NFV-1 Specific Plan

Infrastructure Master Plan

November 1, 2004
Revised: January 24, 2007

Table of Contents

Section 1
Background and Purpose

1.1 Background and Purpose

The Rio Mesa Area Plan was adopted in 1996 by the Madera County Board of Supervisors as part of the overall County of Madera General Plan. The Rio Mesa Area Plan calls for three separate villages, or sub-areas, to be created as centers of development and commercial activity. This Infrastructure Master Plan (IMP) report focuses on the infrastructure needs of the NFV-1 Specific Plan sub-area as a sub-section of the North Fork Village (one of the three villages as proposed in the Rio Mesa Area Plan). The County has accepted a concept under which each landowner (or consortium of landowners) is allowed to develop their respective parcels independently, as long as the overall infrastructure needs of the community are met. In order to plan effectively, the landowners within the Rio Mesa Area Plan have proposed and the County has accepted the concept of infrastructure construction by sub-area. This concept requires appropriate sub-areas be identified and designed through an overall IMP which encompasses each village (or subset thereof) of Rio Mesa. In addition, larger landowners must include in their respective IMP's smaller adjoining parcels owned by others which will require utility services provided by the larger sub-area service provider.

The designs presented in this report and the IMP drawings are based upon the proposed land uses incorporated in the NFV-1 Specific Plan. Future changes in proposed land uses, field investigations and/or preliminary engineering may result in design modifications to the IMP. However, these modifications are expected and any such modifications shall comply with the design standards, and will maintain the overall integrity of the IMP as well as address any environmental or other mitigation measures as called for in the approved EIR for the NFV-1 Specific Plan.

This IMP report has been divided into the following sections which correlate with the listed IMP drawings:

Section	Title	Sheet Description
2	Land Use	L-1, L-2
3	Traffic - Circulation	T-1, T-2
4	Water Production & Distribution	W-1, W-2
5	Sewer Collection & Treatment	S-1, S-2
6	Storm Drainage	ST-1, ST-2
7	Reclaimed Water	R-1, R-2

The goal of the overall IMP is to demonstrate that requisite planning and engineering procedures were followed and that the resulting documents are sufficient master planning documents for the NFV-1 Specific Plan Area. In addition, the IMP has also taken into consideration all of those required elements of the Rio Mesa Area Plan which dictate how development is to occur within each sub-area of Rio Mesa.

For clarity, the NFV-1 Specific Plan Area has been further divided into areas of geographical distinction. The "North" sub-area is approximately 900 acres is size and is bounded by Road 145 to the west and the Millerton Lake State Recreational Area (the 600' contour) to the south. The north and east property lines are bounded by neighboring ranch lands which are not a part of the Rio Mesa Area Plan.

The "South" sub-area is approximately 1270 acres in size and is bounded by Road 206 to the south and west and the Friant-Madera Canal and the 600' contour of Millerton Lake to the east. The north property line is bounded by neighboring ranch lands which are not a part of the Rio Mesa Area Plan. Included in this sub-area is an 85 parcel known as the "Wagner" property as well as 52 acres that front Road 206 known as the "Caglia" properties or which two are owned by the Caglia family while the third is owned by Dr. Graham.

1.2 Project Location

The NFV-1 development (Property) is situated in southern Madera County, approximately 1 mile northwest of Friant, California as is the northernmost property of the Rio Mesa Area Plan.

The property is bounded by the Sierra Nevada foothills to the north, Road 206 to the west and south and Lake Millerton to the east. The property is approximately 2100+ acres and consists of rolling hills, creeks, exposed rock formations and oak trees. When developed, the property will contain approximately 3,000 residential units, with land uses designations varying from rural to high density residential. Lot sizes for single family developments are expected to range from 4,500 sq. ft. to ½ acre. The property will also contain nearly 45 acres of commercial property zoned "Neighborhood Commercial".

Section 2
Land Use

2.1 Introduction

Prior to the commencement of a land use plan, the development team analyzed the subject property in order to establish development criteria. Factors such as terrain, environmental constraints, marketability, utility services and fire services were taken in consideration and applied in determining which lands were developable.

2.2 Development Criteria

Due to the rugged terrain of the subject property, primary consideration was given to the approximate location of collector and local access roads. Constraints such as road grade, fire access and known environmental conditions were factored into the location and alignment of all portions of the circulation plan. Once road locations were determined, secondary consideration was given to the identification of 'buildable' land.

For the subject property, buildable land is defined as those portions of the property where the side slope does not exceed 40% or where grading would be possible to flatten a small portion of land. Given this criteria, a considerable portion of the property was immediately identified as 'unbuildable' and deemed incapable of development. Such lands have been reserved as open space and included such uses as parks, storm drainage facilities, reclaimed water ponds, irrigable reclaimed water use areas and naturally preserved open space.

Upon determination of buildable lands, consideration was then given to viewsheds and the potential visual impacts on portions of the property as well as neighboring lands. Given this criteria, several areas of the development were disqualified and removed from further analysis. Upon completion of this exercise, the next process focused on density assignment, augmentation and allocation.

One of the stated goals of the Rio Mesa Area Plan is to utilize clustering techniques in order to minimize the impacts on open space. Density allocation and location were determined through a trial and error process in combination with a marketability analysis; however, an over-riding consideration of this exercise was the desire to preserve as much of the natural condition as possible. In reference to the North property of the development, in particular, lot placement resulted in the direct preservation of nearly all existing oak trees. This was achieved through the use of digital aerial photographs that were inserted as a backdrop to the AutoCAD drawing used in the creation of the land use portion of the IMP.

In addition to aerial photographs, digital contours were also utilized in determining hill slopes and road grades. By using digital information that contains a high level of accuracy, the development team was able to make quick decisions that moved the land use plan forward in a progressive fashion. The final product is a land use plan that has utilized the latest technologies and land use planning analyses that take into consideration all of the elements of a modern day – master planned development.

2.2.1 Grading

While not readily apparent in the Infrastructure Plan, development has been concentrated on hilltops in order to preserve habitat sensitive valleys and natural drainage paths. It is anticipated that side slopes throughout the Property will range from 2:1 to 1:1 with the predominant side slope between adjacent residential parcels set at 1.5:1. Street grades for local streets will vary between 2% and 13% to allow for differences in lot elevations in order to minimize impacts to the natural sloping terrain of the Property and to comply with Madera County road standards. Ridge top roads follow the crest of hills where nominal grading will be conducted to facilitate double loading of residential development. Where crest lines were found to be too narrow, a single loaded approach was applied. It is important to note that when developed, nearly 50% of the property will remain open space, conserved for indigenous species of animals and plants.

2.3 Land Use Application

The Property will consist of land use types varying from low to high density residential with a small area set aside for the North Fork Village Community Core as called for in the Rio Mesa Area Plan.

2.3.1 Residential

Residential development will range from apartments to large estate-sized lots. In order to provide a unique development that strikes a balance between architecture and the environment, residential development will be organized under strict and specific CC&R's. Examples being considered would disallow property boundary walls, fences or other obstacles on hill top homes. The promotion of common architectural styles and earthen tone colors, minimum and maximum pitch requirements for residential roofs, etc. would be required throughout the development. Cursory architectural adaptations propose a blend between Mediterranean and California Coastal styles.

2.3.2 Commercial

Approximately 60 acres will be planned and developed for a commercial office complex. According to the Rio Mesa Area Plan, the North Fork Village Core will provide retail and service commercial needs to the specific planning area. Such uses include restaurants, community services, personal and financial services and professional and medical offices.

2.3.3 Schools

The NFV-1 property lies within the existing boundaries of the Chawanakee School District. One school site for an elementary school has been selected and is located south of Cottonwood Creek, just west of Rio Mesa Blvd. Chawanakee administrators and the State of California Department of Architecture have reviewed and accepted the proposed location of the school site.

2.3.4 Parks

Neighborhood parks will be located throughout the development and will be maintained either by a Home Owners Association, a Community Services District or other entity. Non-potable water use required for park irrigation will be provided via tertiary treated water from the sewage treatment facility. The Property will also adhere to the desires of the Rio Mesa Area Plan by incorporating a regional trail system into the development.

2.3.5 Irrigated Use Areas

As shown in the reclaimed water master plan (sheets 12 & 13 of the IMP), approximately 256 acres of land will be established for irrigated use areas for the application of reclaimed water. Such areas will consist of either architectural landscaped areas or additionally planted open space lands. As such, reclaimed water will be applied to both native and non-native plants in these areas.

2.3.6 Open Space

Nearly 50% of the subject property shall be preserved as open space lands, of which a majority will be reserved for native plants and animal habitat. The gross density of the project has been calculated at approximately 1.5du/acre. Open space lands will be set aside as both a mitigation measure and as a benefit to the local community to be managed and maintained by the local service provider or community services district. Included in this open space management plan are oak tree preservation and restoration, pseudobahia protection and conservation as well as any and all improvements and enhancements to the natural condition as may be required by the EIR.

2.4 Statistics

According to the Rio Mesa Area Plan, the area contained within the NFV-1 Specific Plan Area, a density of approximately 3,994 units could be applied. However, given the land use criteria applied in the previous discussion, the anticipated build-out as shown in Appendix A is approximately 2,966 units. It is anticipated that this number will diminish as much as 10% once final engineering and development standards are applied due to potential grading and viewshed issues. In addition, densities may be reduced in some areas to accommodate market conditions at the time of development per density transfers.

