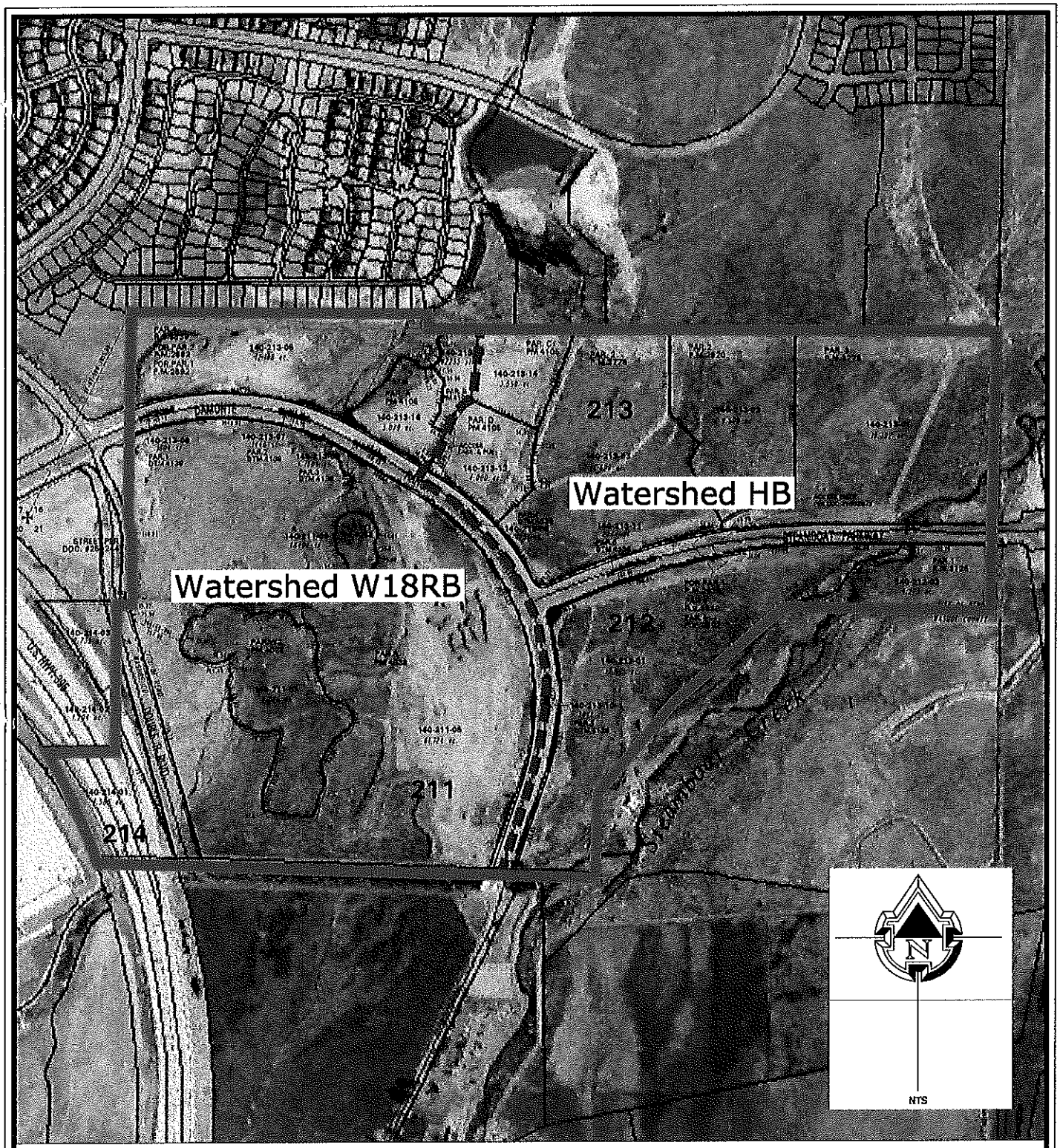
Changes which were made to the models are consistent with the earlier methodologies. The entire area which has been added to the Master Plan is proposed for Commercial-Industrial development and the curve numbers and lag times of the new sub-watersheds were altered to reflect this additional imperviousness. These models are included in the Appendices. A comparison of the results from the two models at key points are presented below in order to demonstrate the effects upon the Central Channel, Steamboat Creek and the Diversion Structure and the Regional Detention Facilities.