Included in the land use analysis is the specification of pad sizes for each market description. The pad size data was assigned to each market description in order to determine not only the amount of land that would be graded into a flat pad, but how much of that land would be made available for landscaping and irrigation. Further statistics on irrigable lands can be found in Section 4 and Appendix B of this report.

Section 3
Traffic - Circulation

3.1 Introduction

As discussed in Section 2.1, the circulation element of the NFV-1 property was established through the application of land use criteria which determined development across the NFV-1 Specific Plan. A backbone road with limited access points was centrally located to serve as the primary collector, capable of accommodating all vehicle trips in to and out of the property. This road has been named Rio Mesa Boulevard and intersects Road 206 approximately 800' east of the west property line, continues through the south property, crosses Road 145 via a grade separation and continues to the north-east quadrant of the north property. The second point of connection of the property is a Secondary Collector that intersects Road 145 approximately 1600' north-east of the Road 145/Road 206 intersection. These two roads serve as the primary points of ingress and egress to the property. A third, limited access road intersects Road 145 prior to the entrance gate of the Millerton Lake SRA.

All roads will be built to specific plan standards, adhering to Madera County Ordinance No. 542 where applicable. All cross sections for each type of road (e.g. collector, arterial) will adhere to the road cross sections as called for in the NFV-1 Specific Plan. Road access point requirements will adhere to Madera County Fire Department standards which require two points of access to all developed lands of the property.

3.2 Street Design

The NFV-1 Specific Plan is the northern-most sub-area of the Rio Mesa Area Plan and will serve as the ultimate boundary of future development due to its proximity to the Sierra Nevada foothills and its rough terrain. Thus, circulation within and across the property has been designed to move vehicles in and out of the property. This condition translates into having the majority of road cross sections being small and designed for the relatively minor impact of vehicle trips per day being generated solely by the property and not be vehicles traveling through the property.

All roads will be constructed to Caltrans and AASHTO engineering standards, where required, and shall adhere to Madera County Ordinance No. 542 for street grades, lengths of cul-de-sacs and multiple access points. Cross sections for each type of road (e.g. collector, arterial) to be constructed within the Specific Plan have been provided as shown in the NFV-1 Specific Plan.

3.2.1 Arterial – Primary(A)

Rio Mesa Boulevard (Road 206 to Roundabout)

Designed as a divided road with 2 travel lanes in each direction, a 6-foot bike lane on each side and a landscaped median. The median will be oversized to allow for greater green space and simplified maintenance of landscaping. This road section will have a design speed of 35 mph and have considerable landscape setbacks on each side of the roadway with wide sidewalks.

3.2.2 Arterial – Primary(B)

Rio Mesa Boulevard (Roundabout to Cottonwood Creek Bridge)

Designed as a divided road with 2 travel lanes in each direction, a 6-foot bike lane on each side and a landscaped median. The median is downsized while oversized landscaped setbacks provide increased vegetation and a road section lower than adjoining residential parcels in order to reduce noise. This road section will have a design speed of 35 mph and have a meandering sidewalk that characterizes a "park-like" setting.

3.2.3 Arterial – Secondary

Wagner Road (Looped Road through South Mesa)

Designed as a two (2) or three (3) lane road with 1 travel lane in each direction, a 14-foot center turn lane (or median) , and a 5 foot bike lane on each side. This road section will have a design speed of 25 mph.

3.2.4 Collector - Primary

Cottonwood Drive

Designed as a divided road with 2 travel lanes in each direction, a 6-foot bike lane on each side and a landscaped median. The median is downsized while oversized landscaped setbacks provide increased vegetation and a road section lower than adjoining residential parcels in order to reduce noise. An 8' trail will also be installed on the north side of this road section. This road section will have a design speed of 30 mph.

3.2.5 Collector - Secondary

Railroad Drive (Rio Mesa Boulevard to Cottonwood Drive)

Designed as a 36-foot paved road with 2-foot roll curb on each side of the section. This road section is designed to provide two lanes of travel with two 6-foot bike lanes (4-foot paved with 2-foot curb). Beyond the 36 feet of paving, a 2% graded and landscaped shoulder backs the roll curb. Cut and fills beyond the edge of shoulder will be governed by the soil stability of the surrounding land and desired landscape architecture. In those areas with cuts greater than 10 feet, additional shoulder will be added to the graded shoulder to collect potential rock falls and sloughing of the hillside. This road section will have a design speed of 30 mph. Parts of this road section will be accompanied by the Cottonwood Creek Trail as described in Section 3 of this Specific Plan.

3.2.6 Collector - Rural

Rio Mesa Boulevard (Cottonwood Creek to east end of the North Property)

Designed as a 32-foot paved road. This road section is designed to provide two 12-foot lanes of travel with two 4-foot bike lanes. Beyond the 32 feet of paving, a 4-foot shoulder, graded at 5% will be provided on each side of the road. Cut and fills beyond the edge of shoulder will be governed by the soil stability of the surrounding land. In those areas with cuts greater than 10 feet, additional shoulder will be added to the graded shoulder to collect potential rock falls and

sloughing of the hillside. This road section will have a design speed of 40 mph. Parts of this road section may be accompanied by trails as described in Section 3 of this Specific Plan.

3.2.7 Local Neighborhood

This street standard will be employed at all local roads where the density is above rural residential. This is a 40-foot right-of-way street that includes a 2-foot roll curb on each side of the street. The intent of this section is to utilize a narrow street section which lends itself to slower travel speeds while instilling a "sense of community" within residential areas. This road section satisfies minimal fire department standards. Horizontal curve radii for this street section will be kept small for residential streets to reduce speed and increase pedestrian safety. Street grades will be kept under 16% according to Madera County Ordinance and to avoid large differences in elevation between adjacent lots. This road section will have a maximum design speed of 25 mph. See Figure 2-14, *Street Sections*.

3.2.8 Local Rural

This street standard will be employed at all local roads where the density of neighboring lands is rural residential. This is a 24-foot paved road with 4-foot shoulders graded at 5%. According to the Rio Mesa Area Plan, this section will also have the capacity to accommodate an 8-foot graded should for emergency vehicle purposes. This road section will have a maximum design speed of 25 mph.

3.2.9 Private Drive

This street standard will be employed along Millerton Shores Drive (estate sized homes just north of Friant Dam along Lake Millerton). This is a one-way paved street with 2-foot graded shoulders that will serve a very small number of homes. This street standard will also be employed on private drives that serve no more than two homes (per Madera County standards). This road section will have a maximum design speed of 15 mph.

3.2.10 Roundabouts

Roundabouts will be employed as both a traffic calming device and as air quality mitigation measure. The design of roundabouts will adhere to Caltrans technical memoranda and will be designed by a civil engineer, experienced in roundabout design. See Figure 2-15, *Roundabouts*.

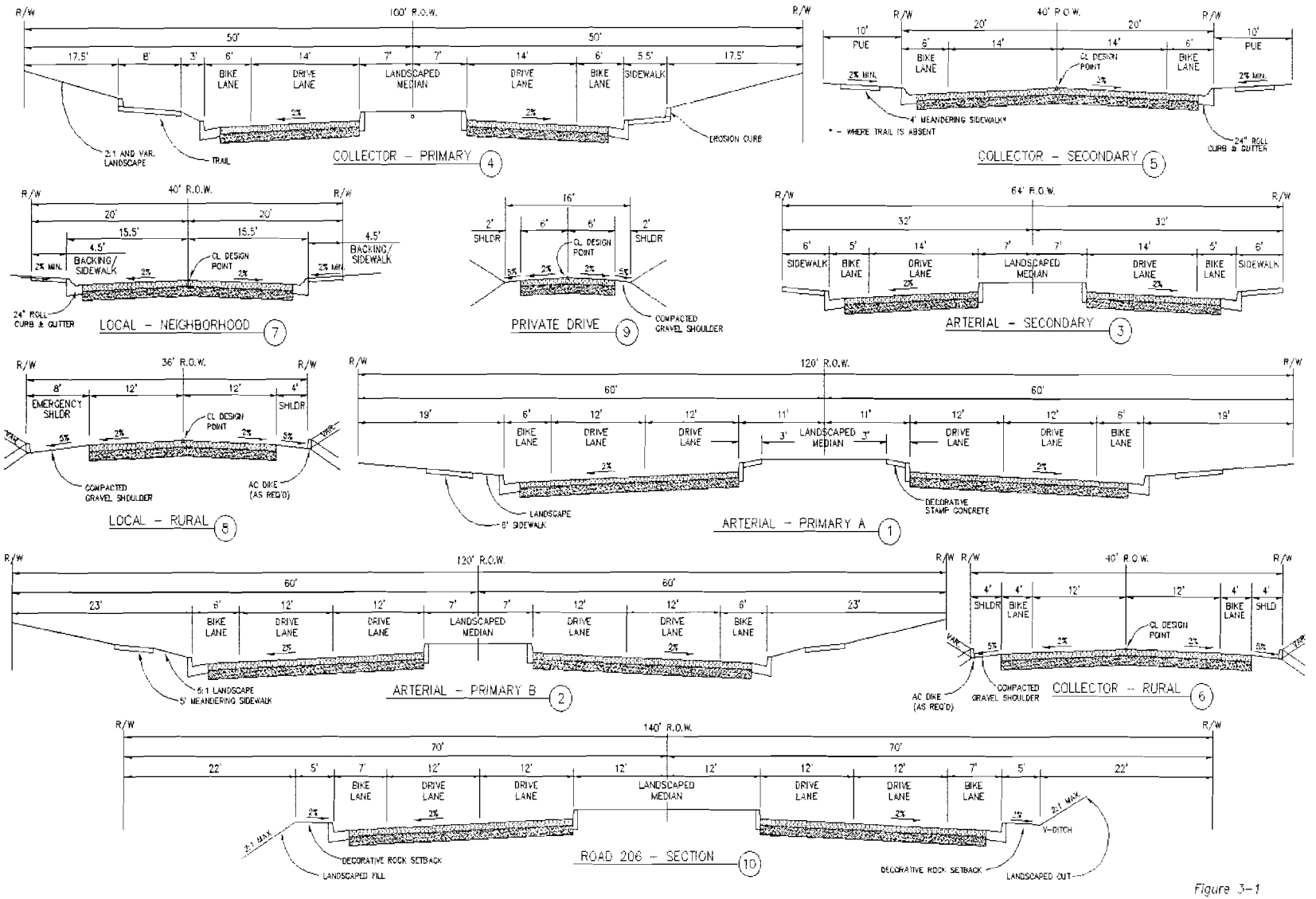

Figure 3-1

Street Sections

3.2.6 Private Drive

This street standard will be employed along Millerton Shores Drive (estate sized homes just north of Friant Dam along Lake Millerton). This is a one-way paved street with 2' graded shoulders that will serve a very small number of homes. This street standard will also be employed on private drives that serve no more than 2 homes (per Madera County standards). This road section will have a design speed of 15 mph.

3.2.7 Roundabouts

Roundabouts will be employed as both a traffic calming device and as air quality mitigation measure. The design of roundabouts will adhere to Caltrans technical memoranda and will be designed by a civil engineer, experienced with roundabout design.

3.3 Off-Site Improvements

As part of Madera County Ordinance 367-O which was passed by the Madera County Board of Supervisors in 1996, impact fees will be collected for road improvements required for existing county roads as well as for requisite improvements to State Route 41 (SR-41). All of Rio Mesa lies within fee zone 'East 41' Zone of Benefit as outlined in Ordinance 367-O. At present, a fee of $161 is collected for each single family dwelling unit constructed within the property for the purposes of improving Madera County roads, as listed in the County Road Improvement Program. Another $1,317 would be collected by the County (on behalf of Caltrans) for the widening of State Route 41. As of January 2007, the road impact fee structure is under review by County staff with the anticipation that fees will be increasing.

According to the Rio Mesa Area Plan, approximately 35,000 dwelling units are planned for all of Rio Mesa. This number of dwelling units multiplied by an average dwelling unit fee of $1,317 would generate $46.1 million for the widening and improvement of State Route 41 from Avenue 12 to Highway 145. By comparison, a fee of $161 per dwelling unit, approximately $5.6 million would be collected for the improvement of Madera County roads bordering the Rio Mesa Area Plan, presently listed in the County Road Improvement Program. Listed roads include Road 206, Road 145, Avenue 15, Avenue 12 and Avenue 9. In addition to these monies, additional monies will be collected for commercial and industrial properties in amounts ranging from $1,381 to $2,969 per 1,000 S.F. for SR-41 and $169 to $364 per 1,000 S.F. for County Roads. Assuming 9,000,000 sq. ft. of retail/industrial space is constructed in the Rio Mesa Area Plan at an average fee per 1,000 S.F. of $1,800 for SR-41 and $250 per 1,000 S.F. for County Roads, an additional $16.2 million will be collected for SR-41 while $2.3 million would be collected for County Roads. These amounts bring the total 'East-41' contribution to $62.3 million for SR-41 and $8.9 million for County Roads.

As of September 2005, the County of Madera had a surplus of $414,727 in the SR-41 account and $2,054,565 in the Madera County Road account. Also, as of September 2005, a final $1,000,000 payment of a total $5,000,000 loan, borrowed against Measure 'A' for the County of Madera portion for improvements to the SR-41/Children's Blvd. interchange, was made. Thus, the County of Madera now has surpluses in both accounts and is ready to pursue further improvements to SR-41 and to County Roads.

For the NFV-1 Specific Plan, Road 145 from State Route 41 to Road 206 and Road 206 from Road 145 to the Madera County line will require upgrading prior to and throughout the development of the subject property. While Road 145 appears sufficient for expansion (adding of lanes), Road 206 does not have either the vertical alignment nor the structural section needed for ultimate configuration. Thus, a complete reconstruction of Road 206 will be required at some point in the development process of the property, the time at which will be determined through a development agreement made between the County of Madera and Friant Development Corporation. It is important that such a development agreement take into consideration all required road improvements as well as construction milestones where specific improvements will be required prior to building permits being issued. In the case of Road 206, a dollar for dollar fee credit will be sought for all improvements made to the road as the entire road requires reconstruction. According to the Rio Mesa Area Plan, this road is to be designed as a 4-lane travel-way.

In addition, fee credits and improvements will include any and all off-site traffic signals. It is anticipated that traffic signals will be required at Road 206 and Rio Mesa Boulevard and the East/West connector road and Road 211.

3.4 Maintenance

All roads will be maintained by either a Home Owners Association, Community Services District or County Services Area as approved by the Madera County Board of Supervisors. All off-site roads will be maintained by the County of Madera and the State of California Department of Transportation.

Section 4
Water Production and Distribution

4.1 Introduction

The water system for the NFV-1 project will be comprised of 11 wells and approximately 19 unique pressure zones – the majority of which will be pumped zones. Each zone will have a minimum of two points of connection while pumped zones will have a redundant booster station design. The water system will be sized to accommodate fire flows as specified by Madera County Fire standards and peak hour demands.

4.2 Well Production

The water system will be supplied by existing proven wells. The 11 wells currently located on the NFV-1 property were drilled between 1989 and 1990, at the end of an unprecedented 4-year drought. Hence, test results would indicate a 'worst case' production level for each of these wells. Given the drought condition during these pump tests, it is anticipated that well production will have a higher range given normal rainfall years. However, for the purposes of this study the worst case condition as generated from the pump test data found in Appendix B was used in generating a water balance for the overall project. The test data shown in Appendix B were conducted to a 10-day pump test standard as well as Madera County and California Department of Health standards.

The distribution and water storage system will be designed and constructed to meet all health and fire code requirements. The table below gives the well numbers, total depth and sustainable yield for each well.

Table B.4 - Well Production Data

Well ID	Test Duration (days)	Yield @ End (gpm)	Total Depth (ft)	Casing Depth (ft)	Sustainable Yield (no Interfere)	Sustainable Yield (w/ Interfere)
Well #13	10.1	50	500	50	30	30
Well #2 $_{2004\ Retest}$	9.9	170	575	50	160	148
Well #1	14	245	400	50	100	100
Well #19	9.9	150	525	50	150	135
Well #15	9.9	239	505	50	200	190
Well #14$_{2006\ Retest}$	10	540	590	50	525	430
Well #17	13.9	100	848	50	95	90
Well #20	11	150	450	50	120	100
Well #B-3$_{2006\ Retest}$	13	110	575	50	70	50
Well #B-1 (B-7)$_{2006\ Retest}$	16	278	444	50	250	50
Well #B-2 (Corral)$_{2006\ Retest}$	11	175	427	50	175	50
TOTAL PRODUCTION						**1373**

(Note: Wells tested from 11/89 thru 6/90 at the end of a 4-year drought)

4.3 Water Assessment

The NFV-1 project shall comply with Senate Bill 610 (SB610) which states that water systems shall demonstrate the ability to deliver water for a 20-year duration. As a part of the EIR process, a recognized hydro-geologist has commented on the sustainable yield of the wells as well as the subsurface strata that contribute to their productivity. This report is entitled, 'Hydrogeologic Analysis NFV-1 Project Madera County, California' and is available for review at the County of Madera. In addition to this report, a Water Supply Assessment, fully complying with SB610 and SB221, has been prepared by Michael Brandman and Associates (MBA). Both reports conclude that existing wells are sufficient to provide potable water for the proposed land uses as specified in the NFV-1 Specific Plan.

4.3.1 Groundwater

Figure D-1 illustrates the drainage area for Cottonwood Creek. This area is approximately 40 sq. mi. in size and does not possess any significant development or pumping action at any location within this tributary area. Given the size of the watershed and the nature of the rock formations as illustrated through the numerous drillers logs from the existing on-site wells and as stated in the Melvin Simons report, sufficient aquifer storage and replenishment is available to the development.

4.4 Water Balance

A water balance analysis for this project has been conducted and is provided in Appendix B. This analysis has taken into account sewage generation rates and landscape application rates. A complete water balance, including the supplementation of surface water rights and groundwater recharge can be found in Section 8 of this Report. The balance is based on the conclusion that internal water uses (shower, toilet, laundry, etc.) are constant throughout the year while landscaping application rates rise and fall throughout the year.

The water balance was calculated in the following, progressive manner:

- *1) Determine interior water use.*
  A universally accepted value of 85 gpcd was provided in the water balance. This value is substantiated by numerous studies and sewer master plans and includes a value of 70 gpcd for internal use plus 15 gpcd for miscellaneous uses and system loss.

- *2) Determine total interior water by land use category*
  Table B.1 - From the Rio Mesa Area Plan for each landuse condition, determine population density. Multiply this density by interior water use to generate total interior water use per land use category.

- *3) Determine total water consumption*
  Table B.2 – From the infrastructure master plan, determine the total number of units for each land use category (total 2,966 units) and commercial land uses. Multiply units by interior water consumption to determine total interior water consumption for the project. From **Table B.6** and

Table B.7, add average landscape water usage rates for each lot size. Determine total annual average water consumption for each land use category.