Damonte Ranch Wetlands to Double Diamond Central Channel

	Existing Conditions 409.EXIST cfs	Post-Development 409.CLOMR cfs
W18RB	138	143
HD	-	113
CB WET	240	247
CB 7 – end of Central Channel	613	621

Steamboat Diversion and Regional Detention Facilities

Modeling Point	Existing Q/elevation cfs/elevation	Post Development Q/elevation cfs/elevation
DIV STR (diversion)	7985/ 4488.11	7791/4488.12
BAS 1 (detention basin)	4089/4481.90	4094/4481
RS DT2 (weir)	2507/4461.85	2510/4461.86
POND 4	2501/4454.02	2504/4454.02
OUT DN	3893	3894



- *Project boundary*

- *Watershed boundary*

Figure 4
On-Site Watersheds

Nimbus Engineers
3765 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

Nimbus Job #0409

Date: June 2004

As can be noted from the summaries above, the effects of the addition of the Phase II of Damonte Ranch to the South East Truckee Meadows Master Flood Control Plan are minimal. The Branch 3 diversion channel has been built and now reduces the flow to the Double Diamond Ranch by almost 2000 cfs. Further discussion of this channel can be found in the original Master Plan and the Application for LOMR previously cited. The Steamboat Diversion and Regional Detention Facilities which have mitigated the increased flows in Steamboat Creek from the entire Damonte Ranch Development from 8525cfs to 8385cfs.

3.0 CONCLUSION

Previous construction of flood control facilities on the Damonte Ranch have mitigated any impacts which might be noted from the inclusion of Damonte Ranch Phase II into the South East Truckee Meadows Master Plan Area. No further detention should be required of these properties. They will be subject to all the existing agreements of previous development. The flow splits as set forth in the models and on Figure 4 should be retained.

APPENDIX A

SUPPORTING CALCULATIONS

APPA

ngineers
01 • Reno, NV 89509
Reno, NV 89510
8630

JOB 3409
SHEET NO. 1 OF 3
CALCULATED BY DW DATE 4/15/04
CHECKED BY DATE
SCALE

030EXIST.DAT

W18RB

A = 2.34 mi²
CN = 85
Lag = .30

Currently all goes to wetlands & Central Channel

Area that will continue going to wetlands (Name W18RB)

A = 84,897 ac = 0.133 mi²

CN = 95 Industrial and Commercial

Lag time

L = 2700 ft

Δh = 25 ft

$\text{slope} = \frac{25}{2700} = .009$ ft/ft

V = 1.9 ft/sec (Fig. 701, Washoe Co Manual)

$T_c = \frac{2700 \text{ ft}}{1.9 \text{ ft/sec}} = 1410 \text{ sec} = 23.7 \text{ min}$

$T_{LAG} = (.6)T_c = (.6)(23.7) = 14.2 \text{ min} = 0.24 \text{ hr}$

Nimbus Engineers
3785 Baker Lane, Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630

JOB 0409
SHEET NO. 2 OF 2
CALCULATED BY DMW DATE 4/15/04
CHECKED BY DATE
SCALE

Area to drain to steamboat CK (Name HD)

$A = 72.966 \text{ ac} = 0.114 \text{ mi}^2$

CN = 95 (Ind + commercial)

Lag Time:

$L = 2700 \text{ ft}$

slope = 0.5% (assumed street slope)

$v = 1.4 \text{ ft/sec}$ (Fig 7.1 Washoe Co Manual)