- *4) Calculate water consumption for each month of the year*
  Table B.3 – Using evapotranspiration data, break down annual landscaping water consumption as a percentage. Multiply the respective percentages for each month of the year by the annual water consumption requirement.

- *5) Calculate water balance ratios*
  From the previous steps, determine annual average water consumption ratio to well production data provided in **Table B.4**. Calculate water ratios for average consumption as well as peak consumption. Conduct analysis.

4.4.1 Conclusions

Through the water balance analysis, it is determined that for the ultimate design of 2,996 units, total water consumption during the month of July will consume approximately 77% of the total well capacity. This value ensures that a 20% safety factor has been achieved and that no further well drilling is needed within the NFV-1 Specific Plan. Additionally, conservation measures, enforced by the local CSD through such measures as a dual water meter system, will further ensure that existing well capacity is sufficient. It is important to recognize that the NFV-1 project will differ from typical developments within the Central Valley as water use will be regulated and enforced with strict conservation practices written into the community CC&R's.

4.5 Water System Design

As stated previously, the NFV-1 Specific Plan will have approximately 11 wells serving approximately 19 pressure zones, the majority of which will be pumped zones. The system has been designed as a dual system with an inter-tie between the north and south portions of the property. Due to the depth to groundwater at drawdown for each of the wells and the need to store water for fire and emergency purposes, a "step-up" system is planned. This design consists of having each well pump into a smaller "at-grade" tank located in each of the north and south well fields. The "at-grade" tank functions as a booster facility, collecting flows from the well field and lifting the water to a higher tank. The large storage volume provided by the tanks for each sub-area is required due to the lack of adequate fire flow yield from the respective well fields. The "step-up" design with an "at-grade" tank has the added benefit of minimizing the elevation head required at each well, thereby reducing energy and initial capital costs. The "at-grade" tank will be equipped with a higher flow booster pump which will empty the tank at set volume intervals and fill the larger gravity tank. Another added benefit of this design is that the pumping of wells can be staggered throughout the day to allow for the recovery of wells, maintaining water quantity and quality.

4.5.1 Distribution Systems

Distribution systems shall be designed to deliver fire flows plus the maximum day demand. Project designers shall be required to submit an engineered model of the water system demonstrating compliance with supply standards under these conditions.

4.5.2 Water Source Requirements and Supply Facilities

Sizing of water supply facilities, tanks and distribution pumps shall be based on the peak demand of the water system. All storage facilities, booster stations and well treatment and supply facilities shall be constructed to County standards and equipped with back-up power generators sufficient to maintain operation in the event of a multi-hour power failure.

4.5.3 Fire Protection Flow Requirements

Fire protection flow requirements, hydrant spacing, etc. shall be in accordance with Uniform Fire Code requirements and shall be confirmed with the Fire Chief of Madera County. Sufficient backup power shall be provided at all relevant facilities. Hydraulic modeling shall size facilities to accommodate 20 psi at all points in the system during fire flow events. A fire flow of 1,000 gpm for residential land uses and 1,500 gpm for commercial land uses has been evaluated. A fire duration of 2 hours for both land uses was also evaluated for both tank and distribution system sizing.

4.5.4 Storage Requirements

The storage tanks specified on the master plan are sized to store a 2-hour fire flow of 1,500 gpm plus emergency storage of 75% of average day demand (ADD). With anticipated tank drawdown, this storage value equates to an approximate 12-hour power failure (including emergency power back-up). Adequate storage shall be made available during all phases of construction of the water system.

4.5.5 Water Treatment

Treatment requirements shall be established in coordination with the California Department of Health Services and Madera County Environmental Health Department. Presently, all wells (except one) have tested negative for any treatment requirements. One well is high in iron and manganese and will likely required blending or treatment. As the groundwater is good in quality, chlorination and/or fluoridation will be provided only at the direction of DHS.

4.5.6 Construction Standards

Construction of water mains and appurtenances, treatment, supply and storage facilities shall conform to applicable standard drawings and specifications of the County of Madera. In the absence of local standards, the applicable AWWA standard shall apply.

4.5.7 Pressure Zones

Pressure zones shall be provided where required. Pumped zones shall have redundant power back-up and two points of connection. Gravity zones shall be designed with two points of connection. Water pressure shall be regulated to maintain an optimum static pressure of between 40 psi and 70 psi. Pressures above 80 psi within a service area shall be reduced with an on-site pressure reducing valve. Pressures below 40 psi within a service area shall be boosted with an on-site booster pump. Pressure reducing/booster pumping stations shall be provided at the interface between pressure zones to allow to the flow of water across boundary lines.

Section 5
Sewer Collection and Treatment

5.1 Introduction

The purpose of this Section is to identify key wastewater collection, treatment and disposal issues and outline policies that will be implemented to provide adequate sewer service throughout the NFV-1 property. In addition to the discussion herein, design values for wastewater treatment facilities are included in Appendix C. As Table C.2 illustrates, a population of approximately 8,883 will generate nearly 240 MG of sewage per year (735 acre-feet).

5.2 System Design

Due to the undulating terrain of the project, the sewer system will be a combination of gravity, force main and pressure sewer systems. A sewer treatment plant has been sited on a 11.7 acre parcel adjacent to Cottonwood Creek along the west property line. This facility will be designed to accommodate an ultimate flow of 0.70 MGD with wastewater treated to a tertiary level. Reclaimed water will be used on common area landscaping as well as landscaping requirements for school grounds, local parks and landscaped use areas.

5.2.1 Gravity Lines

Gravity lines shall be installed in those areas of the property wherever possible. All relevant engineering design standards for gravity pipes shall apply. Velocity breaks shall be employed at manholes where the incoming flow exceeds 10 ft/s. Manholes may require additional concrete backing to serve as a thrust block where sewer flows are being diverted at an angle greater than 45-degrees.

5.2.2 Lift Stations

The IMP illustrates lift stations carrying sewage over crests and through a series of low points. Like water booster stations, lift stations will be designed with redundant backup systems. Lift stations will be designed with submersible pumps and a singular wet well. Flow settings will be dictated by the depth of water in the wet well. Lift stations and force mains will be installed in those areas of the property where gravity lines are not possible (usually localized depressions within a service area).

5.2.3 Pressure Sewers

In areas where the profile of local streets are undulated, or where streets are lower than nearby gravity fed systems, pressure sewers will be installed. Pressure sewers involve the installation of a grinder pump with a small storage tank at each residence. As the tank fills, the grinder pump emulsifies the effluent and pumps the sewage into a small diameter discharge pipe under pressure (not to exceed 60 psi). The discharge pipe is usually a 1½" diameter SDR 11 HDPE pipe that can be installed in narrow

trenches at nominal depths. Pressure sewers shall be installed in localized areas where a lift station system is not economically feasible. All pressure sewers will be designed to discharge into gravity lines.

5.2.4 Septic Tanks

The possibility exists, given the hilly terrain, that several designated estate home sites will require an on site septic system. In those situations, percolation will be proven to Madera County Health Department standards.

5.2.5 Peak Flows

Due to the overall size of the project and the time of concentration of the tributary area, including lift stations, a detention tank shall be installed at the wastewater treatment facility. This tank shall be sized to accommodate 12 hours of sewage flow (roughly 350,000 gals) and will be used to buffer flows into the treatment plant. Redundant storage shall be provided in the tank design as a dual chamber system, capable of isolation under warranted conditions.

5.2.6 Collection Systems

The collection system shall be designed to accommodate peak sewer flows as derived from the Fedorov peaking equation. Project designers shall be required to submit an engineered model of the sewer system demonstrating pipe sizing, sewer flows and overall operability prior to final map approval.

5.3 Report of Waste Discharge

A report of waste discharge was completed for the NFV-1 Specific Plan in the spring of 2005. This report begins the process of approval of the sewer treatment plant in order to procure a waste discharge permit from the Regional Water Quality Control Board. This report can be acquired by contacting the County of Madera Resource Management Agency.

5.4 Biosolid Disposal

Disposal of waste solids generated within the NFV-1 Wastewater Treatment Facilities shall be in accordance with existing USEPA 40 CFR 503 regulations and the State Water Resources Control Board Water Quality Order # 2000-01-DWQ General Waste Discharge Requirements For The Discharge of Biosolids to Land for use as a Soil Amendment in Agricultural, Silvicultural, Horticultural, And Land Reclamation Activities (General Order). All disposal operations will operate under the permitting approval of Regional Water Quality Control Board (RWQCB) and the State Department of Health Services (DHS). The developer shall prepare a Biosolid Disposal Plan for approval by RWQCB and DHS and shall address monitoring, testing, and content of the biosolid.

5.5 Treatment Plant Design (Interim and Permanent)

The wastewater treatment process shall meet the requirements of tertiary treatment consistent with Title 22 Requirements. In addition, treatment plants which produce effluent that will percolate shall implement nitrogen removal to Best Practical Treatment and Control levels (BPTC) to minimize degradation of area groundwater with excess nitrogen. Per discussions with the California Department of Health, clay lining of reclaimed water ponds will likely be required while nitrogen uptake will occur in landscaped use areas and public space landscaping. All wastewater treatment and disposal processes will be subject to review and approval by the RWQCB.

Section 6
Storm Drainage

6.1 Introduction

The purpose of this Section is to identify key site grading and storm drainage issues and outline policies that will be implemented to provide flood protection throughout the NFV-1 area. In addition to the discussion herein, design standards for site grading and storm drainage facilities are included. The objective of these standards is to facilitate the planning process for individual developments to ensure that accepted standards of protection are provided to all developments within the property. These standards are the first step in planning the actual drainage infrastructure for each of the planned drainage areas.