$T_c = \frac{2700 \text{ ft}}{1.4 \text{ ft/sec}} = 1928.6 \text{ sec} = 32.1 \text{ min}$

$T_{LAG} = .6\, t_c = (.6)(32.1) = 19.26 \text{ min} = 0.32 \text{ hr}$

Place this watershed in model between
CB W/# (where Branch 3 combines w/ steamboat)
and DIVSTR (Diversion structure)

Culvert Table

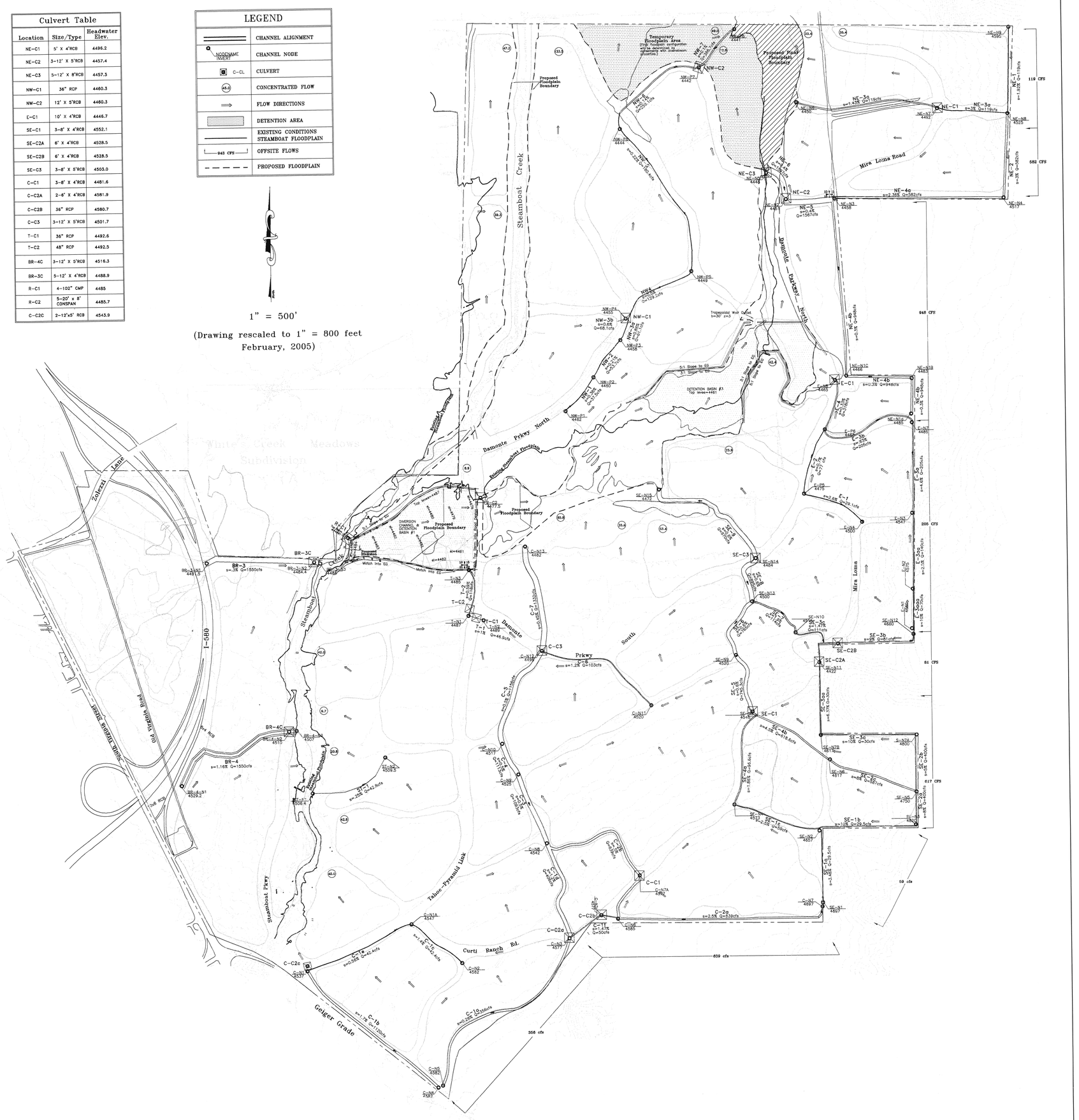
Location	Size/Type	Headwater Elev.
NE-C1	5' X 4'RCB	4496.2
NE-C2	3-12' X 5'RCB	4457.4
NE-C3	5-12' X 8'RCB	4457.3
NW-C1	36" RCP	4460.3
NW-C2	12' X 5'RCB	4460.3
E-C1	10' X 4'RCB	4446.7
SE-C1	3-8' X 4'RCB	4552.1
SE-C2A	6' X 4'RCB	4528.5
SE-C2B	6' X 4'RCB	4528.5
SE-C3	3-8' X 5'RCB	4503.0
C-C1	3-8' X 4'RCB	4481.6
C-C2A	2-6' X 4'RCB	4581.9
C-C2B	36" RCP	4580.7
C-C3	3-12' X 5'RCB	4501.7
T-C1	36" RCP	4492.6
T-C2	48" RCP	4492.5
BR-4C	3-12' X 5'RCB	4516.3
BR-3C	5-12' X 4'RCB	4488.9
R-C1	4-102" CMP	4485
R-C2	5-20' x 8' CONSPAN	4485.7
C-C2C	2-12'x5' RCB	4543.9