All grading operations shall be subject to County ordinances and adopted Codes, namely CBC and UBC. Grading design shall be coordinated with the storm drainage master planning to ensure that developments are graded in such a manner that building finish floors are not inundated in a 100-year flood event. Additionally, site specific development proposals shall include geotechnical investigations to address special grading concerns.

6.2 Water Quality

The western portion of the property drains to Cottonwood Creek while the eastern portion drains into Millerton Lake. In nearly all instances, on site detention basins are designed to first detain, then retain a portion of storm flows that fall on the property. The majority of detention facilities will be constructed in existing drainage channels. In every instance, engineering mechanisms will be constructed to minimize the impact of on-site storm flows to the natural drainage condition. Such mechanisms include weirs, rip-rap overflow channels, small dams, de-silting beds and botanical plantings which are capable of cleansing drainage water prior to entering Cottonwood Creek and Millerton Lake. Where required for commercial properties, oil-water separators will be installed to degrease run-off prior to entering a storm drain basin.

All basins shall be designed to capture potential sediment, floating debris and/or pollutants and shall utilize BMP's to help assure a high quality of storm runoff. Discharge to Cottonwood Creek and/or Millerton Lake will require an NPDES permit from the RWQCB, which shall be the project developer's responsibility.

6.3 Drainage Area Definition

Within the NFV-1 area, drainage zones have been designated and are based upon the natural terrain and drainage paths for the property (sheets 8 & 9 of the IMP). Storm runoff within the property generally drains in two directions; either to Cottonwood Creek or to Millerton Lake.

6.3.1 Cottonwood Creek

The area tributary to Cottonwood creek is approximately 40 sq. miles and continues as far north as Madera County Road 200 and Spring Valley School. Water wells that fall within the boundaries of the creek shall be designed at an elevation greater than the 100-year flood plain. Any and all check dams or weir structures constructed along Cottonwood Creek shall be designed to safely accommodate a 100-year flood. An engineering analysis determining the hydrologic characteristics of Cottonwood Creek shall be conducted prior to the design and placement of any structures within the flood plain of the creek.

6.4 Interim facilities

With the requirement of maintaining storm water quality, interim basins will not be allowed. Basins shall be designed and in place prior to and during construction in order to prevent silt from site construction entering either Cottonwood Creek or Millerton Lake.

6.5 Design Requirements

Each phase of the development shall prepare and submit hydrologic and hydraulic calculations for each component of the subject development. The calculations shall be prepared by a Registered Civil Engineer in the State of California. Calculations shall consider hydraulic grade lines within each drainage area. The grading plan for proposed developments shall provide the necessary freeboard for street design and finish floor elevations to protect against flooding from the 100-year storm event.

Storm drain infrastructure outside the rights-of-way on arterial or collector roadways shown on the IMP shall comply with the same design standards and requirements of this plan. Drainage shall be directed to the nearest storm drainage basin. The storm drainage collection system shall be designed for a 10-year storm event.

Master-planned facilities shall be engineered using hydraulic grade-line design to provide for gravity conveyance of the design flow to the designated retention/detention basin. Pumping of depressed areas will be allowed on an as-needed basis and shall comply with County of Madera standards.

6.5.1 Drainage Basin Design

Natural drainage zones draining to Millerton Lake and to Cottonwood Creek will be used for recharge, as well as for storm water detention. Basin design shall include an outfall structure or other suitable method for basin relief for any rainfall event greater than design capacity.

Basin design shall, to the greatest extent possible, retain storm flows for the purposes of groundwater recharge as stated in the Rio Mesa Area Plan. Depending on the location of the basin and the amount of area tributary to it, overflow structures shall be designed to accommodate the worst case storm condition whereby the basin is full and a 25-year storm event occurs. Preliminary sizing of storm drainage detention basins can be found in Appendix D. Table D.2 shows total surface area for each of the sub-basins plus and their expected runoff coefficients. Using a slight increase to the Fresno Metropolitan

Flood Control District basin sizing equation of 0.55CA (where C is the runoff coefficient and A is the surface area), each basin size was determined if retention were the only option (see "Required Volume"). While the ability to construct basins to satisfy the Required Volume calculation are possible, they would pose as both an environmental and visual detriment to the Specific Plan. Thus, basins shall be designed to retain storm flows to the extent of diminishing the peak hydrograph, but also in potentially releasing those flows to the natural drainage condition when basins are at capacity. These basins will also be designed to serve as habitat for native plant and animal species, thus promoting wetland functionality as mitigation to waters of the U.S.

Section 7
Reclaimed Water

7.1 Introduction

The reclaimed water master plan takes into consideration all sewer flows generated by the development. As the development will not be discharging effluent to another location, the goal of the reclaimed water balance is to ascertain the amount of landscaped use areas and storage ponds required at complete build-out of the development. According to the reclaimed water balance conducted for this report, approximately 767-acre-feet of water per year will be reclaimed at 100% development of the property. Approximately ½ of all recycled water (383 acre-feet) will be made available for groundwater recharge, pending approval of the CRWQCB, while the remainder will be used in landscape irrigation or lost to evaporation. More than 200 acres of landscaped use areas are provided within the project to be irrigated with recycled water. Rainy season storage requirements will be satisfied with nearly 16 acres of storage ponds (161-acre-feet) plus an additional 4 acres of seasonal pond (54-acre-feet). The overall goal for the reclaimed water balance and the development is to create a lush environment which can be specifically tailored to benefit and enhance local plant types and animal species.

7.2 Effluent Treatment

Sewage treated within the property is not anticipated to contain elevated levels of heavy metals, organic solvents, or similar agents which degrade the quality of treatment plant sludge. Preliminary design of tertiary treated water calls for a Membrane Bio Reactor system which can be modified to produce lower levels of nitrogen. The need to remove nitrogen will be dictated by the Department of Health with the understanding that landscaped use areas, capable of nitrogen uptake, are being created and reclaimed water ponds are being constructed to store effluent.

7.3 Effluent Disposal

The wastewater treatment facility shall be designed to produce tertiary treated effluent, capable of being applied to landscaped areas. The treatment facility shall create effluent in the most cost-effective manner while maintaining a high standard of treatment. By maintaining this approach, a valuable resource can be conserved and made available to benefit both man and nature as well as reduced the overall dependence on groundwater within the NFV-1 Specific Plan. Sheets 12 & 13 of the IMP illustrate the size and location for each landscaped use area and reclaimed water pond. Further detail on these facilities are shown in Appendix C. These facilities have been sized through a complete wastewater balance that takes into consideration rainfall data for Friant, CA as provided by the National Climate Data Center as well as pan evaporation data provided by CSU-Fresno. In addition, a crop uptake analysis has been conducted to determine the size of the landscaped use areas required for the uptake of tertiary treated water.

Land required for use areas of effluent will include public spaces such as parks, school sites, median islands, trail ways and other public rights-of-way landscaping. Appropriate easements shall be provided to insure the ability of the managing utility to utilize effluent storage areas as needed.

All facilities associated with the storage, pumping, application and disposal of reclaimed water shall comply with DHS Title 22 requirements for construction and operation. All pipelines shall maintain necessary clearance from potable water sources and shall be purple in color or shall be encased in a purple sock material. In addition, any irrigation system supplied with reclaimed water shall be designed and constructed with purple pipe and backflow prevention as needed.

Methods of effluent disposal other than reclamation on turf and landscaped areas within the NFV-1 Specific Plan area may include discharge or export to agricultural cropped areas in return for other water resources. For any such use, the developer shall obtain the appropriate Waste Discharge and Water Reclamation permits from RWQCB and DHS respectively.

7.3.1 Distribution System

Distribution systems for reclaimed water shall be designed to deliver irrigation water during peak demand periods. However, given the fact that all landscaped use areas will be owned, operated and maintained by the utility provider, the system shall be designed to allow for coordinated landscaped use area application. Project designers shall be required to submit an engineered model of the reclaimed water system demonstrating delivery and operability prior to final map.

Preliminary design calls for the reclaimed water ponds to serve as source points for nearby landscaped use areas. Reclaimed water from the treatment plant will pumped into Basin R6-Regulator, located at the treatment plant (sheet 12 of the IMP). This basin will be equipped with several outlet pumps and intake structures that will pump water directly into other ponds in the reclaimed water system. A similar design will be employed at each basin whereby water will be pumped from a pond and used for irrigation of landscaped use areas and common open space. This design is simple in that the system does not pump reclaimed water until it is required for irrigation, reducing energy consumption. In essence, the system is pressurized when telemetry data warrant pumping. The reclaimed water system will be monitored and operated in a fashion similar to the potable water system.

Appendix A
Land Use Summary

Table A.1 - Land Use Density (North Region)

Region	Market Description	Pad Size	Acreage	Du/Ac	Lot Count
North	North West Corner - 5 Acre (Gross)	20000			19
North	West Side Canyon Views - 1 Acre	20000			27
North	Ridge Top Estates - 1/3 Acre	20000			45
North	West Ridge Top Estates - 5 Acre (Gros:	20000			17
North	Lower Middle Estates - 1/2 Acre	20000			15
North	North East Ranch - 1 Acre	20000			86
North	Lower Oak Forest Ranch	6000			97
North	State Park Lake View Estates - 1/2 Acre	10000			10
North	Plan Area 1	5000	15.2	5	76
North	Plan Area 2	5000	14.2	5	71
North	Plan Area 3	6000	23.3	5	117
North	Plan Area 4	6000	10.3	5	52
North	Plan Area 5	6000	7.7	3.75	29
North	Mixed Use	6000	27.7	4	111
				Subtota	**772**

Table A.2 - Land Use Density (South Region)

Region	Market Description	Pad Size	Acreage	Du/Ac	Lot Count
South - Upper	Millerton Shores Estates - 1/2 Acre	20000			40
South - Upper	North West Ranch	16000			16
South - Upper	R-16000	16000			139
South - Upper	R-14000	14000			130
South - Upper	R-12000	12000			194
South - Upper	R-10000	10000			254
South - Upper	R-6000	6000			40
South - Upper	Plan Area 6	6000	12.6	6	76
South - Upper	Plan Area 7	6000	11.6	6	70
South - Upper	Plan Area 8	6000	26.4	6	158
South - Upper	Plan Area 9	6000	4.7	6	28
South - Lower	Plan Area 10	6000	14.3	6	86
South - Lower	Plan Area 11	6000	21.5	6	129
South - Lower	Plan Area 12	6000	20.2	6	121
South - Lower	Plan Area 13	3500	13.8	6	83
South - Lower	Plan Area 14	3500	25.6	6	154
South - Lower	Plan Area 15	3500	8.7	6	52
South - Lower	Plan Area 16	3500	12.6	6	76
South - Lower	Mixed Use	6000	47.8	5.5	263
South - Lower	High Density Residential	3500	5.0	17	85
South - Lower	Commercial/Office		61.7		
South - Lower	Public/Semi Public		42.0		
				Subtota	**2194**

Total Landuse Density	=	**2966**

Appendix B
Water Supply

INTERIOR WATER USAGE w/ LOSSES

Interior water use - Per Person per Day	70	gpcd (gallons/capita/day)
Exterior water use (non-landscaping)	15	gpcd (gallons/capita/day)
Total water use	85	

Table B.1 - Land Use Per Capita Water Usage

Designation	Land Use	Capita/DU	Water Use/Day
Commercial/Office	C/O	N/A	1600/ac
Low Density Residential	LDR	3.20	272
Medium Density Residential	MDR	2.90	247
Rural Reserve	RR	3.20	272
Very Low Density Residential	VLDR	3.20	272

(Note: The above information was obtained from the Rio Mesa Area Plan)

(Note: Mixed Use and HDR lands are lumped into MDR for water consumption calculations)

Table B.2 - Annual Water Consumption by Lot Size and Land Use

Planned Units (Lot Size)	No. of Units	Land Use Designation	Total Population	Interior Water Use per Unit	Total Usage per Day	Total Usage per Year	Landscape Use per Unit[1]	Annual Landscape	Total Usage per Year
20000	249	RR	797	272	67,728	24,720,720	191,317	47,637,995	72,358,715
16000	155	VLDR	496	272	42,160	15,388,400	144,714	22,430,721	37,819,121
14000	130	VLDR	416	272	35,360	12,906,400	132,450	17,218,553	30,124,953
12000	194	LDR	621	272	52,768	19,260,320	100,564	19,509,454	38,769,774
10000	264	LDR	845	272	71,808	26,209,920	85,847	22,663,736	48,873,656
6000	1377	MDR	3,993	247	339,431	123,892,133	31,886	43,907,309	123,892,133
5000	147	MDR	426	247	36,236	13,225,958	26,000	3,821,930	13,225,958
3500	450	MDR//HDR	1,305	247	110,925	40,487,625	15,453	6,953,646	40,487,625
Commercial		C/O			98,742	36,040,976		9,732,344	36,040,976
	2,966		8,899		855,157	312,132,451		129,460,459	441,592,910

(Note: All above units are in gallons)

[1] See Table B.7 - Calculated Irrigable Lands Water Consumption

[2] Landscaping on all MU,C/O, MDR, & HDR lands will use reclaimed water (non-potable) and are included in the reclaimed water estimate

Table B.3 - Estimated Monthly Water Use

Irrigation months	Eto[2]	% annum	Days per Month	Interior gals required	Landscaping gals required	Total gals required	Total Daily gpm	% of capacity[3]	Daily gpcpd
Jan	0.85	1.58%	31	26,509,879	2,049,570	28,559,449	640	46.60%	103.53
Feb	1.63	3.04%	28	23,944,407	3,930,351	27,874,758	691	50.35%	111.87
Mar	3.23	6.02%	31	26,509,879	7,788,364	34,298,244	768	55.96%	124.33
Apr	5.23	9.74%	30	25,654,722	12,610,881	38,265,603	886	64.51%	143.33
May	6.96	12.96%	31	26,509,879	16,782,358	43,292,237	970	70.63%	156.93
Jun	7.97	14.84%	30	25,654,722	19,217,729	44,872,451	1,039	75.65%	168.08
Jul	8.65	16.11%	31	26,509,879	20,857,384	47,367,264	1,061	77.28%	171.70
Aug	7.64	14.23%	31	26,509,879	18,422,014	44,931,893	1,007	73.31%	162.87
Sep	5.41	10.08%	30	25,654,722	13,044,907	38,699,629	896	65.25%	144.96
Oct	3.59	6.69%	31	26,509,879	8,656,417	35,166,297	788	57.38%	127.47
Nov	1.68	3.13%	30	25,654,722	4,050,914	29,705,636	688	50.08%	111.27
Dec	0.85	1.58%	31	26,509,879	2,049,570	28,559,449	640	46.60%	103.53
	53.69	100.00%		312,132,451	129,460,459	441,592,910		Average gpcpd =	135.82
[2] Dept. Water Resource Eto Values (CIMIS Site #80) Fresno State						**1355.2**	**acre-feet**		

[3] Capacity as derived from well production data (sustainable yield w/ interference)

Table B.4 - Well Production Data

Well ID	Test Duration (days)	Yield @ End (gpm)	Total Depth (ft)	Casing Depth (ft)	Sustainable Yield (no Interfere)	Sustainable Yield (w/ Interfere)
Well #13	10.1	50	500	50	30	30
Well #2 $_{2004\ Retest}$	9.9	170	575	50	160	148
Well #1	14	245	400	50	100	100
Well #19	9.9	150	525	50	150	135
Well #15	9.9	239	505	50	200	190
Well #14$_{2006\ Retest}$	10	540	590	50	525	430
Well #17	13.9	100	848	50	95	90
Well #20	11	150	450	50	120	100
Well #B-3$_{2006\ Retest}$	13	110	575	50	70	50
Well #B-1 (B-7)$_{2006\ Retest}$	16	278	444	50	250	50
Well #B-2 (Corral)$_{2006\ Retest}$	11	175	427	50	175	50
TOTAL PRODUCTION						**1373**

(Note: Wells tested from 11/89 thru 6/90 at the end of a 4-year drought)

Table B.5 - Water Balance Ratios

ANNUAL WATER USE	gallons	Acre-Ft	%
TOTAL WATER AVAILABLE PER DAY	1,977,120	6.07	100.0%
TOTAL WATER AVAILABLE PER YEAR	721,648,800	2,214.66	100.0%
TOTAL WATER USED (ANNUALLY)	441,592,910	1,355.20	61.2%
ADDITIONAL WATER AVAILABLE BUT NOT USED (ANNUALLY)	280,055,890	859.46	38.8%

AVERAGE DAILY WATER USE	gal/day	gpm	%
Interior use	855,157	592	43.1%
Irrigation use (average)	354,686	246	17.9%
	1,209,844	839	61.1%

MAXIMUM DAY WATER USE (by Month)	gal/day	gpm	%
Interior use	855,157	592	43.1%
Irrigation use (July)	672,819	467	34.0%
	1,527,976	1,059	77.2%

Irrigation Peaking Factor (July/Annual Avg.	**1.90**

Maximum Day - Surplus	314	
Desired Max. Day Safety Factor	20%	
Desired Max. Day Production (w/ Safety)	1271	gpm
Desired Additional Well Production	-102	gpm
Actual Max. Day Safety Factor	**23%**	

Conclusion: There is existing, tested well capacity established to satisfy a maximum day demand (+23%) for a 2,966 unit + commercial development.

Maximum Day + Fire Flow

Fire Flow Requirements (1200 gpm x 2 hrs.	144,000	gals
Fire Flow Storage (daily gpm)	100	gpm

Conclusion: The current Max. Day surplus is 314 gpm which is greater than the 100 gpm required for fire storage. Thus, there is sufficient well production available (+214 gpm) for both a Max. Day plus Fire Flow condition for 2,966 units + commercial development.