LEGEND

	CHANNEL ALIGNMENT
NODENAME INVERT	CHANNEL NODE
C-CL	CULVERT
45.0	CONCENTRATED FLOW
	FLOW DIRECTIONS
	DETENTION AREA
	EXISTING CONDITIONS STEAMBOAT FLOODPLAIN
943 CFS	OFFSITE FLOWS
	PROPOSED FLOODPLAIN

1" = 500'

(Drawing rescaled to 1" = 800 feet
February, 2005)



SHEET NO.	SOUTHEAST TRUCKEE MEADOWS FLOOD CONTROL MASTER PLAN	SCALE: 1" = 500' DATE: MAY 1995 FILE: DAMART.DWG REVISIONS: REVISED JULY 1995	Nimbus Engineers 3710 Grant Dr. Reno NV. 89509 (702)689-8630 JOB NO. 9301
1 of 1			

Drawing rescaled to 1" = 800 feet
February, 2005

FIGURE 2

Existing Conditions

Nimbus Engineers

SEAL:

Nimbus Job #	9301
Date :	May 1995
Scale :	1 : 62500
Drawing Name	301BOR.DW
Sheet # :	1 of

SCALE 1:62500

SEAL:

Nimbus Engineers

FIGURE 3

Proposed Conditions

Watershed Map

Nimbus Job # :	9301
Date :	May 1995
Scale :	1 : 62500
Drawing Name :	301BOR.DWG
Sheet # :	1 of 1