Table B.6 - Estimated Irrigable Land per Lot

Lot size		20,000	16,000	14,000	12,000	10,000	6000	5000	3500
House Size		5,000	4,300	4,000	3,800	3,200	2,500	2,200	1,800
Hard surface - garage		1,200	1,100	1,000	900	800	600	500	400
Hard surface - pool/other		1,000	900	800	600	600	300	240	0
Hard surface - driveway		1,800	1,200	1,000	900	700	500	400	320
Hard surface - walks patio, etc.		3,200	2,600	1,800	1,700	1,200	800	600	350
Total Hard Surface		12,200	10,100	8,600	7,900	6,500	4,700	3,940	2,870
Balance of lot for landscaping		7,800	5,900	5,400	4,100	3,500	1,300	1,060	630
Area for grass lawn	50.00%	3,900	2,950	2,700	2,050	1,750	650	530	315
Area for landscaping	50.00%	3,900	2,950	2,700	2,050	1,750	650	530	315
Coverage ratio (hard/irrigated)		61.00%	63.13%	61.43%	65.83%	65.00%	78.33%	78.80%	82.00%

Table B.7 - Calculated Irrigable Lands Water Consumption

Type of planting	Lot size	Annual Eto	PF	HA	Conv fac	Annual IE		Total irrig per unit/year
Lawn	20,000	53.69	0.8	3,900.00	0.62	95%	109,324	
Planting	20,000	53.69	0.6	3,900.00	0.62	95%	81,993	191,317
Lawn	16,000	53.69	0.8	2,950.00	0.62	95%	82,694	
Planting	16,000	53.69	0.6	2,950.00	0.62	95%	62,020	144,714
Lawn	14,000	53.69	0.8	2,700.00	0.62	95%	75,686	
Planting	14,000	53.69	0.6	2,700.00	0.62	95%	56,764	132,450
Lawn	12,000	53.69	0.8	2,050.00	0.62	95%	57,465	
Planting	12,000	53.69	0.6	2,050.00	0.62	95%	43,099	100,564
Lawn	10,000	53.69	0.8	1,750.00	0.62	95%	49,056	
Planting	10,000	53.69	0.6	1,750.00	0.62	95%	36,792	85,847
Lawn	6,000	53.69	0.8	650.00	0.62	95%	18,221	
Planting	6,000	53.69	0.6	650.00	0.62	95%	13,666	31,886
Lawn	5,000	53.69	0.8	530.00	0.62	95%	14,857	
Planting	5,000	53.69	0.6	530.00	0.62	95%	11,143	26,000
Lawn	3,500	53.69	0.8	315.00	0.62	95%	8,830	
Planting	3,500	53.69	0.6	315.00	0.62	95%	6,623	15,453

Legend

Estimated Irrigable Water Consumption

EWU = (Eto) (PF) (HA) (.62) / (IE)

where:

EWU = Estimated water use (gallons per year)

Eto = Evapotranspiration rate (DWR - Fresno State Station #80)

PF = Plant Factor (Crop Coefficient), typical values

HA = Hydrozone area (square feet of irrigated land)

(0.62)=Conversion factor (convets to gallons per square foot)

IE = Irrigation factor. (Effiency of irrigation system)

(A Guide to Estimating Irrigation Water Needs of Landscape Planting in California - Dept. of Water Resources - August 2000)

Appendix C
Sewage Generation and Reclaimed Water Supply

SEWER GENERATION

Interior water use - Per Person per Day	70	gpcd (gallons/capita/day)

Table C.1 - Land Use Per Capita Sewer Generation

Designation	Land Use	Capita/DU	Sewer Use/Day
Commercial/Office	C/O	N/A	1000/ac
High Density Residential	HDR	2.75	193
Low Density Residential	LDR	3.20	224
Medium Density Residential	MDR	2.90	203
Rural Residential	RR	3.20	224
Very Low Density Residential	VLDR	3.20	224

(Note: The above information was obtained from the Rio Mesa Area Plan)

Table C.2 - Annual Sewer Generation by Lot Size and Land Use

Planned Units (Lot Size)	No. of Units	Land Use Designation	Population	Interior Water Use per Unit	Total Sewage per Day	Total Sewage per Year
20000	249	RR	797	224	55,776	20,358,240
16000	155	VLDR	496	224	34,720	12,672,800
14000	130	VLDR	416	224	29,120	10,628,800
12000	194	LDR	621	224	43,456	15,861,440
10000	264	LDR	845	224	59,136	21,584,640
6000	1377	MDR	3,993	203	279,531	102,028,815
5000	147	MDR	426	203	29,841	10,891,965
3500	450	MDR	1,305	203	91,350	33,342,750
Commercial		COM			61,714	22,525,610
	2,966		8,899		684,644	249,895,060

(Note: All above units are in gallons)

Avg. Daily WWTP Outflow	**684,644**	**gal/day**		
Avg. Daily WWTP Outflow	**2.10**	**A-F/day**	**766.90**	**A-F/year**
Desired Pond Increase	**1.50**	**inch/day**		
Desired Ponding Area	**16.81**	**Acres**		

Table C.3 - Monthly Average Reclaimed Water Balance

Irrigation months	Days per Month	Reclaimed water (gals)	Reclaimed water (Ac-Ft)	Avg. Evap.[1] (in.)	Avg. Rainfall [2] (in.)	Net Evap. (in./mo)	Net Evap. (in./day)
Jan	31	21,223,964	65	1.23	2.63	1.40	0.05
Feb	28	19,170,032	59	2.08	2.37	0.29	0.01
Mar	31	21,223,964	65	3.84	2.35	-1.49	-0.05
Apr	30	20,539,320	63	6.01	1.21	-4.80	-0.16
May	31	21,223,964	65	8.71	0.44	-8.27	-0.27
Jun	30	20,539,320	63	10.31	0.08	-10.23	-0.34
Jul	31	21,223,964	65	10.88	0.01	-10.87	-0.35
Aug	31	21,223,964	65	9.63	0.01	-9.62	-0.31
Sep	30	20,539,320	63	6.99	0.22	-6.77	-0.23
Oct	31	21,223,964	65	4.43	0.65	-3.78	-0.12
Nov	30	20,539,320	63	2.23	1.48	-0.75	-0.02
Dec	31	21,223,964	65	1.17	2.07	0.90	0.03
		249,895,060	767	67.51	13.53	-53.98	

[1] *Average monthly evaporation from Class 'A' pan in irrigated pasture environments at CSU-Fresno from 1968-2003*

[2] *National Climate Data Center - Statistical Average Rainfall Data for Friant, CA (1900 - 1989)*

Table C.4 - Reclaimed Water Pond Seasonal Balance

Reclaimed Pond ID	Area (sf)	Surface Area (ac)	Avg. Depth (ft)	Avg. Vol. (a-f)	Summer Depth Vol. (6 ft)	Winter Depth Vol. (15 ft)
R1	78,812	1.81	10	18.09	10.86	27.14
R2	123,991	2.85	10	28.46	17.08	42.70
R3	48,141	1.11	10	11.05	6.63	16.58
R4	196,230	4.50	10	45.05	27.03	67.57
R5	40,033	0.92	10	9.19	5.51	13.79
R6 - Regulator	46,035	1.06	10	10.57	6.34	15.85
R7	15,854	0.36	10	3.64	2.18	5.46
R8	20,633	0.47	10	4.74	2.84	7.11
R9	19,199	0.44	10	4.41	2.64	6.61
R10	24,989	0.57	10	5.74	3.44	8.61
R11	15,147	0.35	10	3.48	2.09	5.22
R12	12,596	0.29	10	2.89	1.74	4.34
R13	21,500	0.49	10	4.94	2.96	7.40
R14	25,008	0.57	10	5.74	3.44	8.61
R15	13,103	0.30	10	3.01	1.80	4.51
R16	45,633	1.05	10	10.48	6.29	15.71
		16.10		160.99	96.59	241.48

Seasonal Storage (Included as Storm Pond in Specific Plan - Table 2.1)

Reclaimed Pond ID	Area (sf)	Area (ac)	Avg. Depth (ft)	Volume (a-f)
Seasonal Storage				
RX	155,316	3.57	15	53.48

3-Month Seasonal Storage	**189.10**	(Dec. + Jan. + Feb)
Winter-Summer Surcharge	**144.89**	(5-feet of surcharge storage/pond)
Winter Storage Pond	**53.48**	(Pond RX Storage)
Net Remainder	**-9.28**	Acre-Feet

Table C.5 - Use Area Application

Spray Field ID	Acres	Annual Eto	Plant Factor PF	HA	Conv fac	Annual IE	Total gals per year	
UA1	4.38	53.69	0.9	190,918.20	0.62	90%	6,355,247	
UA2	9.07	53.69	0.9	395,011.30	0.62	90%	13,149,057	
UA3	2.55	53.69	0.9	111,025.90	0.62	90%	3,695,808	
UA4	11.60	53.69	0.9	505,264.70	0.62	90%	16,819,150	
UA5	1.30	53.69	0.9	56,459.02	0.62	90%	1,879,397	
UA6	6.27	53.69	0.9	273,098.30	0.62	90%	9,090,842	
UA7	5.01	53.69	0.9	218,030.00	0.62	90%	7,257,739	
UA8	7.96	53.69	0.9	346,649.80	0.62	90%	11,539,209	
UA9	3.09	53.69	0.9	134,712.90	0.62	90%	4,484,296	
UA10	5.45	53.69	0.9	237,490.00	0.62	90%	7,905,520	
UA11	15.24	53.69	0.9	663,665.20	0.62	90%	22,091,954	
UA12	2.49	53.69	0.9	108,579.50	0.62	90%	3,614,373	
UA13	8.95	53.69	0.9	389,832.00	0.62	90%	12,976,650	
UA14	0.93	53.69	0.9	40,650.23	0.62	90%	1,353,157	
UA15	1.05	53.69	0.9	45,623.32	0.62	90%	1,518,700	
UA16	1.44	53.69	0.9	62,746.02	0.62	90%	2,088,677	
UA17	0.59	53.69	0.9	25,895.29	0.62	90%	861,997	
UA18	4.43	53.69	0.9	192,805.60	0.62	90%	6,418,074	
UA19	2.31	53.69	0.9	100,476.50	0.62	90%	3,344,642	
UA20	3.25	53.69	0.9	141,529.10	0.62	90%	4,711,192	
UA21	7.05	53.69	0.9	307,266.00	0.62	90%	10,228,209	
UA22	0.87	53.69	0.9	37,853.86	0.62	90%	1,260,072	
UA23	2.85	53.69	0.9	124,170.90	0.62	90%	4,133,376	
UA24	18.87	53.69	0.9	821,827.90	0.62	90%	27,356,843	
UA25	3.84	53.69	0.9	167,082.90	0.62	90%	5,561,822	
UA26	7.00	53.69	0.9	304,910.40	0.62	90%	10,149,796	
UA27	1.24	53.69	0.9	54,019.91	0.62	90%	1,798,204	
UA28	2.87	53.69	0.9	124,941.40	0.62	90%	4,159,024	
UA29	3.85	53.69	0.9	167,825.80	0.62	90%	5,586,552	
UA30	0.88	53.69	0.9	38,295.06	0.62	90%	1,274,758	
UA31	2.68	53.69	0.9	116,565.40	0.62	90%	3,880,206	
UA32	1.90	53.69	0.9	82,733.53	0.62	90%	2,754,017	
UA33	0.91	53.69	0.9	39,752.74	0.62	90%	1,323,281	
UA34	2.00	53.69	0.9	87,245.30	0.62	90%	2,904,204	
UA35	0.94	53.69	0.9	40,894.23	0.62	90%	1,361,279	
UA36	2.11	53.69	0.9	91,899.59	0.62	90%	3,059,135	
UA-Misc.(MDR, HDR, C/O, MU)	44.42	53.69	0.9	1,935,100.22	0.62	90%	64,415,229	64,415,229
	197.24						286,006,442	

Total Sewage Generation	**249,895,060**	**gal/year**	(2900+ units)	**767**	**acre-feet/yr.**
Total Pond Evap./Year	**23,597,120**	**gal/year**	(18+ acres of ponds)	**72**	**acre-feet/yr.**
Total Use Area Uptake	**286,006,442**	**gal/year**	(200 acres of use areas)	**878**	**acre-feet/yr.**
Net Remainder	**-59,708,502**	**gal/year**		**-183**	**acre-feet/yr.**

Note: No percolation from reclaimed ponds has been considered

Table C.6 - Average Monthly Evaporation

Month	Average	STD DEV	STD Error
	Evaporation in Inches		
January	1.23	0.26	0.04
February	2.08	0.41	0.07
March	3.84	0.72	0.12
April	6.01	0.83	0.14
May	8.71	1.06	0.18
June	10.31	0.95	0.16
July	10.88	0.69	0.12
August	9.63	0.69	0.12
September	6.99	0.56	0.09
October	4.43	0.46	0.08
November	2.23	0.41	0.07
December	1.17	0.28	0.05
Total	67.51	3.06	0.52

[1] AVERAGE MONTHLY EVAPORATION FROM CLASS 'A' PAN IN IRRIGATED PASTURE ENVIRONMENTS AT CALIFORNIA STATE UNIVERSTIY AT FRESNO FROM 1968-2003

Appendix D
Hydrology and Storm Water Design

Table D.1 - Rational Formula Coefficients

Land Use	Density	Runoff Coefficient
Rural Residential	0-1 DU/AC	0.25
Very Low Density	1-2 DU/ AC	0.30
Low Density	3-5 DU/AC	0.40
Medium Density	5-8 DU/AC	0.55
High Density	9+ DU/AC	0.65
Commercial		.75 (1)
Light Industrial		.75(1)
Parks & Open Space		0.15
Schools		0.20
Roads & Parking		0.90

RETENTION BASIN SIZING EQUATION

$V = 0.55^{1} * C * A$

C = Coefficient

A = Drainage Area

Table D.2 - Storm Drainage Facility Design

Basin ID	Acres	Basin Size (ac)	Runoff Coefficient[2]	Required Volume (a-f)[3]	Required Depth (ft)	Actual (Nominal) Depth (ft)	Actual Volume (a-f)	Retention Detention
0	37	1.25	0.70	14.43	11.58	9	11.22	Detention
1	179	5.15	0.70	69.08	13.41	9	46.35	Detention
2	73	2.07	0.70	28.24	13.67	9	18.60	Detention
3	53	1.54	0.65	19.04	12.37	9	13.86	Detention
4	45	1.19	0.65	16.05	13.53	9	10.68	Detention
5	90	2.41	0.70	34.72	14.40	9	21.71	Detention
6	*12*	*0.53*	*0.55*	*3.73*	*6.99*	9	*4.80*	*Retention*
7	85	2.81	0.55	25.57	9.10	9	25.30	Detention
8	24	0.62	0.60	7.83	12.61	9	5.59	Detention
9	296	2.85	0.40	65.05	22.80	9	25.68	Detention
10	19	0.65	0.70	7.39	11.40	9	5.84	Detention
11	117	1.09	0.50	32.04	29.27	9	9.85	Detention
12	20	0.31	0.60	6.65	21.56	9	2.78	Detention
13	44	0.63	0.50	12.04	19.18	9	5.65	Detention
14	74	0.57	0.40	16.28	28.65	9	5.11	Detention
15	142	0.79	0.45	35.05	44.63	9	7.07	Detention
16	*8*	*0.38*	*0.45*	*2.01*	*5.25*	9	*3.45*	*Retention*
17	57	0.50	0.60	18.77	37.29	9	4.53	Detention
18	44	0.60	0.55	13.25	22.04	9	5.41	Detention
19	90	0.93	0.40	19.91	21.45	9	8.35	Detention
20	154	0.45	0.35	29.59	65.76	9	4.05	Detention
21	54	0.47	0.60	17.78	38.19	9	4.19	Detention
22	*13*	*0.34*	*0.45*	*3.11*	*9.27*	9	*3.02*	Detention
23	260	1.09	0.45	64.44	59.18	9	9.80	Detention
		27.96		**547.62**		**Total Storage =**	**251.65**	

[1] *Runoff equation is 10% higher design standard than Fresno Metropolitan Flood Control District standard of 0.5.*

[2] *Runoff coefficients determined via visual inspection of tributary areas and from Table D.1*

[3] *Required as meaning that if only Retention (no detention) is provided*

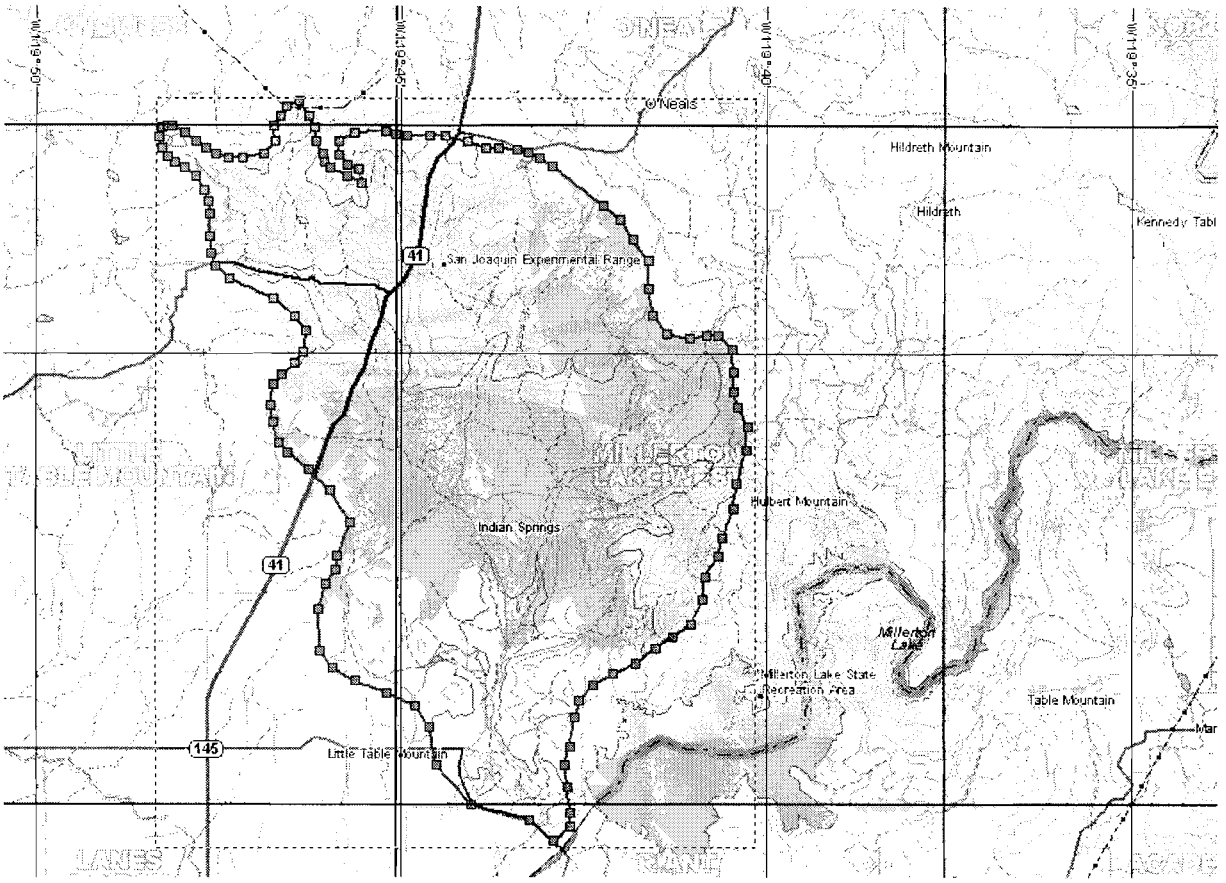

Figure D-1

Cottonwood Creek - Tributary Area
Area = 40 sq. mi.