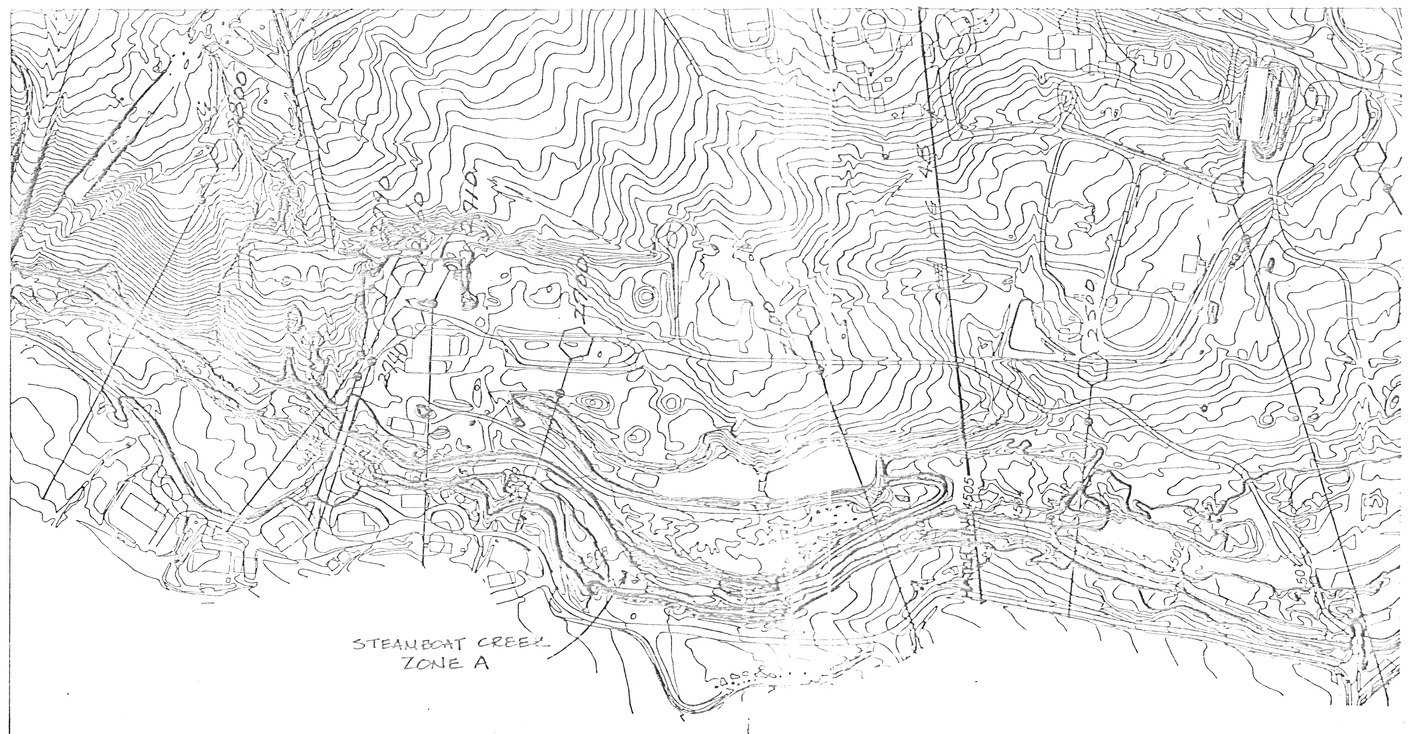
FIGURE 4B
STEAMBOAT CREEK
Existing Cond.
Work Map

	:
Nimbus Job # :	9301
Date :	JULY 1993
Scale :	1" = 200'
Drawing Name :	215WSB
Sheet # :	1 of 1

Nimbus Engineers

2710 Grant Dr., Reno, NV 89509
Mail : P.O. Box 10220, Reno, NV 89510 (702) 689-8630

SEAL:



NORTH

Scale
1"=200'

SEAL:

Nimbus Engineers
3710 Grant Dr., Reno, NV 89509

FIGURE 4A
STEAMBOAT CREEK
Existing Cond.
Work Map

Nimbus Job # :	9301
Date :	JULY 1993
Scale :	1" = 200'
Drawing Name :	215WSB
Sheet # :	1 of 1

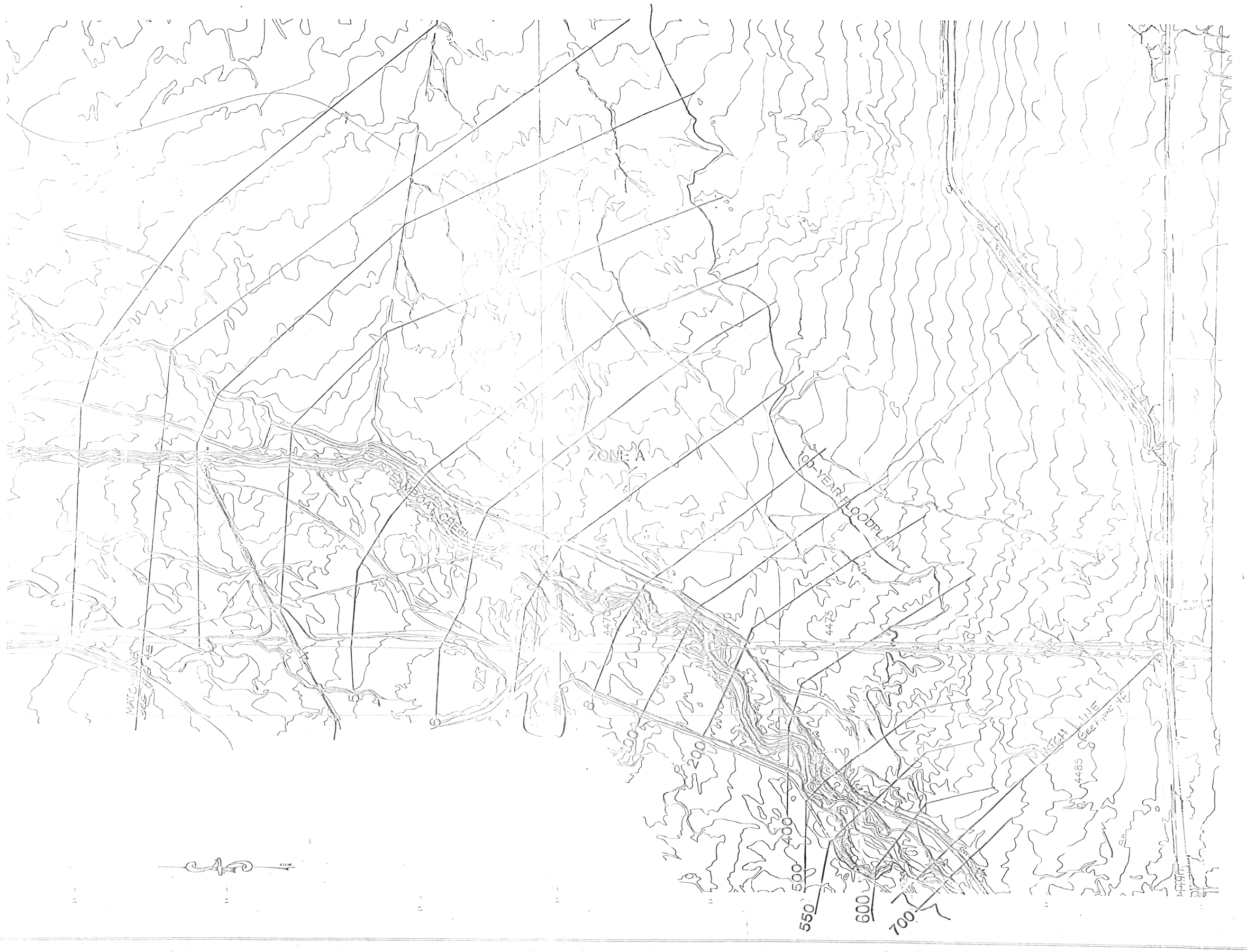


FIGURE 4D

Nimb

Date
NO

Scale

Draw

Sheet

MATCH LINE

Nimbus Engineers

3710 Grant Dr., Reno, NV 89509

Mail : P.O. Box 10220, Reno, NV 89510 (702) 689-0650

SEAL:

FIGURE 4C
STEAMBOAT CREEK
Existing Cond.
Work Map

Nimbus Job # : 9301

Date : OCTOBER 1994

Scale : 1" = 200'

Drawing Name : WHTWKMPU.DWG

Sheet # : 1 of 1